Sanitary Sewer Service Study Final Report

City of North Liberty, Iowa

April 2011

414 South 17th Street, Suite 107
Ames, Iowa 50010
Phone: 515-233-0000/800-433-3469 Fax: 515-233-0103
Web: www.foxeng.com E-Mail: info@foxeng.com

CERTIFICATION

Sanitary Sewer Service Study
Final Report

North Liberty, Iowa

JOHN M. GADE LICENSED 16015 IOWA PROFESSIONAL ENGINEER	I hereby certify that this engineering document was prepared by me or under my direct personal supervision and that I am a duly licensed Professional Engineer under the laws of the State of Iowa. 4/14/2011 JOHN M. GADE P.E. DATE License number 16015 My license renewal date is December 31, 2011. Pages or sheets covered by this seal: ALL

TABLE OF CONTENTS

1 EXECUTIVE SUMMARY
- 1.1 Fox Recommendations

2 INTRODUCTION
- 2.1 Background
- 2.2 Purpose and Scope
- 2.3 General Description of Facilities

3 BASIS OF EVALUATION AND DESIGN
- 3.1 Standards
- 3.2 Assumptions
- 3.3 Peak Flow Determination

4 EXISTING COLLECTION SYSTEM
- 4.1 Trunk Sewer
- 4.2 Lift Stations and Force Mains

5 GROWTH CORRIDORS

6 PROPOSED COLLECTION SYSTEM IMPROVEMENTS
- 6.1 Existing Trunk Sewer
  - 6.1.1 Short-Term Improvements
  - 6.1.2 Longer-Term Improvements
- 6.2 Lift Stations
  - 6.2.1 Existing
  - 6.2.2 Proposed Jasper Avenue Lift Station
- 6.3 Growth Corridors
  - 6.3.1 Southeast Growth Corridor
  - 6.3.2 Western Growth Corridor
  - 6.3.3 Northern Growth Corridor

7 WASTEWATER TREATMENT PLANT
- 7.1 Facility Separation Requirements
- 7.2 Phase 1 & 2 Improvements
- 7.3 Phase 3 & 4 Improvements: Option 1 – Expand Existing WWTP
  - 7.3.1 Phase 3 Improvements for Option 1
  - 7.3.2 Phase 4 Improvements for Option 1
- 7.4 Phase 3 & 4 Improvements: Option 2 – Construct a New, Satellite Treatment Plan
  - 7.4.1 Phase 3 Improvements for Option 2
  - 7.4.2 Phase 4 Improvements for Option 2

8 OPINION OF PROBABLE COST AND SCHEDULE
- 8.1 Cost Opinions
  - 8.1.1 Existing Trunk Sewer Improvements
  - 8.1.2 Growth Corridors
  - 8.1.3 Wastewater Treatment Facility Improvements
- 8.2 Schedule

9 RECOMMENDATIONS
- 9.1 Existing Trunk Sewers
- 9.2 Growth Corridors
- 9.2 Wastewater Treatment Plant
- 9.3 Summary of Short-Term Recommendations

TABLES

1 Peak Design Flows
2 Lift Station Data
3 Existing WWTP Expansion
4 Existing Trunk Sewer Improvements – Parallel Sewer Costs
5 Jasper Ave Lift Station Costs
6 Growth Corridor Costs
7 WWTP Capital Costs
8 WWTP Operation and Maintenance Costs
9 WWTP Option Comparison

FIGURES

1 Existing Development
2 Existing Residential Development
3 Sanitary Sewer System - East
4 Sanitary Sewer System – West
5 Potential Ultimate Service Area
6 Southeast Growth Corridor
7 Western Growth Corridor – Existing WWTP
8 Western Growth Corridor – New WWTP
9 Western Growth Corridor – Probable Force Main Route
10 Northern Growth Corridor

APPENDICES

A Existing Trunk Sewer – Capacity Evaluation Spreadsheets
B Existing Trunk Sewer – Improvements
C Southeast Growth Corridor – Cost Spreadsheets and Figures
D Western Growth Corridor – Cost Spreadsheets and Figures
E Northern Growth Corridor – Cost Spreadsheets and Figures
F Treatment Plant – Costs and Figures
G Model Outputs
Existing Sewers and Flows
Existing Flows and Short-Term Improvements – Existing Sewers, Parallel Sewers
Ultimate Flows and All Improvements – Existing Sewers, Parallel Sewers

1 EXECUTIVE SUMMARY

North Liberty is currently one of the most rapidly growing communities in Iowa. During periods of rapid growth, it is important to remain proactive in the planning process to avoid delays in providing sanitary sewer service to new developments. Preparing for growth, instead of reacting to it, is essential to promoting the continued expansion of the city.

Goals of the Study:

Goal One was to determine the appropriate peak hour sanitary sewer flows for evaluation of the collection system. Using the highest flow observed at the wastewater treatment plant (WWTP) and Iowa Department of Natural Resources (IDNR) guidelines the following was determined:

Condition	Design Flow (gpad)*
Existing Development	4,100
Future Residential Development	4,000
Future Non-Residential Development	5,000

* gpad = gallons per acre per day

Goal Two was to evaluate the ability of the existing trunk sewers to convey peak hour flows. A computer model of all trunk sewers 12-inches and larger was developed. This model identified constraints in the collection system based on current flows and projected ultimate build-out flows. In addition, the model can be utilized to analyze intermediate scenarios as the possibility for development arises in various areas of the collection system.

The model identified two stretches of trunk sewer that are approaching their capacity and should be planned for relief as budget allows. As growth continues in the City of North Liberty, more sewer segments will reach their capacity. The flow capacity of each trunk segment is highlighted in the analysis and the costs of the improvements are discussed in this report.

Goal Three was to develop a proposed trunk sewer alignment and associated costs for each of the three identified growth corridors. The growth corridors are located to the southeast, west, and north of the existing city limits. This analysis yielded an estimated cost per acre to provide sanitary sewer service, which can be utilized to establish tapping fees and to determine the feasibility of development in particular areas.

Goal Four was to evaluate the ultimate build-out for the wastewater treatment plant (WWTP). The study concluded that the existing WWTP site is too small to handle future expansion needs. The report concluded that there is adequate land for expansion needs adjacent to the east of the WWTP. Alternatively, constructing a second treatment plant in the growth corridor west of the existing city is a feasible long-term option. This report outlines the economic comparisons of a one-plant and two-plant scheme, but the decision will ultimately require consideration of other factors, such as land availability and public perception.

1.1 FOX RECOMMENDATIONS:

1. Utilize this report as a resource for making development decisions.

2. Sanitary sewer districts and/or tapping fees could be developed based the opinion of costs for each growth area.

3. Design and construct two segments of parallel relief sewer as soon as the budget allows.

4. Update the WWTP facility plan and plan for construction of Phase 2 improvements.

5. Pursue land acquisition to allow expansion of existing WWTP and utilize ordinances to protect the buildable area around the WWTP.

2 INTRODUCTION

2.1 Background

Due to North Liberty's location between Iowa City and Cedar Rapids, the community has experienced extremely rapid growth. This rapid growth has placed a burden on the sanitary sewer infrastructure. The existing sanitary sewer system serves a majority of the city by gravity. Several small lift stations serve individual residential developments and discharge into the gravity trunk main systems.

The 2000 Census placed the population at 5,367, and city staff estimate the population at 13,500 in 2010. The staff estimate is confirmed by the 2010 Census, which returned a population of 13,374. The growth rate from 2000 to 2010 was 149%, or 9.6% annually. This is an extremely high growth rate, especially when compared to the growth rate for Iowa as a whole. In the previous ten years, Iowa's population grew a total of 4.1%, or 0.40% per year. As is discussed in the section on the wastewater treatment plant (WWTP), North Liberty's growth rate has been even higher than was predicted in previous planning studies.

2.2 Purpose and Scope

The purpose of this study is to serve as a guide to city officials for the continued growth of North Liberty. The City has historically had very little, if any, problems with sewer capacity. This report is intended to help allow the continued growth of the community without overwhelming the sewer system. It is also intended to provide guidance as to the cost of providing sanitary sewer service to various properties, both inside and outside current city limits.

The scope of this study includes analysis of the existing wastewater collection and treatment facilities, proposed improvements to the collection and treatment facilities, and opinions of cost for necessary improvements and new facilities to handle anticipated growth and development.

Information for this report was obtained from a number of sources including past project files, the City engineer; and City planning, wastewater, water, and street departments.

2.3 General Description of Facilities

The North Liberty wastewater collection system consists of gravity sewer mains from 8 to 24 inches in diameter, as well as several lift stations (eight currently operational) and force mains which discharge into the gravity sewer system. The wastewater treatment plant (WWTP) is located in the southeastern corner of North Liberty. The plant consists of preliminary treatment, a membrane bioreactor (MBR) process, and solids handling facilities.

3 BASIS OF EVALUATION AND DESIGN

3.1 Standards

The wastewater treatment plant evaluation will follow the guidelines set forth by the Iowa Department of Natural Resources Design Standards for Wastewater Treatment Facilities. In this study, the design standards will be mainly used in determining the area available for treatment plant expansion without encroaching upon the 1,000-foot radius around existing habitable buildings.

The wastewater collection system evaluation will follow the guidelines set forth by the Iowa Department of Natural Resources (IDNR) Design Standards for Wastewater Treatment Facilities, Chapter 12, Iowa Standards for Sewer Systems. A preliminary draft of amendments to this chapter was proposed in 2009. Some of these amendments are considered in this study. For example, new sewers were sized to carry the design flow at 2/3 full for sewers 15 inches or less in diameter and 3/4 full for 18 inches or larger. The current requirement is 3/4 full for 15 inch and smaller and full pipe diameter for 18 inch and larger. North Liberty's design standards also call for the more stringent criteria. Lift stations and force mains were evaluated based on Chapter 13 of the Design Standards.

3.2 Assumptions

Several assumptions were necessary in order to complete this study. While some assumptions are noted throughout this report, the following assumptions made were made at the start of the analysis:

1. Sewer basins were defined based on property lines and natural drainage divides.
2. Evaluation of the ultimate build-out conditions is sufficient. Intermediate conditions are not of concern for this study.
3. Growth areas were limited to the boundaries provided by the City.
4. Existing sewers at more than 120 percent of design capacity were considered to be in need of additional capacity.
5. Defined elevations on provided sewer maps are more reliable than defined slopes.

3.3 Peak Flow Determination

The 2009 revisions to the Chapter 12 IDNR Standards for Sewer Systems specifically call for sewers to be designed for the peak hour domestic flow and additional maximum wastewater flow. Therefore, the highest flow observed over an hour is reasonable to use for evaluation. The highest average flow maintained for an hour at the WWTP was approximately 6,145 gallons per minute (gpm) or 8.8 million gallons per day (MGD), observed on June 18, 2010.

Since no reliable information was available to determine what portion of this flow is due to residential, commercial, and industrial contributors, the flow was assumed to be distributed evenly over the developed area of North Liberty. As shown in Figure 1, 2,145 acres of North Liberty is currently developed. Therefore the average flow per developed acre is 4,100 gallons per day (gpad). IDNR standards specify a design flow of 5,000 gallons per acre for commercial land and 10,000 gpad for industrial land. For single-family residential land, IDNR recommends a peak design flow of about 4,000 gpad. Therefore, an overall peak flow of 4,100 gpad is reasonable.

There are two aspects to growth of any city: infill and expansion. Infill is the development of empty lots within existing subdivisions, and this includes subdividing larger parcels to promote development. The second aspect of growth is expansion beyond the current boundaries of the city. In the case of North Liberty, city staff have identified several potential areas for expansion in the future.

In order to size sanitary sewers for areas that are not currently developed, an ultimate flow must be assumed for those areas. An overall peak design flow of 5,000 gpad was assumed for non-residential (commercial and industrial) land. Although IDNR Standards recommend 5,000 gpad for commercial land and 10,000 gpad for industrial, any future industries in North Liberty are not expected to be major water users. Instead, warehousing and light industrial usage are anticipated. Given that warehousing uses an extremely small amount of water, the 5,000 gpad design flow is appropriate. The existing average flow of 4,100 gpad also supports the lower industrial flow rate.

For residential areas, average flows are typically around 100 gallons per capita per day (gpcd), and peak flows are generally around 400 gpcd. IDNR standards include an allowance of 10 people per acre for single family dwellings, as well as 15 and 30 people, respectively, for medium and high density multi-family housing.

The current density of developed residential areas in North Liberty was examined. As shown in Figure 2, the average density is **9.6 people per acre**. Therefore, a peak design flow of 4,000 gpad was utilized for residential areas.

Table 1 summarizes the design flows. The flows for future development are used both for infill of the existing city and for expansion outside the current city limits.

Table 1 – Peak Design Flows

Condition	Design Flow (gpad)
Existing Development	4,100
Future Residential Development	4,000
Future Non-Residential Development	5,000

One 9-hole golf course exists within city limits. This area (74 acres) was assumed to have zero ultimate flow. Most small parks and public lands were treated as residential land. However, one large proposed park area in the Northern Growth Corridor was assigned an ultimate peak flow of 720 gpad. The residential area within the Progress Park basin was assigned a higher flow of 12,000 gpad, since the only residential zoning in the basin is RM-12 (maximum density 12 units/acre).

4 EXISTING COLLECTION SYSTEM

Figures 3 and 4 show the existing collection system in North Liberty. The current system consists of a large gravity basin and eight lift stations that discharge into the gravity system.

4.1 Trunk Sewer

In order to evaluate the existing system, manhole numbers were assigned by starting with MH 0 at the treatment plant and numbering up the main trunk. Manholes on major branch sewers were also numbered, by adding a second number after the number of the main trunk manhole to which the sewer discharges. For example, the branch that outlets to MH 8 has manholes numbered from 8-1 near the trunk to 8-35 at the upstream end.

In order to identify current and future deficiencies, the existing trunk sewer was evaluated on the basis of pipe flowing full, with two flow conditions: current estimated peak flow and the projected ultimate peak flow. The tabular results of this analysis, including additional scenarios, can be seen in Appendix A. These results are based on spreadsheet calculations, but a sewer model program was used to further analyze deficient sections. The resulting hydraulic grade line under different modeling scenarios can be found in Appendix G. Any sewer segment that was found to be at greater than 120% of capacity was flagged to be improved. Under current conditions, there were three sewer sections that were found to be above design capacity. For the ultimate condition, several additional sewer sections were found to be above their design capacity. These sewer sections and proposed improvements are discussed further in Section 6. To alleviate overloaded conditions at ultimate peak flow, where possible, existing lift stations were assumed to be redirected from the existing trunk sewer to the proposed sewer in the growth corridors.

The detailed analysis included the trunk main and three branches. The influent sewers for each lift station were also checked for their ability to convey the ultimate flow. All were found to be adequate.

4.2 Lift Stations and Force Mains

There are eight lift stations in North Liberty, and an additional one planned for the Penn Meadows development. Important characteristics of the lift stations are summarized in Table 2, below. All lift stations are submersible-type lift stations, with duplex pumps situated in a wet well manhole. The wet wells all appear to be large enough to accommodate larger pumps and increased capacity as growth in their service area occurs. As can be seen in Table 2, five of the lift stations will require larger pumps to meet the ultimate design capacity. However, it is anticipated that several of these lift stations will be removed from service as growth occurs. See Section 6 for further details.

Force mains were evaluated based on IDNR design standards recommended maximum velocity of 8 feet per second (fps). Assuming that ultimate development occurs in each basin and the existing force mains are utilized, Table 2 indicates the maximum anticipated velocity in each force main. The force mains for four lift stations will be at or above the recommended maximum velocity. Exceeding the maximum recommended velocity does not necessarily require replacement of the force main, but may result in increased pumping costs due to higher friction losses in the pipe. While a detailed life cycle cost comparison is beyond the scope of this study, it is unlikely that savings from reduced energy consumption would justify replacement of the force mains. This would be the case for Fox Valley and Cedar Springs lift stations.

As growth occurs in the north and west corridors, it is likely that the Progress Park and West Penn lift stations will be removed from service, so replacement of these pumps and force mains is unlikely. Replacement of the Aspen Ridge Lift Station is included in the Northern Growth Corridor because the basin for this lift station is extended into the growth corridor.

Table 2 – Lift Station Data

Lift Station	Current Pump Capacity (gpm)	Required Pump Capacity at Ultimate Design (gpm)	Wet Well Diameter (Feet)	Force Main Diameter (Inches)	Ultimate Velocity (fps)
Fox Valley	335	1280	8	8	8.15
West Lake	700	1760	10	12	4.98
West Penn	300	300	8	8	1.87
Progress Park	600	2200	10	10[1]	8.94[2]
Remington Court	550	170	8	6	1.96
230th Street	350	180	10	6	2.00
Aspen Ridge	200	550	8	6	6.28
Cedar Springs	900	1250	10	8	7.98

[1] Exact size of this force main was not available. Based on connected force mains, a size of 10 inches was assumed.

[2] The West Penn and Progress Park force mains come together in a tee. The combined force main is 10 inches in diameter. Based on ultimate development of both lift station basins, the maximum velocity in the combined force main is 10.14 fps.

An additional lift station, called Penn Meadows, is under construction at the extension of E Jefferson Street to the current city limits. Construction will be completed as part of the development of the approximately 10 acre parcel which will form the majority of its service area. More discussion of this lift station is included in the section on the southeast growth corridor later in this report.

There are also some private pumping facilities in North Liberty, which are indicated on Figure 3 and discharge to the Cedar Springs lift station via City-owned gravity sewer. Several private grinder pumps and a private force main serve an area just north of the city limits. The very northeastern extent of North Liberty is also serviced by seven private lift stations. While the lift stations and force mains are the responsibility of the homeowners, each lift station is fed by gravity sewer, for which the City is responsible. No sizing information on the pumps or force mains was available for this report. All of these pumping facilities are expected to remain in service and the responsibility of the homeowners. For this report, the ultimate flow from these areas was included in calculations for the Cedar Springs lift station and downstream gravity sewers.

5 GROWTH CORRIDORS

City staff indicated approximate areas that are likely candidates for development in the coming years. These areas are referred to as the Southeast, Western, and Northern Growth Corridors. All three areas are illustrated on Figure 5. The growth corridors include some areas that are currently served by existing lift stations. These lift stations are proposed for removal from service as the growth corridors develop. Proposed improvements for these corridors are described in Section 6 of this report.

6 PROPOSED COLLECTION SYSTEM IMPROVEMENTS

6.1 Existing Trunk Sewer

When existing sewers are inadequate and surcharging, the typically recommended improvement is to install parallel sewers. Where parallel sewers are possible, they are sized to accommodate the peak flow while keeping both lines below the DNR-specified depth of 67% or 75% full depending on pipe diameter. Specific sizes and costs of the parallel sewer pipes are included later in this report. See Figures 3 and 4 for the locations of these improvements.

6.1.1 Short-Term Improvements

There are two segments 1of sewer that appear to be approaching their capacity. As growth continues, both in the natural gravity basin and the lift station basins, flows in these sewers will begin to exceed capacity. If these issues are not addressed, sewage could backup into basements or overflow out the top of manholes.

The first segment is the 24-inch trunk sewer from the treatment plant (MH 0), upstream to northwest of the intersection of Front Street and Windsor Road (MH 10). This segment of sewer carries virtually all the wastewater flow for the entire City. It is likely that this sewer was not sized to account for all the lift station basins which now discharge into the gravity sewer system. The sewer is currently at 101 to 126 percent of its capacity. For ultimate build-out, the sewer will be at 197 to 272 percent of its capacity. In order to eliminate these deficiencies, it is recommended that a parallel sewer be installed as soon as the City budget allows. This parallel sewer should be 33 inches in diameter between the treatment plant and MH 8 and 27 inches in diameter between MH 8 and MH 10. The parallel sewer should be interconnected with the existing trunk at MH 8 to allow for division of flow.

The second deficient sewer segment is the 12-inch sewer which reaches the 24-inch trunk sewer at Cherry Street about a block east of Highway 965 (MH 40 to 40-4). This branch sewer services a large area, and City staff has observed surcharging in MH 40-4. An 18-inch, a 10-inch and an 8-inch sewer all flow into a 12-inch sewer at MH 40-4. The sewer is currently at 165 percent of its capacity. For ultimate build-out, the sewer will be at 165 percent of its capacity. Although new development will cause in increase in flow to this sewer, lift station flow is assumed to be diverted to the growth corridors, causing an offsetting decrease in flow. In order to eliminate the deficiencies, it is recommended that a 15-inch parallel sewer be installed as soon as the City budget allows.

6.1.2 Longer-Term Improvements

As infill growth continues in the City of North Liberty, more sewer segments will reach their capacity. Specific segments have been identified and are described below. The same potential problems as discussed above could eventually occur in these areas. The sewer model should be updated periodically as development occurs, and these sewers should be monitored and considered for improvements as they approach capacity. The timing of these improvements will depend on continued growth in the drainage basins.

Three additional segments of the 24-inch trunk will become inadequate under ultimate flow conditions. From MH 11 to MH 13, the sewer will be at 149 percent of its capacity. A 21-inch parallel sewer is recommended. From MH 13 to 21, the sewer will be at 122 to 125 percent of capacity. An 18-inch parallel sewer is recommended from MH 13 to 21. The sewer will be at 121 percent of its capacity from MH 23 to MH 25, therefore an 18-inch parallel sewer is recommended for this segment.

Two segments of the branch 8 sewer will also become inadequate under ultimate flow conditions. From MH 8 to MH 8-2, the sewer will be at 946 percent of its capacity. A 30-inch parallel sewer is recommended for this segment. The sewer will be at 373 to 404 percent of its capacity from MH 8-2 to MH 8-9, therefore a 21-inch parallel sewer is recommended for this segment.

6.2 Lift Stations

6.2.1 Existing

There are currently eight lift stations operated by the City. As discussed earlier in this report, no force main upgrades are anticipated outside of the growth corridors. The requirements for upgrades in the growth corridor are detailed later in this report.

Pumps typically have a 7-10 year useful life. Unless growth occurs rapidly within a particular basin, all pumps should have adequate capacity for the duration of their service life. As pumps are replaced, increased capacity should be considered based on historical and anticipated development in the basin. Since intermediately-sized pumps may be installed over many years in a particular lift station, costs for these pump upgrades were not included in this report.

6.2.2 Proposed Jasper Avenue Lift Station

One new lift station is proposed (other than those in the growth corridors) to handle infill development in existing developed areas. This lift station would serve substantial areas both within and outside of the current city limits. Since it is located on Japser Ave SW (one-quarter mile west of I-380 and one-half mile north of Forevegreen Road), this lift station is identified as the Japser Avenue Lift Station for purposes of this report. This area can be seen on Figure 4, which shows a possible route for the 10-inch force main, discharging to the 24-inch sewer near S Jones Boulevard and Clubhouse Road.

Although it was not analyzed in detail for this report, it would be possible to abandon the existing West Lake Lift Station and route this flow to the new Jasper Avenue Lift Station by gravity. This would require that some of the sewer proposed in the Jasper Avenue basin be enlarged and installed deeper. It would also require a larger lift station and force main. Before proceeding with design of sewers and pumping facilities in the Japser Avenue basin, a detailed economic analysis of eliminating the West Lake Lift Station should be undertaken.

6.3 Growth Corridors

As described earlier in this report, there are three proposed growth corridors. See Figure 5 for the locations of the Southeast, Western, and Northern Growth Corridors.

In order to properly serve these growth areas, expansion and improvements to the collection system will be required, including gravity sewers, lift stations, and force mains. Two types of lift stations are proposed. The first is a simple duplex submersible lift station, similar to the existing lift stations in North Liberty. This will be used for flows up to 2100 gpm. For flows in excess of 2,100 gpm, larger and more sophisticated lift stations were proposed. These lift stations would include screening ahead of the pumps and include trench-type wet wells to enable easier cleaning of the wet wells than traditional submersible lift stations.

6.3.1 Southeast Growth Corridor

The Southeast Growth Corridor consists of 1,275 acres of mostly undeveloped land (see Figure 6). City staff indicated that the Southeast Growth Corridor is currently the subject of development interest from multiple parties. Therefore, it is anticipated that this area will develop sooner than the other areas. For planning purposes, the Southeast Growth Corridor was divided into three basins, numbered 1, 2 and 3 from south to north. Multiple options were developed for providing sewer service to each basin of this corridor. Appendix C includes spreadsheets and figures detailing the various options and phases for serving this growth corridor. Geography poses a significant challenge to serving this area.

Basin 1 was further divided into three phases, Phases 1, 2 and 3 from southwest to northeast across Basin 1. Due to a ridge across what would otherwise be the obvious path for the trunk sewer, three options were evaluated for Phase 1 in Basin 1. The first option goes directly through the ridge, taking the shortest route feasible, but resulting in very deep sewers (nearly 50 feet). The second option takes a longer route but avoids excessive depths. However, this option poses an environmental concern, running along a creek. The third option utilizes force mains to get over the ridge. Based on the cost analysis presented in Section 8 and Appendix C, the first option is the most cost effective, and is recommended for implementation. The second and third phases for Basin 1 consist of additional gravity sewer to reach the rest of the basin (see Appendix C).

Two options were also evaluated for serving Basin 2 (see Appendix C). The first includes a lift station and force mains routed to the existing treatment plant. The second option includes much shorter force mains, discharging into the gravity sewer in Basin 1. While option 2 is the most cost effective, development may play a role in determining which option is desirable. If development occurs in Basin 2 before Basin 1, it may be necessary to proceed with option 1 to most cost-effectively serve the immediate need of Basin 2 without having to install the sewers in Basin 1. This need must be balanced with the need to control the total cost of serving the entire growth corridor.

Finally, Basin 3 is a small basin which is proposed to utilize a lift station and force main to pump into Basin 2 (See Appendix C). This basin encompasses the Penn Meadows Lift Station, which is currently being built by the developer of the land it serves. However, the Penn Meadows lift station only serves a small area of this Basin 3, and would eventually need to be abandoned in favor of a larger lift station that could serve the entire area. Depending on the timing of development, it may be feasible for the developer to finance part of the construction of the Basin 3 lift station and force main, rather than constructing a lift station with a relatively small service area which discharges to the existing trunk sewer.

6.3.2 Western Growth Corridor

The Western Growth Corridor consists of 2,665 acres of mostly undeveloped land west of I-380, including the existing industrial area at the intersection of I-380 and Penn (see Figures 7 and 8). Like the Southeast Growth Corridor, the Western Growth Corridor was divided into basins (1 and 2), with sewer service provided as development occurs. See Appendix D for figures showing the various phases. The first phase eliminates the West Penn Lift Station and services an area north and west of the existing I-380 industrial park with a new lift station. Phase 2 provides service to the area north of the business park and adjacent to the interstate, and requires an additional lift station. It should be noted that this area could be serviced by gravity to the Northern Growth Corridor, depending on the timing of development (see discussion below). Both Phase 1 and Phase 2 utilize the existing West Penn force main. Phase 3 expands this service area substantially (811 acres) to the south and west and requires a new lift station and force main to the existing treatment plant. The lift station from Phase 1 would then be removed.

The remaining phases (4 and 5) for developing this corridor are dependent on the decision to build, operate, and maintain a second treatment plant. This is further discussed in Section 7 of this report. Phase 4 involves providing service to Basin 2, and would also accept substantial flow from the Northern Growth Corridor. Phase 5 provides service to the western portion of Basin 1, and would also connect to the sewers for Phases 1 and 3, eliminating the lift station built in phase 3.

In order to provide service for the ultimate area in the Western Growth Corridor, one option is to expand the existing treatment plant to serve the ultimate population of North Liberty. In this scenario, Phase 4 would include a large lift station and new force main to the existing plant site. A preliminary route for this force main is shown in Figure 9. The gravity sewers constructed in Phase 5 would discharge to the new lift station.

The other option is to build a new wastewater treatment plant (WWTP) in the northwest area of the Western Growth Corridor to service that area. Under that scenario, Phase 4 would consist of gravity sewer to serve the northern portion of the corridor and accept the Northern Growth Corridor flow, and construction of a new lift station and short force main to convey the flow to the new WWTP. The new treatment plant would need to be built as part of Phase 4. Phase 5 would then consist of gravity sewer to convey the remainder of the flow from the corridor to the new WWTP. This will enable the removal of the lift station built in Phase 3.

Figures 7 and 8 show the ultimate build-out improvements recommended for both options. Cost evaluations of these two options are presented in Section 8 and Appendix D. Based on the cost analysis, the option which involves constructing a new WWTP is more cost effective. See Section 8 for further discussion.

6.3.3 Northern Growth Corridor

The Northern Growth Corridor consists of 1,622 acres of mostly undeveloped land. For evaluation purposes, this area was divided into four basins (see Figure 10). Four phases were identified for servicing this area as development occurs (see Appendix E). Phase 1 in the Northern Growth Corridor includes a new lift station and force main to the existing treatment plant. This phase allows the removal of the existing Progress Park and Remington Court Lift Stations, as well as the lift station that would be constructed in Phase 2 of the Western Growth Corridor. It also serves a portion of Basin 1 in the northern corridor. Phase 2 extends service to the rest of Basin 1 and allows for the removal of the 230th Street Lift Station, with the construction of a new lift station and force main to the existing treatment plant. This new force main would parallel the force main installed in Phase 1. This lift station and force main can be removed from service when the Western Growth Corridor nears ultimate development. Phase 3 provides service to Basin 2 with a new lift station and force main discharging to Basin 1.

Phase 4 extends the service area of the Aspen Ridge Lift Station. It includes the removal and replacement of this pump station and the installation of a new force main which discharges to the existing trunk sewer at the same point as the existing force main. The existing force main would be abandoned.

Figure 10 shows the ultimate build-out improvements for the Northern Growth Corridor. Basin 2 is pumped into Basin 1. Once the Western Growth Corridor is developed, the lift station constructed in Phase 2 above can be removed, and Basin 1 and 4 will flow by gravity to the Western Growth Corridor. Basin 3 is pumped into the main trunk gravity basin by the upgraded Aspen Ridge Lift Station.

7 WASTEWATER TREATMENT PLANT

When planning for future development and community growth, the wastewater treatment plant (WWTP) must be evaluated for its ability to process the additional flow and organic load created by development. The city of North Liberty resides on a ridge that extends from the south to the northeastern area of the city. This ridge creates a natural divide for gravity sanitary sewer service between the eastern and western parts of the projected drainage basin. The majority of wastewater from the developed areas of the city and the southeast growth corridor will flow by gravity to the existing WWTP site. Wastewater to the west of the ridge would be collected in the northwest corner of the Western Growth Corridor. One of the main goals of this study was to provide insight into and compare the following treatment options:

1. **Expand the existing WWTP to handle the ultimate development:** This would involve constructing a large pumping station in the Western Growth Corridor and a new force main to transmit the wastewater to the existing plant. The existing WWTP would then be expanded at its current location to handle the increased flows.
2. **Construct a second WWTP:** This new plant would be located in the Western Growth Corridor to serve the north and western areas of the city. It would eliminate the need to construct a large pump station and force main to pump wastewater from the northwest area of the City to the southeast. This alternative requires the existing WWTP continue to be utilized, so the City would be required to operate and maintain two WWTPs.

7.1 Facility Separation Requirements

When WWTP facilities are constructed, separation distance requirements set forth by Iowa DNR must be followed. The separation distances can affect the location of a new WWTP, and the ability to expand an existing plant. The existing WWTP site is located in the southeastern corner of the city and is bordered by schools to the west and residences to the north and south. Iowa DNR Design Standards for Wastewater Treatment Facilities prohibit the construction of wastewater treatment plant processes within 1,000-feet of a habitable structure without obtaining waivers from the property owner. If a habitable building is already within 1,000 feet of the existing treatment plant, new wastewater treatment processes may only be built 10% closer to said structure. Based on existing structures, it was determined that the existing WWTP is able to expand approximately 570-feet to the east of the existing east property line before encroaching upon a 1,000-foot radius of a habitable building. Expansion to the northeast is also possible, but the natural relief of the land sets at a higher elevation than the remainder of the treatment plant. In order to expand in these directions, the city must purchase the property immediately east of their current parcel to ensure that space is available for the facility to expand with increasing capacity needs. See Appendix F for the area available for expansion that meets IDNR guidelines.

In Appendix F, it can be seen that the existing WWTP site is not large enough to build additional facilities to meet the ultimate growth of the City. However, the agricultural land immediately east of the WWTP site would be sufficient to support the plant build-out through Phase 4 improvements if the single WWTP option is selected.

7.2 Phase 1 & 2 Improvements

In 2006, FOX Engineering conducted a facility plan of the existing wastewater treatment plant. The report evaluated the capacity of individual unit processes within the plant and recommended a phased improvement schedule. The facility plan anticipated that the Phase 1 improvements, completed in 2009, would support a population of approximately 14,000 people (projected for the year 2015). The proposed Phase 2 improvements are designed for a population of 22,000 (projected for the year 2025). From the 2010 census, the current population is 13,374, which is nearing the design population of the Phase 1 improvements. However, based on plant flow data for the past several years, the average flow per capita is less than what was utilized for design. In addition, the plant has been operated at higher flows than what it was designed for. Therefore, the plant should be capable of handling a greater population. However, since planning for and constructing a plant expansion can take several years, planning for the Phase 2 expansion should be considered.

As described in the facility plan, the Phase 2 improvements will include an expansion of the existing MBR process by converting the existing sludge storage tank into aeration basins. A new sludge storage tank will be constructed along with a solids handling facility for sludge dewatering prior to land application. The existing Equalization (EQ) Basin pumping station will receive upsized pumps to increase pumping capacity to handle a higher peak flow event. And the raw influent screen will be replaced with a screen capable of passing 7 MGD of flow to match the design flow of the raw influent pumps.

7.3 Phase 3 & 4 Improvements: Option 1 – Expand Existing WWTP

7.3.1 Phase 3 Improvements for Option 1

Option 1 for the WWTP improvements involves constructing a 20.4 MGD pump station in the northwest area of the Western Growth Corridor to transmit wastewater approximately 7 miles from the northern and western growth corridors back to the existing WWTP site for treatment. The existing WWTP would need to undergo significant expansion at the current site to enable the treatment of the additional flow from those areas. First, a new preliminary treatment and raw pumping building would be constructed with a capacity of approximately 12 MGD. A second 20 MGD equalization (EQ) basin pumping station would be installed to pump excess wastewater flow up to a new 10 million gallon (MG) EQ basin located east of the existing basin. In addition, a new MBR building would be constructed immediately adjacent to the existing MBR building and the existing aerobic digesters converted into aeration basins. These MBR improvements would increase the MBR treatment capacity to 7.9 MGD. To replace the existing aerobic digesters, new aerobic digesters would be constructed adjacent to the solids handling facilities constructed in Phase 2 along with a second sludge storage tank.

After the Phase 3 improvements are complete, the WWTP would be rated to serve a population of approximately 44,000 people. The PHWW treatment capacity of the Phase 3 WWTP would be approximately 42.77 MGD.

7.3.2 Phase 4 Improvements for Option 1

Once the Phase 3 improvements were made, there would likely be considerable time before the Phase 4 improvements would be necessary. As growth and development continues, the Phase 4 improvements would be necessary to increase the MBR treatment capacity and the sludge storage volume. A new 4.0 MGD MBR facility and aeration basins would be added as a separate building located east of the existing MBR facilities. A third sludge storage tank would be constructed east of the two previous sludge storage tanks.

After the Phase 4 improvements are complete, the WWTP would be rated to serve a population of approximately 78,000 people. The PHWW treatment capacity of the Phase 4 WWTP would be approximately 46.77 MGD.

As growth and development continues, expansion of the plant beyond Phase 1 will be necessary. As shown in Table 3, each phase of improvements increases the plant's minimum design capacity (AWW, or average wet weather, flow). Peak Hour Wet Weather (PHWW) flow was assumed to have a peaking factor of four times the AWW flow rate. Influent flow rates greater than the treatment plant design capacity would be pumped to the equalization (EQ) basin(s) for temporary storage until the influent flow subsides.

Table 3 – Option 1 - Existing WWTP Expansion

Phase	Population (Est.)	AWW Flow[1] (MGD)	MWW Flow[2] (MGD)	PHWW Flow (MGD)
1	14,000	2.53	4.39	10.1
2	22,000	3.95	6.85	15.8
3	44,000	7.90	13.70	31.6
4	78,000	11.69	20.27	46.77

[1] The AWW flow = 0.25 x PHWW and is used as the minimum design flow for the WWTP.
[2] The MWW flow was calculated as 1.734 x AWW from historical data analysis.

7.4 Phase 3 & 4 Improvements: Option 2 – Construct a New, Satellite Treatment Plant

7.4.1 Phase 3 Improvements for Option 2

Option 2 for the WWTP improvements involves the construction of a second WWTP in the northwest corner of the western growth corridor to treat the waste there instead of pumping it across the city to the existing WWTP. The idea of adding a second wastewater treatment plant came about during the initial discussions during this study. The issue was whether it would be more cost effective to pump the wastewater across the city versus building a new treatment plant where the pumping station would have otherwise been located.

Under the Phase 3 improvements, the existing WWTP would undergo a less-extensive capacity improvement project than outlined in Option 1. The existing WWTP site would require a new 10 MGD EQ basin pumping station, a new 5.0 MG EQ basin located east of the existing basin, a new MBR facility with 2.65 MGD of treatment capacity, aerobic digesters and additional sludge storage. These improvements would bring the PHWW capacity of the existing treatment facility to 26.41 MGD, which is adequate to serve the existing area of city development as well as the southeast growth corridor.

It is anticipated that the new wastewater treatment plant would be built as a 5.0 MGD Sequencing Batch Reactor (SBR) with flow equalization, preliminary treatment, sludge digestion, and sludge storage. It is likely that the new WWTP would discharge to the Iowa River directly north of the proposed city limits, but the permit limits are difficult to predict due to regulatory changes and permitting requirements. By the time a new WWTP is necessary, there will likely be nutrient limits on the WWTP effluent along with advanced treatment technologies to better achieve those limits. In addition to the new WWTP, an 11 MGD collection system pumping station would be constructed to lift the flow from the North Growth Corridor and the north basin of the Western Growth Corridor up to the new treatment plant. Due to the topography of the land, flowing by gravity to the new WWTP site would be difficult without installing a deep wet well structure at the treatment plant. The PHWW capacity of this plant would be 20.36 MGD, which is adequate to serve the Northern and Western Growth Corridors.

7.4.2 Phase 4 Improvements for Option 2

No Phase 4 improvements are necessary once the Phase 3 improvements have been completed. However, it may be cost effective and beneficial to construct the new plant in phases rather than all at once. This should be evaluated in more detail in the future.

8 OPINION OF PROBABLE COST & SCHEDULE

8.1 Cost Opinions

Opinions of probable cost were developed based on the necessary improvements identified in this report. The cost opinions are summarized in this section. Details, including development of these costs, are included in the Appendices B through F. Cost opinions were developed for three basic categories:

1. Improvements to the existing trunk sewer system (including the addition of a new lift station at Jasper Avenue).
2. Improvements for serving each of the growth corridors. These costs include phased construction and are allocated on a per acres basis to guide in establishing tapping fees.
3. Improvements for the wastewater treatment facilities.

8.1.1 Existing Trunk Sewer Improvements

Table 4 summarizes the cost opinions for addressing the needs of the existing trunk sewers. The cost were developed assuming installation of parallel sewers next to the existing, in lieu of replacement. The cost opinions include sewer construction and associated costs, such as mobilization, clearing and grubbing, seeding, erosion control, field tile repair, traffic control, and engineering. See Appendix B for details.

In Table 4, several of the items are highlighted. The highlighted items are those that were identified in Section 6 as short term improvements. These improvements should be completed as soon as the funding can be made available. The branch sewer from manhole 40 to manhole 40-4 along Cherry Street has already been included in the City's current Capital Improvement Plan ($230,000 in fiscal year 2013).

Table 4 – Existing Trunk Sewer Improvements (Parallel Sewer Costs)

Segment (MH)	Size	Opinion of Probable Cost
Trunk Sewer		
0 to 8	33	$922,100
8 to 10	27	$162,400
11 to 13	21	$124,000
13 to 21	18	$528,800
23 to 25	18	$80,200
Branch Sewer		
8 to 8-2	30	$174,900
8-2 to 8-9	21	$799,800
40 to 40-4	15	$269,300
Total Opinion of Probable Cost		**$3,061,500**
Opinion of Probable Cost for Short Term Needs		**$1,353,800**

In addition to the existing trunk sewer improvements, a new lift station will be required to allow full development in the existing service area. The Jasper Avenue Lift Station cost opinion includes construction of gravity sewers, a lift station, and a force main to service that area. The costs included are similar to those described for the growth corridors. The cost opinions are summarized in Table 5 below. Detail, including cost per acre, can be found in Appendix B.

Table 5 – Jasper Avenue Lift Station Costs

Component	Opinion of Probable Cost
Gravity Sewer	$896,700
Lift Station and Force Main	$2,046,100
Total	**$2,942,800**

8.1.2 Growth Corridors

Proposed improvements to provide sanitary sewer service for the three growth corridors are detailed earlier in this report. Detailed opinions of probable cost are presented in Appendices C through E. Cost opinions include gravity sewers, lift stations, and force mains. It should be noted that cost opinions for the gravity sewers generally only include those sewers with a diameter of 12 inches or more. Smaller sewers are expected to be installed by the developers of individual properties. Table 6 presents a summary costs for each growth corridor.

Table 6 – Growth Corridor Costs

Growth Corridor	Opinion of Probable Cost	Cost per Acre
Southeast Growth Corridor		
Basin 1, Phase 1[1,2]	$1,566,100	$4,079
Basin 1, Phase 2	$ 678,200	
Basin 1, Phase 3	$ 447,600	
Basin 2	$1,587,400	$3,575
Basin 3	$1,148,900	$6,603
Total SE Growth Corridor	**$5,428,200**	**$4,247**
Western Growth Corridor – Pump to Existing WWTP		
Basin 1, Phase 1 [3]	$1,081,100	$6,691 [3]
Phase 2 [4]	$ 600,400	$7,234
Basin 1, Phase 3 [3]	$8,151,900	$6,691 [3]
Basin 2, Phase 4 [3]	$23,080,400	$31,574
Basin 1, Phase 5 [3]	$3,064,500	$6,691 [3]
Total W. Growth Corridor -- Pump to Existing WWTP	**$35,978,300**	**$13,566**
Western Growth Corridor – New WWTP		
Basin 1, Phase 1	$1,081,100	$5,850 [3]
Phase 2 [4]	$ 600,400	$7,234
Basin 1, Phase 3 [3]	$8,151,900	$5,850 [3]
Basin 2, Phase 4 [3]	$8,036,700	$10,994
Basin 1, Phase 5 [3]	$1,384,300	$5,850 [3]
Total Western Growth Corridor -- New WWTP	**$19,254,400**	**$7,324**
Northern Growth Corridor – New WWTP		
Basin 1, Phase 1	$7,229,300	$15,460
Basin 1, Phase 2	$8,664,000	
Basin 2, Phase 3	$1,419,800	$4,625
Basin 3, Phase 4	$1,124,800	$6,3691
Total N. Growth Corridor	**$18,837,900**	**$12,202**

[1] *Low-cost option; cost for other options are presented in Appendix C*
[2] *Excludes costs ($243,100) for upsizing sewers to service basin 2; this is include in basin 2 costs.*
[3] *Overall average cost per acre for basin 1*
[4] *Consists of temporary service to part of Northern Growth Corridor*

Costs are also broken down per acre for each growth corridor and each basin within the growth corridors. These costs are intended to aid in the determination of tapping fees. Since tapping fees represent a substantial expense to the developer and could affect the feasibility of certain developments, care should be taken to ensure that such fees are set in a fair and equitable manner. This data can be found in Appendices C through E.

Easement costs for the primary trunk through basin 1 of the Southeast Growth Corridor have also been developed. Total easement cost is estimated to be $75,125. Cost details and the location of these easements can be found in Appendix C.

8.1.3 Wastewater Treatment Facility Improvements

As growth and development occur, expansion of the existing treatment facility, or construction of new facilities, will become necessary. Wastewater treatment plant upgrades are described earlier in this report. Opinions of probable cost for these improvement options have been developed, and are summarized below in Table 7. In addition, Table 8 presents a summary of operation and maintenance costs, for comparison purposes, for the different options. Personnel costs are not included, since the possibility of additional staff to operate a larger plant or multiple plants is unknown. Detailed cost opinions can be found in Appendix F.

Table 7 – WWTP Capital Costs

Phase	Opinion of Probable Cost
Expand Existing Wastewater Treatment Plant	
Phase 2	$8,950,000
Phase 3	$17,500,000
Phase 4	$9,500,000
Total – Expand Existing WWTP	**$35,950,000**
New Wastewater Treatment Plant	
Phase 2	$8,950,000
Phase 3	$24,600,000
Total – New WWTP	**$33,550,000**

Table 8 – WWTP Operation and Maintenance Costs

Phase	Annual Cost
Expand Existing Wastewater Treatment Plant	
Phase 2	$113,250
Phase 3	$324,500
Phase 4	$237,500
Total – Expand Existing WWTP	**$675,250**
New Wastewater Treatment Plant	
Phase 2	$113,250
Phase 3	$393,500
Total – New WWTP	**$506,750**

Tables 7 and 8 above compare the treatment plant costs alone. Table 9 includes costs for the collection system improvements proposed in the Western Growth Corridor, offering a more complete comparison of the two options considered.

As can be seen in Tables 7 through 9, it appears to be more cost effective to build and operate two wastewater treatment plants to serve the ultimate development area. As table 9 shows, the primary cost difference is due to the large lift station and force main required to pump to the existing treatment plant. Some factors that may influence the decision of whether or not to utilized two plants include future environmental regulations, the rate at which development occurs, and energy costs. Since the final decision will not need to be made until significant development has occurred in the Western Growth Corridor, additional evaluations should be conducted in the future, when the need is closer at hand. Regardless of the option that is chosen, steps should be taken to ensure that the existing wastewater treatment plant can be expanded at its current location. These step should include purchasing additional land, enacting zoning to prevent encroachment on the required separation distances for future expansion, or obtaining waivers from property owners.

Table 9 – WWTP Option Comparison

	Capital Cost (Millions)	Annual Operation and Maintenance Cost
Expand Existing Wastewater Treatment Plant		
WWTP Improvements	$35.95	$675,250
Major Lift Station and Force Main	$19.91	$171,000
Western Growth Corridor Collection System [1]	$16.07	
Total	**$71.93**	**$846,250**
New Wastewater Treatment Plant		
WWTP Improvements	$33.55	$506,750
Major Lift Station and Force Main	$5.34	$30,000
Western Growth Corridor Collection System [1]	$13.91	
Total	**$52.80**	**$536,750**

[1] Includes all gravity sewers and all lift stations and force mains except the large lift station in basin 2, which is listed separately.

8.2 Schedule

The overall schedule of improvements will be highly dependent on the rate and location of continued growth in North Liberty. Some areas of the existing collection system were identified as needing short-term improvements. These items should be addressed as soon as budget allows. Also, planning for implementing Phase 2 of the WWTP expansion should be started in the near future. In addition, steps should be taken to preserve the separation distances and the ability to expand the existing wastewater treatment plant at its current site as soon as possible. Other improvements can occur as growth and development dictate. See the recommendations section for specific actions to be undertaken.

9 RECOMMENDATIONS

9.1 Existing Trunk Sewers

1. Two areas of the existing trunk sewer have been identified as needing improvements in the short-term. These improvements should be designed and constructed as soon as they can reasonably worked into the City budget.

2. As continued growth occurs, the model utilized for this report should be updated to identify areas approaching capacity before they become issues.

3. Flow monitoring should be considered to more precisely distribute flows throughout the existing collection system, providing for more realistic modeling. This monitoring may consist of placing several meters throughout the system and analyzing the data collected.

4. City staff should visually check selected manholes during and following major rain events, in order to investigate possible surcharging.

5. As segments of sewer approach capacity, parallel sewers should be designed and constructed. The model used in this report should be updated to reflect the actual sewers constructed.

9.2 Growth Corridors

1. The analysis presented in this report should be utilized for making decisions for expanding the sanitary sewer system.

2. Whererever possible, development in these growth corridors should be planned based on the most cost effective options for serving these areas.

3. Proposed developments should be contingent on compatibility with the planned sewer system in the growth corridors.

4. Tapping fees should be based on the costs to serve different areas. The City must decide what level of breakdown is preferred.

9.3 Wastewater Treatment Plant

1. Update the facility plan to reflect current population and flow trends.

2. Pursue land acquisition for the expansion of the existing plant based on the updated facility plan.

3. Pursue annexation and zoning restrictions to prevent new construction from reducing the buildable area for the WWTP expansion. This may entail requiring a waiver of the 1000-foot rule in order to obtain a building permit near the plant.

4. As growth occurs in the Western Growth Corridor, additional evaluation and consideration of the economic and non-economic factors of constructing an additional wastewater plant should be completed.

9.4 Summary of Short-Term Recommendations

1. Utilize this report as a resource for making development decisions.

2. Sanitary sewer districts and/or tapping fees could be developed based the opinion of costs for each growth area.

3. Design and construct two segments of parallel relief sewer as soon as the budget allows.

4. Update the WWTP facility plan and plan for construction of Phase 2 improvements.

5. Pursue land acquisition to allow expansion of existing WWTP and utilize ordinances to protect the buildable area around the WWTP.

Figure 1
Existing Development

North Liberty, Iowa
Sanitary Sewer Service Study, 2010

FOX engineering

0 600 1200
SCALE

NORTH

NOTES:
1) Area delineated represents developed area within city limits.

2) Total developed area is 2,145 acres; overall flow per acre of 4,100 gallons per acre per day (based on 8.8 million gallons per day).

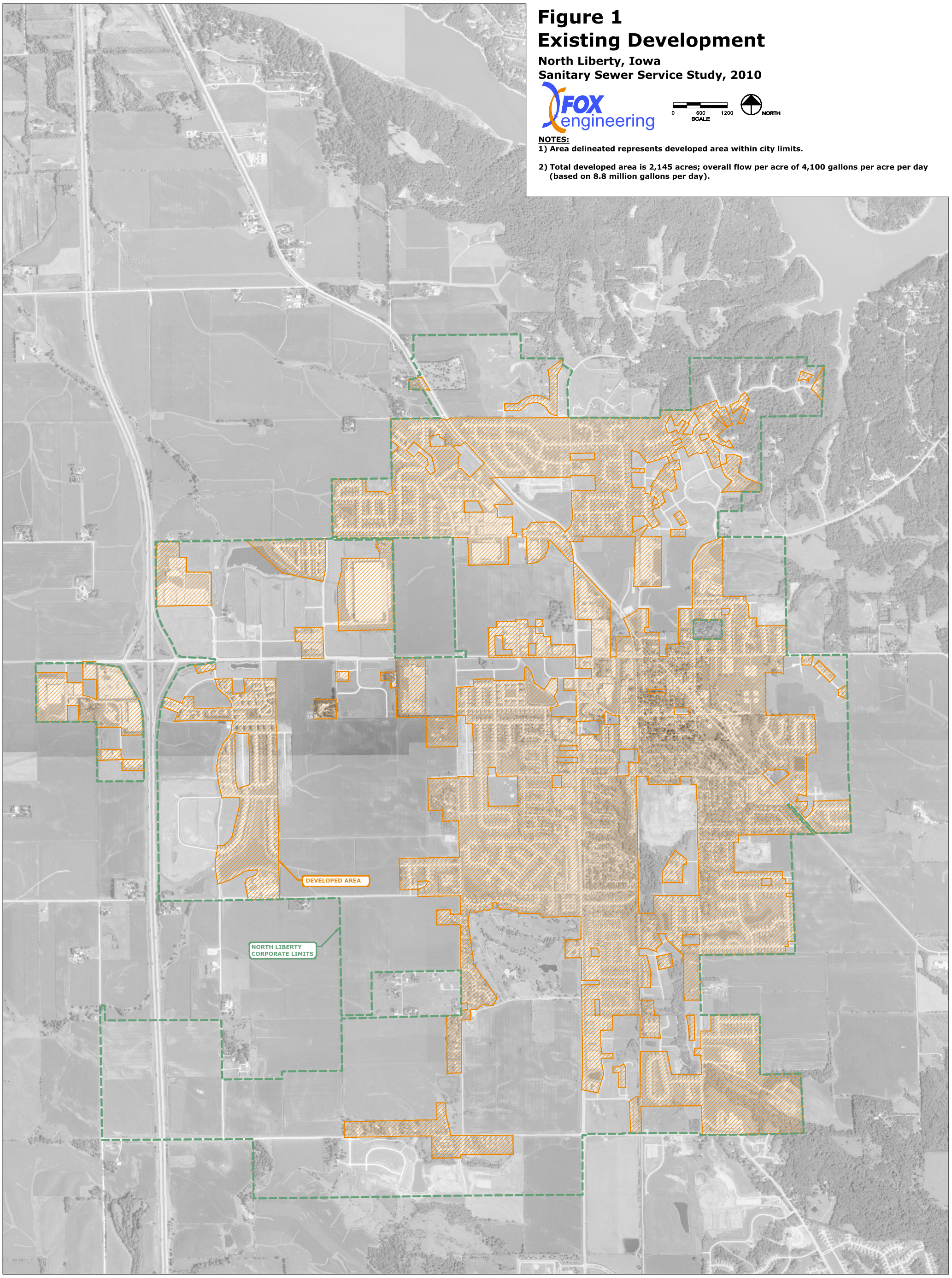


Figure 2
Existing Residential Development

North Liberty, Iowa
Sanitary Sewer Service Study, 2010

FOX engineering

0 600 1200
SCALE

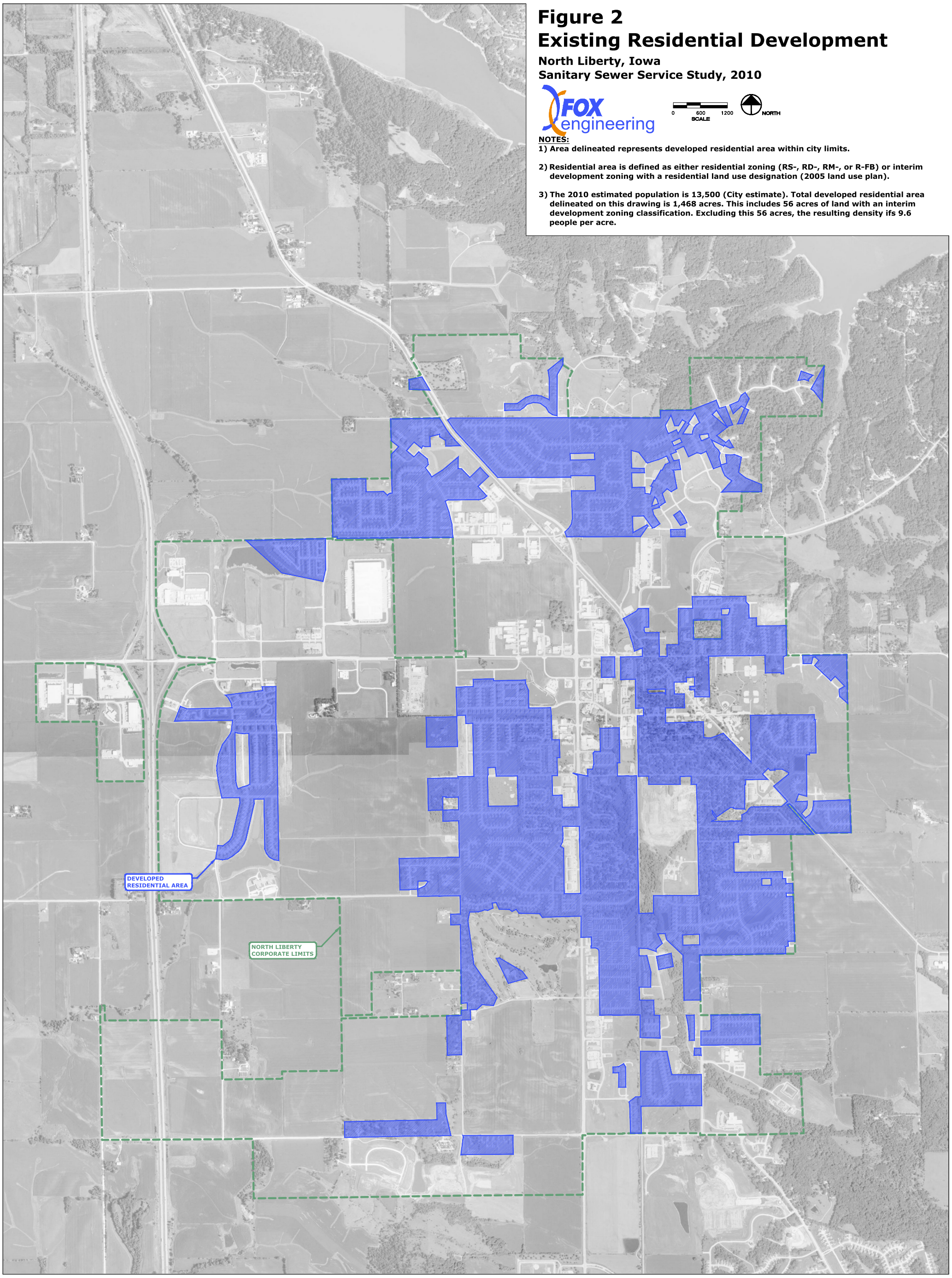
NORTH

NOTES:

1) Area delineated represents developed residential area within city limits.

2) Residential area is defined as either residential zoning (RS-, RD-, RM-, or R-FB) or interim development zoning with a residential land use designation (2005 land use plan).

3) The 2010 estimated population is 13,500 (City estimate). Total developed residential area delineated on this drawing is 1,468 acres. This includes 56 acres of land with an interim development zoning classification. Excluding this 56 acres, the resulting density ifs 9.6 people per acre.



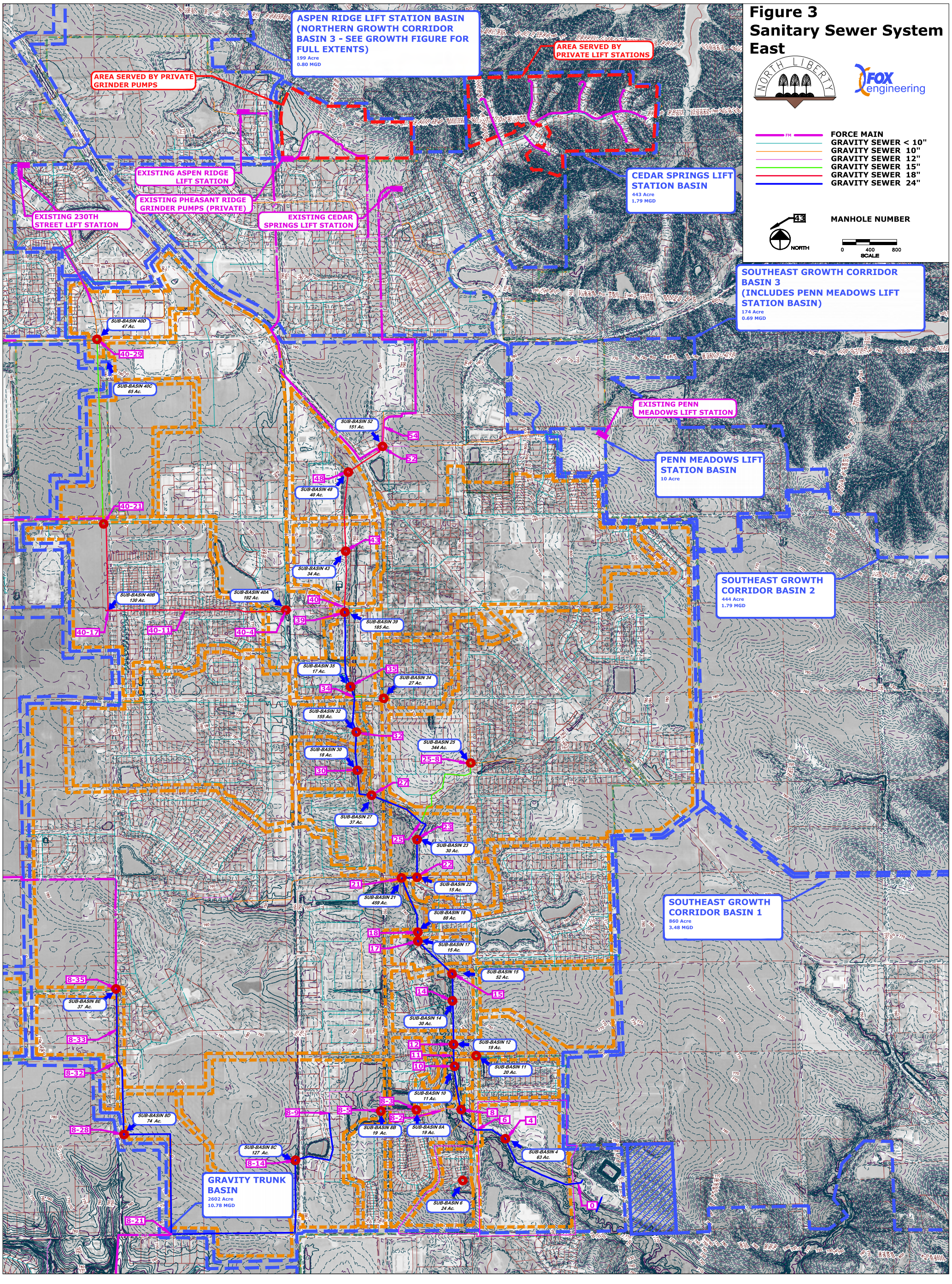


Figure 3
Sanitary Sewer System East
NORTH LIBERTY
FOX engineering
FORCE MAIN
GRAVITY SEWER < 10"
GRAVITY SEWER 10"
GRAVITY SEWER 12"
GRAVITY SEWER 15"
GRAVITY SEWER 18"
GRAVITY SEWER 24"
MANHOLE NUMBER
NORTH
0 400 800
SCALE
ASPEN RIDGE LIFT STATION BASIN (NORTHERN GROWTH CORRIDOR BASIN 3 - SEE GROWTH FIGURE FOR FULL EXTENTS)
199 Acre
0.80 MGD
AREA SERVED BY PRIVATE LIFT STATIONS
AREA SERVED BY PRIVATE GRINDER PUMPS
EXISTING ASPEN RIDGE LIFT STATION
EXISTING PHEASANT RIDGE GRINDER PUMPS (PRIVATE)
EXISTING 230TH STREET LIFT STATION
EXISTING CEDAR SPRINGS LIFT STATION
CEDAR SPRINGS LIFT STATION BASIN
443 Acre
1.79 MGD
SOUTHEAST GROWTH CORRIDOR BASIN 3 (INCLUDES PENN MEADOWS LIFT STATION BASIN)
174 Acre
0.69 MGD
EXISTING PENN MEADOWS LIFT STATION
PENN MEADOWS LIFT STATION BASIN
10 Acre
SOUTHEAST GROWTH CORRIDOR BASIN 2
444 Acre
1.79 MGD
SOUTHEAST GROWTH CORRIDOR BASIN 1
860 Acre
3.48 MGD
GRAVITY TRUNK BASIN
2602 Acre
10.78 MGD
SUB-BASIN 40D 47 Ac.
SUB-BASIN 40C 65 Ac.
SUB-BASIN 52 151 Ac.
SUB-BASIN 48 40 Ac.
SUB-BASIN 43 34 Ac.
SUB-BASIN 40B 130 Ac.
SUB-BASIN 40A 192 Ac.
SUB-BASIN 39 185 Ac.
SUB-BASIN 35 17 Ac.
SUB-BASIN 34 27 Ac.
SUB-BASIN 32 155 Ac.
SUB-BASIN 30 18 Ac.
SUB-BASIN 25 344 Ac.
SUB-BASIN 27 37 Ac.
SUB-BASIN 23 30 Ac.
SUB-BASIN 22 15 Ac.
SUB-BASIN 21 459 Ac.
SUB-BASIN 18 88 Ac.
SUB-BASIN 17 15 Ac.
SUB-BASIN 15 52 Ac.
SUB-BASIN 14 30 Ac.
SUB-BASIN 12 19 Ac.
SUB-BASIN 11 20 Ac.
SUB-BASIN 10 11 Ac.
SUB-BASIN 8E 37 Ac.
SUB-BASIN 8D 74 Ac.
SUB-BASIN 8C 127 Ac.
SUB-BASIN 8B 19 Ac.
SUB-BASIN 8A 19 Ac.
SUB-BASIN 6 24 Ac.
SUB-BASIN 4 63 Ac.
40-29
40-21
40-17
40-11
40-4
54
52
48
43
40
39
35
34
32
30
27
25-8
25
23
22
21
18
17
15
14
12
11
10
8
8-35
8-33
8-32
8-28
8-21
8-14
8-9
8-5
8-3
8-2
6
4
0

Figure 4
Sanitary Sewer System West

NORTH LIBERTY

FOX engineering

FORCE MAIN
GRAVITY SEWER < 10"
GRAVITY SEWER 10"
GRAVITY SEWER 12"
GRAVITY SEWER 15"
GRAVITY SEWER 18"
GRAVITY SEWER 24"

43 MANHOLE NUMBER

NORTH

0 400 800
SCALE

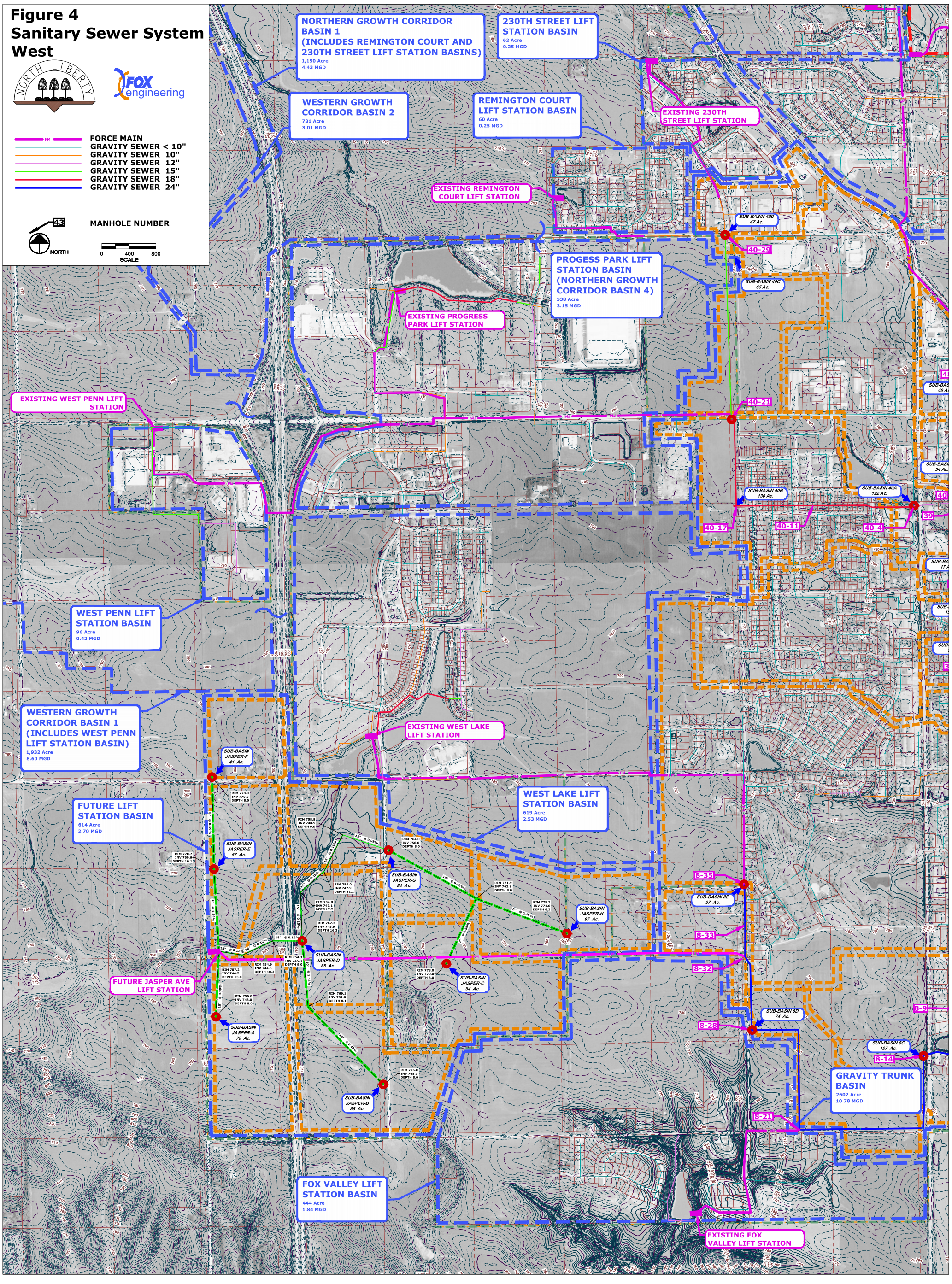


Figure 5
Potential Ultimate Service Area
North Liberty, Iowa
Sanitary Sewer Service Study, 2010

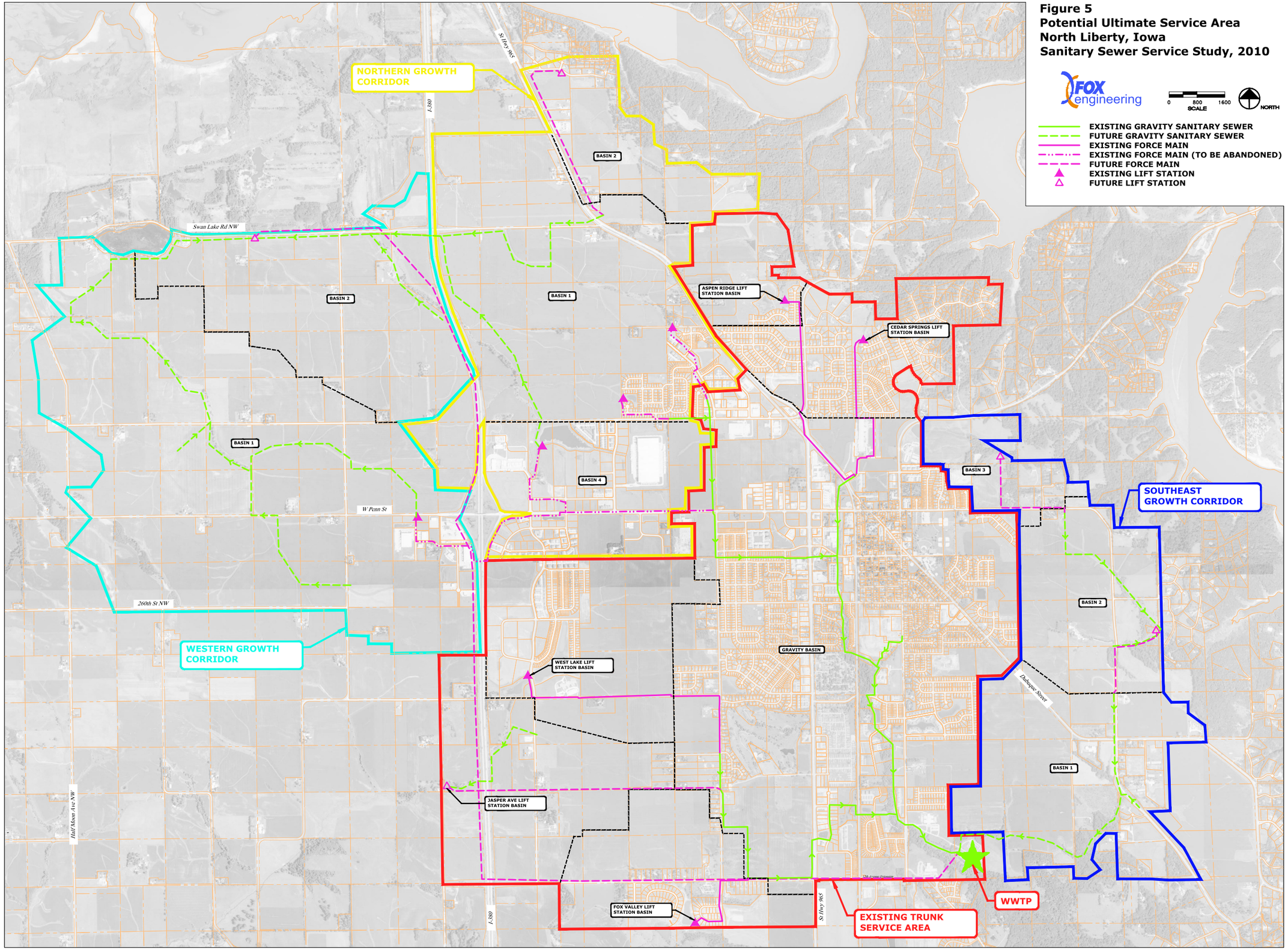


Figure 6
Southeast Growth Corridor

North Liberty, Iowa
Sanitary Sewer Service Study, 2010

FOX engineering

0 300 600
SCALE

NORTH

NOTES:

1) Entire Growth Corridor consists of residential land use.

2) For residential land use, assumed ultimate build out of single-family residential units.
   - -10 people per acre
   - -100 gallons per capita per day
   - -Peaking factor of 4.0
   - -Resulting peak flow of 4,000 gallons per acre per day

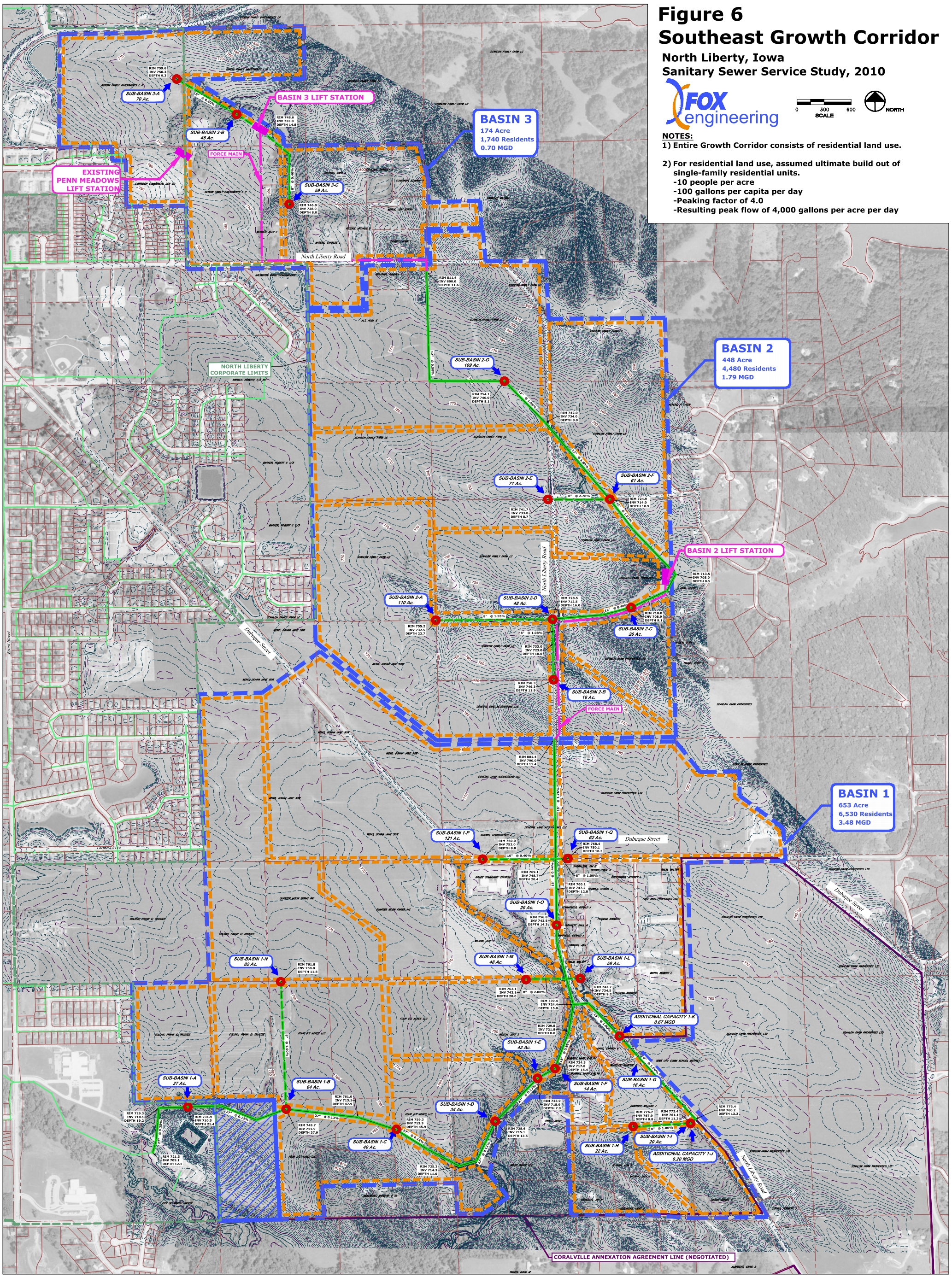


Figure 7
Western Growth Corridor Existing WWTP

North Liberty, Iowa
Sanitary Sewer Service Study, 2010

FOX engineering

0 400 800
SCALE

NORTH

NOTES:

1) Entire Growth Corridor consists of agricultural and industrial land use.

2) For agricultural land use, assumed ultimate build out of single family residential.
   - -10 people per acre
   - -100 gallons per capita per day
   - -Peaking factor of 4.0
   - -Resulting peak flow of 4,000 gallons per acre per day

3) For industrial land use, assumed 5,000 gallons per acre per day.

4) Area of floodplain is not included in basin areas.

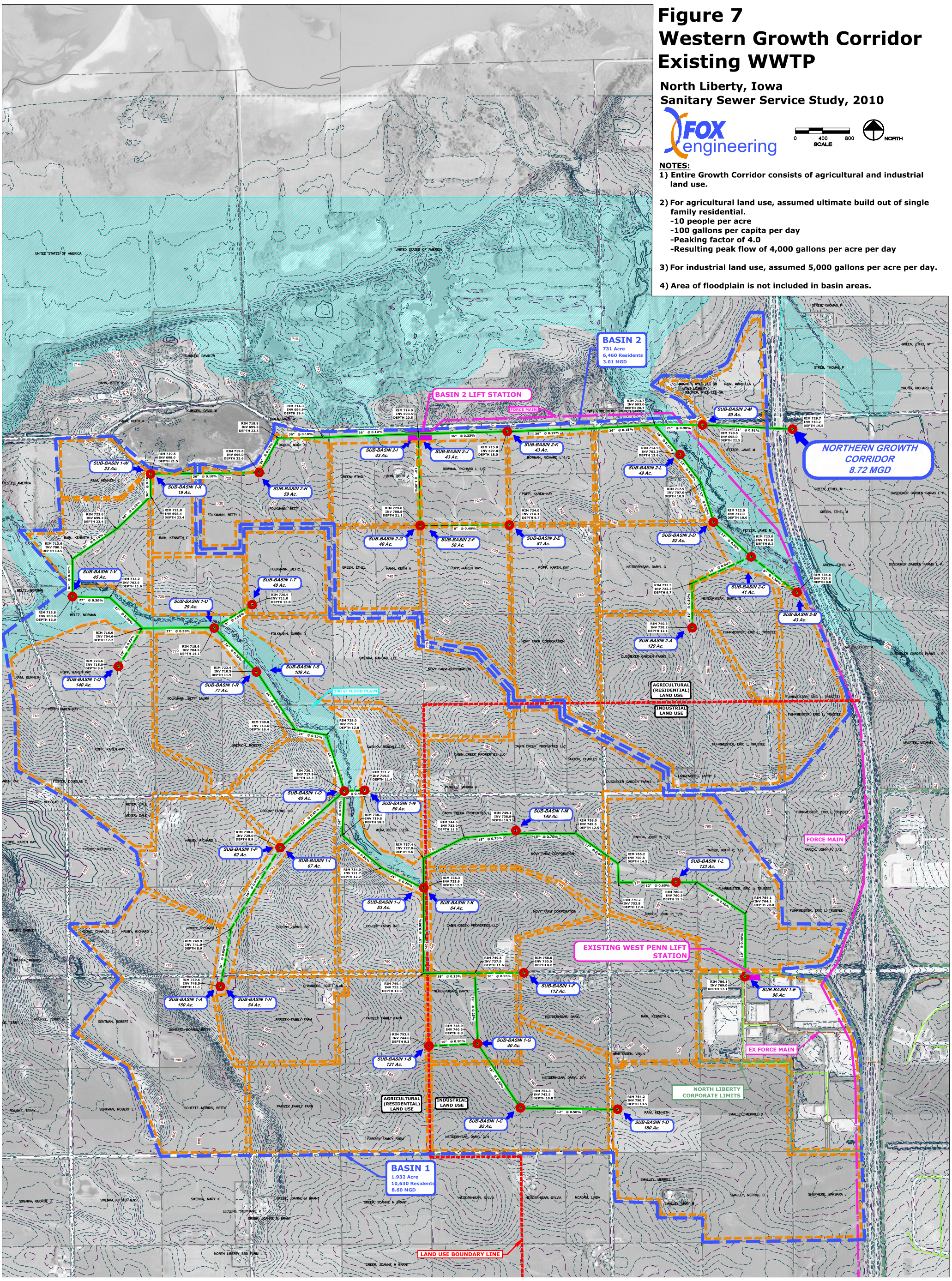


Figure 8
Western Growth Corridor New WWTP

North Liberty, Iowa
Sanitary Sewer Service Study, 2010

FOX engineering

0 400 800
SCALE

NORTH

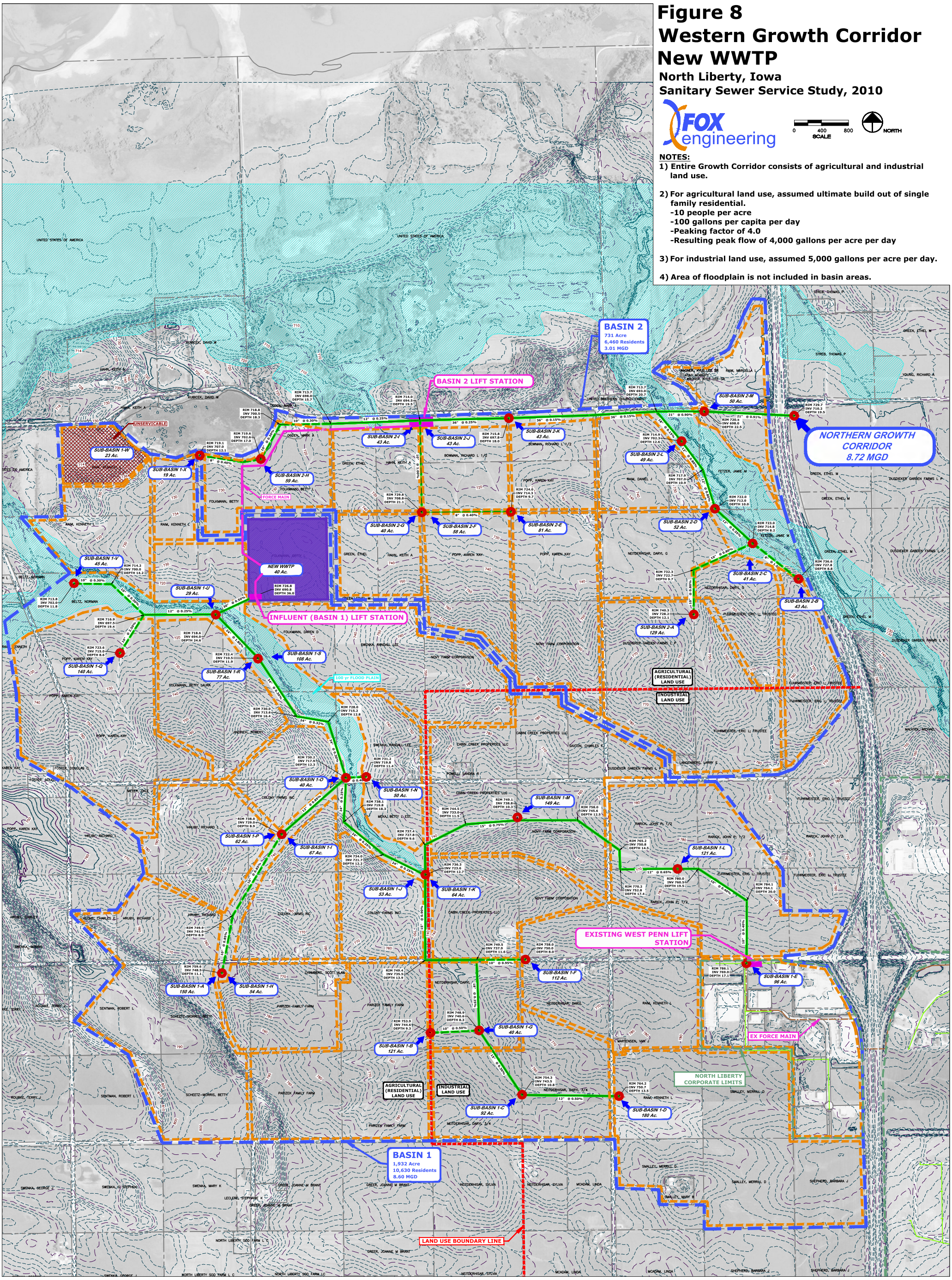
NOTES:

1) Entire Growth Corridor consists of agricultural and industrial land use.

2) For agricultural land use, assumed ultimate build out of single family residential.
   - -10 people per acre
   - -100 gallons per capita per day
   - -Peaking factor of 4.0
   - -Resulting peak flow of 4,000 gallons per acre per day

3) For industrial land use, assumed 5,000 gallons per acre per day.

4) Area of floodplain is not included in basin areas.



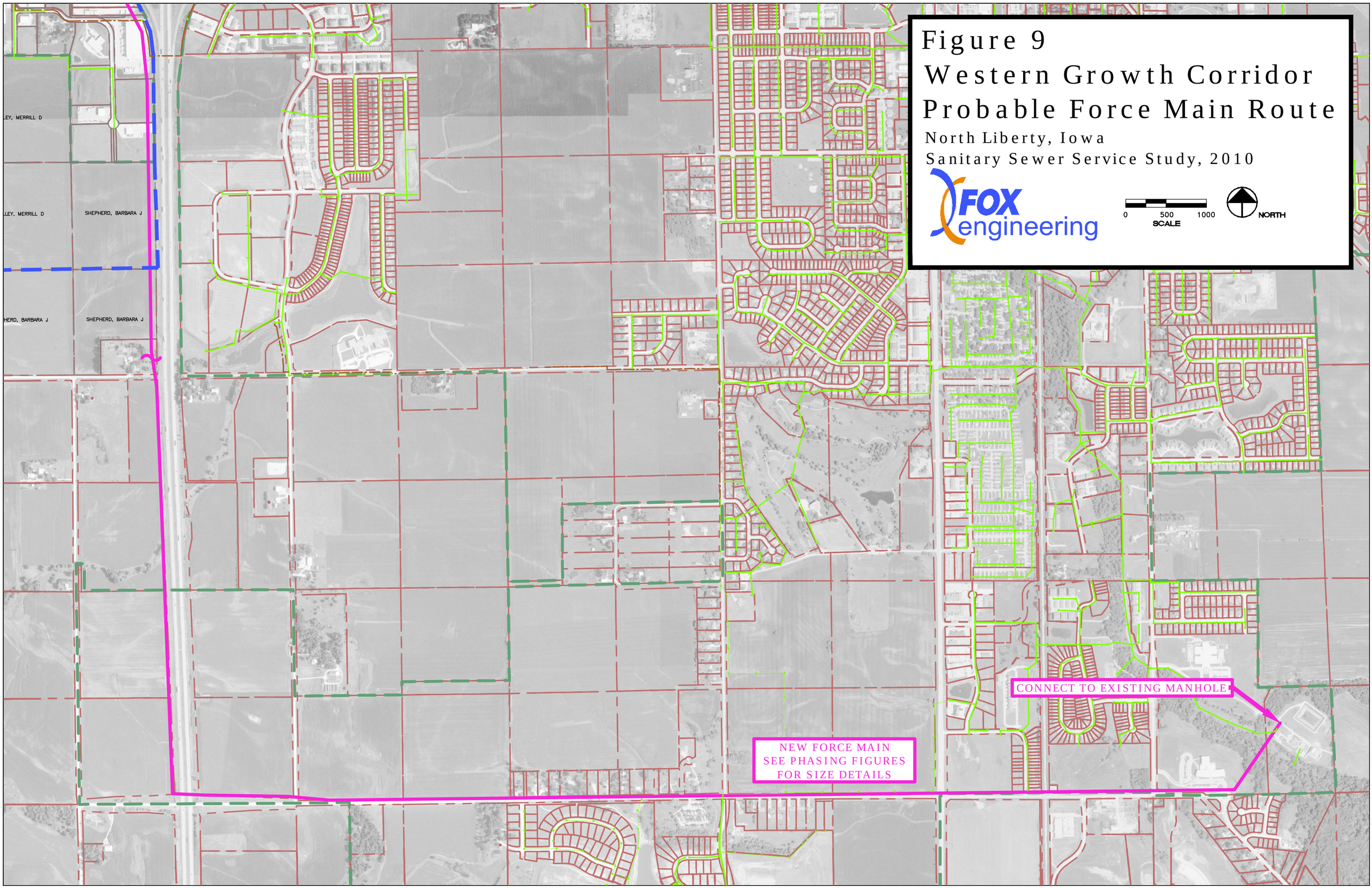


Figure 9
Western Growth Corridor
Probable Force Main Route
North Liberty, Iowa
Sanitary Sewer Service Study, 2010
FOX engineering
0
500
1000
SCALE
NORTH
LEY, MERRILL D
LEY, MERRILL D
SHEPHERD, BARBARA J
HERD, BARBARA J
SHEPHERD, BARBARA J
CONNECT TO EXISTING MANHOLE
NEW FORCE MAIN
SEE PHASING FIGURES
FOR SIZE DETAILS

Figure 10
Northern Growth Corridor
North Liberty, Iowa
Sanitary Sewer Service Study, 2010

FOX engineering

0 400 800
SCALE

NORTH

NOTES:

1) Flow is based upon zoning within city limits and land use designation outside city limits. Zoning and land use are not indicated outside the basins shown.

2) All basins shown outside city limits consist of industrial, parks and recreation, public, and residential land use. Residential land use is prevalent, other uses are indicated on the map.

3) For industrial land use and zoning, assumed 5,000 gallons per acre per day.

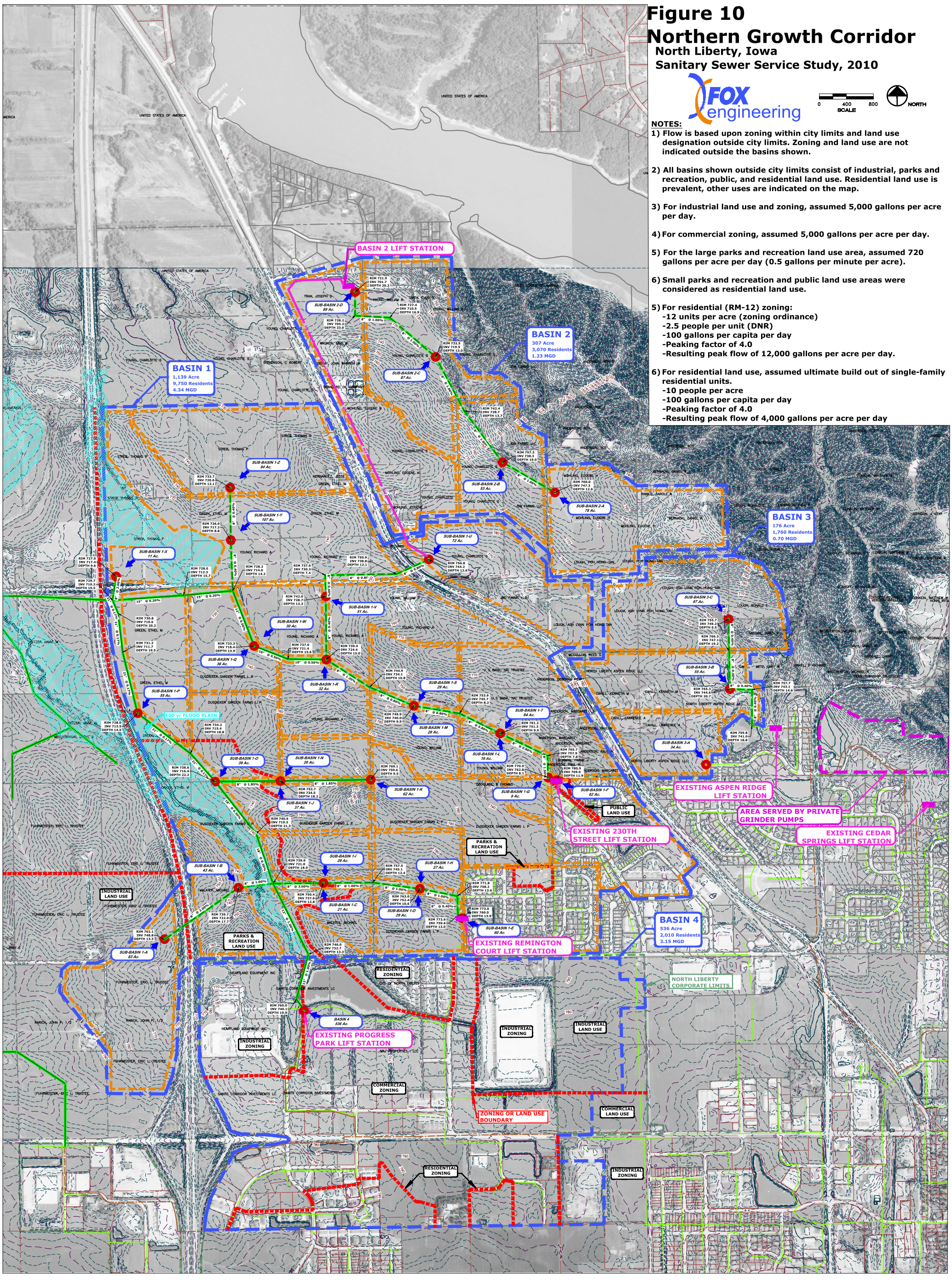
4) For commercial zoning, assumed 5,000 gallons per acre per day.

5) For the large parks and recreation land use area, assumed 720 gallons per acre per day (0.5 gallons per minute per acre).

6) Small parks and recreation and public land use areas were considered as residential land use.

5) For residential (RM-12) zoning:
-12 units per acre (zoning ordinance)
-2.5 people per unit (DNR)
-100 gallons per capita per day
-Peaking factor of 4.0
-Resulting peak flow of 12,000 gallons per acre per day.

6) For residential land use, assumed ultimate build out of single-family residential units.
-10 people per acre
-100 gallons per capita per day
-Peaking factor of 4.0
-Resulting peak flow of 4,000 gallons per acre per day



Existing (2010) Flows

Down Stream MH	Up Stream MH	Size (in)	Min Slope (%)	Full Capacity MGD	DNR Capacity MGD	Peak Flow (MGD)	% of Capacity[1]
0	4	24	0.27	7.61	7.00	8.67	114%
4	6	24	0.29	7.89	7.26	8.41	107%
6	8	24	0.32	8.29	7.63	8.37	101%
8	10	24	0.17	6.02	5.54	7.57	126%
10	11	24	0.92	14.09	12.96	7.56	54%
11	13	24	0.29	7.89	7.26	7.49	95%
13	14	24	0.40	9.27	8.53	7.49	81%
14	15	24	0.40	9.27	8.53	7.43	80%
15	17	24	0.40	9.27	8.53	7.43	80%
17	18	24	0.39	9.16	8.42	7.39	81%
18	21	24	0.37	8.92	8.20	7.05	79%
21	22	24	0.67	12.02	11.06	6.07	50%
22	23	24	0.70	12.29	11.30	6.01	49%
23	25	24	0.26	7.46	6.87	5.98	80%
25	27	24	0.23	7.02	6.46	5.22	74%
27	30	24	0.19	6.37	5.86	5.08	80%
30	32	24	0.23	7.02	6.46	5.01	71%
32	34	24	0.21	6.70	6.17	4.46	67%
34	35	24	0.25	7.32	6.73	4.35	59%
35	39	24	0.24	7.17	6.60	4.30	60%
39	40	24	0.39	9.16	8.42	3.65	40%
40	43	18	0.23	3.20	2.95	1.43	45%
43	48	18	0.24	3.27	3.02	1.29	40%
48	49	18	0.29	3.60	3.32	1.18	33%
49	52	18	0.17	2.74	2.53	1.18	43%
8	8-2	12	0.17	0.90	0.72	0.80	89%
8-2	8-3	12	1.07	2.28	1.82	0.80	35%
8-3	8-5	12	0.87	2.05	1.64	0.69	34%
8-5	8-9	12	0.97	2.17	1.73	0.66	31%
8-9	8-14	24	0.40	9.27	8.53	0.66	7%
8-14	8-21	24	0.22	6.86	6.31	0.58	9%
8-21	8-29	24	0.21	6.70	6.17	0.41	6%
8-29	8-32	24	0.18	6.20	5.70	0.41	7%
8-32	8-33	24	0.18	6.20	5.70	0.41	7%
8-33	8-35	24	0.10	4.59	4.23	0.41	9%
25	25-8	15	0.15	1.56	1.25	0.76	49%
40	40-4	12	0.38	1.35	1.08	2.23	165%
40-4	40-11	18	0.17	2.74	2.53	1.89	69%
40-11	40-17	18	0.31	3.72	3.43	1.89	51%
40-17	40-21	18	0.12	2.30	2.12	1.56	68%
40-21	40-29	15	0.15	1.56	1.25	0.61	39%

[1] Full-flow capacity used to determine percent-of-capacity values.

Ultimate Flow

Full development of gravity basin, existing lift stations and Jasper Ave LS

Down Stream MH	Up Stream MH	Size (in)	Min Slope (%)	Full Capacity MGD	DNR Capacity MGD	Peak Flow (MGD)	% of Capacity[1]
0	4	24	0.27	7.61	7.00	24.52	322%
4	6	24	0.29	7.89	7.26	24.25	307%
6	8	24	0.32	8.29	7.63	24.16	291%
8	10	24	0.17	6.02	5.54	15.66	260%
10	11	24	0.92	14.09	12.96	15.62	111%
11	13	24	0.29	7.89	7.26	15.53	197%
13	14	24	0.40	9.27	8.53	15.46	167%
14	15	24	0.40	9.27	8.53	15.34	165%
15	17	24	0.40	9.27	8.53	15.13	163%
17	18	24	0.39	9.16	8.42	15.07	165%
18	21	24	0.37	8.92	8.20	14.71	165%
21	22	24	0.67	12.02	11.06	13.08	109%
22	23	24	0.70	12.29	11.30	13.02	106%
23	25	24	0.26	7.46	6.87	12.87	172%
25	27	24	0.23	7.02	6.46	11.46	163%
27	30	24	0.19	6.37	5.86	11.31	178%
30	32	24	0.23	7.02	6.46	11.24	160%
32	34	24	0.21	6.70	6.17	10.59	158%
34	35	24	0.25	7.32	6.73	10.48	143%
35	39	24	0.24	7.17	6.60	10.41	145%
39	40	24	0.39	9.16	8.42	9.65	105%
40	43	18	0.23	3.20	2.95	3.59	112%
43	48	18	0.24	3.27	3.02	3.45	106%
48	49	18	0.29	3.60	3.32	3.28	91%
49	52	18	0.17	2.74	2.53	3.28	119%
8	8-2	12	0.17	0.90	0.72	8.50	946%
8-2	8-3	12	1.07	2.28	1.82	8.50	373%
8-3	8-5	12	0.87	2.05	1.64	8.29	404%
8-5	8-9	12	0.97	2.17	1.73	8.22	379%
8-9	8-14	24	0.40	9.27	8.53	8.22	89%
8-14	8-21	24	0.22	6.86	6.31	7.62	111%
8-21	8-29	24	0.21	6.70	6.17	5.78	86%
8-29	8-32	24	0.18	6.20	5.70	5.41	87%
8-32	8-33	24	0.18	6.20	5.70	5.41	87%
8-33	8-35	24	0.10	4.59	4.23	5.41	118%
25	25-8	15	0.15	1.56	1.25	1.41	90%
40	40-4	12	0.38	1.35	1.08	6.05	448%
40-4	40-11	18	0.17	2.74	2.53	5.17	188%
40-11	40-17	18	0.31	3.72	3.43	5.17	139%
40-17	40-21	18	0.12	2.30	2.12	4.60	200%
40-21	40-29	15	0.15	1.56	1.25	1.03	66%

[1] Full-flow capacity used to determine percent-of-capacity values.

Ultimate Flow + Western Phase 1 & 2

Full development of gravity basin, existing lift stations, Jasper Ave LS, and phases 1 & 2 in Western Growth Corridor

Down Stream MH	Up Stream MH	Size (in)	Min Slope (%)	Full Capacity MGD	DNR Capacity MGD	Peak Flow (MGD)	% of Capacity[1]
0	4	24	0.27	7.61	7.00	25.54	336%
4	6	24	0.29	7.89	7.26	25.27	320%
6	8	24	0.32	8.29	7.63	25.18	304%
8	10	24	0.17	6.02	5.54	16.68	277%
10	11	24	0.92	14.09	12.96	16.64	118%
11	13	24	0.29	7.89	7.26	16.55	210%
13	14	24	0.40	9.27	8.53	16.48	178%
14	15	24	0.40	9.27	8.53	16.36	176%
15	17	24	0.40	9.27	8.53	16.15	174%
17	18	24	0.39	9.16	8.42	16.09	176%
18	21	24	0.37	8.92	8.20	15.73	176%
21	22	24	0.67	12.02	11.06	14.10	117%
22	23	24	0.70	12.29	11.30	14.04	114%
23	25	24	0.26	7.46	6.87	13.89	186%
25	27	24	0.23	7.02	6.46	12.48	178%
27	30	24	0.19	6.37	5.86	12.33	194%
30	32	24	0.23	7.02	6.46	12.26	175%
32	34	24	0.21	6.70	6.17	11.61	173%
34	35	24	0.25	7.32	6.73	11.50	157%
35	39	24	0.24	7.17	6.60	11.43	159%
39	40	24	0.39	9.16	8.42	10.67	116%
40	43	18	0.23	3.20	2.95	3.59	112%
43	48	18	0.24	3.27	3.02	3.45	106%
48	49	18	0.29	3.60	3.32	3.28	91%
49	52	18	0.17	2.74	2.53	3.28	119%
8	8-2	12	0.17	0.90	0.72	8.50	946%
8-2	8-3	12	1.07	2.28	1.82	8.50	373%
8-3	8-5	12	0.87	2.05	1.64	8.29	404%
8-5	8-9	12	0.97	2.17	1.73	8.22	379%
8-9	8-14	24	0.40	9.27	8.53	8.22	89%
8-14	8-21	24	0.22	6.86	6.31	7.62	111%
8-21	8-29	24	0.21	6.70	6.17	5.78	86%
8-29	8-32	24	0.18	6.20	5.70	5.41	87%
8-32	8-33	24	0.18	6.20	5.70	5.41	87%
8-33	8-35	24	0.10	4.59	4.23	5.41	118%
25	25-8	15	0.15	1.56	1.25	1.41	90%
40	40-4	12	0.38	1.35	1.08	7.07	523%
40-4	40-11	18	0.17	2.74	2.53	6.19	226%
40-11	40-17	18	0.31	3.72	3.43	6.19	166%
40-17	40-21	18	0.12	2.30	2.12	5.62	245%
40-21	40-29	15	0.15	1.56	1.25	1.03	66%

[1] Full-flow capacity used to determine percent-of-capacity values.

Ultimate Flow - 3 Lift Stations (Used to Size Parallel Sewers)

Full development of gravity basin, existing lift stations and Jasper Ave LS; Progress Park, West Penn and Remington Court LS removed

Down Stream MH	Up Stream MH	Size (in)	Min Slope (%)	Full Capacity MGD	DNR Capacity MGD	Peak Flow (MGD)	% of Capacity[1]
0	4	24	0.27	7.61	7.00	20.70	272%
4	6	24	0.29	7.89	7.26	20.43	259%
6	8	24	0.32	8.29	7.63	20.34	245%
8	10	24	0.17	6.02	5.54	11.84	197%
10	11	24	0.92	14.09	12.96	11.80	84%
11	13	24	0.29	7.89	7.26	11.71	149%
13	14	24	0.40	9.27	8.53	11.64	125%
14	15	24	0.40	9.27	8.53	11.52	124%
15	17	24	0.40	9.27	8.53	11.31	122%
17	18	24	0.39	9.16	8.42	11.25	123%
18	21	24	0.37	8.92	8.20	10.89	122%
21	22	24	0.67	12.02	11.06	9.26	77%
22	23	24	0.70	12.29	11.30	9.20	75%
23	25	24	0.26	7.46	6.87	9.05	121%
25	27	24	0.23	7.02	6.46	7.64	109%
27	30	24	0.19	6.37	5.86	7.49	118%
30	32	24	0.23	7.02	6.46	7.42	106%
32	34	24	0.21	6.70	6.17	6.77	101%
34	35	24	0.25	7.32	6.73	6.66	91%
35	39	24	0.24	7.17	6.60	6.59	92%
39	40	24	0.39	9.16	8.42	5.83	64%
40	43	18	0.23	3.20	2.95	3.59	112%
43	48	18	0.24	3.27	3.02	3.45	106%
48	49	18	0.29	3.60	3.32	3.28	91%
49	52	18	0.17	2.74	2.53	3.28	119%
8	8-2	12	0.17	0.90	0.72	8.50	946%
8-2	8-3	12	1.07	2.28	1.82	8.50	373%
8-3	8-5	12	0.87	2.05	1.64	8.29	404%
8-5	8-9	12	0.97	2.17	1.73	8.22	379%
8-9	8-14	24	0.40	9.27	8.53	8.22	89%
8-14	8-21	24	0.22	6.86	6.31	7.62	111%
8-21	8-29	24	0.21	6.70	6.17	5.78	86%
8-29	8-32	24	0.18	6.20	5.70	5.41	87%
8-32	8-33	24	0.18	6.20	5.70	5.41	87%
8-33	8-35	24	0.10	4.59	4.23	5.41	118%
25	25-8	15	0.15	1.56	1.25	1.41	90%
40	40-4	12	0.38	1.35	1.08	2.23	165%
40-4	40-11	18	0.17	2.74	2.53	1.35	49%
40-11	40-17	18	0.31	3.72	3.43	1.35	36%
40-17	40-21	18	0.12	2.30	2.12	0.78	34%
40-21	40-29	15	0.15	1.56	1.25	0.78	50%

[1] Full-flow capacity used to determine percent-of-capacity values.

Basin 40 Analysis

Existing (2010) flows, except: Full Development in basin 40 (244 acres), 48 additonal acres developed in West Penn, Progress Park, or Western Growth Corridor phases 1 & 2; Total additional development = 292 acres

Down Stream MH	Up Stream MH	Size (in)	Min Slope (%)	Full Capacity MGD	DNR Capacity MGD	Peak Flow (MGD)	% of Capacity[1]
0	4	24	0.27	7.61	7.00	10.08	132%
4	6	24	0.29	7.89	7.26	9.81	124%
6	8	24	0.32	8.29	7.63	9.77	118%
8	10	24	0.17	6.02	5.54	8.97	149%
10	11	24	0.92	14.09	12.96	8.96	64%
11	13	24	0.29	7.89	7.26	8.89	113%
13	14	24	0.40	9.27	8.53	8.89	96%
14	15	24	0.40	9.27	8.53	8.83	95%
15	17	24	0.40	9.27	8.53	8.83	95%
17	18	24	0.39	9.16	8.42	8.80	96%
18	21	24	0.37	8.92	8.20	8.45	95%
21	22	24	0.67	12.02	11.06	7.47	62%
22	23	24	0.70	12.29	11.30	7.41	60%
23	25	24	0.26	7.46	6.87	7.39	99%
25	27	24	0.23	7.02	6.46	6.62	94%
27	30	24	0.19	6.37	5.86	6.48	102%
30	32	24	0.23	7.02	6.46	6.41	91%
32	34	24	0.21	6.70	6.17	5.86	87%
34	35	24	0.25	7.32	6.73	5.75	79%
35	39	24	0.24	7.17	6.60	5.70	80%
39	40	24	0.39	9.16	8.42	5.06	55%
40	43	18	0.23	3.20	2.95	1.43	45%
43	48	18	0.24	3.27	3.02	1.29	40%
48	49	18	0.29	3.60	3.32	1.18	33%
49	52	18	0.17	2.74	2.53	1.18	43%
8	8-2	12	0.17	0.90	0.72	0.80	89%
8-2	8-3	12	1.07	2.28	1.82	0.80	35%
8-3	8-5	12	0.87	2.05	1.64	0.69	34%
8-5	8-9	12	0.97	2.17	1.73	0.66	31%
8-9	8-14	24	0.40	9.27	8.53	0.66	7%
8-14	8-21	24	0.22	6.86	6.31	0.58	9%
8-21	8-29	24	0.21	6.70	6.17	0.41	6%
8-29	8-32	24	0.18	6.20	5.70	0.41	7%
8-32	8-33	24	0.18	6.20	5.70	0.41	7%
8-33	8-35	24	0.10	4.59	4.23	0.41	9%
25	25-8	15	0.15	1.56	1.25	0.76	49%
40	40-4	12	0.38	1.35	1.08	3.63	268%
40-4	40-11	18	0.17	2.74	2.53	2.74	100%
40-11	40-17	18	0.31	3.72	3.43	2.74	74%
40-17	40-21	18	0.12	2.30	2.12	2.18	95%
40-21	40-29	15	0.15	1.56	1.25	0.99	63%

[1] Full-flow capacity used to determine percent-of-cap Acres

ENGINEER'S PRELIMINARY OPINION OF PROBABLE COST
NORTH LIBERTY SANITARY SEWER SERVICE STUDY
Existing Sanitary Sewer Paralleling Expansion
City of North Liberty, IA

Sanitary Sewer Section to be Paralleled	Diameter (in)	Estimated Total Cost*
Trunk Sewer		
MH 0 to MH 8	33	$ 922,100
MH 8 to MH 10	27	$ 162,400
MH 11 to MH 13	21	$ 124,000
MH 13 to 21	18	$ 528,800
MH 23 to MH 25	18	$ 80,200
MH 49 to MH 54	21	$ 323,800
Branch Sewer		
MH 8 to MH 8-2	30	$ 174,900
MH 8-2 to MH 8-9	21	$ 799,800
MH 40 to MH 40-4	15	$ 269,300
Lift Station Influent Sewer		
Fox Valley	12	$ 123,600
Cedar Springs	12	$ 87,100
Total Esimated Cost		***$ 3,596,000***

**Estimated costs include mobilization(3.5%), Stabilization Material/Special Backfill (2.5%), Erosion Control (1%), and Field Tile Repair (1%).*

**Esimated costs include contingencies (20%), engineering fees (10%), and field observation and staking (10%).*

ENGINEER'S PRELIMINARY OPINION OF PROBABLE COST
NORTH LIBERTY SANITARY SEWER SERVICE STUDY
Existing SS Paralleling Expansion
City of North Liberty, IA

LAST UPDATE:2/3/2011
FOX PN: 2489-10A.300

			Engineer's Opinion of Probable Cost	MH 0 to MH 8		MH 8 to MH 10		MH 11 to MH 13	
ITEM NO.	DESCRIPTION	UNITS	UNIT PRICE	QUANTITY	TOTAL PRICE	QUANTITY	TOTAL PRICE	QUANTITY	TOTAL PRICE
1	Mobilization, Bonds, Insurance	LS	3.5%	1	$22,500.00	1	$4,000.00	1	$3,100.00
2	Clearing and Grubbing	LF	$30	600	$18,000.00	766	$22,980.00	408	$12,240.00
3	Stabilization Material/Special Backfill	LS	2.5%	1	$16,100.00	1	$2,900.00	1	$2,200.00
4	**8" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$45		$0.00		$0.00		$0.00
5	8" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$60		$0.00		$0.00		$0.00
6	8" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$75		$0.00		$0.00		$0.00
7	**10" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$50		$0.00		$0.00		$0.00
8	10" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$65		$0.00		$0.00		$0.00
9	10" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$80		$0.00		$0.00		$0.00
10	**12" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$55		$0.00		$0.00		$0.00
11	12" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$70		$0.00		$0.00		$0.00
12	12" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$85		$0.00		$0.00		$0.00
13	**15" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$60		$0.00		$0.00		$0.00
14	15" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$75		$0.00		$0.00		$0.00
15	15" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$90		$0.00		$0.00		$0.00
16	**18" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$65		$0.00		$0.00		$0.00
17	18" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$80		$0.00		$0.00		$0.00
18	18" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$95		$0.00		$0.00		$0.00
19	**21" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$70		$0.00		$0.00	88	$6,160.00
20	21" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$85		$0.00		$0.00	360	$30,600.00
21	21" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$100		$0.00		$0.00		$0.00
22	**24" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$75		$0.00		$0.00		$0.00
23	24" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$90		$0.00		$0.00		$0.00
24	24" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$105		$0.00		$0.00		$0.00
25	**27" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$80		$0.00	688	$55,040.00		$0.00
26	27" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$95		$0.00		$0.00		$0.00
27	27" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$110		$0.00		$0.00		$0.00
28	**30" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$90		$0.00		$0.00		$0.00
29	30" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$105		$0.00		$0.00		$0.00
30	30" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$120		$0.00		$0.00		$0.00
31	**33" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$100	323	$32,300.00		$0.00		$0.00
32	33" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$115	2,028	$233,220.00		$0.00		$0.00
33	33" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$130		$0.00		$0.00		$0.00
31	**36" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$110		$0.00		$0.00		$0.00
32	36" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$125		$0.00		$0.00		$0.00
33	36" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$140		$0.00		$0.00		$0.00
34	**48" Sanitary Sewer Manholes (0-15 ft)**	EA	$3,000		$0.00		$0.00		$0.00
35	48" Sanitary Sewer Manholes (15-25 ft)	EA	$5,000		$0.00		$0.00		$0.00
36	48" Sanitary Sewer Manholes (>25 ft)	EA	$10,000		$0.00		$0.00		$0.00
37	**60" Sanitary Sewer Manholes (0-15 ft)**	EA	$5,000		$0.00		$0.00		$0.00
38	60" Sanitary Sewer Manholes (15-25 ft)	EA	$10,000	7	$70,000.00	2	$20,000.00	1	$10,000.00
39	60" Sanitary Sewer Manholes (>25 ft)	EA	$15,000	2	$30,000.00		$0.00	1	$15,000.00
40	Connect to Existing Manhole	EA	$1,500	9	$13,500.00	2	$3,000.00	2	$3,000.00
41	8" & 12" Parallel Force Mains (C900)	LF	$42		$0.00		$0.00		$0.00
42	6" Force Main (C900)	LF	$15		$0.00		$0.00		$0.00
43	8" Force Main (C900)	LF	$19		$0.00		$0.00		$0.00
44	24" Force Main (C900)	LF	$81		$0.00		$0.00		$0.00
45	36" Force Main (DI)	LF	$144		$0.00		$0.00		$0.00
46	Connect to Existing Forcemain	EA	$3,000		$0.00		$0.00		$0.00
47	Force Main Air Release/Cleanout Manholes	EA	$56,400		$0.00		$0.00		$0.00
48	8" to 15" Bored Road Crossing and Casing	LF	$300		$0.00		$0.00		$0.00
49	18" to 27" Bored Road Crossing and Casing	LF	$600		$0.00		$0.00		$0.00
50	27"+ Bored Road Crossing and Casing	LF	$900	200	$180,000.00		$0.00		$0.00
51	Stream Crossing	EA	$20,000		$0.00		$0.00		$0.00
52	Submersible Duplex Pump Station	LS	$250,000		$0.00		$0.00		$0.00
53	Trench Type Wet Well Pump Station	LS	$1,000,000		$0.00		$0.00		$0.00
54	Sanitary Sewer and Manhole Testing	EA	$500	9	$4,500.00	2	$1,000.00	2	$1,000.00
55	Type 5 Rural Seeding	LF	$2	2,351	$5,407.30	688	$1,582.40	448	$1,030.40
56	Erosion Control	LS	1%	1	$6,403.34	1	$1,127.58	1	$860.51
57	Field Tile Repair	LS	1%	1	$6,403.34	1	$1,127.58	1	$860.51
58	Traffic Control	LS	$2,000	1	$2,000.00		$0.00		$0.00
	Subtotal				$640,334		$112,758		$86,051
	20% CONTINGENCIES				$128,067		$22,552		$17,210
	SUBTOTAL				$768,401		$135,309		$103,262
	10% ENGINEERING				$76,840		$13,531		$10,326
	10% OBSERVATION/STAKING				$76,840		$13,531		$10,326
	Pipe Run Total				***$922,100***		***$162,400***		***$124,000***

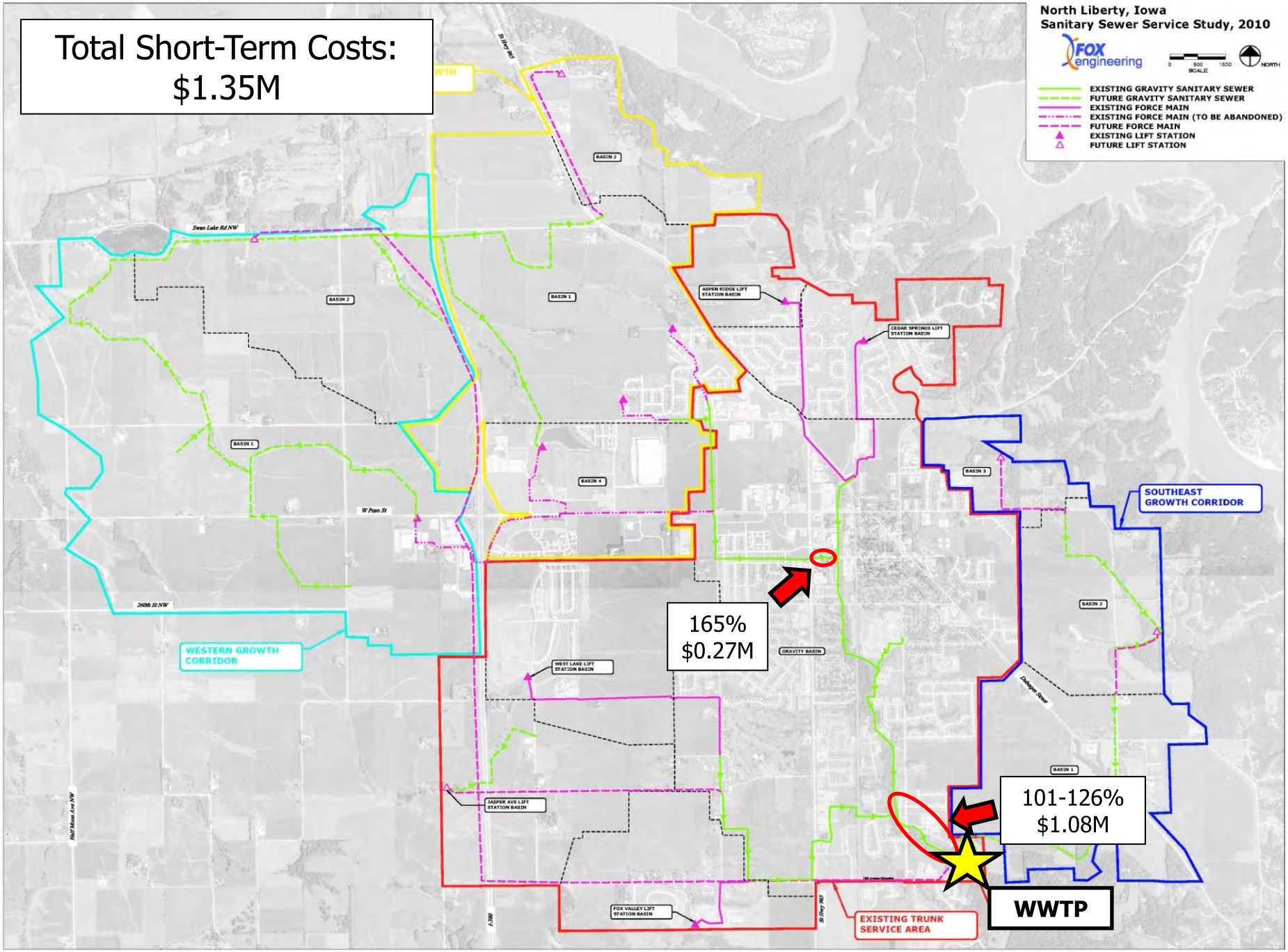
GENERAL NOTES AND ASSUMPTION:
1. Land acquisition is not included in the opinion of costs presented.
2. Geotechnical Exploration costs are not included in the opinion of costs presented.

PREPARED BY:
FOX ENGINEERING ASSOCIATES, INC.
AMES, IOWA

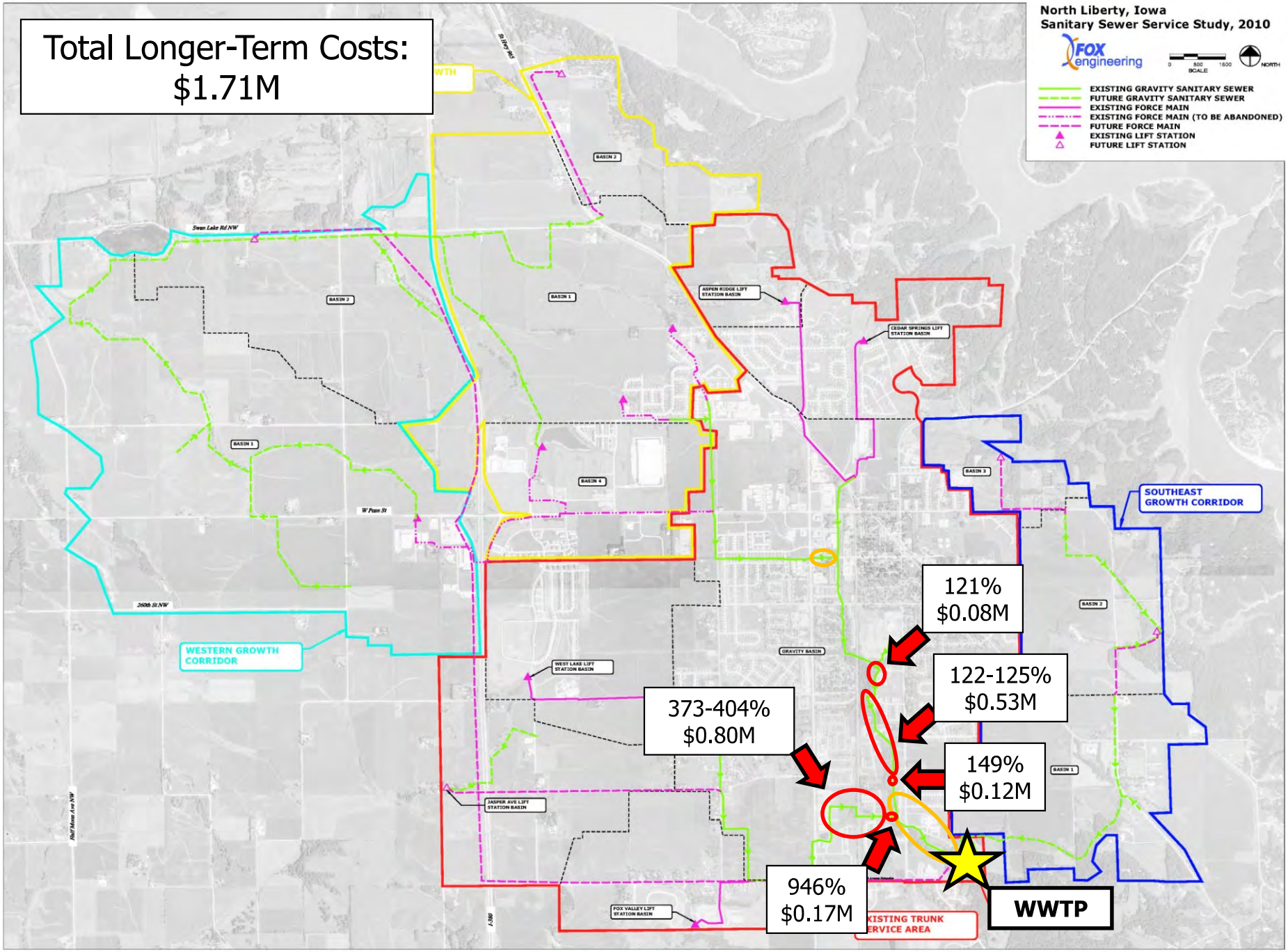
	MH 13 to MH 21		MH 23 to MH 25		MH 49 to MH 54		MH 8 to MH 8-2	
ITEM NO.	QUANTITY	TOTAL PRICE	QUANTITY	TOTAL PRICE	QUANTITY	TOTAL PRICE	QUANTITY	TOTAL PRICE
1	1	$12,900.00	1	$2,000.00	1	$7,900.00	1	$4,300.00
2	1,748	$52,440.00	344	$10,320.00		$0.00	309	$9,270.00
3	1	$9,200.00	1	$1,400.00	1	$5,700.00	1	$3,100.00
4		$0.00		$0.00		$0.00		$0.00
5		$0.00		$0.00		$0.00		$0.00
6		$0.00		$0.00		$0.00		$0.00
7		$0.00		$0.00		$0.00		$0.00
8		$0.00		$0.00		$0.00		$0.00
9		$0.00		$0.00		$0.00		$0.00
10		$0.00		$0.00		$0.00		$0.00
11		$0.00		$0.00		$0.00		$0.00
12		$0.00		$0.00		$0.00		$0.00
13		$0.00		$0.00		$0.00		$0.00
14		$0.00		$0.00		$0.00		$0.00
15		$0.00		$0.00		$0.00		$0.00
16	2,173	$141,245.00	384	$24,960.00		$0.00		$0.00
17	450	$36,000.00		$0.00		$0.00		$0.00
18		$0.00		$0.00		$0.00		$0.00
19		$0.00		$0.00	465	$32,550.00		$0.00
20		$0.00		$0.00	276	$23,460.00		$0.00
21		$0.00		$0.00		$0.00		$0.00
22		$0.00		$0.00		$0.00		$0.00
23		$0.00		$0.00		$0.00		$0.00
24		$0.00		$0.00		$0.00		$0.00
25		$0.00		$0.00		$0.00		$0.00
26		$0.00		$0.00		$0.00		$0.00
27		$0.00		$0.00		$0.00		$0.00
28		$0.00		$0.00		$0.00	220	$19,800.00
29		$0.00		$0.00		$0.00	149	$15,645.00
30		$0.00		$0.00		$0.00		$0.00
31		$0.00		$0.00		$0.00		$0.00
32		$0.00		$0.00		$0.00		$0.00
33		$0.00		$0.00		$0.00		$0.00
31		$0.00		$0.00		$0.00		$0.00
32		$0.00		$0.00		$0.00		$0.00
33		$0.00		$0.00		$0.00		$0.00
34	6	$18,000.00	3	$9,000.00		$0.00		$0.00
35	1	$5,000.00		$0.00		$0.00		$0.00
36		$0.00		$0.00		$0.00		$0.00
37		$0.00		$0.00	3	$15,000.00		$0.00
38		$0.00		$0.00	2	$20,000.00	1	$10,000.00
39		$0.00		$0.00		$0.00	2	$30,000.00
40	7	$10,500.00	3	$4,500.00	5	$7,500.00	3	$4,500.00
41		$0.00		$0.00		$0.00		$0.00
42		$0.00		$0.00		$0.00		$0.00
43		$0.00		$0.00		$0.00		$0.00
44		$0.00		$0.00		$0.00		$0.00
45		$0.00		$0.00		$0.00		$0.00
46		$0.00		$0.00		$0.00		$0.00
47		$0.00		$0.00		$0.00		$0.00
48		$0.00		$0.00		$0.00		$0.00
49	105	$63,000.00		$0.00	170	$102,000.00		$0.00
50		$0.00		$0.00		$0.00		$0.00
51		$0.00		$0.00		$0.00	1	$20,000.00
52		$0.00		$0.00		$0.00		$0.00
53		$0.00		$0.00		$0.00		$0.00
54	7	$3,500.00	3	$1,500.00	5	$2,500.00	3	$1,500.00
55	2,623	$6,032.90	384	$883.20	741	$1,704.30	369	$848.70
56	1	$3,671.61	1	$556.77	1	$2,248.11	1	$1,213.92
57	1	$3,671.61	1	$556.77	1	$2,248.11	1	$1,213.92
58	1	$2,000.00		$0.00	1	$2,000.00		$0.00
		$367,161		$55,677		$224,811		$121,392
		$73,432		$11,135		$44,962		$24,278
		$440,593		$66,812		$269,773		$145,670
		$44,059		$6,681		$26,977		$14,567
		$44,059		$6,681		$26,977		$14,567
		$528,800		***$80,200***		***$323,800***		***$174,900***

	MH 8-2 to MH 8-9		MH 40 to MH 40-4		Fox Valley		Cedar Springs	
ITEM NO.	QUANTITY	TOTAL PRICE	QUANTITY	TOTAL PRICE	QUANTITY	TOTAL PRICE	QUANTITY	TOTAL PRICE
1	1	$19,500.00	1	$6,600.00	1	$3,100.00	1	$2,200.00
2		$0.00		$0.00		$0.00		$0.00
3	1	$13,900.00	1	$4,700.00	1	$2,200.00	1	$1,600.00
4		$0.00		$0.00		$0.00		$0.00
5		$0.00		$0.00		$0.00		$0.00
6		$0.00		$0.00		$0.00		$0.00
7		$0.00		$0.00		$0.00		$0.00
8		$0.00		$0.00		$0.00		$0.00
9		$0.00		$0.00		$0.00		$0.00
10		$0.00		$0.00	334	$18,370.00	413	$22,715.00
11		$0.00		$0.00	465	$32,550.00	180	$12,600.00
12		$0.00		$0.00		$0.00		$0.00
13		$0.00	763	$45,780.00		$0.00		$0.00
14		$0.00	150	$11,250.00		$0.00		$0.00
15		$0.00		$0.00		$0.00		$0.00
16		$0.00		$0.00		$0.00		$0.00
17		$0.00		$0.00		$0.00		$0.00
18		$0.00		$0.00		$0.00		$0.00
19	1,382	$96,740.00		$0.00		$0.00		$0.00
20	877	$74,545.00		$0.00		$0.00		$0.00
21		$0.00		$0.00		$0.00		$0.00
22		$0.00		$0.00		$0.00		$0.00
23		$0.00		$0.00		$0.00		$0.00
24		$0.00		$0.00		$0.00		$0.00
25		$0.00		$0.00		$0.00		$0.00
26		$0.00		$0.00		$0.00		$0.00
27		$0.00		$0.00		$0.00		$0.00
28		$0.00		$0.00		$0.00		$0.00
29		$0.00		$0.00		$0.00		$0.00
30		$0.00		$0.00		$0.00		$0.00
31		$0.00		$0.00		$0.00		$0.00
32		$0.00		$0.00		$0.00		$0.00
33		$0.00		$0.00		$0.00		$0.00
31		$0.00		$0.00		$0.00		$0.00
32		$0.00		$0.00		$0.00		$0.00
33		$0.00		$0.00		$0.00		$0.00
34		$0.00	3	$9,000.00	1	$3,000.00	2	$6,000.00
35		$0.00	1	$5,000.00	3	$15,000.00	1	$5,000.00
36		$0.00		$0.00		$0.00		$0.00
37		$0.00		$0.00		$0.00		$0.00
38	4	$40,000.00		$0.00		$0.00		$0.00
39	3	$45,000.00		$0.00		$0.00		$0.00
40	7	$10,500.00	4	$6,000.00	4	$6,000.00	3	$4,500.00
41		$0.00		$0.00		$0.00		$0.00
42		$0.00		$0.00		$0.00		$0.00
43		$0.00		$0.00		$0.00		$0.00
44		$0.00		$0.00		$0.00		$0.00
45		$0.00		$0.00		$0.00		$0.00
46		$0.00		$0.00		$0.00		$0.00
47		$0.00		$0.00		$0.00		$0.00
48		$0.00	296	$88,800.00		$0.00		$0.00
49	389	$233,400.00		$0.00		$0.00		$0.00
50		$0.00		$0.00		$0.00		$0.00
51		$0.00		$0.00		$0.00		$0.00
52		$0.00		$0.00		$0.00		$0.00
53		$0.00		$0.00		$0.00		$0.00
54	7	$3,500.00	4	$2,000.00	4	$2,000.00	3	$1,500.00
55	2,259	$5,195.70	913	$2,099.90	799	$1,837.70	493	$1,133.90
56	1	$5,553.88	1	$1,869.69	1	$857.73	1	$604.58
57	1	$5,553.88	1	$1,869.69	1	$857.73	1	$604.58
58	1	$2,000.00	1	$2,000.00		$0.00	1	$2,000.00
		$555,388		$186,969		$85,773		$60,458
		$111,078		$37,394		$17,155		$12,092
		$666,466		$224,363		$102,928		$72,550
		$66,647		$22,436		$10,293		$7,255
		$66,647		$22,436		$10,293		$7,255
		$799,800		***$269,300***		***$123,600***		***$87,100***

Total Short-Term Costs: $1.35M



Total Longer-Term Costs: $1.71M



ENGINEER'S PRELIMINARY OPINION OF PROBABLE COST
NORTH LIBERTY SANITARY SEWER SERVICE STUDY
Jasper Ave. Growth Corridor Probable Cost/Acre Summary
City of North Liberty, IA

Total Jordan Ave. Corridor Cost per Acre for Sanitary Sewer

Total Basin Cost/Acre	Total Area Served in Corridor (Acres)	Total Corridor Cost	Total Corridor Cost/Acre
Gravity Sewer	*614*	*$896,700*	*$1,460*
Pump Station and Force Main	*614*	*$2,046,100*	*$3,332*
Total Cost per Acre			**$4,793**

ENGINEER'S PRELIMINARY OPINION OF PROBABLE COST
NORTH LIBERTY SANITARY SEWER SERVICE STUDY
SOUTHWESTERN GROWTH CORRIDOR
Future Lift Station Basin
City of North Liberty, IA

LAST UPDATE:2/23/2011
FOX PN: 2489-10A.300

			Engineer's Opinion of Probable Cost	Sub-basin 1-L Gravity Sewer		Sub-basin 1-L Gravity, Force Main, PS	
ITEM NO.	DESCRIPTION	UNITS	UNIT PRICE	QUANTITY	TOTAL PRICE	QUANTITY	TOTAL PRICE
1	Mobilization, Bonds, Insurance	LS	3.5%	1	$21,800.00	1	$49,800.00
2	Clearing and Grubbing	LF	$30		$0.00		$0.00
3	Stabilization Material/Special Backfill	LS	2.5%	1	$15,600.00	1	$35,600.00
4	**8" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$45		$0.00		$0.00
5	8" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$60		$0.00		$0.00
6	8" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$75		$0.00		$0.00
7	**10" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$50		$0.00		$0.00
8	10" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$65		$0.00		$0.00
9	10" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$80		$0.00		$0.00
10	**12" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$55		$0.00		$0.00
11	12" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$70		$0.00		$0.00
12	12" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$85		$0.00		$0.00
13	**15" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$60	2,350	$141,000.00		$0.00
14	15" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$75	150	$11,250.00		$0.00
15	15" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$90		$0.00		$0.00
16	**18" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$65	1,290	$83,850.00		$0.00
17	18" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$80		$0.00		$0.00
18	18" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$95		$0.00		$0.00
19	**21" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$70		$0.00		$0.00
20	21" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$85		$0.00		$0.00
21	21" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$100		$0.00		$0.00
22	**24" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$75		$0.00		$0.00
23	24" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$90		$0.00		$0.00
24	24" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$105		$0.00		$0.00
25	**27" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$80		$0.00		$0.00
26	27" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$95		$0.00		$0.00
27	27" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$110		$0.00		$0.00
28	**30" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$90		$0.00		$0.00
29	30" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$105		$0.00		$0.00
30	30" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$120		$0.00		$0.00
31	**36" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$110		$0.00		$0.00
32	36" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$125		$0.00		$0.00
33	36" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$140		$0.00		$0.00
34	**48" Sanitary Sewer Manholes (0-15 ft)**	EA	$3,000	11	$33,000.00		$0.00
35	48" Sanitary Sewer Manholes (15-25 ft)	EA	$5,000	1	$5,000.00		$0.00
36	48" Sanitary Sewer Manholes (>25 ft)	EA	$10,000		$0.00		$0.00
37	**60" Sanitary Sewer Manholes (0-15 ft)**	EA	$5,000		$0.00		$0.00
38	60" Sanitary Sewer Manholes (15-25 ft)	EA	$10,000		$0.00		$0.00
39	60" Sanitary Sewer Manholes (>25 ft)	EA	$15,000		$0.00		$0.00
40	Connect to Existing Manhole	EA	$1,500		$0.00	1	$1,500.00
41	8" & 12" Parallel Force Mains (C900)	LF	$42		$0.00		$0.00
42	6" Force Main (C900)	LF	$15		$0.00		$0.00
43	10" Force Main (C900)	LF	$30		$0.00	7,850	$235,500.00
44	24" Force Main (C900)	LF	$81		$0.00		$0.00
45	36" Force Main (DI)	LF	$144		$0.00		$0.00
46	Connect to Existing Forcemain	EA	$3,000		$0.00		$0.00
47	Force Main Air Release/Cleanout Manholes	EA	$65,800		$0.00		$0.00
48	8" to 15" Bored Road Crossing and Casing	LF	$300	60	$18,000.00		$0.00
49	18" to 27" Bored Road Crossing and Casing	LF	$600	440	$264,000.00	500	$300,000.00
50	Stream Crossing	EA	$20,000		$0.00		$0.00
51	Submersible Duplex Pump Station	LS	$250,000		$0.00		$0.00
52	Trench Type Wet Well Pump Station	LS	$750,000		$0.00	1	$750,000.00
53	Sanitary Sewer and Manhole Testing	EA	$500	12	$6,000.00	0	$0.00
54	Type 5 Rural Seeding	LF	$2	3,790	$8,717.00	7,850	$18,055.00
55	Erosion Control	LS	1%	1	$6,226.70	1	$14,208.72
56	Field Tile Repair	LS	1%	1	$6,226.70	1	$14,208.72
57	Traffic Control	LS	$2,000	1	$2,000.00	1	$2,000.00
	Subtotal				$622,670		$1,420,872
	20% CONTINGENCIES				$124,534		$284,174
	SUBTOTAL				$747,204		$1,705,047
	10% ENGINEERING				$74,720		$170,505
	10% OBSERVATION/STAKING				$74,720		$170,505
	Pipe Run Total				***$896,700***		***$2,046,100***
	Phase Total						***$2,942,800***

GENERAL NOTES AND ASSUMPTION:
1. Land acquisition is not included in the opinion of costs presented.
2. Geotechnical Exploration costs are not included in the opinion of costs presented.

PREPARED BY:
FOX ENGINEERING ASSOCIATES, INC.
AMES, IOWA

ENGINEER'S PRELIMINARY OPINION OF PROBABLE COST
NORTH LIBERTY SANITARY SEWER SERVICE STUDY
SE Interceptor Probable Cost Summary
City of North Liberty, IA

Basin 1	Trunk Probable Cost	Total Branch Probable Cost**	Total Sub-Basin Cost	Sub-Basin Min. Total Cost
Phase 1				
Option 1 - Gravity Sewer Option	$1,809,200	$0	$1,809,200	$1,809,200
Option 2 - Gravity Sewer Along Stream Channel	$1,066,100	$1,131,400	$2,197,500	
Option 3A - Temp. Submersible PS and FM (2.5 MGD Maximum)*	$1,279,400	$0	$1,279,400	
Option 3B - Trench Self-Cleaning Wet Well PS and FM (>2.5 MGD)	$2,453,300	$0	$2,453,300	
Phase 2				
Gravity Trunk and Branches to K,M, and L	$405,500	$272,700	$678,200	$678,200
Phase 3				
Gravity Trunk and Branches to P and Q	$447,600	$0	$447,600	$447,600
Basin 1 Total Probable Cost^				***$2,691,900***

*Selection of Option 3A will result in needing to upgrade to a Trench Self-Cleaning Wet Well PS as in Option 3B when flows exceed 2.5 MGD.
**For pipe diameters greater than 10 inches.
^Includes deduct of $243,100 to account for increase in trunk size due to flows from Basin 2. Deduct was added to probable cost in Basin 2.

Basin 2	Trunk Probable Cost	Branch Probable Cost	Total Cost	Sub-Basin Min. Total Cost
Sub-Basins 2A through 2D				
12" Gravity Sewer To Pump Station	$317,300	$0	$317,300	$317,300
E through G^				
12" Gravity Sewer To Pump Station	$331,300	$0	$331,300	$331,300
Pump Station To WWTP				
Option 1- FM from Pump Station to WWTP	$1,641,300	$0	$1,641,300	$1,641,300
Option 2- FM to Gravity Sewer in Basin 1 (includes additional $243,100 to acocunt for increase in Basin 1, Option 2 gravity sewer size)	$938,800	$0	$938,800	$938,800
Basin 2 Option 1 Total Probable Cost				***$2,289,900***
Basin 2 Option 2 Probable Total Cost				***$1,587,400***

^Includes $415,500 deduct for increase in trunk size due to flows from Basin 3. Deduct was added to probable cost in Basin 3.

Basin 3	Trunk Probable Cost	Branch Probable Cost	Total Cost	Sub-Basin Min. Total Cost
6" Force Main to Basin 2	$733,400	$0	$733,400	$733,400
Basin 2 sizing adjustments to facilitate flows from Basin 3				
Increase E-G sizing to 15" and add 12"	$204,600	$0	$204,600	$204,600
Connect 12" from Basin 3 Boarder to Basin 2 trunk	$210,900	$0	$210,900	$210,900
Basin 3 Total Probable Cost				***$1,148,900***

Total SE Growth Corridor Development Cost (with Basin 2, Option 1)	***$6,130,700***
Total SE Growth Corridor Development Cost (with Basin 2, Option 2)	***$5,428,200***

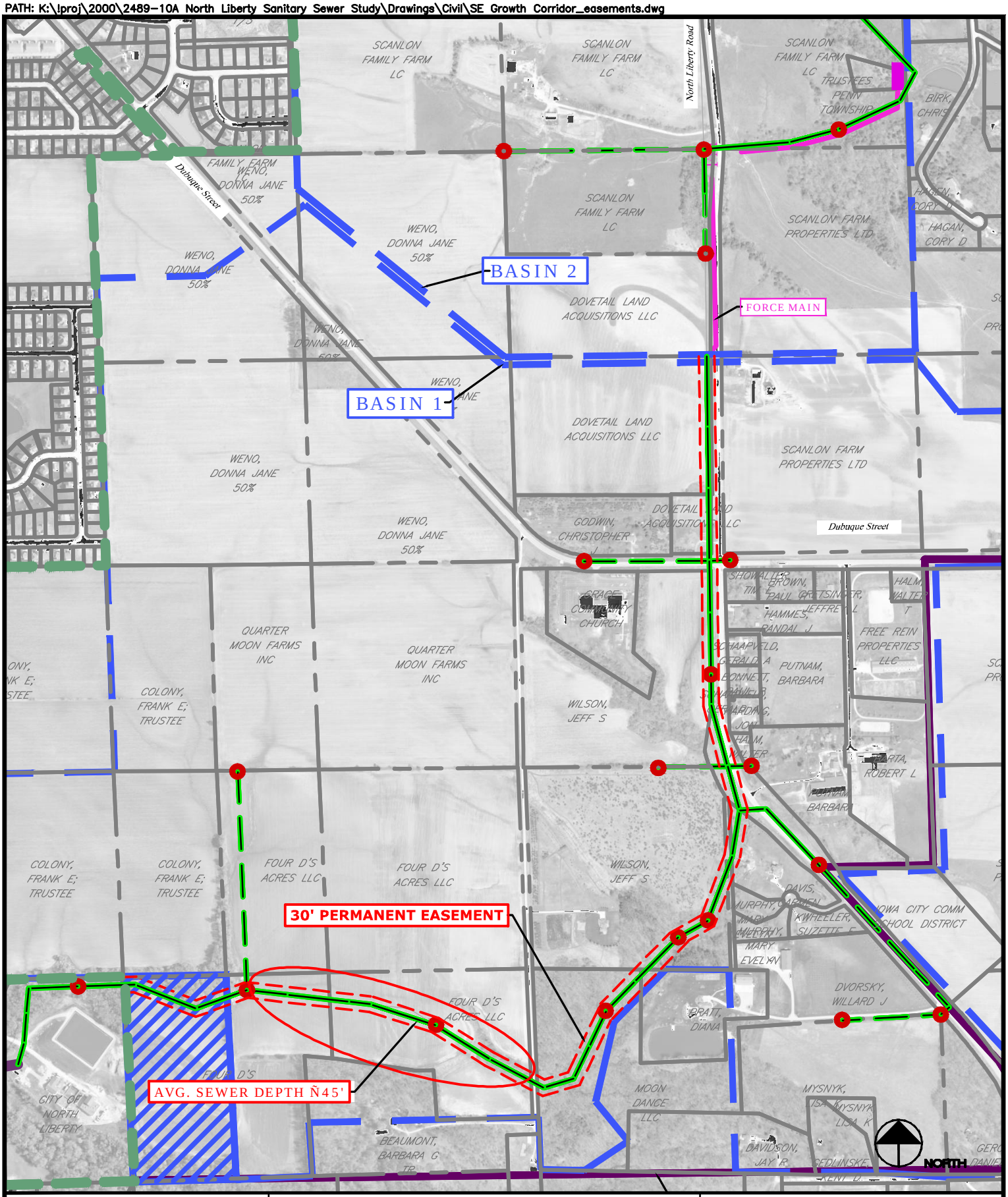
NORTH LIBERTY SANITARY SEWER SERVICE STUDY
SE Growth Corridor
Basin 1 Permanent Easements Required for Trunk Sewer

Easement No.	Property Owner	Easement Length (LF)	Avg. Sewer Depth (±ft)	Permanent Easement Width (ft)	Permanent Easement Cost ($/SF)	Easement Cost
1	FOUR D'S ACRES LLC	2802	45	30	$ 0.29	$ 24,377
2	MOON DANCE LLC	1724	12	30	$ 0.29	$ 14,999
3	PRATT, DIANA	55	10	30	$ 0.29	$ 479
4	WILSON, JEFF S	1346	10	30	$ 0.29	$ 11,710
5	DAVIS, CARMEN K	321	10	30	$ 0.29	$ 2,793
6	WILSON, JEFF S	877	13	30	$ 0.29	$ 7,630
7	DOVETAIL LAND ACUISITIONS LLC	1510	12	30	$ 0.29	$ 13,137
	TOTAL					**$ 75,125**

Assumptions:

1. Cost of land = $25,000/Acre
2. Permanent area= 50% of land value.
3. Four D's Acres LLC sewer depth averages 45'. FOX Engineering assumed that the gravity sewer would not be removed once in place. Future removal of the gravity sewer would require an easement of at least 75 feet.

PATH: K:\!proj\2000\2489-10A North Liberty Sanitary Sewer Study\Drawings\Civil\SE Growth Corridor_easements.dwg



FOX engineering

NORTH LIBERTY SANITARY SEWER SERVICE STUDY - SE GROWTH CORRIDOR

BASIN 1 TRUNK SEWER PERMANENT EASEMENT REQUIREMENTS

FIGURE: 1

REVISION	NO.	DATE
DRAWN ----	PROJECT NO. 2489-10A	DATE 12/17/10

ENGINEER'S PRELIMINARY OPINION OF PROBABLE COST
NORTH LIBERTY SANITARY SEWER SERVICE STUDY
SE Interceptor Probable Cost/Acre Summary
City of North Liberty, IA

SE Corridor Basin Costs per Acre for Sanitary Sewer

Basin	Basin Area (Acres)	Trunk, FM, Lift Station Probable Cost*	Basin Projected Cost/Acre
Basin 1**			
Basin 1 with Additional Capacity (Gravity Sewer)	860	$2,691,900	$3,130
Basin 1 without Additional Capacity (Gravity Sewer)	660	$2,691,900	$4,079
Basin 2^			
Basin 2, Option 1 (Forcemain to WWTP)	444	$2,289,900	$5,157
Basin 2, Option 2** (Forcemain to Basin 1)	444	$1,587,400	$3,575
Basin 3^			
Lift Station and Force Main to Basin 2	174	$1,148,900	$6,603

*Total Cost for gravity trunk sewer greater than 10" diameter, force main, and lift station required to serve basin.

**Includes $243,100 deduct for increase in trunk size due to flows from Basin 2. Deduct was added to probable cost in Basin 2, Option 2.

^Includes $415,500 deduct for increase in trunk sewer size due to flows from Basin 3. Deduct was added to probable cost in Basin 3.

Total SE Corridor Cost per Acre for Sanitary Sewer

Total SE Corridor Cost/Acre	Total Area Served in Corridor (Acres)	Total Corridor Cost	Total Corridor Cost/Acre
Basin 1 Additional Capacity; Basin 2, Option 1; Basin 3	*1478*	*$6,130,700*	***$4,148***
Basin 1 Additional Capacity; Basin 2, Option 2; Basin 3	*1478*	*$5,428,200*	***$3,673***
Basin 1 No Additional Capacity; Basin 2, Option 1; Basin 3	*1278*	*$6,130,700*	***$4,797***
Basin 1 No Additional Capacity; Basin 2, Option 2; Basin 3	*1278*	*$5,428,200*	***$4,247***

Southeast Growth Corridor

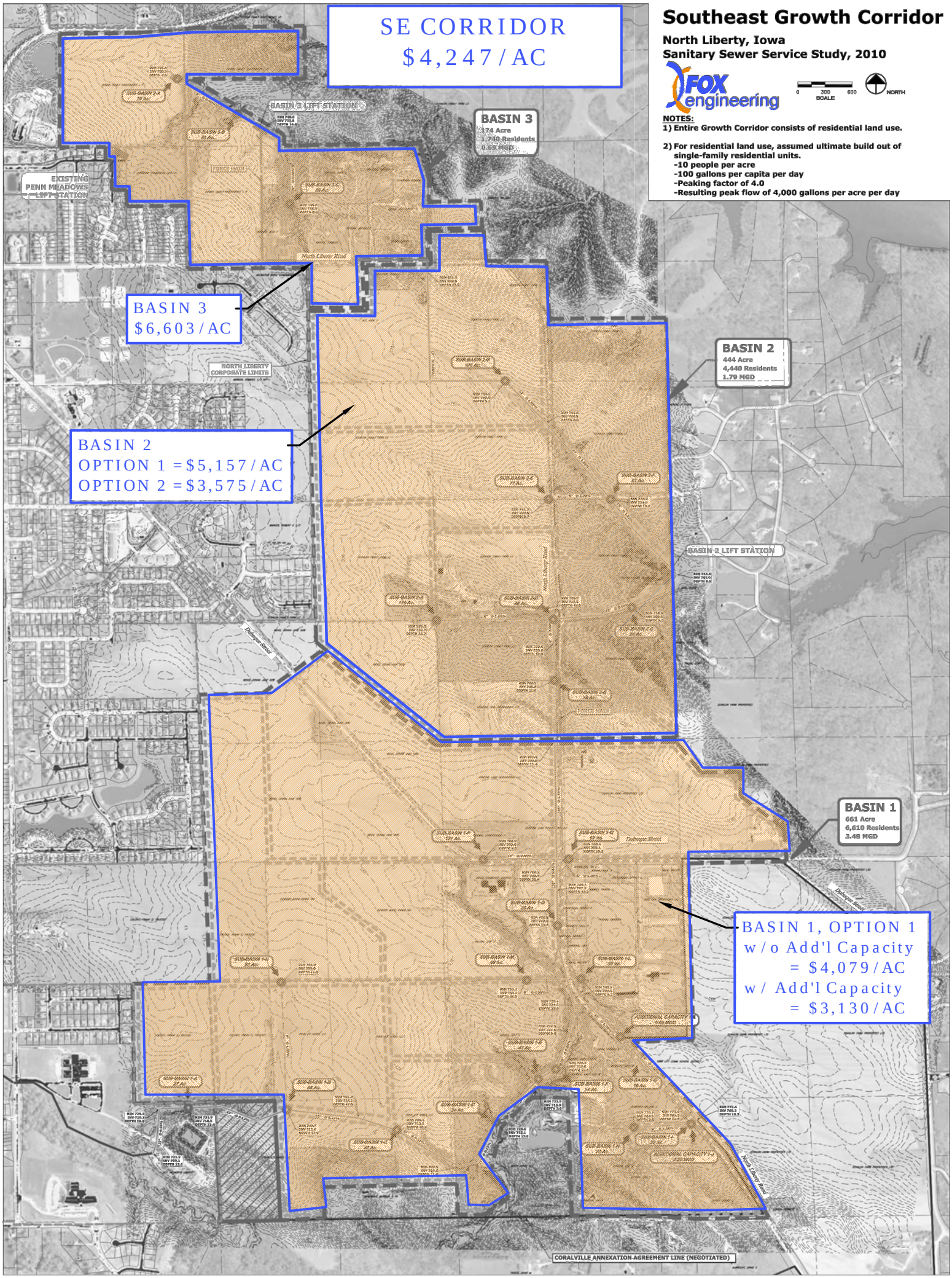
North Liberty, Iowa
Sanitary Sewer Service Study, 2010

FOX engineering

0 300 600 SCALE NORTH

NOTES:
1) Entire Growth Corridor consists of residential land use.

2) For residential land use, assumed ultimate build out of single-family residential units.
-10 people per acre
-100 gallons per capita per day
-Peaking factor of 4.0
-Resulting peak flow of 4,000 gallons per acre per day



ENGINEER'S PRELIMINARY OPINION OF PROBABLE COST
NORTH LIBERTY SANITARY SEWER SERVICE STUDY
SE INTERCEPTOR, Basin 1 - A, B, C, D, N
Option 1- Gravity Sewer Option
City of North Liberty, IA

LAST UPDATE:11/18/2010
FOX PN: 2489-10A.300

			Engineer's Opinion of Probable Cost	WWTP (MH 1) to MH 4		MH 4 to MH 7		MH 7 to MH 10		MH 10 to MH15	
ITEM NO.	DESCRIPTION	UNITS	UNIT PRICE	QUANTITY	TOTAL PRICE	QUANTITY	TOTAL PRICE	QUANTITY	TOTAL PRICE	QUANTITY	TOTAL PRICE
1	Mobilization, Bonds, Insurance	LS	3.5%	1	$9,000.00	1	$9,500.00	1	$13,100.00	1	$12,600.00
2	Clearing and Grubbing	LF	$30	822	$24,660.00	941	$28,230.00		$0.00	1,072	$32,160.00
3	Stabilization Material/Special Backfill	LS	2.5%	1	$6,500.00	1	$6,800.00	1	$9,400.00	1	$9,000.00
4	**8" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$45		$0.00		$0.00		$0.00		$0.00
5	8" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$60		$0.00		$0.00		$0.00		$0.00
6	8" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$75		$0.00		$0.00		$0.00		$0.00
7	**10" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$50		$0.00		$0.00		$0.00		$0.00
8	10" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$65		$0.00		$0.00		$0.00		$0.00
9	10" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$80		$0.00		$0.00		$0.00		$0.00
10	**12" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$55		$0.00		$0.00		$0.00		$0.00
11	12" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$70		$0.00		$0.00		$0.00		$0.00
12	12" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$85		$0.00		$0.00		$0.00		$0.00
13	**15" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$60		$0.00		$0.00		$0.00		$0.00
14	15" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$75		$0.00		$0.00		$0.00		$0.00
15	15" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$90		$0.00		$0.00		$0.00		$0.00
16	**18" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$65		$0.00		$0.00		$0.00		$0.00
17	18" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$80		$0.00		$0.00		$0.00		$0.00
18	18" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$95		$0.00		$0.00		$0.00		$0.00
19	**21" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$70		$0.00		$0.00		$0.00		$0.00
20	21" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$85		$0.00		$0.00		$0.00		$0.00
21	21" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$100		$0.00		$0.00		$0.00		$0.00
22	**24" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$75		$0.00		$0.00		$0.00		$0.00
23	24" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$90		$0.00		$0.00		$0.00		$0.00
24	24" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$105		$0.00		$0.00		$0.00		$0.00
25	**27" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$80	60	$4,800.00		$0.00		$0.00	687	$54,960.00
26	27" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$95	762	$72,390.00		$0.00		$0.00	200	$19,000.00
27	27" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$110		$0.00	791	$87,010.00		$0.00	400	$44,000.00
28	27" Gravity Sanitary Sewer, Trenched (45 ft)	LF	$235		$0.00	352	$82,720.00	1,247	$293,045.00	200	$47,000.00
28	**30" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$90		$0.00		$0.00		$0.00		$0.00
29	30" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$105		$0.00		$0.00		$0.00		$0.00
30	30" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$120		$0.00		$0.00		$0.00		$0.00
31	**36" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$110		$0.00		$0.00		$0.00		$0.00
32	36" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$125		$0.00		$0.00		$0.00		$0.00
33	36" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$140		$0.00		$0.00		$0.00		$0.00
34	**48" Sanitary Sewer Manholes (0-15 ft)**	EA	$3,000		$0.00		$0.00		$0.00		$0.00
35	48" Sanitary Sewer Manholes (15-25 ft)	EA	$5,000		$0.00		$0.00		$0.00		$0.00
36	48" Sanitary Sewer Manholes (>25 ft)	EA	$10,000		$0.00		$0.00		$0.00		$0.00
37	**60" Sanitary Sewer Manholes (0-15 ft)**	EA	$5,000	1	$5,000.00		$0.00		$0.00	4	$20,000.00
38	60" Sanitary Sewer Manholes (15-25 ft)	EA	$10,000	2	$20,000.00		$0.00		$0.00		$0.00
39	60" Sanitary Sewer Manholes (>25 ft)	EA	$15,000		$0.00	3	$45,000.00	3	$45,000.00	1	$15,000.00
40	Connect to Existing Manhole	EA	$1,500	1	$1,500.00		$0.00		$0.00		$0.00
41	8" & 12" Parallel Force Main (C900)	LF	$42		$0.00		$0.00		$0.00		$0.00
42	12" Force Main (C900)	LF	$15		$0.00		$0.00		$0.00		$0.00
43	Force Main Air Release/Cleanout Manholes	EA	$8,000		$0.00		$0.00		$0.00		$0.00
44	8" to 15" Bored Road Crossing and Casing	LF	$300		$0.00		$0.00		$0.00		$0.00
45	18" to 27" Bored Road Crossing and Casing	LF	$600	170	$102,000.00		$0.00		$0.00	120	$72,000.00
46	Stream Crossing	EA	$20,000		$0.00		$0.00		$0.00	1	$20,000.00
47	Submersible Duplex Pump Station	LS	$250,000		$0.00		$0.00		$0.00		$0.00
48	Trench Type Wet Well Pump Station	LS	$1,000,000		$0.00		$0.00		$0.00		$0.00
49	Sanitary Sewer and Manhole Testing	EA	$500	3	$1,500.00	3	$1,500.00	3	$1,500.00	5	$2,500.00
50	Type 5 Rural Seeding	LF	$2	822	$1,890.60	1,143	$2,628.90	1,247	$2,868.10	1,487	$3,420.10
51	Erosion Control	LS	1%	1	$2,563.68	1	$2,687.64	1	$3,723.60	1	$3,588.16
52	Field Tile Repair	LS	1%	1	$2,563.68	1	$2,687.64	1	$3,723.60	1	$3,588.16
53	Traffic Control	LS	$2,000	1	$2,000.00		$0.00		$0.00		$0.00
	Subtotal				$256,367.96		$268,764.18		$372,360.31		$358,816.43
	20% CONTINGENCIES				$51,273.59		$53,752.84		$74,472.06		*$71,763.29*
	SUBTOTAL				$307,641.55		$322,517.02		$446,832.37		*$430,579.71*
	10% ENGINEERING				*$30,764.16*		*$32,251.70*		*$44,683.24*		*$43,057.97*
	10% OBSERVATION/STAKING				*$30,764.16*		*$32,251.70*		*$44,683.24*		*$43,057.97*
	Pipe Run Total				***$369,200.00***		***$387,100.00***		***$536,200.00***		***$516,700.00***
	Phase Total										***$1,809,200.00***

GENERAL NOTES AND ASSUMPTION:
1. Land acquisition is not included in the opinion of costs presented.
2. Geotechnical Exploration costs are not included in the opinion of costs presented.

PREPARED BY:
FOX ENGINEERING ASSOCIATES, INC.
AMES, IOWA

ENGINEER'S PRELIMINARY OPINION OF PROBABLE COST
NORTH LIBERTY SANITARY SEWER SERVICE STUDY
SE INTERCEPTOR, Basin 1 - A, B, C, D, N
Option 1- Gravity Sewer Option, NO FLOW FROM BASIN 2
City of North Liberty, IA

LAST UPDATE:11/18/2010
FOX PN: 2489-10A.300

			Engineer's Opinion of Probable Cost	WWTP (MH 1) to MH 4		MH 4 to MH 7		MH 7 to MH 10		MH 10 to MH15	
ITEM NO.	DESCRIPTION	UNITS	UNIT PRICE	QUANTITY	TOTAL PRICE	QUANTITY	TOTAL PRICE	QUANTITY	TOTAL PRICE	QUANTITY	TOTAL PRICE
1	Mobilization, Bonds, Insurance	LS	3.5%	1	$8,900.00	1	$6,100.00	1	$4,300.00	1	$10,700.00
2	Clearing and Grubbing	LF	$30	822	$24,660.00	941	$28,230.00		$0.00	1,072	$32,160.00
3	Stabilization Material/Special Backfill	LS	2.5%	1	$6,300.00	1	$4,400.00	1	$3,100.00	1	$7,700.00
4	**8" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$45		$0.00		$0.00		$0.00		$0.00
5	8" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$60		$0.00		$0.00		$0.00		$0.00
6	8" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$75		$0.00		$0.00		$0.00		$0.00
7	**10" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$50		$0.00		$0.00		$0.00		$0.00
8	10" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$65		$0.00		$0.00		$0.00		$0.00
9	10" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$80		$0.00		$0.00		$0.00		$0.00
10	**12" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$55		$0.00		$0.00		$0.00		$0.00
11	12" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$70		$0.00		$0.00		$0.00		$0.00
12	12" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$85		$0.00		$0.00		$0.00		$0.00
13	**15" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$60		$0.00		$0.00		$0.00		$0.00
14	15" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$75		$0.00		$0.00		$0.00		$0.00
15	15" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$90		$0.00		$0.00		$0.00		$0.00
16	**18" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$65		$0.00		$0.00		$0.00		$0.00
17	18" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$80		$0.00		$0.00		$0.00		$0.00
18	18" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$95		$0.00		$0.00		$0.00		$0.00
19	**21" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$70		$0.00		$0.00	890	$62,300.00	887	$62,090.00
20	21" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$85		$0.00		$0.00		$0.00	200	$17,000.00
21	21" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$100		$0.00		$0.00		$0.00	370	$37,000.00
22	**24" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$75	60	$4,500.00	1,143	$85,725.00		$0.00		$0.00
23	24" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$90	762	$68,580.00		$0.00		$0.00		$0.00
24	24" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$105		$0.00		$0.00		$0.00		$0.00
25	**27" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$80		$0.00		$0.00		$0.00		$0.00
26	27" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$95		$0.00		$0.00		$0.00		$0.00
27	27" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$110		$0.00		$0.00		$0.00		$0.00
28	**30" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$90		$0.00		$0.00		$0.00		$0.00
29	30" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$105		$0.00		$0.00		$0.00		$0.00
30	30" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$120		$0.00		$0.00		$0.00		$0.00
31	**36" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$110		$0.00		$0.00		$0.00		$0.00
32	36" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$125		$0.00		$0.00		$0.00		$0.00
33	36" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$140		$0.00		$0.00		$0.00		$0.00
34	**48" Sanitary Sewer Manholes (0-15 ft)**	EA	$3,000		$0.00		$0.00		$0.00		$0.00
35	48" Sanitary Sewer Manholes (15-25 ft)	EA	$5,000		$0.00		$0.00		$0.00		$0.00
36	48" Sanitary Sewer Manholes (>25 ft)	EA	$10,000		$0.00		$0.00		$0.00		$0.00
37	**60" Sanitary Sewer Manholes (0-15 ft)**	EA	$5,000	1	$5,000.00		$0.00		$0.00	4	$20,000.00
38	60" Sanitary Sewer Manholes (15-25 ft)	EA	$10,000	2	$20,000.00		$0.00		$0.00		$0.00
39	60" Sanitary Sewer Manholes (>25 ft)	EA	$15,000		$0.00	3	$45,000.00	3	$45,000.00	1	$15,000.00
40	Connect to Existing Manhole	EA	$1,500	1	$1,500.00		$0.00		$0.00		$0.00
41	8" & 12" Parallel Force Main (C900)	LF	$42		$0.00		$0.00		$0.00		$0.00
42	12" Force Main (C900)	LF	$15		$0.00		$0.00		$0.00		$0.00

43	Force Main Air Release/Cleanout Manholes	EA	$8,000		$0.00		$0.00		$0.00		$0.00
44	8" to 15" Bored Road Crossing and Casing	LF	$300		$0.00		$0.00		$0.00		$0.00
45	18" to 27" Bored Road Crossing and Casing	LF	$600	170	$102,000.00		$0.00		$0.00	120	$72,000.00
46	Stream Crossing	EA	$20,000		$0.00		$0.00		$0.00	1	$20,000.00
47	Submersible Duplex Pump Station	LS	$250,000		$0.00		$0.00		$0.00		$0.00
48	Trench Type Wet Well Pump Station	LS	$1,000,000		$0.00		$0.00		$0.00		$0.00
49	Sanitary Sewer and Manhole Testing	EA	$500	3	$1,500.00	3	$1,500.00	3	$1,500.00	5	$2,500.00
50	Type 5 Rural Seeding	LF	$2	822	$1,890.60	1,143	$2,628.90	890	$2,047.00	1,457	$3,351.10
51	Erosion Control	LS	1%	1	$2,518.68	1	$0.01	1	$1,206.60	1	$3,056.13
52	Field Tile Repair	LS	1%	1	$2,518.68	1	$0.01	1	$1,206.60	1	$3,056.13
53	Traffic Control	LS	$2,000	1	$2,000.00		$0.00		$0.00		$0.00
	Subtotal				$251,867.96		$173,583.92		$120,660.20		$305,613.37
	20% CONTINGENCIES				$50,373.59		$34,716.78		$24,132.04		*$61,122.67*
	SUBTOTAL				$302,241.55		$208,300.70		$144,792.24		*$366,736.04*
	10% ENGINEERING				*$30,224.16*		*$20,830.07*		*$14,479.22*		*$36,673.60*
	10% OBSERVATION/STAKING				*$30,224.16*		*$20,830.07*		*$14,479.22*		*$36,673.60*
	Pipe Run Total				***$362,700.00***		***$250,000.00***		***$173,800.00***		***$440,100.00***
	Phase Total										

GENERAL NOTES AND ASSUMPTION:

1. Land acquisition is not included in the opinion of costs presented.
2. Geotechnical Exploration costs are not included in the opinion of costs presented.

PREPARED BY:
FOX ENGINEERING ASSOCIATES, INC.
AMES, IOWA

SE BASIN 1
PHASE 1, OPTION 1

Southeast Growth Corridor

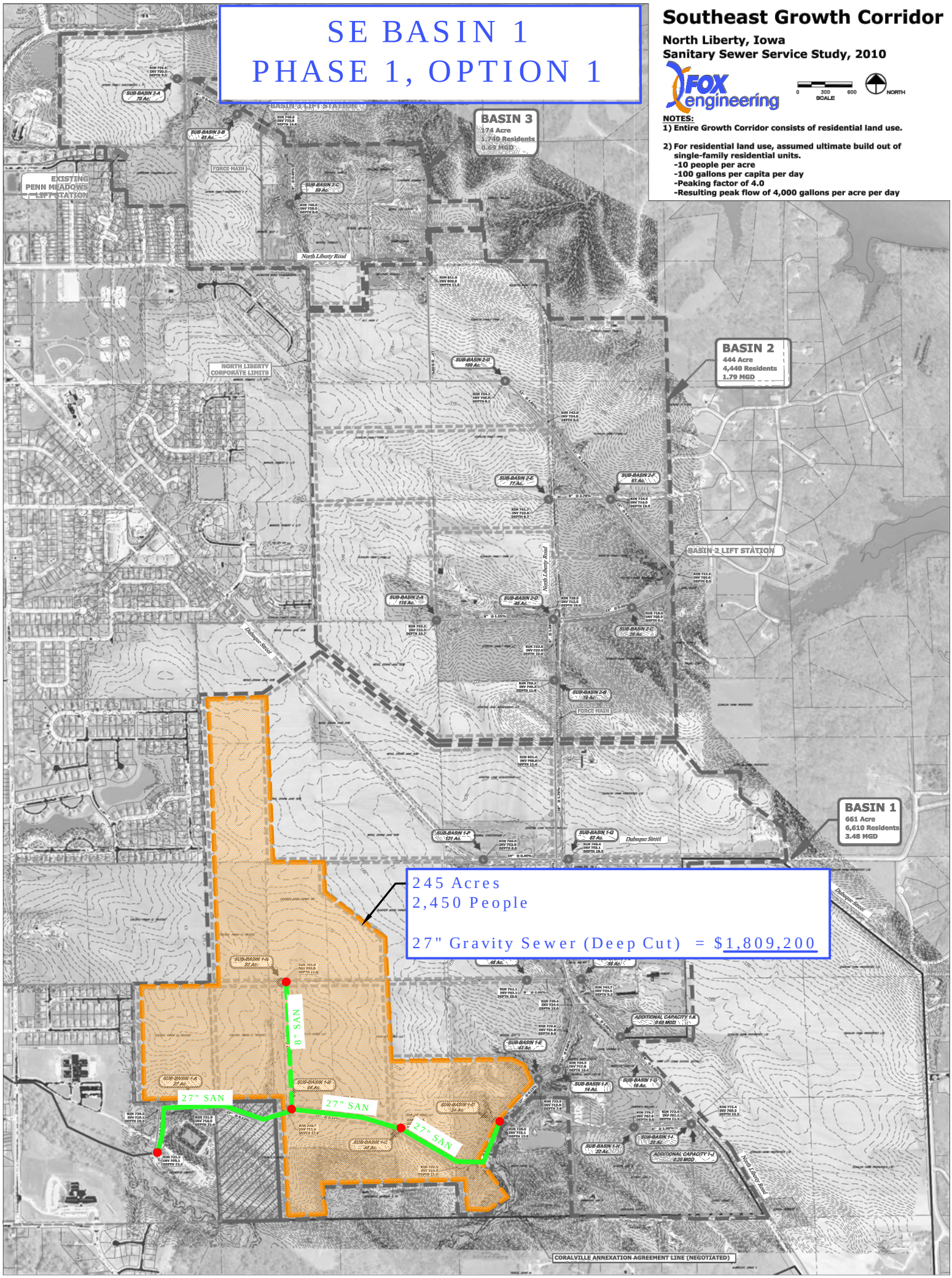
North Liberty, Iowa
Sanitary Sewer Service Study, 2010

FOX engineering

0 300 600 SCALE NORTH

NOTES:
1) Entire Growth Corridor consists of residential land use.

2) For residential land use, assumed ultimate build out of single-family residential units.
-10 people per acre
-100 gallons per capita per day
-Peaking factor of 4.0
-Resulting peak flow of 4,000 gallons per acre per day



ENGINEER'S PRELIMINARY OPINION OF PROBABLE COST
NORTH LIBERTY SANITARY SEWER SERVICE STUDY
SE INTERCEPTOR, Basin 1 - A, B, C, D, N
Option 2- Gravity Sewer Option Along Stream Channel
City of North Liberty, IA

LAST UPDATE:11/18/2010
FOX PN: 2489-10A.300

			Engineer's Opinion of Probable Cost	Stream Route- WWTP (MH 1) to MH 15		WWTP (MH 1) to MH 4		MH 4 to MH 7	
ITEM NO.	DESCRIPTION	UNITS	UNIT PRICE	QUANTITY	TOTAL PRICE	QUANTITY	TOTAL PRICE	QUANTITY	TOTAL PRICE
1	Mobilization, Bonds, Insurance	LS	3.5%	1	$26,000.00	1	$22,700.00	1	$4,900.00
2	Clearing and Grubbing	LF	$30	5,284	$158,520.00	822	$24,660.00	941	$28,230.00
3	Stabilization Material/Special Backfill	LS	2.5%	1	$18,600.00	1	$16,200.00	1	$3,500.00
4	**8" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$45		$0.00		$0.00		$0.00
5	8" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$60		$0.00		$0.00		$0.00
6	8" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$75		$0.00		$0.00		$0.00
7	**10" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$50		$0.00		$0.00		$0.00
8	10" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$65		$0.00		$0.00		$0.00
9	10" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$80		$0.00		$0.00		$0.00
10	**12" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$55		$0.00	822	$45,210.00		$0.00
11	12" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$70		$0.00		$0.00	1,143	$80,010.00
12	12" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$85		$0.00		$0.00		$0.00
13	**15" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$60		$0.00		$0.00		$0.00
14	15" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$75		$0.00		$0.00		$0.00
15	15" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$90		$0.00		$0.00		$0.00
16	**18" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$65		$0.00		$0.00		$0.00
17	18" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$80		$0.00		$0.00		$0.00
18	18" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$95		$0.00		$0.00		$0.00
19	**21" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$70		$0.00		$0.00		$0.00
20	21" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$85		$0.00		$0.00		$0.00
21	21" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$100		$0.00		$0.00		$0.00
22	**24" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$75		$0.00		$0.00		$0.00
23	24" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$90		$0.00		$0.00		$0.00
24	24" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$105		$0.00		$0.00		$0.00
25	**27" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$80	5,284	$422,720.00		$0.00		$0.00
26	27" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$95		$0.00		$0.00		$0.00
27	27" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$110		$0.00		$0.00		$0.00
28	**30" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$90		$0.00		$0.00		$0.00
29	30" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$105		$0.00		$0.00		$0.00
30	30" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$120		$0.00		$0.00		$0.00
31	**36" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$110		$0.00		$0.00		$0.00
32	36" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$125		$0.00		$0.00		$0.00
33	36" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$140		$0.00		$0.00		$0.00
34	**48" Sanitary Sewer Manholes (0-15 ft)**	EA	$3,000		$0.00	3	$9,000.00		$0.00
35	48" Sanitary Sewer Manholes (15-25 ft)	EA	$5,000		$0.00		$0.00	3	$15,000.00
36	48" Sanitary Sewer Manholes (>25 ft)	EA	$10,000		$0.00		$0.00		$0.00
37	**60" Sanitary Sewer Manholes (0-15 ft)**	EA	$5,000	12	$60,000.00		$0.00		$0.00
38	60" Sanitary Sewer Manholes (15-25 ft)	EA	$10,000		$0.00		$0.00		$0.00
39	60" Sanitary Sewer Manholes (>25 ft)	EA	$15,000		$0.00		$0.00		$0.00
40	Connect to Existing Manhole	EA	$1,500	1	$1,500.00	1	$1,500.00		$0.00
41	8" & 12" Parallel Force Mains (C900)	LF	$42		$0.00		$0.00		$0.00
42	12" Force Main (C900)	LF	$15		$0.00		$0.00		$0.00
43	Force Main Air Release/Cleanout Manholes	EA	$8,000		$0.00		$0.00		$0.00
44	8" to 15" Bored Road Crossing and Casing	LF	$300		$0.00		$0.00		$0.00
45	18" to 27" Bored Road Crossing and Casing	LF	$600		$0.00	170	$102,000.00		$0.00
46	Stream Crossing	EA	$20,000	1	$20,000.00		$0.00		$0.00
47	Submersible Duplex Pump Station	LS	$250,000		$0.00		$0.00		$0.00
48	Trench Type Wet Well Pump Station	LS	$1,000,000		$0.00		$0.00		$0.00
49	Sanitary Sewer and Manhole Testing	EA	$500	12	$6,000.00	3	$411,000.00	3	$1,500.00
50	Type 5 Rural Seeding	LF	$2	5,284	$12,153.20	822	$1,890.60	1,143	$2,628.90
51	Erosion Control	LS	1%	1	$7,402.99	1	$6,471.03	1	$1,385.40
52	Field Tile Repair	LS	1%	1	$7,402.99	1	$6,471.03	1	$1,385.40
53	Traffic Control	LS	$2,000		$0.00	1	$2,000.00		$0.00
	Subtotal				$740,299		$647,103		$138,540
	20% CONTINGENCIES				*$148,060*		$129,421		*$27,708*
	SUBTOTAL				*$888,359*		$776,523		*$166,248*
	10% ENGINEERING				*$88,836*		$77,652		*$16,625*
	10% OBSERVATION/STAKING				*$88,836*		$77,652		*$16,625*
	Pipe Run Total				***$1,066,100***		***$931,900***		***$199,500***
	Phase Total				***$1,066,100***				***$1,131,400***

GENERAL NOTES AND ASSUMPTION:
1. Land acquisition is not included in the opinion of costs presented.
2. Geotechnical Exploration costs are not included in the opinion of costs presented.

PREPARED BY:
FOX ENGINEERING ASSOCIATES, INC.
AMES, IOWA

SE BASIN 1
PHASE 1, OPTION 2

Southeast Growth Corridor

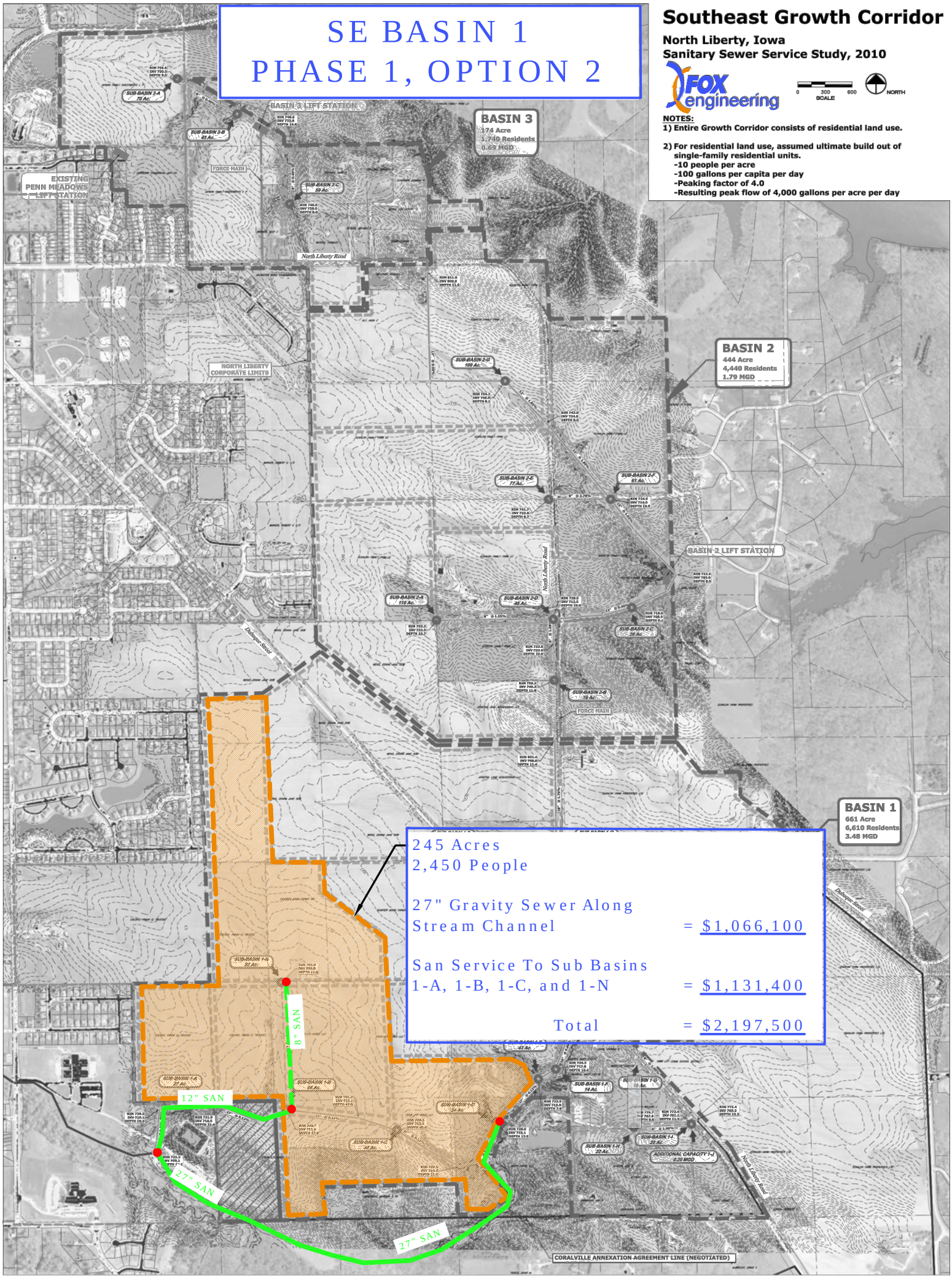
North Liberty, Iowa
Sanitary Sewer Service Study, 2010

FOX engineering

0 300 600 SCALE NORTH

NOTES:
1) Entire Growth Corridor consists of residential land use.

2) For residential land use, assumed ultimate build out of single-family residential units.
-10 people per acre
-100 gallons per capita per day
-Peaking factor of 4.0
-Resulting peak flow of 4,000 gallons per acre per day



ENGINEER'S PRELIMINARY OPINION OF PROBABLE COST
NORTH LIBERTY SANITARY SEWER SERVICE STUDY
SE INTERCEPTOR, Basin 1 - A, B, C, D, N
Option 3A- Temp. Submersible Pump Station and FM
City of North Liberty, IA

LAST UPDATE:11/18/2010
FOX PN: 2489-10A.300

			Engineer's Opinion of Probable Cost	WWTP (MH 1) to MH 4		MH 4 to MH 7		Force Main- Pump Station (MH 15) to MH 7	
ITEM NO.	DESCRIPTION	UNITS	UNIT PRICE	QUANTITY	TOTAL PRICE	QUANTITY	TOTAL PRICE	QUANTITY	TOTAL PRICE
1	Mobilization, Bonds, Insurance	LS	3.5%	1	$8,200.00	1	$6,600.00	1	$16,500.00
2	Clearing and Grubbing	LF	$30	822	$24,660.00	941	$28,230.00	450	$13,500.00
3	Stabilization Material/Special Backfill	LS	2.5%	1	$5,900.00	1	$4,700.00	1	$11,800.00
4	**8" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$45		$0.00		$0.00		$0.00
5	8" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$60		$0.00		$0.00		$0.00
6	8" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$75		$0.00		$0.00		$0.00
7	**10" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$50		$0.00		$0.00		$0.00
8	10" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$65		$0.00		$0.00		$0.00
9	10" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$80		$0.00		$0.00		$0.00
10	**12" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$55		$0.00		$0.00		$0.00
11	12" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$70		$0.00		$0.00		$0.00
12	12" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$85		$0.00		$0.00		$0.00
13	**15" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$60		$0.00		$0.00		$0.00
14	15" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$75		$0.00		$0.00		$0.00
15	15" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$90		$0.00		$0.00		$0.00
16	**18" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$65		$0.00		$0.00		$0.00
17	18" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$80		$0.00		$0.00		$0.00
18	18" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$95		$0.00		$0.00		$0.00
19	**21" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$70		$0.00		$0.00		$0.00
20	21" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$85		$0.00		$0.00		$0.00
21	21" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$100		$0.00		$0.00		$0.00
22	**24" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$75		$0.00		$0.00		$0.00
23	24" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$90		$0.00		$0.00		$0.00
24	24" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$105		$0.00		$0.00		$0.00
25	**27" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$80	822	$65,760.00		$0.00		$0.00
26	27" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$95		$0.00	1,143	$108,585.00		$0.00
27	27" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$110		$0.00		$0.00		$0.00
28	**30" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$90		$0.00		$0.00		$0.00
29	30" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$105		$0.00		$0.00		$0.00
30	30" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$120		$0.00		$0.00		$0.00
31	**36" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$110		$0.00		$0.00		$0.00
32	36" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$125		$0.00		$0.00		$0.00
33	36" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$140		$0.00		$0.00		$0.00
34	**48" Sanitary Sewer Manholes (0-15 ft)**	EA	$3,000		$0.00		$0.00		$0.00
35	48" Sanitary Sewer Manholes (15-25 ft)	EA	$5,000		$0.00		$0.00		$0.00
36	48" Sanitary Sewer Manholes (>25 ft)	EA	$10,000		$0.00		$0.00		$0.00
37	**60" Sanitary Sewer Manholes (0-15 ft)**	EA	$5,000	3	$15,000.00		$0.00		$0.00
38	60" Sanitary Sewer Manholes (15-25 ft)	EA	$10,000		$0.00	3	$30,000.00		$0.00
39	60" Sanitary Sewer Manholes (>25 ft)	EA	$15,000		$0.00		$0.00		$0.00
40	Connect to Existing Manhole	EA	$1,500	1	$1,500.00		$0.00		$0.00
41	8" & 12" Parallel Force Main (C900)	LF	$42		$0.00		$0.00	2,351	$98,742.00
42	12" Force Main (C900)	LF	$15		$0.00		$0.00		$0.00
43	Force Main Air Release/Cleanout Manholes	EA	$8,000		$0.00		$0.00	2	$16,000.00
44	8" to 15" Bored Road Crossing and Casing	LF	$300		$0.00		$0.00		$0.00
45	18" to 27" Bored Road Crossing and Casing	LF	$600	170	$102,000.00		$0.00	80	$48,000.00
46	Stream Crossing	EA	$20,000		$0.00		$0.00		$0.00
47	Submersible Duplex Pump Station	LS	$250,000		$0.00		$0.00	1	$250,000.00
48	Trench Wet Well Type Pump Station	LS	$1,000,000		$0.00		$0.00		$0.00
49	Sanitary Sewer and Manhole Testing	EA	$500	3	$1,500.00	3	$1,500.00		$0.00
50	Type 5 Rural Seeding	LF	$2	822	$1,890.60	1,143	$2,628.90	2,351	$5,407.30
51	Erosion Control	LS	1%	1	$2,330.72	1	$1,859.63	1	$4,693.36
52	Field Tile Repair	LS	1%	1	$2,330.72	1	$1,859.63	1	$4,693.36
53	Traffic Control	LS	$2,000	1	$2,000.00		$0.00		$0.00
	Subtotal				$233,072.04		$185,963.16		$469,336.02
	20% CONTINGENCIES				$46,614.41		*$37,192.63*		*$93,867.20*
	SUBTOTAL				$279,686.45		*$223,155.80*		*$563,203.22*
	10% ENGINEERING				$27,968.64		*$22,315.58*		*$56,320.32*
	10% OBSERVATION/STAKING				$27,968.64		*$22,315.58*		*$56,320.32*
	Pipe Run Total				***$335,700.00***		***$267,800.00***		***$675,900.00***
	Phase Total								***$1,279,400.00***

GENERAL NOTES AND ASSUMPTION:
1. Land acquisition is not included in the opinion of costs presented.
2. Geotechnical Exploration costs are not included in the opinion of costs presented.

PREPARED BY:
FOX ENGINEERING ASSOCIATES, INC.
AMES, IOWA

ENGINEER'S PRELIMINARY OPINION OF PROBABLE COST
NORTH LIBERTY SANITARY SEWER SERVICE STUDY
SE INTERCEPTOR, Basin 1 - A, B, C, D, N
Option 3B- Trench Wet Well Pump Station and FM
City of North Liberty, IA

LAST UPDATE:11/18/2010
FOX PN: 2489-10A.300

			Engineer's Opinion of Probable Cost	WWTP (MH 1) to MH 4		MH 4 to MH 7		Force Main- Pump Station (MH 15) to MH 7	
ITEM NO.	DESCRIPTION	UNITS	UNIT PRICE	QUANTITY	TOTAL PRICE	QUANTITY	TOTAL PRICE	QUANTITY	TOTAL PRICE
1	Mobilization, Bonds, Insurance	LS	3.5%	1	$8,200.00	1	$6,600.00	1	$45,000.00
2	Clearing and Grubbing	LF	$30	822	$24,660.00	941	$28,230.00	450	$13,500.00
3	Stabilization Material/Special Backfill	LS	2.5%	1	$5,900.00	1	$4,700.00	1	$32,200.00
4	**8" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$45		$0.00		$0.00		$0.00
5	8" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$60		$0.00		$0.00		$0.00
6	8" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$75		$0.00		$0.00		$0.00
7	**10" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$50		$0.00		$0.00		$0.00
8	10" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$65		$0.00		$0.00		$0.00
9	10" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$80		$0.00		$0.00		$0.00
10	**12" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$55		$0.00		$0.00		$0.00
11	12" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$70		$0.00		$0.00		$0.00
12	12" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$85		$0.00		$0.00		$0.00
13	**15" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$60		$0.00		$0.00		$0.00
14	15" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$75		$0.00		$0.00		$0.00
15	15" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$90		$0.00		$0.00		$0.00
16	**18" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$65		$0.00		$0.00		$0.00
17	18" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$80		$0.00		$0.00		$0.00
18	18" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$95		$0.00		$0.00		$0.00
19	**21" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$70		$0.00		$0.00		$0.00
20	21" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$85		$0.00		$0.00		$0.00
21	21" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$100		$0.00		$0.00		$0.00
22	**24" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$75		$0.00		$0.00		$0.00
23	24" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$90		$0.00		$0.00		$0.00
24	24" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$105		$0.00		$0.00		$0.00
25	**27" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$80	822	$65,760.00		$0.00		$0.00
26	27" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$95		$0.00	1,143	$108,585.00		$0.00
27	27" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$110		$0.00		$0.00		$0.00
28	**30" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$90		$0.00		$0.00		$0.00
29	30" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$105		$0.00		$0.00		$0.00
30	30" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$120		$0.00		$0.00		$0.00
31	**36" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$110		$0.00		$0.00		$0.00
32	36" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$125		$0.00		$0.00		$0.00
33	36" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$140		$0.00		$0.00		$0.00
34	**48" Sanitary Sewer Manholes (0-15 ft)**	EA	$3,000		$0.00		$0.00		$0.00
35	48" Sanitary Sewer Manholes (15-25 ft)	EA	$5,000		$0.00		$0.00		$0.00
36	48" Sanitary Sewer Manholes (>25 ft)	EA	$10,000		$0.00		$0.00		$0.00
37	**60" Sanitary Sewer Manholes (0-15 ft)**	EA	$5,000	3	$15,000.00		$0.00		$0.00
38	60" Sanitary Sewer Manholes (15-25 ft)	EA	$10,000		$0.00	3	$30,000.00		$0.00
39	60" Sanitary Sewer Manholes (>25 ft)	EA	$15,000		$0.00		$0.00		$0.00
40	Connect to Existing Manhole	EA	$1,500	1	$1,500.00		$0.00		$0.00
41	8" & 12" Parallel Force Main (C900)	LF	$42		$0.00		$0.00	2,351	$98,742.00
42	12" Force Main (C900)	LF	$15		$0.00		$0.00		$0.00
43	Force Main Air Release/Cleanout Manholes	EA	$8,000		$0.00		$0.00	2	$16,000.00
44	8" to 15" Bored Road Crossing and Casing	LF	$300		$0.00		$0.00		$0.00
45	18" to 27" Bored Road Crossing and Casing	LF	$600	170	$102,000.00		$0.00	80	$48,000.00
46	Stream Crossing	EA	$20,000		$0.00		$0.00		$0.00
47	Submersible Duplex Pump Station	LS	$250,000		$0.00		$0.00		$0.00
48	Trench Wet Well Type Pump Station	LS	$1,000,000		$0.00		$0.00	1	$1,000,000.00
49	Sanitary Sewer and Manhole Testing	EA	$500	3	$1,500.00	3	$1,500.00		$0.00
50	Type 5 Rural Seeding	LF	$2	822	$1,890.60	1,143	$2,628.90	2,351	$5,407.30
51	Erosion Control	LS	1%	1	$2,330.72	1	$1,859.63	1	$12,845.40
52	Field Tile Repair	LS	1%	1	$2,330.72	1	$1,859.63	1	$12,845.40
53	Traffic Control	LS	$2,000	1	$2,000.00		$0.00		$0.00
	Subtotal				$233,072.04		$185,963.16		$1,284,540.10
	20% CONTINGENCIES				$46,614.41		*$37,192.63*		*$256,908.02*
	SUBTOTAL				$279,686.45		*$223,155.80*		*$1,541,448.12*
	10% ENGINEERING				$27,968.64		*$22,315.58*		*$154,144.81*
	10% OBSERVATION/STAKING				$27,968.64		*$22,315.58*		*$154,144.81*
	Pipe Run Total				***$335,700.00***		***$267,800.00***		***$1,849,800.00***
	Phase Total								***$2,453,300.00***

GENERAL NOTES AND ASSUMPTION:
1. Land acquisition is not included in the opinion of costs presented.
2. Geotechnical Exploration costs are not included in the opinion of costs presented.

PREPARED BY:
FOX ENGINEERING ASSOCIATES, INC.
AMES, IOWA

SE BASIN 1
PHASE 1, OPTION 3

Southeast Growth Corridor

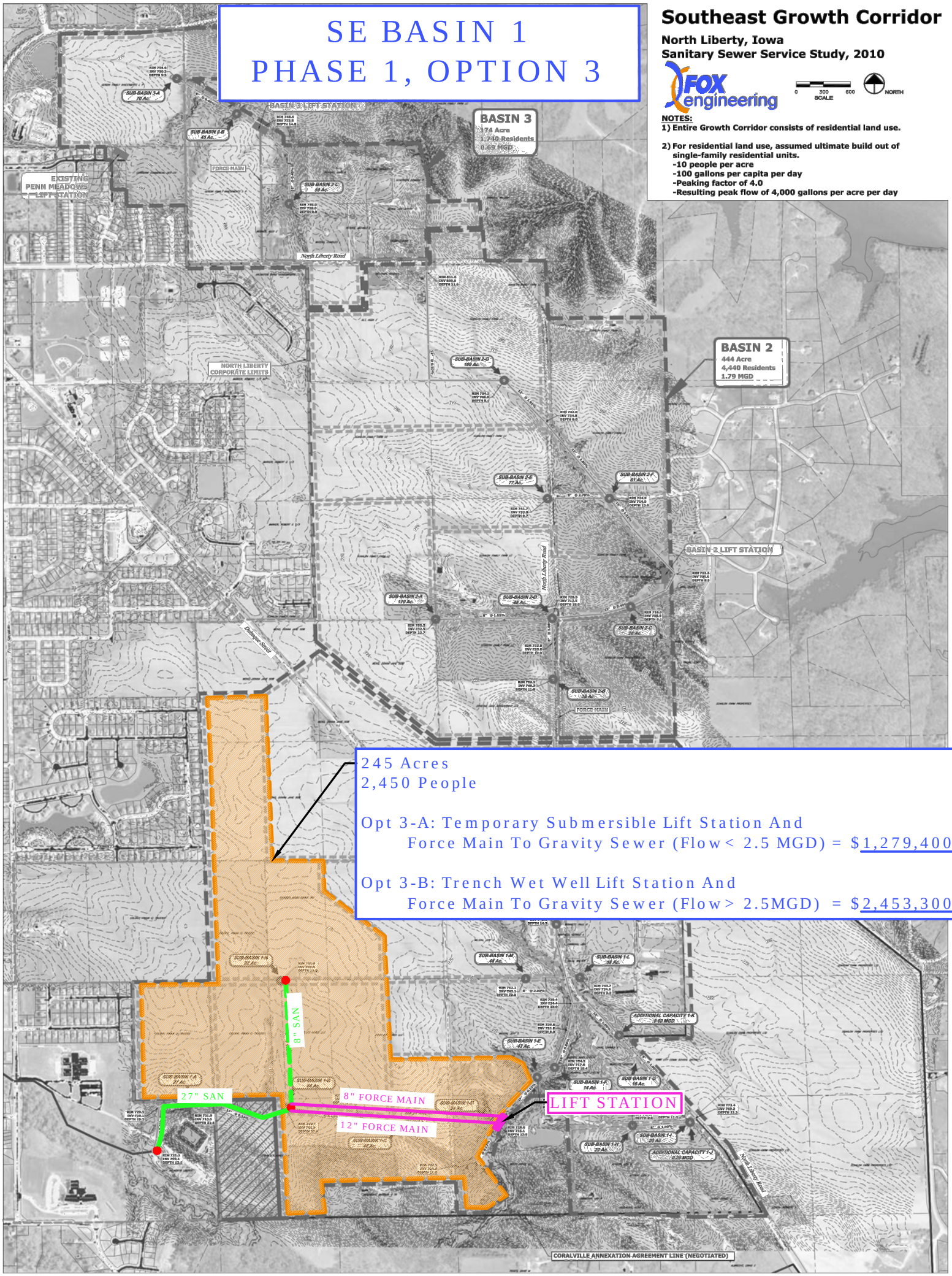
North Liberty, Iowa
Sanitary Sewer Service Study, 2010

FOX engineering

0 300 600 SCALE NORTH

NOTES:
1) Entire Growth Corridor consists of residential land use.

2) For residential land use, assumed ultimate build out of single-family residential units.
-10 people per acre
-100 gallons per capita per day
-Peaking factor of 4.0
-Resulting peak flow of 4,000 gallons per acre per day



ENGINEER'S PRELIMINARY OPINION OF PROBABLE COST
NORTH LIBERTY SANITARY SEWER SERVICE STUDY
SE INTERCEPTOR
Basin 1- Sub-Basin E-M
City of North Liberty, IA

LAST UPDATE:11/18/2010
FOX PN: 2489-10A.300

			Engineer's Opinion of Probable Cost	MH 15 to MH 18		MH 18 to MH 20		MH 20 to MH 21		15" K Branch: MH 20 to MH 20-8	
ITEM NO.	DESCRIPTION	UNITS	UNIT PRICE	QUANTITY	TOTAL PRICE	QUANTITY	TOTAL PRICE	QUANTITY	TOTAL PRICE	QUANTITY	TOTAL PRICE
1	Mobilization, Bonds, Insurance	LS	3.5%	1	$5,000.00	1	$3,100.00	1	$1,900.00	1	$6,700.00
2	Clearing and Grubbing	LF	$30	990	$29,700.00	747	$22,410.00	150	$4,500.00	60	$1,800.00
3	Stabilization Material/Special Backfill	LS	2.5%	1	$3,600.00	1	$2,200.00	1	$1,400.00	1	$4,800.00
4	**8" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$45		$0.00		$0.00		$0.00		$0.00
5	8" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$60		$0.00		$0.00		$0.00		$0.00
6	8" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$75		$0.00		$0.00		$0.00		$0.00
7	**10" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$50		$0.00		$0.00		$0.00		$0.00
8	10" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$65		$0.00		$0.00		$0.00		$0.00
9	10" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$80		$0.00		$0.00		$0.00		$0.00
10	**12" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$55		$0.00		$0.00		$0.00		$0.00
11	12" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$70		$0.00		$0.00		$0.00		$0.00
12	12" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$85		$0.00		$0.00		$0.00		$0.00
13	**15" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$60		$0.00		$0.00		$0.00	257	$15,420.00
14	15" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$75		$0.00		$0.00		$0.00	430	$32,250.00
15	15" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$90		$0.00		$0.00		$0.00		$0.00
16	**18" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$65		$0.00	747	$48,555.00	295	$19,175.00		$0.00
17	18" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$80		$0.00		$0.00		$0.00		$0.00
18	18" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$95		$0.00		$0.00		$0.00		$0.00
19	**21" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$70		$0.00		$0.00		$0.00		$0.00
20	21" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$85		$0.00		$0.00		$0.00		$0.00
21	21" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$100		$0.00		$0.00		$0.00		$0.00
22	**24" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$75		$0.00		$0.00		$0.00		$0.00
23	24" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$90		$0.00		$0.00		$0.00		$0.00
24	24" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$105		$0.00		$0.00		$0.00		$0.00
25	**27" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$80	990	$79,200.00		$0.00		$0.00		$0.00
26	27" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$95		$0.00		$0.00		$0.00		$0.00
27	27" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$110		$0.00		$0.00		$0.00		$0.00
28	**30" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$90		$0.00		$0.00		$0.00		$0.00
29	30" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$105		$0.00		$0.00		$0.00		$0.00
30	30" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$120		$0.00		$0.00		$0.00		$0.00
31	**36" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$110		$0.00		$0.00		$0.00		$0.00
32	36" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$125		$0.00		$0.00		$0.00		$0.00
33	36" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$140		$0.00		$0.00		$0.00		$0.00
34	**48" Sanitary Sewer Manholes (0-15 ft)**	EA	$3,000		$0.00	2	$6,000.00	1	$3,000.00	2	$6,000.00
35	48" Sanitary Sewer Manholes (15-25 ft)	EA	$5,000		$0.00		$0.00		$0.00	1	$5,000.00

36	48" Sanitary Sewer Manholes (>25 ft)	EA	$10,000		$0.00		$0.00		$0.00		$0.00
37	**60" Sanitary Sewer Manholes (0-15 ft)**	EA	$5,000	3	$15,000.00		$0.00		$0.00		$0.00
38	60" Sanitary Sewer Manholes (15-25 ft)	EA	$10,000		$0.00		$0.00		$0.00		$0.00
39	60" Sanitary Sewer Manholes (>25 ft)	EA	$15,000		$0.00		$0.00		$0.00		$0.00
40	Connect to Existing Manhole	EA	$1,500	1	$1,500.00		$0.00		$0.00		$0.00
41	8" & 12" Parallel Force Main (C900)	LF	$42		$0.00		$0.00		$0.00		$0.00
42	12" Force Main (C900)	LF	$15		$0.00		$0.00		$0.00		$0.00
43	Force Main Air Release/Cleanout Manholes	EA	$8,000		$0.00		$0.00		$0.00		$0.00
44	8" to 15" Bored Road Crossing and Casing	LF	$300		$0.00		$0.00		$0.00	235	$70,500.00
45	18" to 27" Bored Road Crossing and Casing	LF	$600		$0.00		$0.00		$0.00		$0.00
46	Stream Crossing	EA	$20,000		$0.00		$0.00	1	$20,000.00	2	$40,000.00
47	Submersible Duplex Pump Station	LS	$250,000		$0.00		$0.00		$0.00		$0.00
48	Trench Wet Well Type Pump Station	LS	$1,000,000		$0.00		$0.00		$0.00		$0.00
49	Sanitary Sewer and Manhole Testing	EA	$500	3	$1,500.00	2	$1,000.00	1	$500.00	3	$1,500.00
50	Type 5 Rural Seeding	LF	$2	990	$2,277.00	747	$1,718.10	295	$678.50	687	$1,580.10
51	Erosion Control	LS	1%	1	$1,426.30	1	$867.17	1	$521.97	1	$1,893.37
52	Field Tile Repair	LS	1%	1	$1,426.30	1	$867.17	1	$521.97	1	$1,893.37
53	Traffic Control	LS	$2,000	1	$2,000.00		$0.00		$0.00		$0.00
	Subtotal				$142,629.59		$86,717.45		$52,197.45		$189,336.84
	20% CONTINGENCIES				$28,525.92		*$17,343.49*		*$10,439.49*		*$37,867.37*
	SUBTOTAL				$171,155.51		*$104,060.94*		*$62,636.94*		*$227,204.20*
	10% ENGINEERING				$17,115.55		*$10,406.09*		*$6,263.69*		*$22,720.42*
	10% OBSERVATION/STAKING				$17,115.55		*$10,406.09*		*$6,263.69*		*$22,720.42*
	Pipe Run Total				***$205,400.00***		***$124,900.00***		***$75,200.00***		***$272,700.00***
	Phase Total								***$405,500.00***		***$272,700.00***

GENERAL NOTES AND ASSUMPTION:

1. Land acquisition is not included in the opinion of costs presented.
2. Geotechnical Exploration costs are not included in the opinion of costs presented.

ENGINEER'S PRELIMINARY OPINION OF PROBABLE COST
NORTH LIBERTY SANITARY SEWER SERVICE STUDY
SE INTERCEPTOR
Basin 1- Sub-Basin E-M, NO FLOW FROM BASIN 2
City of North Liberty, IA

LAST UPDATE:11/18/2010
FOX PN: 2489-10A.300

			Engineer's Opinion of Probable Cost	MH 15 to MH 18		MH 18 to MH 20		MH 20 to MH 21		K Branch: MH 20 to MH 20-8	
ITEM NO.	DESCRIPTION	UNITS	UNIT PRICE	QUANTITY	TOTAL PRICE	QUANTITY	TOTAL PRICE	QUANTITY	TOTAL PRICE	QUANTITY	TOTAL PRICE
1	Mobilization, Bonds, Insurance	LS	3.5%	1	$4,700.00	1	$2,900.00	1	$1,700.00	1	$13,700.00
2	Clearing and Grubbing	LF	$30	990	$29,700.00	747	$22,410.00	150	$4,500.00	60	$1,800.00
3	Stabilization Material/Special Backfill	LS	2.5%	1	$3,300.00	1	$2,100.00	1	$1,300.00	1	$9,800.00
4	**8" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$45		$0.00		$0.00		$0.00	1,123	$50,535.00
5	8" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$60		$0.00		$0.00		$0.00	822	$49,320.00
6	8" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$75		$0.00		$0.00		$0.00		$0.00
7	**10" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$50		$0.00		$0.00		$0.00		$0.00
8	10" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$65		$0.00		$0.00		$0.00		$0.00
9	10" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$80		$0.00		$0.00		$0.00		$0.00
10	**12" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$55		$0.00		$0.00	295	$16,225.00	364	$20,020.00
11	12" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$70		$0.00		$0.00		$0.00	363	$25,410.00
12	12" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$85		$0.00		$0.00		$0.00		$0.00
13	**15" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$60		$0.00	747	$44,820.00		$0.00	257	$15,420.00
14	15" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$75		$0.00		$0.00		$0.00	430	$32,250.00
15	15" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$90		$0.00		$0.00		$0.00		$0.00
16	**18" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$65		$0.00		$0.00		$0.00		$0.00
17	18" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$80		$0.00		$0.00		$0.00		$0.00
18	18" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$95		$0.00		$0.00		$0.00		$0.00
19	**21" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$70	990	$69,300.00		$0.00		$0.00		$0.00
20	21" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$85		$0.00		$0.00		$0.00		$0.00
21	21" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$100		$0.00		$0.00		$0.00		$0.00
22	**24" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$75		$0.00		$0.00		$0.00		$0.00
23	24" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$90		$0.00		$0.00		$0.00		$0.00
24	24" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$105		$0.00		$0.00		$0.00		$0.00
25	**27" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$80		$0.00		$0.00		$0.00		$0.00
26	27" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$95		$0.00		$0.00		$0.00		$0.00
27	27" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$110		$0.00		$0.00		$0.00		$0.00
28	**30" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$90		$0.00		$0.00		$0.00		$0.00
29	30" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$105		$0.00		$0.00		$0.00		$0.00
30	30" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$120		$0.00		$0.00		$0.00		$0.00
31	**36" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$110		$0.00		$0.00		$0.00		$0.00
32	36" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$125		$0.00		$0.00		$0.00		$0.00
33	36" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$140		$0.00		$0.00		$0.00		$0.00
34	**48" Sanitary Sewer Manholes (0-15 ft)**	EA	$3,000		$0.00	2	$6,000.00	1	$3,000.00	8	$24,000.00
35	48" Sanitary Sewer Manholes (15-25 ft)	EA	$5,000		$0.00		$0.00		$0.00	3	$15,000.00
36	48" Sanitary Sewer Manholes (>25 ft)	EA	$10,000		$0.00		$0.00		$0.00		$0.00
37	**60" Sanitary Sewer Manholes (0-15 ft)**	EA	$5,000	3	$15,000.00		$0.00		$0.00		$0.00
38	60" Sanitary Sewer Manholes (15-25 ft)	EA	$10,000		$0.00		$0.00		$0.00		$0.00

39	60" Sanitary Sewer Manholes (>25 ft)	EA	$15,000		$0.00		$0.00		$0.00		$0.00
40	Connect to Existing Manhole	EA	$1,500	1	$1,500.00		$0.00		$0.00		$0.00
41	8" & 12" Parallel Force Main (C900)	LF	$42		$0.00		$0.00		$0.00		$0.00
42	12" Force Main (C900)	LF	$15		$0.00		$0.00		$0.00		$0.00
43	Force Main Air Release/Cleanout Manholes	EA	$8,000		$0.00		$0.00		$0.00		$0.00
44	8" to 15" Bored Road Crossing and Casing	LF	$300		$0.00		$0.00		$0.00	235	$70,500.00
45	18" to 27" Bored Road Crossing and Casing	LF	$600		$0.00		$0.00		$0.00		$0.00
46	Stream Crossing	EA	$20,000		$0.00		$0.00	1	$20,000.00	2	$40,000.00
47	Submersible Duplex Pump Station	LS	$250,000		$0.00		$0.00		$0.00		$0.00
48	Trench Wet Well Type Pump Station	LS	$1,000,000		$0.00		$0.00		$0.00		$0.00
49	Sanitary Sewer and Manhole Testing	EA	$500	3	$1,500.00	2	$1,000.00		$0.00	11	$5,500.00
50	Type 5 Rural Seeding	LF	$2	990	$2,277.00	747	$1,718.10	295	$678.50	3,359	$7,725.70
51	Erosion Control	LS	1%	1	$1,319.15	1	$826.00	1	$483.71	1	$3,887.56
52	Field Tile Repair	LS	1%	1	$1,319.15	1	$826.00	1	$483.71	1	$3,887.56
53	Traffic Control	LS	$2,000	1	$2,000.00		$0.00		$0.00		$0.00

	Subtotal				$131,915.31		$82,600.10		$48,370.92		$388,755.82
	20% CONTINGENCIES				$26,383.06		*$16,520.02*		*$9,674.18*		*$77,751.16*
	SUBTOTAL				$158,298.37		*$99,120.12*		*$58,045.10*		*$466,506.98*
	10% ENGINEERING				$15,829.84		*$9,912.01*		*$5,804.51*		*$46,650.70*
	10% OBSERVATION/STAKING				$15,829.84		*$9,912.01*		*$5,804.51*		*$46,650.70*
	Pipe Run Total				***$190,000.00***		***$119,000.00***		***$69,700.00***		***$559,900.00***
	Phase Total										

GENERAL NOTES AND ASSUMPTION:

1. Land acquisition is not included in the opinion of costs presented.
2. Geotechnical Exploration costs are not included in the opinion of costs presented.

PREPARED BY:
FOX ENGINEERING ASSOCIATES, INC.
AMES, IOWA

SE BASIN 1
PHASE 2

Southeast Growth Corridor

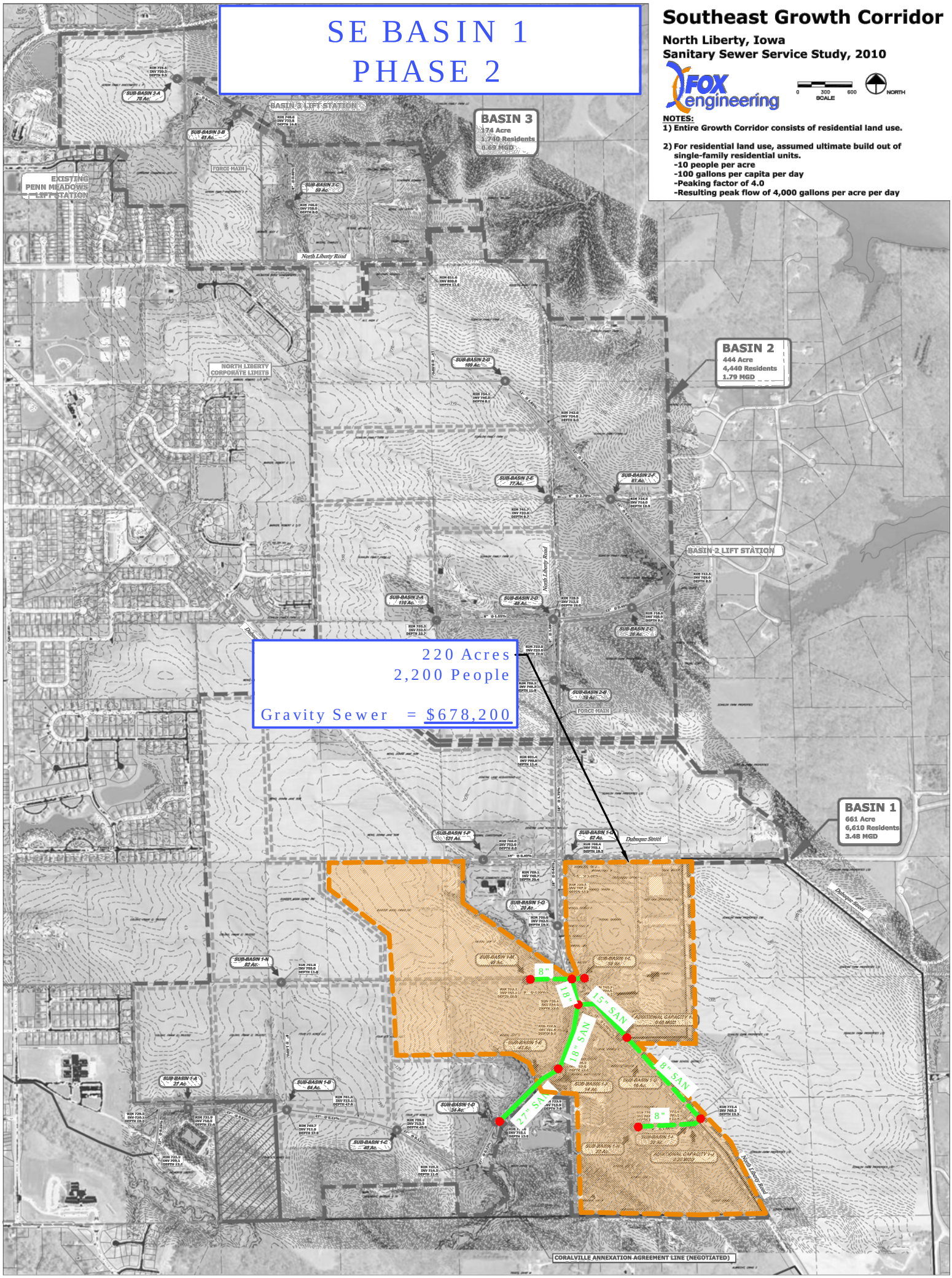
North Liberty, Iowa
Sanitary Sewer Service Study, 2010

FOX engineering

0 300 600 SCALE NORTH

NOTES:
1) Entire Growth Corridor consists of residential land use.

2) For residential land use, assumed ultimate build out of single-family residential units.
-10 people per acre
-100 gallons per capita per day
-Peaking factor of 4.0
-Resulting peak flow of 4,000 gallons per acre per day



ENGINEER'S PRELIMINARY OPINION OF PROBABLE COST
NORTH LIBERTY SANITARY SEWER SERVICE STUDY
SE INTERCEPTOR
Basin 1- Sub-Basin O - Q
City of North Liberty, IA

LAST UPDATE:11/18/2010
FOX PN: 2489-10A.300

			Engineer's Opinion of Probable Cost	MH 21 to MH 25		MH 25 to MH 28	
ITEM NO.	DESCRIPTION	UNITS	UNIT PRICE	QUANTITY	TOTAL PRICE	QUANTITY	TOTAL PRICE
1	Mobilization, Bonds, Insurance	LS	3.5%	1	$6,800.00	1	$4,200.00
2	Clearing and Grubbing	LF	$30	200	$6,000.00		$0.00
3	Stabilization Material/Special Backfill	LS	2.5%	1	$4,900.00	1	$3,000.00
4	**8" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$45		$0.00		$0.00
5	8" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$60		$0.00		$0.00
6	8" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$75		$0.00		$0.00
7	**10" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$50		$0.00		$0.00
8	10" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$65		$0.00		$0.00
9	10" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$80		$0.00		$0.00
10	**12" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$55		$0.00		$0.00
11	12" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$70		$0.00		$0.00
12	12" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$85		$0.00		$0.00
13	**15" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$60		$0.00		$0.00
14	15" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$75		$0.00		$0.00
15	15" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$90		$0.00		$0.00
16	**18" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$65	1,172	$76,180.00	1,096	$71,240.00
17	18" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$80	170	$13,600.00	231	$18,480.00
18	18" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$95		$0.00		$0.00
19	**21" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$70		$0.00		$0.00
20	21" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$85		$0.00		$0.00
21	21" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$100		$0.00		$0.00
22	**24" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$75		$0.00		$0.00
23	24" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$90		$0.00		$0.00
24	24" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$105		$0.00		$0.00
25	**27" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$80		$0.00		$0.00
26	27" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$95		$0.00		$0.00
27	27" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$110		$0.00		$0.00
28	**30" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$90		$0.00		$0.00
29	30" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$105		$0.00		$0.00
30	30" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$120		$0.00		$0.00
31	**36" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$110		$0.00		$0.00
32	36" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$125		$0.00		$0.00
33	36" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$140		$0.00		$0.00
34	**48" Sanitary Sewer Manholes (0-15 ft)**	EA	$3,000	3	$9,000.00	3	$9,000.00
35	48" Sanitary Sewer Manholes (15-25 ft)	EA	$5,000	1	$5,000.00	1	$5,000.00
36	48" Sanitary Sewer Manholes (>25 ft)	EA	$10,000		$0.00		$0.00
37	**60" Sanitary Sewer Manholes (0-15 ft)**	EA	$5,000		$0.00		$0.00
38	60" Sanitary Sewer Manholes (15-25 ft)	EA	$10,000		$0.00		$0.00
39	60" Sanitary Sewer Manholes (>25 ft)	EA	$15,000		$0.00		$0.00
40	Connect to Existing Manhole	EA	$1,500		$0.00		$0.00
41	8" & 12" Parallel Force Main (C900)	LF	$42		$0.00		$0.00
42	12" Force Main (C900)	LF	$15		$0.00		$0.00
43	Force Main Air Release/Cleanout Manholes	EA	$8,000		$0.00		$0.00
44	8" to 15" Bored Road Crossing and Casing	LF	$300		$0.00		$0.00
45	18" to 27" Bored Road Crossing and Casing	LF	$600	100	$60,000.00		$0.00
46	Stream Crossing	EA	$20,000		$0.00		$0.00
47	Submersible Duplex Pump Station	LS	$250,000		$0.00		$0.00
48	Trench Wet Well Type Pump Station	LS	$1,000,000		$0.00		$0.00
49	Sanitary Sewer and Manhole Testing	EA	$500	4	$2,000.00	4	$2,000.00
50	Type 5 Rural Seeding	LF	$2	1,342	$3,086.60	1,327	$3,052.10
51	Erosion Control	LS	1%	1	$1,924.15	1	$1,183.39
52	Field Tile Repair	LS	1%	1	$1,924.15	1	$1,183.39
53	Traffic Control	LS	$2,000	1	$2,000.00		$0.00
	Subtotal				$192,414.90		$118,338.88
	20% CONTINGENCIES				$38,482.98		*$23,667.78*
	SUBTOTAL				$230,897.88		*$142,006.65*
	10% ENGINEERING				$23,089.79		*$14,200.67*
	10% OBSERVATION/STAKING				$23,089.79		*$14,200.67*
	Pipe Run Total				***$277,100.00***		***$170,500.00***
	Phase Total						***$447,600.00***

GENERAL NOTES AND ASSUMPTION:
1. Land acquisition is not included in the opinion of costs presented.
2. Geotechnical Exploration costs are not included in the opinion of costs presented.

PREPARED BY:
FOX ENGINEERING ASSOCIATES, INC.
AMES, IOWA

ENGINEER'S PRELIMINARY OPINION OF PROBABLE COST
NORTH LIBERTY SANITARY SEWER SERVICE STUDY
SE INTERCEPTOR
Basin 1- Sub-Basin O - Q, NO FLOW FROM BASIN 2
City of North Liberty, IA

LAST UPDATE:11/18/2010
FOX PN: 2489-10A.300

			Engineer's Opinion of Probable Cost	MH 21 to MH 25		MH 25 to MH 28		P Branch: MH 25 to MH 25-1A	
ITEM NO.	DESCRIPTION	UNITS	UNIT PRICE	QUANTITY	TOTAL PRICE	QUANTITY	TOTAL PRICE	QUANTITY	TOTAL PRICE
1	Mobilization, Bonds, Insurance	LS	3.5%	1	$6,000.00	1	$3,400.00	1	$2,100.00
2	Clearing and Grubbing	LF	$30	200	$6,000.00		$0.00		$0.00
3	Stabilization Material/Special Backfill	LS	2.5%	1	$4,300.00	1	$2,500.00	1	$1,500.00
4	**8" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$45		$0.00		$0.00		$0.00
5	8" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$60		$0.00		$0.00		$0.00
6	8" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$75		$0.00		$0.00		$0.00
7	**10" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$50	1,172	$58,600.00	1,096	$54,800.00	406	$20,300.00
8	10" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$65	170	$11,050.00	231	$15,015.00	406	$26,390.00
9	10" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$80		$0.00		$0.00		$0.00
10	**12" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$55		$0.00		$0.00		$0.00
11	12" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$70		$0.00		$0.00		$0.00
12	12" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$85		$0.00		$0.00		$0.00
13	**15" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$60		$0.00		$0.00		$0.00
14	15" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$75		$0.00		$0.00		$0.00
15	15" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$90		$0.00		$0.00		$0.00
16	**18" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$65		$0.00		$0.00		$0.00
17	18" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$80		$0.00		$0.00		$0.00
18	18" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$95		$0.00		$0.00		$0.00
19	**21" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$70		$0.00		$0.00		$0.00
20	21" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$85		$0.00		$0.00		$0.00
21	21" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$100		$0.00		$0.00		$0.00
22	**24" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$75		$0.00		$0.00		$0.00
23	24" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$90		$0.00		$0.00		$0.00
24	24" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$105		$0.00		$0.00		$0.00
25	**27" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$80		$0.00		$0.00		$0.00
26	27" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$95		$0.00		$0.00		$0.00
27	27" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$110		$0.00		$0.00		$0.00
28	**30" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$90		$0.00		$0.00		$0.00
29	30" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$105		$0.00		$0.00		$0.00
30	30" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$120		$0.00		$0.00		$0.00
31	**36" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$110		$0.00		$0.00		$0.00
32	36" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$125		$0.00		$0.00		$0.00
33	36" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$140		$0.00		$0.00		$0.00
34	**48" Sanitary Sewer Manholes (0-15 ft)**	EA	$3,000	3	$9,000.00	3	$9,000.00	2	$6,000.00
35	48" Sanitary Sewer Manholes (15-25 ft)	EA	$5,000	1	$5,000.00	1	$5,000.00		$0.00
36	48" Sanitary Sewer Manholes (>25 ft)	EA	$10,000		$0.00		$0.00		$0.00
37	**60" Sanitary Sewer Manholes (0-15 ft)**	EA	$5,000		$0.00		$0.00		$0.00
38	60" Sanitary Sewer Manholes (15-25 ft)	EA	$10,000		$0.00		$0.00		$0.00
39	60" Sanitary Sewer Manholes (>25 ft)	EA	$15,000		$0.00		$0.00		$0.00
40	Connect to Existing Manhole	EA	$1,500		$0.00		$0.00		$0.00
41	8" & 12" Parallel Force Main (C900)	LF	$42		$0.00		$0.00		$0.00
42	12" Force Main (C900)	LF	$15		$0.00		$0.00		$0.00
43	Force Main Air Release/Cleanout Manholes	EA	$8,000		$0.00		$0.00		$0.00
44	8" to 15" Bored Road Crossing and Casing	LF	$300		$0.00		$0.00		$0.00
45	18" to 27" Bored Road Crossing and Casing	LF	$600	100	$60,000.00		$0.00		$0.00
46	Stream Crossing	EA	$20,000		$0.00		$0.00		$0.00
47	Submersible Duplex Pump Station	LS	$250,000		$0.00		$0.00		$0.00
48	Trench Wet Well Type Pump Station	LS	$1,000,000		$0.00		$0.00		$0.00
49	Sanitary Sewer and Manhole Testing	EA	$500	4	$2,000.00	4	$2,000.00		$0.00
50	Type 5 Rural Seeding	LF	$2	1,342	$3,086.60	1,327	$3,052.10	812	$1,867.60
51	Erosion Control	LS	1%	1	$1,704.46	1	$967.01	1	$593.44
52	Field Tile Repair	LS	1%	1	$1,704.46	1	$967.01	1	$593.44
53	Traffic Control	LS	$2,000	1	$2,000.00		$0.00		$0.00
	Subtotal				$170,445.51		$96,701.12		$59,344.49
	20% CONTINGENCIES				$34,089.10		*$19,340.22*		*$11,868.90*
	SUBTOTAL				$204,534.61		*$116,041.35*		*$71,213.39*
	10% ENGINEERING				$20,453.46		*$11,604.13*		*$7,121.34*
	10% OBSERVATION/STAKING				$20,453.46		*$11,604.13*		*$7,121.34*
	Pipe Run Total				$245,500.00		***$139,300.00***		***$85,500.00***
	Phase Total								

GENERAL NOTES AND ASSUMPTION:
1. Land acquisition is not included in the opinion of costs presented.
2. Geotechnical Exploration costs are not included in the opinion of costs presented.

PREPARED BY:
FOX ENGINEERING ASSOCIATES, INC.
AMES, IOWA

Southeast Growth Corridor

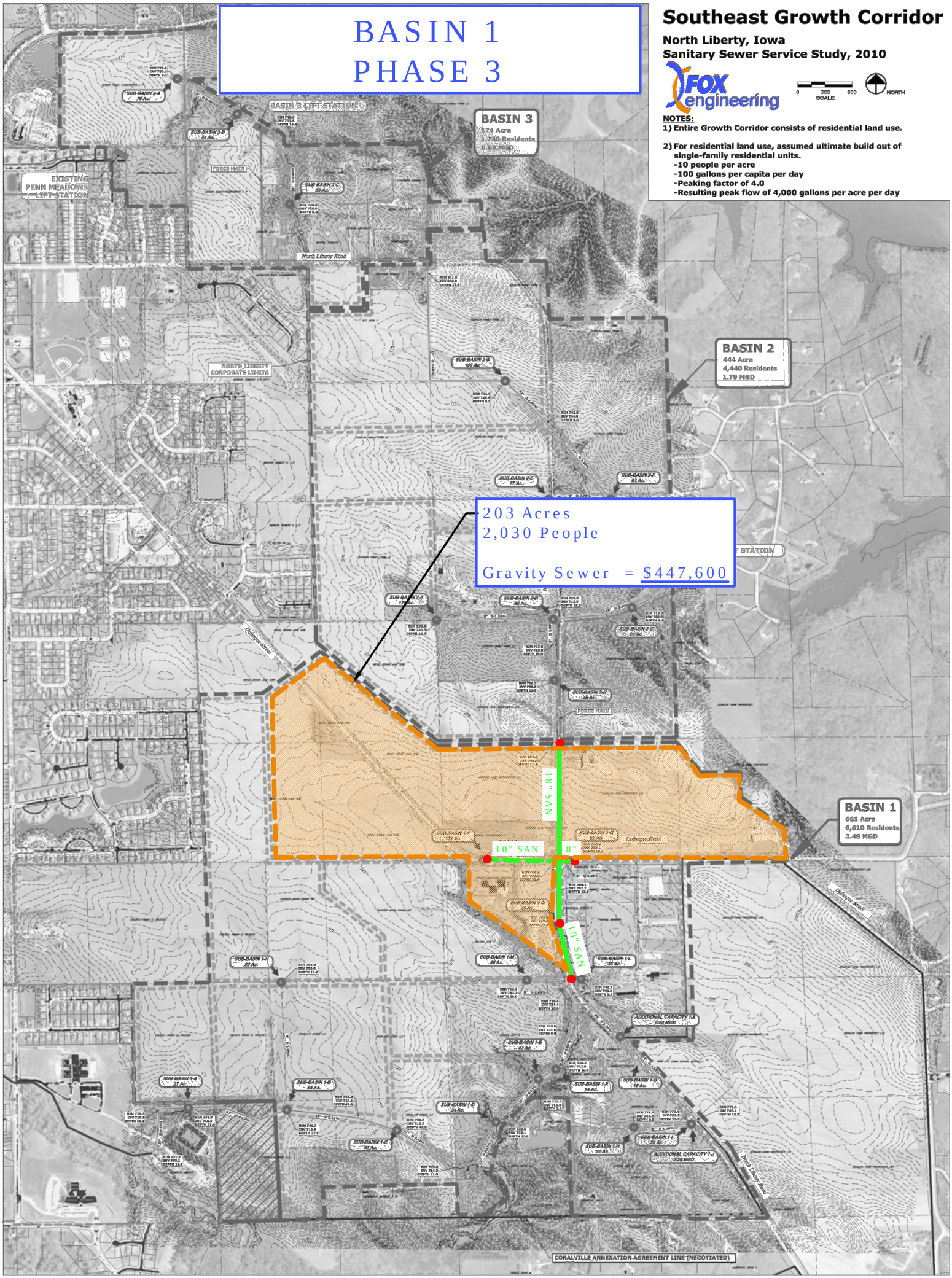
North Liberty, Iowa
Sanitary Sewer Service Study, 2010

FOX engineering

0 300 600 SCALE NORTH

NOTES:
1) Entire Growth Corridor consists of residential land use.

2) For residential land use, assumed ultimate build out of single-family residential units.
-10 people per acre
-100 gallons per capita per day
-Peaking factor of 4.0
-Resulting peak flow of 4,000 gallons per acre per day



ENGINEER'S PRELIMINARY OPINION OF PROBABLE COST
NORTH LIBERTY SANITARY SEWER SERVICE STUDY
SE INTERCEPTOR
Basin 2- 2 Force Main Options (Pipes sized for Basin 3 Flow Contributions)
City of North Liberty, IA

LAST UPDATE:11/18/2010
FOX PN: 2489-10A.300

			Engineer's Opinion of Probable Cost	2-A through 2-D Branch (12")		2-E through 2-G Branch (15" and 12")		Connection to 12 " FM from Basin 3		Basin 2, Option 1- FM to WWTP		Basin 2, Option 2- FM to Gravity Sewer System in Basin 1*	
ITEM NO.	DESCRIPTION	UNITS	UNIT PRICE	QUANTITY	TOTAL PRICE	QUANTITY	TOTAL PRICE	QUANTITY	TOTAL PRICE	QUANTITY	TOTAL PRICE	QUANTITY	TOTAL PRICE
1	Mobilization, Bonds, Insurance	LS	3.5%	1	$8,100.00	1	$12,700.00	1	$5,200.00	1	$39,900.00	1	$17,000.00
2	Clearing and Grubbing	LF	$30	1,295	$38,850.00		$0.00		$0.00		$0.00		$0.00
3	Stabilization Material/Special Backfill	LS	2.5%	1	$5,800.00	1	$9,100.00	1	$3,700.00	1	$28,500.00	1	$12,100.00
4	**8" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$45		$0.00		$0.00		$0.00		$0.00		$0.00
5	8" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$60		$0.00		$0.00		$0.00		$0.00		$0.00
6	8" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$75		$0.00		$0.00		$0.00		$0.00		$0.00
7	**10" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$50		$0.00		$0.00		$0.00		$0.00		$0.00
8	10" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$65		$0.00		$0.00		$0.00		$0.00		$0.00
9	10" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$80		$0.00		$0.00		$0.00		$0.00		$0.00
10	**12" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$55	1,530	$84,150.00	1,759	$96,745.00	2,044	$112,420.00		$0.00		$0.00
11	12" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$70		$0.00		$0.00		$0.00		$0.00		$0.00
12	12" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$85		$0.00		$0.00		$0.00		$0.00		$0.00
13	**15" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$60		$0.00	1,108	$66,480.00		$0.00		$0.00		$0.00
14	15" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$75		$0.00		$0.00		$0.00		$0.00		$0.00
15	15" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$90		$0.00		$0.00		$0.00		$0.00		$0.00
16	**18" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$65		$0.00		$0.00		$0.00		$0.00		$0.00
17	18" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$80		$0.00		$0.00		$0.00		$0.00		$0.00
18	18" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$95		$0.00		$0.00		$0.00		$0.00		$0.00
19	**21" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$70		$0.00		$0.00		$0.00		$0.00		$0.00
20	21" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$85		$0.00		$0.00		$0.00		$0.00		$0.00
21	21" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$100		$0.00		$0.00		$0.00		$0.00		$0.00
22	**24" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$75		$0.00		$0.00		$0.00		$0.00		$0.00
23	24" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$90		$0.00		$0.00		$0.00		$0.00		$0.00
24	24" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$105		$0.00		$0.00		$0.00		$0.00		$0.00
25	**27" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$80		$0.00		$0.00		$0.00		$0.00		$0.00
26	27" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$95		$0.00		$0.00		$0.00		$0.00		$0.00
27	27" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$110		$0.00		$0.00		$0.00		$0.00		$0.00
28	**30" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$90		$0.00		$0.00		$0.00		$0.00		$0.00
29	30" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$105		$0.00		$0.00		$0.00		$0.00		$0.00
30	30" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$120		$0.00		$0.00		$0.00		$0.00		$0.00
31	**36" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$110		$0.00		$0.00		$0.00		$0.00		$0.00
32	36" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$125		$0.00		$0.00		$0.00		$0.00		$0.00
33	36" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$140		$0.00		$0.00		$0.00		$0.00		$0.00
34	**48" Sanitary Sewer Manholes (0-15 ft)**	EA	$3,000	5	$15,000.00	9	$27,000.00	5	$15,000.00		$0.00		$0.00
35	48" Sanitary Sewer Manholes (15-25 ft)	EA	$5,000	1	$5,000.00		$0.00		$0.00		$0.00		$0.00
36	48" Sanitary Sewer Manholes (>25 ft)	EA	$10,000		$0.00		$0.00		$0.00		$0.00		$0.00
37	**60" Sanitary Sewer Manholes (0-15 ft)**	EA	$5,000		$0.00		$0.00		$0.00		$0.00		$0.00
38	60" Sanitary Sewer Manholes (15-25 ft)	EA	$10,000		$0.00		$0.00		$0.00		$0.00		$0.00
39	60" Sanitary Sewer Manholes (>25 ft)	EA	$15,000		$0.00		$0.00		$0.00		$0.00		$0.00
40	Connect to Existing Manhole	EA	$1,500		$0.00		$0.00		$0.00		$0.00		$0.00
41	8" & 12" Parallel Force Main (C900)	LF	$42		$0.00		$0.00		$0.00	12,880	$540,960.00	2,851	$119,742.00
42	12" Force Main (C900)	LF	$15		$0.00		$0.00		$0.00		$0.00		$0.00

43	Force Main Air Release/Cleanout Manholes	EA	$8,000		$0.00		$0.00		$0.00	3	$24,000.00	1	$8,000.00
44	8" to 15" Bored Road Crossing and Casing	LF	$300		$0.00		$0.00		$0.00		$0.00		$0.00
45	18" to 27" Bored Road Crossing and Casing	LF	$600	100	$60,000.00	220	$132,000.00		$0.00	340	$204,000.00	100	$60,000.00
46	Stream Crossing	EA	$20,000		$0.00		$0.00		$0.00		$0.00		$0.00
47	Submersible Duplex Pump Station	LS	$250,000		$0.00		$0.00		$0.00	1	$250,000.00	1	$250,000.00
48	Trench Wet Well Type Pump Station	LS	$1,000,000		$0.00		$0.00		$0.00		$0.00		$0.00
49	Sanitary Sewer and Manhole Testing	EA	$500	6	$3,000.00	9	$4,500.00	5	$2,500.00	0	$0.00	0	$0.00
50	Type 5 Rural Seeding	LF	$2	1,530	$3,519.00	2,867	$6,594.10	2,044	$4,701.20	12,880	$29,624.00	2,851	$6,557.30
51	Erosion Control	LS	1%	1	$2,300.19	1	$3,623.66	1	$1,464.50	1	$11,397.80	1	$4,830.61
52	Field Tile Repair	LS	1%	1	$2,300.19	1	$3,623.66	1	$1,464.50	1	$11,397.80	1	$4,830.61
53	Traffic Control	LS	$2,000	1	$2,000.00		$0.00		$0.00		$0.00		$0.00
	Subtotal				$230,019		$362,366		$146,450		$1,139,780		$483,061
	20% CONTINGENCIES				*$46,004*		*$72,473*		*$29,290*		*$227,956*		*$96,612*
	SUBTOTAL				*$276,023*		*$434,840*		*$175,740*		*$1,367,736*		*$579,673*
	10% ENGINEERING				*$27,602*		*$43,484*		*$17,574*		*$136,774*		*$57,967*
	10% OBSERVATION/STAKING				*$27,602*		*$43,484*		*$17,574*		*$136,774*		*$57,967*
	Pipe Run Total				***$331,300***		***$521,900***		***$210,900***		***$1,641,300***		***$695,700***
	Option Total										***$2,705,400***		***$1,759,800***

GENERAL NOTES AND ASSUMPTION:

1. Land acquisition is not included in the opinion of costs presented.
2. Geotechnical Exploration costs are not included in the opinion of costs presented.

*Need to consider cost of installing Basin 1 Trunk in addition to total for Option 2 for Basin 2.

PREPARED BY:
FOX ENGINEERING ASSOCIATES, INC.
AMES, IOWA

ENGINEER'S PRELIMINARY OPINION OF PROBABLE COST
NORTH LIBERTY SANITARY SEWER SERVICE STUDY
SE INTERCEPTOR
Basin 2- FM to Basin 1 Option (Pipes NOT sized for Basin 3 Flow Contributions)
City of North Liberty, IA

LAST UPDATE:11/18/2010
FOX PN: 2489-10A.300

			Engineer's Opinion of Probable Cost	2-E through 2-G Branch (15" reduced to 12"; 12" reduced to 8" [not included])		2-A through 2-D Branch (12")		Basin 2, Option 1- FM to WWTP		Basin 2, Option 2- FM to Gravity Sewer System in Basin 1*	
ITEM NO.	DESCRIPTION	UNITS	UNIT PRICE	QUANTITY	TOTAL PRICE	QUANTITY	TOTAL PRICE	QUANTITY	TOTAL PRICE	QUANTITY	TOTAL PRICE
1	Mobilization, Bonds, Insurance	LS	3.5%	1	$7,800.00	1	$8,100.00	1	$39,900.00	1	$17,000.00
2	Clearing and Grubbing	LF	$30		$0.00	1,295	$38,850.00		$0.00		$0.00
3	Stabilization Material/Special Backfill	LS	2.5%	1	$5,600.00	1	$5,800.00	1	$28,500.00	1	$12,100.00
4	**8" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$45		$0.00		$0.00		$0.00		$0.00
5	8" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$60		$0.00		$0.00		$0.00		$0.00
6	8" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$75		$0.00		$0.00		$0.00		$0.00
7	**10" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$50		$0.00		$0.00		$0.00		$0.00
8	10" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$65		$0.00		$0.00		$0.00		$0.00
9	10" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$80		$0.00		$0.00		$0.00		$0.00
10	**12" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$55	1,108	$60,940.00	1,530	$84,150.00		$0.00		$0.00
11	12" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$70		$0.00		$0.00		$0.00		$0.00
12	12" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$85		$0.00		$0.00		$0.00		$0.00
13	**15" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$60		$0.00		$0.00		$0.00		$0.00
14	15" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$75		$0.00		$0.00		$0.00		$0.00
15	15" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$90		$0.00		$0.00		$0.00		$0.00
16	**18" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$65		$0.00		$0.00		$0.00		$0.00
17	18" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$80		$0.00		$0.00		$0.00		$0.00
18	18" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$95		$0.00		$0.00		$0.00		$0.00
19	**21" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$70		$0.00		$0.00		$0.00		$0.00
20	21" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$85		$0.00		$0.00		$0.00		$0.00
21	21" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$100		$0.00		$0.00		$0.00		$0.00
22	**24" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$75		$0.00		$0.00		$0.00		$0.00
23	24" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$90		$0.00		$0.00		$0.00		$0.00
24	24" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$105		$0.00		$0.00		$0.00		$0.00
25	**27" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$80		$0.00		$0.00		$0.00		$0.00
26	27" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$95		$0.00		$0.00		$0.00		$0.00
27	27" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$110		$0.00		$0.00		$0.00		$0.00
28	**30" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$90		$0.00		$0.00		$0.00		$0.00
29	30" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$105		$0.00		$0.00		$0.00		$0.00
30	30" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$120		$0.00		$0.00		$0.00		$0.00
31	**36" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$110		$0.00		$0.00		$0.00		$0.00
32	36" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$125		$0.00		$0.00		$0.00		$0.00
33	36" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$140		$0.00		$0.00		$0.00		$0.00
34	**48" Sanitary Sewer Manholes (0-15 ft)**	EA	$3,000	2	$6,000.00	5	$15,000.00		$0.00		$0.00
35	48" Sanitary Sewer Manholes (15-25 ft)	EA	$5,000		$0.00	1	$5,000.00		$0.00		$0.00
36	48" Sanitary Sewer Manholes (>25 ft)	EA	$10,000		$0.00		$0.00		$0.00		$0.00

37	**60" Sanitary Sewer Manholes (0-15 ft)**	EA	$5,000		$0.00		$0.00		$0.00		$0.00
38	60" Sanitary Sewer Manholes (15-25 ft)	EA	$10,000		$0.00		$0.00		$0.00		$0.00
39	60" Sanitary Sewer Manholes (>25 ft)	EA	$15,000		$0.00		$0.00		$0.00		$0.00
40	Connect to Existing Manhole	EA	$1,500		$0.00		$0.00		$0.00		$0.00
41	8" & 12" Parallel Force Main (C900)	LF	$42		$0.00		$0.00	12,880	$540,960.00	2,851	$119,742.00
42	12" Force Main (C900)	LF	$15		$0.00		$0.00		$0.00		$0.00
43	Force Main Air Release/Cleanout Manholes	EA	$8,000		$0.00		$0.00	3	$24,000.00	1	$8,000.00
44	8" to 15" Bored Road Crossing and Casing	LF	$300		$0.00		$0.00		$0.00		$0.00
45	18" to 27" Bored Road Crossing and Casing	LF	$600	220	$132,000.00	100	$60,000.00	340	$204,000.00	100	$60,000.00
46	Stream Crossing	EA	$20,000		$0.00		$0.00		$0.00		$0.00
47	Submersible Duplex Pump Station	LS	$250,000		$0.00		$0.00	1	$250,000.00	1	$250,000.00
48	Trench Wet Well Type Pump Station	LS	$1,000,000		$0.00		$0.00		$0.00		$0.00
49	Sanitary Sewer and Manhole Testing	EA	$500	2	$1,000.00	6	$3,000.00	0	$0.00	0	$0.00
50	Type 5 Rural Seeding	LF	$2	1,108	$2,548.40	1,530	$3,519.00	12,880	$29,624.00	2,851	$6,557.30
51	Erosion Control	LS	1%	1	$2,202.94	1	$2,300.19	1	11397.79592	1	4830.605102
52	Field Tile Repair	LS	1%	1	$2,202.94	1	$2,300.19	1	11397.79592	1	4830.605102
53	Traffic Control	LS	$2,000		$0.00	1	$2,000.00		$0.00		$0.00
	Subtotal				$220,294.29		$230,019		$1,139,780		$483,061
	20% CONTINGENCIES				*$44,058.86*		*$46,004*		*$227,956*		*$96,612*
	SUBTOTAL				*$264,353.14*		*$276,023*		*$1,367,736*		*$579,673*
	10% ENGINEERING				*$26,435.31*		*$27,602*		*$136,774*		*$57,967*
	10% OBSERVATION/STAKING				*$26,435.31*		*$27,602*		*$136,774*		*$57,967*
	Pipe Run Total				***$317,300.00***		***$331,300***		***$1,641,300***		***$695,700***
	Option Total (w/pipe diameter reduction; no basin 3 contributions)								***$2,289,900***		***$1,344,300***
	Deduct for decrease in pipe diameter (Add to Basin 3)								***($415,500)***		***($415,500)***

GENERAL NOTES AND ASSUMPTION:

1. Land acquisition is not included in the opinion of costs presented.
2. Geotechnical Exploration costs are not included in the opinion of costs presented.

SE BASIN 2 OPTION 1

Southeast Growth Corridor

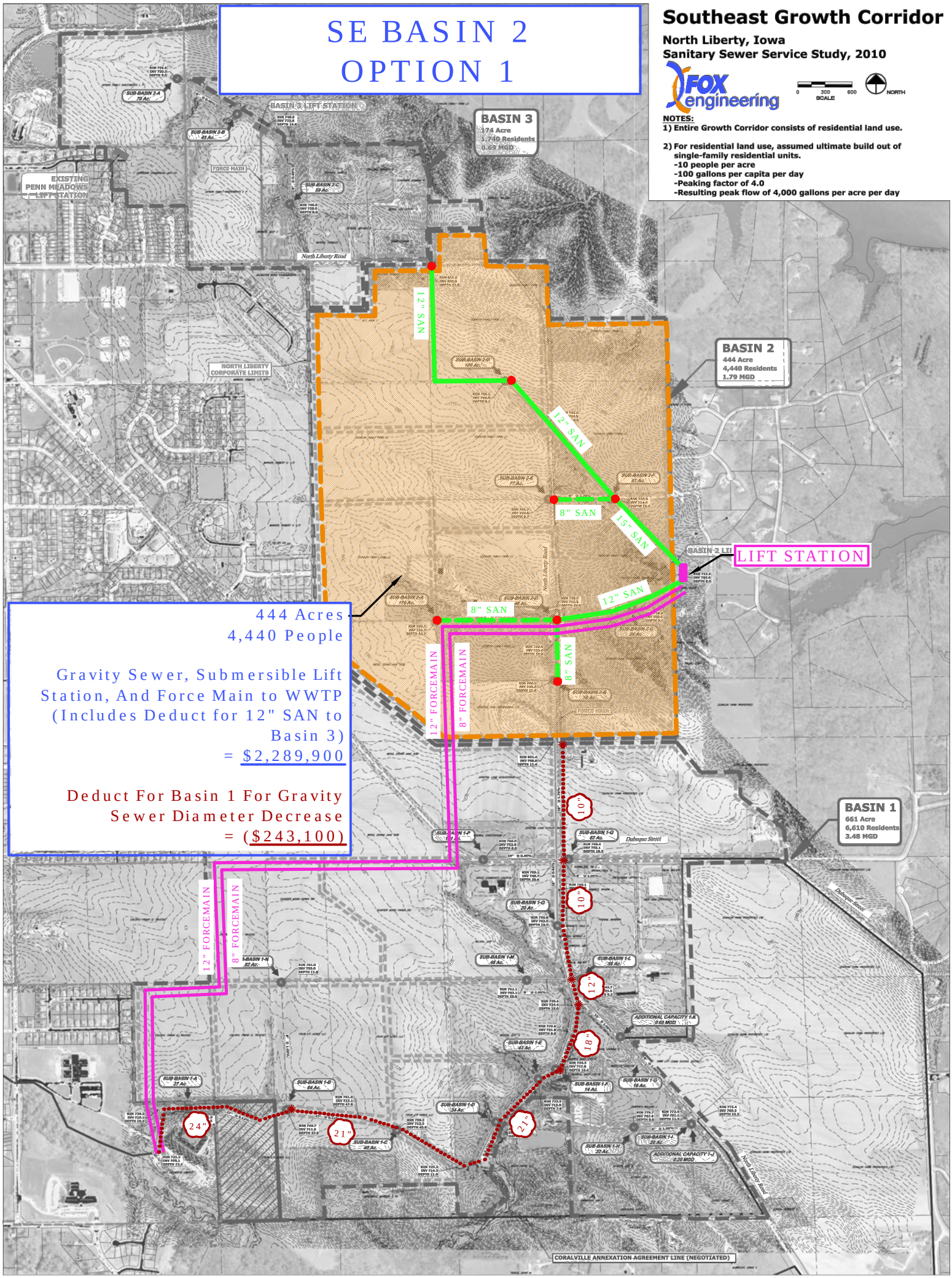
North Liberty, Iowa
Sanitary Sewer Service Study, 2010

FOX engineering

0 300 600 SCALE NORTH

NOTES:
1) Entire Growth Corridor consists of residential land use.

2) For residential land use, assumed ultimate build out of single-family residential units.
-10 people per acre
-100 gallons per capita per day
-Peaking factor of 4.0
-Resulting peak flow of 4,000 gallons per acre per day



444 Acres
4,440 People

Gravity Sewer, Submersible Lift Station, And Force Main to WWTP (Includes Deduct for 12" SAN to Basin 3)
= $2,289,900

Deduct For Basin 1 For Gravity Sewer Diameter Decrease
= ($243,100)

SE BASIN 2 OPTION 2

Southeast Growth Corridor

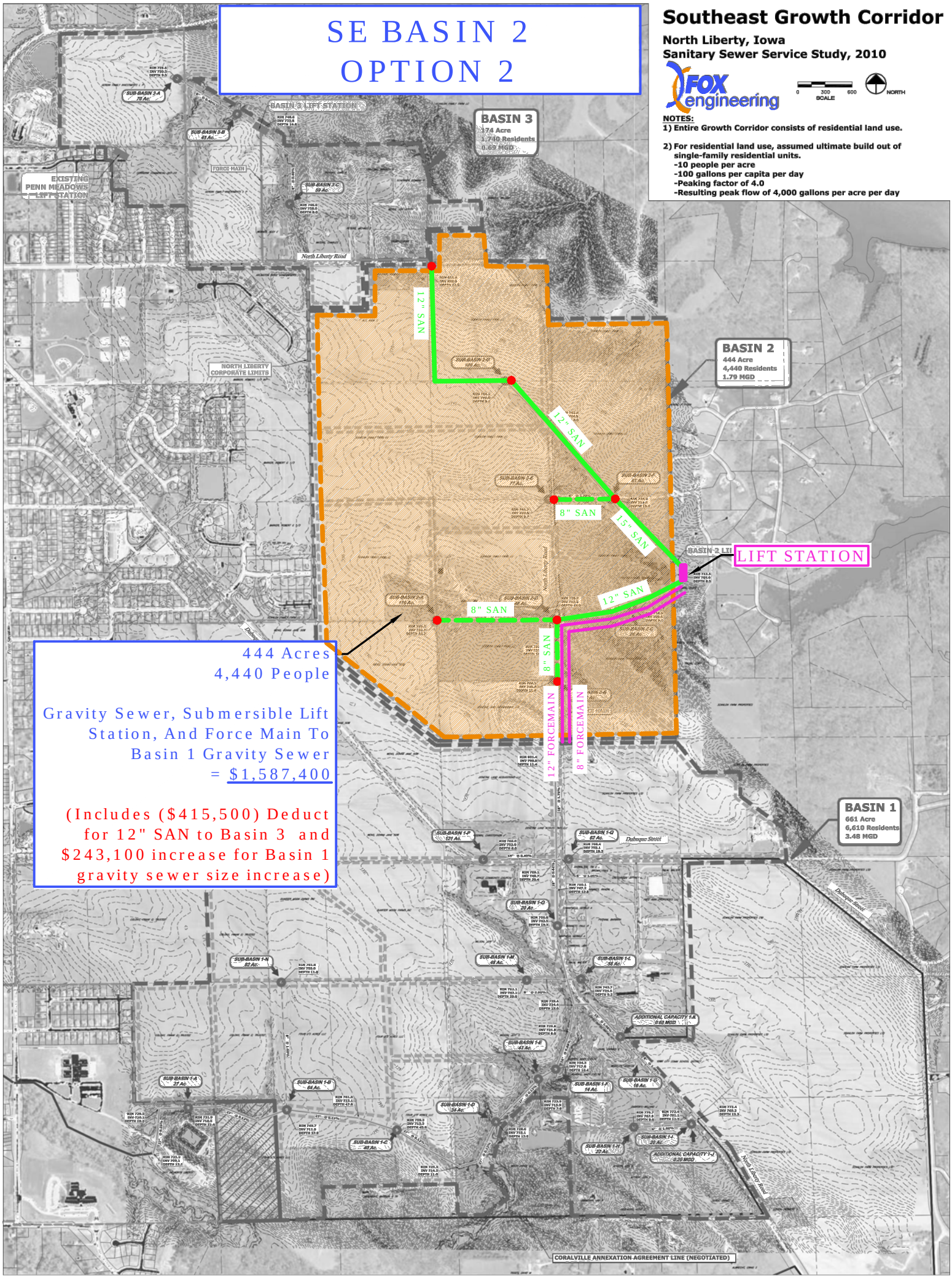
North Liberty, Iowa
Sanitary Sewer Service Study, 2010

FOX engineering

0 300 600 SCALE NORTH

NOTES:
1) Entire Growth Corridor consists of residential land use.

2) For residential land use, assumed ultimate build out of single-family residential units.
-10 people per acre
-100 gallons per capita per day
-Peaking factor of 4.0
-Resulting peak flow of 4,000 gallons per acre per day



444 Acres
4,440 People

Gravity Sewer, Submersible Lift Station, And Force Main To Basin 1 Gravity Sewer = $1,587,400

(Includes ($415,500) Deduct for 12" SAN to Basin 3 and $243,100 increase for Basin 1 gravity sewer size increase)

ENGINEER'S PRELIMINARY OPINION OF PROBABLE COST
NORTH LIBERTY SANITARY SEWER SERVICE STUDY
SE INTERCEPTOR
Basin 3
City of North Liberty, IA

LAST UPDATE:11/18/2010
FOX PN: 2489-10A.300

			Engineer's Opinion of Probable Cost	6" Force Main from Lift Station to Basin 2	
ITEM NO.	DESCRIPTION	UNITS	UNIT PRICE	QUANTITY	TOTAL PRICE
1	Mobilization, Bonds, Insurance	LS	3.5%	1	$17,900.00
2	Clearing and Grubbing	LF	$30	1,975	$59,250.00
3	Stabilization Material/Special Backfill	LS	2.5%	1	$12,800.00
4	**8" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$45		$0.00
5	8" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$60		$0.00
6	8" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$75		$0.00
7	**10" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$50		$0.00
8	10" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$65		$0.00
9	10" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$80		$0.00
10	**12" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$55		$0.00
11	12" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$70		$0.00
12	12" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$85		$0.00
13	**15" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$60		$0.00
14	15" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$75		$0.00
15	15" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$90		$0.00
16	**18" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$65		$0.00
17	18" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$80		$0.00
18	18" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$95		$0.00
19	**21" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$70		$0.00
20	21" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$85		$0.00
21	21" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$100		$0.00
22	**24" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$75		$0.00
23	24" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$90		$0.00
24	24" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$105		$0.00
25	**27" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$80		$0.00
26	27" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$95		$0.00
27	27" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$110		$0.00
28	**30" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$90		$0.00
29	30" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$105		$0.00
30	30" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$120		$0.00
31	**36" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$110		$0.00
32	36" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$125		$0.00
33	36" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$140		$0.00
34	**48" Sanitary Sewer Manholes (0-15 ft)**	EA	$3,000		$0.00
35	48" Sanitary Sewer Manholes (15-25 ft)	EA	$5,000		$0.00
36	48" Sanitary Sewer Manholes (>25 ft)	EA	$10,000		$0.00
37	**60" Sanitary Sewer Manholes (0-15 ft)**	EA	$5,000		$0.00
38	60" Sanitary Sewer Manholes (15-25 ft)	EA	$10,000		$0.00
39	60" Sanitary Sewer Manholes (>25 ft)	EA	$15,000		$0.00
40	Connect to Existing Manhole	EA	$1,500		$0.00
41	8" & 12" Parallel Force Main (C900)	LF	$42		$0.00
42	6" Force Main (C900)	LF	$15	3,418	$51,270.00
43	Force Main Air Release/Cleanout Manholes	EA	$8,000	2	$16,000.00
44	8" to 15" Bored Road Crossing and Casing	LF	$300	280	$84,000.00
45	18" to 27" Bored Road Crossing and Casing	LF	$600		$0.00
46	Stream Crossing	EA	$20,000		$0.00
47	Submersible Duplex Pump Station	LS	$250,000	1	$250,000.00
48	Trench Wet Well Type Pump Station	LS	$1,000,000		$0.00
49	Sanitary Sewer and Manhole Testing	EA	$500		$0.00
50	Type 5 Rural Seeding	LF	$2	3,418	$7,861.40
51	Erosion Control	LS	1%	1	$5,092.67
52	Field Tile Repair	LS	1%	1	$5,092.67
53	Traffic Control	LS	$2,000		$0.00
	Subtotal				$509,267
	20% CONTINGENCIES				*$101,853*
	SUBTOTAL				*$611,120*
	10% ENGINEERING				*$61,112*
	10% OBSERVATION/STAKING				*$61,112*
	Pipe Run Total				**$733,400**
	Phase Total				**$733,400**
	Add for increase in Basin 2 pipe diameter required				$415,500
	Basin 3 Total				***$1,148,900***

GENERAL NOTES AND ASSUMPTION:

1. Land acquisition is not included in the opinion of costs presented.
2. Geotechnical Exploration costs are not included in the opinion of costs presented.

*Need to consider cost of installing Basin 1 Trunk in addition to total for Option 2 for Basin 2.

SE BASIN 3

Southeast Growth Corridor

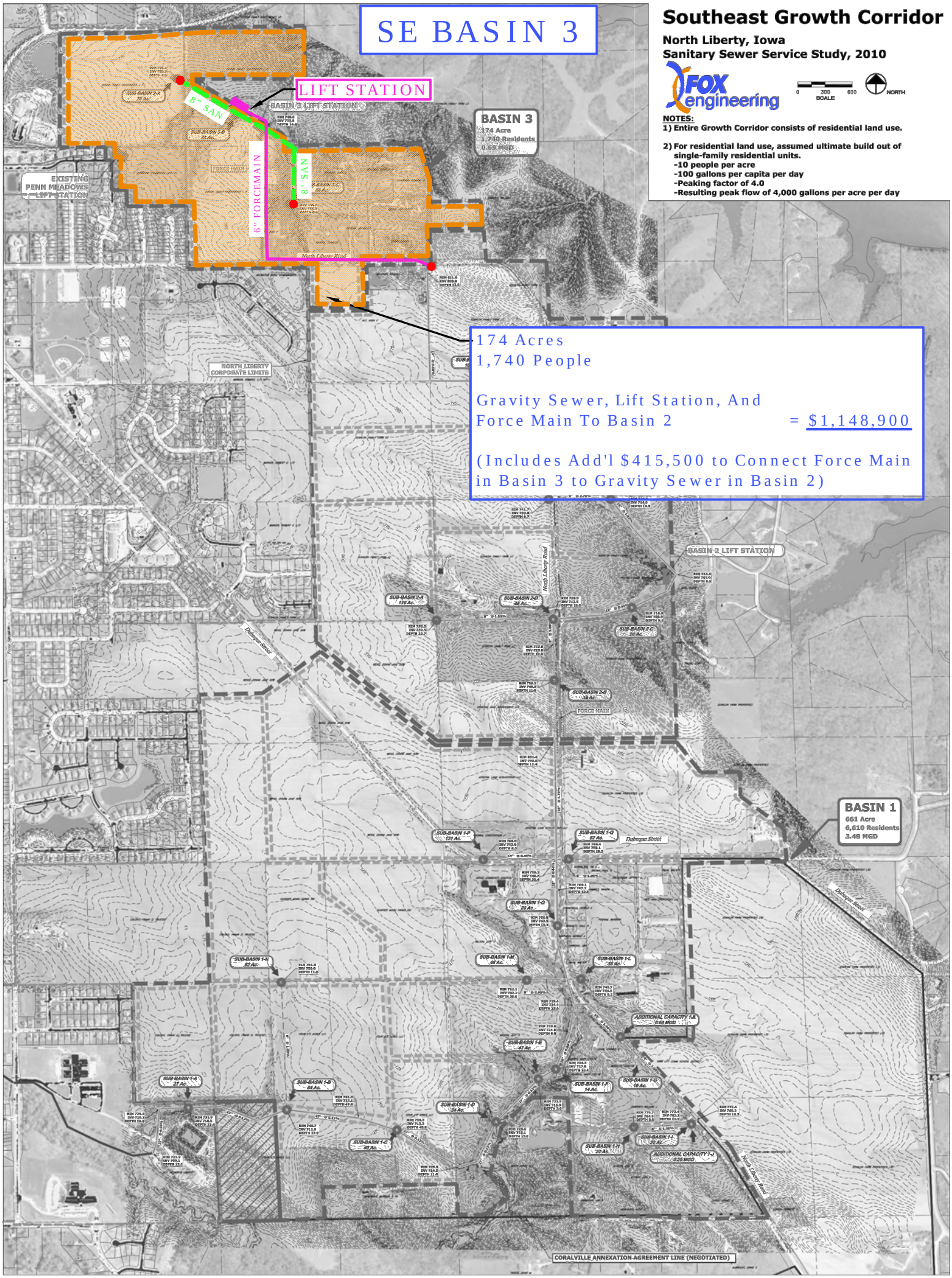
North Liberty, Iowa
Sanitary Sewer Service Study, 2010

FOX engineering

0 300 600 SCALE NORTH

NOTES:
1) Entire Growth Corridor consists of residential land use.

2) For residential land use, assumed ultimate build out of single-family residential units.
-10 people per acre
-100 gallons per capita per day
-Peaking factor of 4.0
-Resulting peak flow of 4,000 gallons per acre per day



174 Acres
1,740 People

Gravity Sewer, Lift Station, And
Force Main To Basin 2 = $1,148,900

(Includes Add'l $415,500 to Connect Force Main in Basin 3 to Gravity Sewer in Basin 2)

ENGINEER'S PRELIMINARY OPINION OF PROBABLE COST
NORTH LIBERTY SANITARY SEWER SERVICE STUDY
Western Growth Corridor Probable Cost Summary
City of North Liberty, IA

Trench Wet Well Lift Station to Existing WWTP Option (20.4 MGD)	Gravity Sewer Cost	Lift Station and Force Main Costs	Phase Total
Phase 1			
Service to Sub-Basin L and existing Sub-basin E	$519,000	$562,100	$1,081,100
Phase 2			
Expand Service To Basin 3	$0	$600,400	$600,400
Phase 3			
Expand Service To Sub-Basins B,C,D,F,G,J,K, and M	$1,202,000	$6,949,900	$8,151,900
Phase 4			
Basin 2 Gravity Sewer and Lift Station	$3,173,300	$19,907,100	$23,080,400
Phase 5			
Remaining Basin 1 Trunk to Lift Station	$3,064,500	$0	$3,064,500
Phased Total Probable Cost (Lift Station)*			***$35,978,300***

Does not include any improvements to existing WWTP.

New WWTP Option (20.4 MGD)	Gravity Sewer Cost	Lift Station and Force Main Costs	Phase Total
Phase 1			
Service to Sub-Basin L and existing Sub-basin E	$519,000	$562,100	$1,081,100
Phase 2			
Expand Service To Basin 3	$0	$600,400	$600,400
Phase 3			
Expand Service To Sub-Basins B,C,D,F,G,J,K, and M	$1,202,000	$6,949,900	$8,151,900
Phase 4			
Basin 2 Gravity Sewer, trench wet well, and WWTP Influent Lift Station	$2,696,700	$5,340,000	$8,036,700
Phase 5			
Remaining Basin 1 Trunk	$1,384,300	$0	$1,384,300
***Total Probable Cost* (New WWTP in Western Corridor)**			***$19,254,400***

Does not include cost of new WWTP ($14,00,000)

ENGINEER'S PRELIMINARY OPINION OF PROBABLE COST
NORTH LIBERTY SANITARY SEWER SERVICE STUDY
Western Growth Corridor Probable Cost/Acre Summary
City of North Liberty, IA

Total Western Corridor Cost per Acre for Sanitary Sewer

Total Basin Cost/Acre	Total Area Served in Corridor (Acres)	Total Corridor Cost	Total Corridor Cost/Acre
New Lift Station to Existing WWTP			
Basin 1 Total	*1838*	*$12,297,500*	*$6,691*
Basin 2 Total	*731*	*$23,080,400*	*$31,574*
Basin 3 Total	*83*	*$600,400*	*$7,234*
Total Western Corridor (Lift Station)*	***2652***	***$35,978,300***	***$13,566***
New WWTP			
Basin 1 Total	*1815*	*$10,617,300*	*$5,850*
Basin 2 Total	*731*	*$8,036,700*	*$10,994*
Basin 3 Total	*83*	*$600,400*	*$7,234*
Total Western Corridor (WWTP)**	***2629***	***$19,254,400***	***$7,324***

**Does not include upgrades to existing WWTP.*

***Does not include cost of new WWTP ($14,000,000).*

W. CORRIDOR
LIFT STATION OPTION
$13,566/AC

Western Growth Corridor

North Liberty, Iowa
Sanitary Sewer Service Study, 2010

FOX engineering

0 400 800 SCALE NORTH

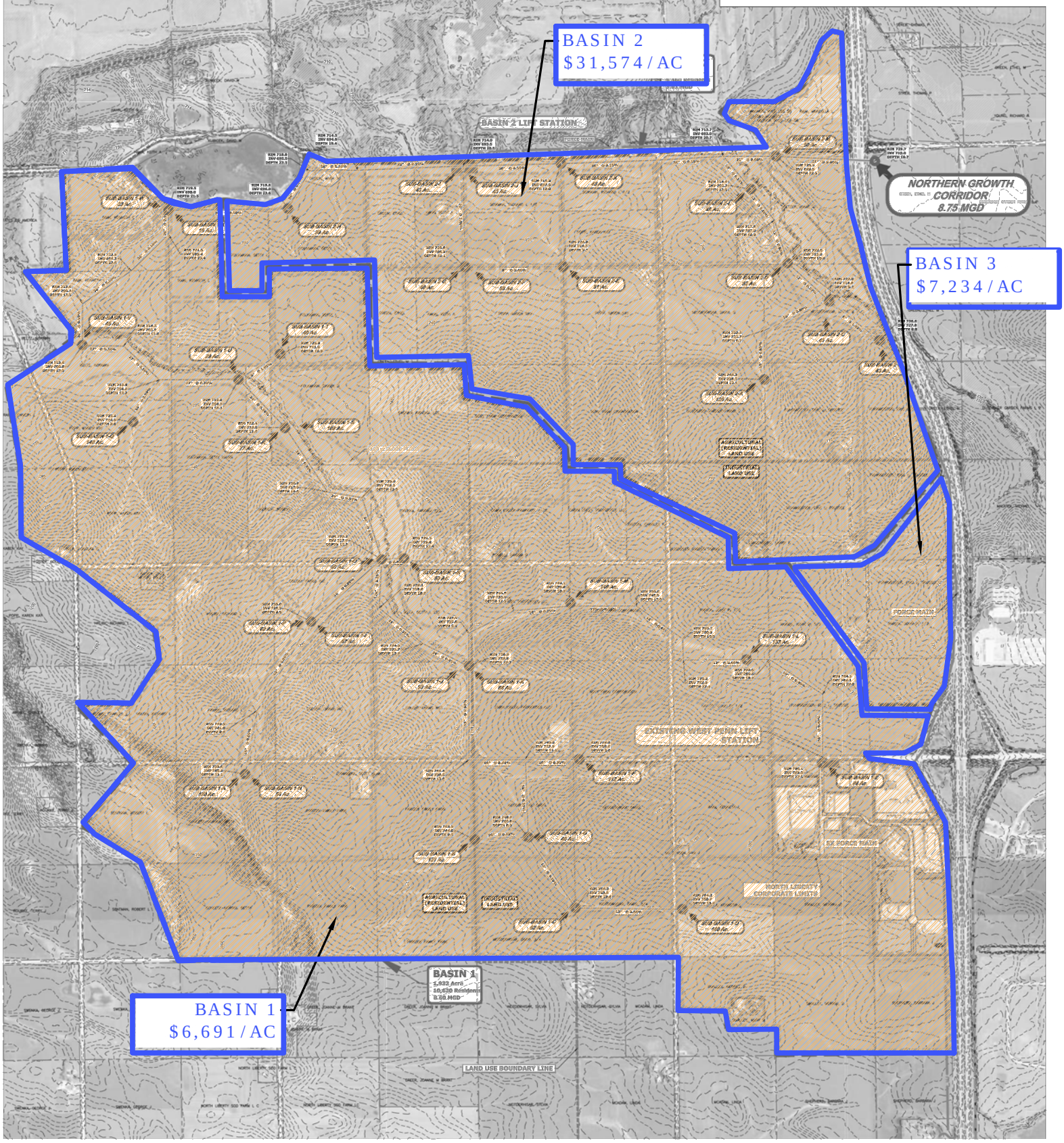
NOTES:

1) Entire Growth Corridor consists of agricultural and industrial land use.

2) For agricultural land use, assumed ultimate build out of single family residential.
   - -10 people per acre
   - -100 gallons per capita per day
   - -Peaking factor of 4.0
   - -Resulting peak flow of 4,000 gallons per acre per day

3) For industrial land use, assumed 5,000 gallons per acre per day.

4) Area of floodplain is not included in basin areas.



Western Growth Corridor

North Liberty, Iowa
Sanitary Sewer Service Study, 2010

FOX engineering

0 400 800 SCALE

NORTH

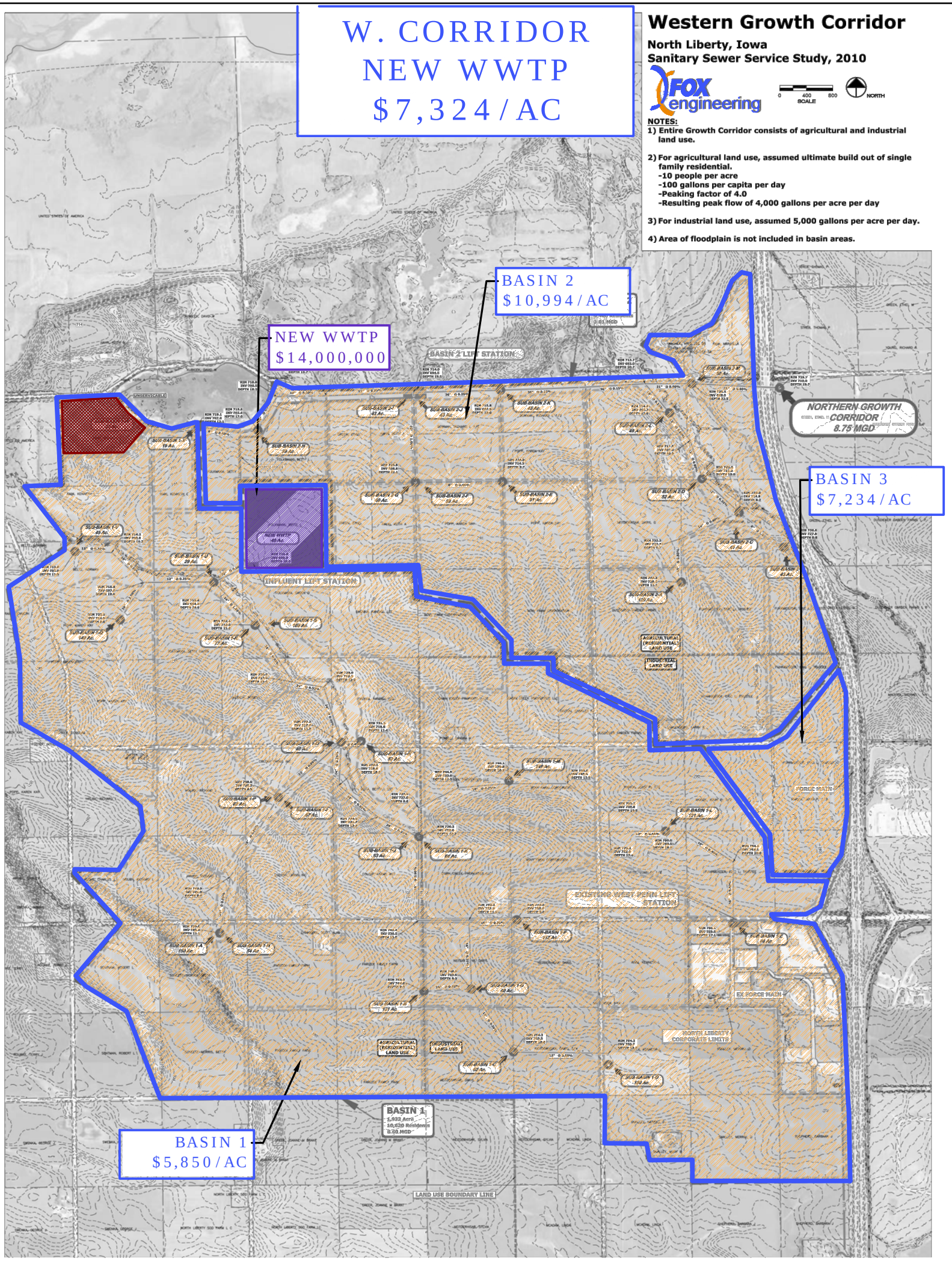
NOTES:

1) Entire Growth Corridor consists of agricultural and industrial land use.

2) For agricultural land use, assumed ultimate build out of single family residential.
   - -10 people per acre
   - -100 gallons per capita per day
   - -Peaking factor of 4.0
   - -Resulting peak flow of 4,000 gallons per acre per day

3) For industrial land use, assumed 5,000 gallons per acre per day.

4) Area of floodplain is not included in basin areas.



ENGINEER'S PRELIMINARY OPINION OF PROBABLE COST
NORTH LIBERTY SANITARY SEWER SERVICE STUDY
WESTERN GROWTH CORRIDOR
Basin 1, Phase 1
City of North Liberty, IA

LAST UPDATE:11/18/2010
FOX PN: 2489-10A.300

			Engineer's Opinion of Probable Cost	Sub-basin 1-L Gravity Sewer		Sub-basin 1-L Gravity, Force Main, PS	
ITEM NO.	DESCRIPTION	UNITS	UNIT PRICE	QUANTITY	TOTAL PRICE	QUANTITY	TOTAL PRICE
1	Mobilization, Bonds, Insurance	LS	3.5%	1	$12,700.00	1	$13,700.00
2	Clearing and Grubbing	LF	$30		$0.00		$0.00
3	Stabilization Material/Special Backfill	LS	2.5%	1	$9,100.00	1	$9,800.00
4	**8" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$45		$0.00		$0.00
5	8" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$60		$0.00		$0.00
6	8" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$75		$0.00		$0.00
7	**10" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$50		$0.00		$0.00
8	10" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$65	1,781	$115,765.00		$0.00
9	10" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$80		$0.00		$0.00
10	**12" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$55	200	$11,000.00		$0.00
11	12" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$70	1,439	$100,730.00		$0.00
12	12" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$85		$0.00		$0.00
13	**15" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$60		$0.00		$0.00
14	15" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$75		$0.00		$0.00
15	15" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$90		$0.00		$0.00
16	**18" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$65		$0.00		$0.00
17	18" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$80		$0.00		$0.00
18	18" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$95		$0.00		$0.00
19	**21" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$70		$0.00		$0.00
20	21" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$85		$0.00		$0.00
21	21" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$100		$0.00		$0.00
22	**24" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$75		$0.00		$0.00
23	24" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$90		$0.00		$0.00
24	24" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$105		$0.00		$0.00
25	**27" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$80		$0.00		$0.00
26	27" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$95		$0.00		$0.00
27	27" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$110		$0.00		$0.00
28	**30" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$90		$0.00		$0.00
29	30" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$105		$0.00		$0.00
30	30" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$120		$0.00		$0.00
31	**36" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$110		$0.00		$0.00
32	36" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$125		$0.00		$0.00
33	36" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$140		$0.00		$0.00
34	**48" Sanitary Sewer Manholes (0-15 ft)**	EA	$3,000		$0.00		$0.00
35	48" Sanitary Sewer Manholes (15-25 ft)	EA	$5,000	10	$50,000.00		$0.00
36	48" Sanitary Sewer Manholes (>25 ft)	EA	$10,000		$0.00		$0.00
37	**60" Sanitary Sewer Manholes (0-15 ft)**	EA	$5,000		$0.00		$0.00
38	60" Sanitary Sewer Manholes (15-25 ft)	EA	$10,000		$0.00		$0.00
39	60" Sanitary Sewer Manholes (>25 ft)	EA	$15,000		$0.00		$0.00
40	Connect to Existing Manhole	EA	$1,500		$0.00		$0.00
41	8" & 12" Parallel Force Mains (C900)	LF	$42		$0.00		$0.00
42	6" Force Main (C900)	LF	$15		$0.00		$0.00
43	8" Force Main (C900)	LF	$19		$0.00	3,420	$64,980.00
44	24" Force Main (C900)	LF	$81		$0.00		$0.00
45	36" Force Main (DI)	LF	$144		$0.00		$0.00
46	Connect to Existing Forcemain	EA	$3,000		$0.00	1	$3,000.00
47	Force Main Air Release/Cleanout Manholes	EA	$56,400		$0.00		$0.00
48	8" to 15" Bored Road Crossing and Casing	LF	$300	130	$39,000.00	130	$39,000.00
49	18" to 27" Bored Road Crossing and Casing	LF	$600		$0.00		$0.00
50	Stream Crossing	EA	$20,000		$0.00		$0.00
51	Submersible Duplex Pump Station	LS	$250,000		$0.00	1	$250,000.00
52	Trench Type Wet Well Pump Station	LS	$1,000,000		$0.00		$0.00
53	Sanitary Sewer and Manhole Testing	EA	$500	10	$5,000.00	0	$0.00
54	Type 5 Rural Seeding	LF	$2	3,420	$7,866.00		$0.00
55	Erosion Control	LS	1%	1	$3,603.68	1	$3,902.86
56	Field Tile Repair	LS	1%	1	$3,603.68	1	$3,902.86
57	Traffic Control	LS	$2,000	1	$2,000.00	1	$2,000.00
	Subtotal				$360,368		$390,286
	20% CONTINGENCIES				$72,074		$78,057
	SUBTOTAL				$432,442		$468,343
	10% ENGINEERING				$43,244		$46,834
	10% OBSERVATION/STAKING				$43,244		$46,834
	Pipe Run Total				***$519,000***		***$562,100***
	Phase Total						***$1,081,100***

GENERAL NOTES AND ASSUMPTION:
1. Land acquisition is not included in the opinion of costs presented.
2. Geotechnical Exploration costs are not included in the opinion of costs presented.

PREPARED BY:
FOX ENGINEERING ASSOCIATES, INC.
AMES, IOWA

W. BASIN 1
PHASE 1

Western Growth Corridor

North Liberty, Iowa
Sanitary Sewer Service Study, 2010

FOX engineering

0 400 800 SCALE

NORTH

NOTES:

1) Entire Growth Corridor consists of agricultural and industrial land use.

2) For agricultural land use, assumed ultimate build out of single family residential.
   - -10 people per acre
   - -100 gallons per capita per day
   - -Peaking factor of 4.0
   - -Resulting peak flow of 4,000 gallons per acre per day

3) For industrial land use, assumed 5,000 gallons per acre per day.

4) Area of floodplain is not included in basin areas.

LEGEND

- CURRENT PHASE
- PREVIOUS PHASES
- COMBINED SERVICE BOUNDARY

PHASE 1
121 Acres Add'l
217 Acres Net
Industrial Land Use

Temporary Lift Station, Force Main, and Gravity Sewer
$1,081,100

LIFT STATION

12" SAN

10" SAN

8" FORCE MAIN

CONNECT TO EX FORCE MAIN AND ABANDON EX LIFT STATION

EXISTING SERVICE AREA. GRAVITY FLOW TO NEW LIFT STATION

BASIN 2

BASIN 2 LIFT STATION

BASIN 1

EXISTING WEST PENN LIFT STATION

FORCE MAIN

NORTH LIBERTY CORPORATE LIMITS

AGRICULTURAL (RESIDENTIAL) LAND USE

INDUSTRIAL LAND USE

LAND USE BOUNDARY LINE

ENGINEER'S PRELIMINARY OPINION OF PROBABLE COST
NORTH LIBERTY SANITARY SEWER SERVICE STUDY
WESTERN GROWTH CORRIDOR
Basin 3, Phase 2
City of North Liberty, IA

LAST UPDATE:11/18/2010
FOX PN: 2489-10A.300

			Engineer's Opinion of Probable Cost	Basin 3 Connect to Existing FM	
ITEM NO.	DESCRIPTION	UNITS	UNIT PRICE	QUANTITY	TOTAL PRICE
1	Mobilization, Bonds, Insurance	LS	3.5%	1	$14,600.00
2	Clearing and Grubbing	LF	$30		$0.00
3	Stabilization Material/Special Backfill	LS	2.5%	1	$10,500.00
4	**8" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$45		$0.00
5	8" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$60		$0.00
6	8" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$75		$0.00
7	**10" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$50		$0.00
8	10" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$65		$0.00
9	10" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$80		$0.00
10	**12" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$55		$0.00
11	12" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$70		$0.00
12	12" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$85		$0.00
13	**15" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$60		$0.00
14	15" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$75		$0.00
15	15" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$90		$0.00
16	**18" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$65		$0.00
17	18" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$80		$0.00
18	18" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$95		$0.00
19	**21" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$70		$0.00
20	21" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$85		$0.00
21	21" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$100		$0.00
22	**24" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$75		$0.00
23	24" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$90		$0.00
24	24" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$105		$0.00
25	**27" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$80		$0.00
26	27" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$95		$0.00
27	27" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$110		$0.00
28	**30" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$90		$0.00
29	30" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$105		$0.00
30	30" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$120		$0.00
31	**36" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$110		$0.00
32	36" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$125		$0.00
33	36" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$140		$0.00
34	**48" Sanitary Sewer Manholes (0-15 ft)**	EA	$3,000		$0.00
35	48" Sanitary Sewer Manholes (15-25 ft)	EA	$5,000		$0.00
36	48" Sanitary Sewer Manholes (>25 ft)	EA	$10,000		$0.00
37	**60" Sanitary Sewer Manholes (0-15 ft)**	EA	$5,000		$0.00
38	60" Sanitary Sewer Manholes (15-25 ft)	EA	$10,000		$0.00
39	60" Sanitary Sewer Manholes (>25 ft)	EA	$15,000		$0.00
40	Connect to Existing Manhole	EA	$1,500		$0.00
41	8" & 12" Parallel Force Mains (C900)	LF	$42		$0.00
42	6" Force Main (C900)	LF	$15		$0.00
43	8" Force Main (C900)	LF	$19	4,200	$79,800.00
44	24" Force Main (C900)	LF	$81		$0.00
45	36" Force Main (DI)	LF	$144		$0.00
46	Connect to Existing Forcemain	EA	$3,000	1	$3,000.00
47	Force Main Air Release/Cleanout Manholes	EA	$56,400		$0.00
48	8" to 15" Bored Road Crossing and Casing	LF	$300	130	$39,000.00
49	18" to 27" Bored Road Crossing and Casing	LF	$600		$0.00
50	Stream Crossing	EA	$20,000		$0.00
51	Submersible Duplex Pump Station	LS	$250,000	1	$250,000.00
52	Trench Type Wet Well Pump Station	LS	$1,000,000		$0.00
53	Sanitary Sewer and Manhole Testing	EA	$500	0	$0.00
54	Type 5 Rural Seeding	LF	$2	4,200	$9,660.00
55	Erosion Control	LS	1%	1	$4,168.98
56	Field Tile Repair	LS	1%	1	$4,168.98
57	Traffic Control	LS	$2,000	1	$2,000.00
	Subtotal				$416,898
	20% CONTINGENCIES				$83,380
	SUBTOTAL				$500,278
	10% ENGINEERING				$50,028
	10% OBSERVATION/STAKING				$50,028
	Pipe Run Total				***$600,400***
	Phase Total				***$600,400***

GENERAL NOTES AND ASSUMPTION:

1. Land acquisition is not included in the opinion of costs presented.
2. Geotechnical Exploration costs are not included in the opinion of costs presented.

PREPARED BY:
FOX ENGINEERING ASSOCIATES, INC.
AMES, IOWA

W. BASIN 1
PHASE 2

Western Growth Corridor

North Liberty, Iowa
Sanitary Sewer Service Study, 2010

FOX engineering

0 400 800
SCALE

NORTH

NOTES:

1) Entire Growth Corridor consists of agricultural and industrial land use.

2) For agricultural land use, assumed ultimate build out of single family residential.
   - -10 people per acre
   - -100 gallons per capita per day
   - -Peaking factor of 4.0
   - -Resulting peak flow of 4,000 gallons per acre per day

3) For industrial land use, assumed 5,000 gallons per acre per day.

4) Area of floodplain is not included in basin areas.

LEGEND

- CURRENT PHASE
- PREVIOUS PHASES
- COMBINED SERVICE BOUNDARY

Phase 2
83 Acres Add'l
300 Acres Net
Industrial Land Use

Submersible Lift Station and 8" Force Main to Connect With Existing Force Main
$600,400

LIFT STATION

8" FORCE MAIN

EXISTING WEST PENN LIFT STATION

PHASE 1

CONNECT TO EXISTING FORCE MAIN

BASIN 2

BASIN 2 LIFT STATION

BASIN 1

AGRICULTURAL (RESIDENTIAL) LAND USE

INDUSTRIAL LAND USE

NORTH LIBERTY CORPORATE LIMITS

LAND USE BOUNDARY LINE

ENGINEER'S PRELIMINARY OPINION OF PROBABLE COST
NORTH LIBERTY SANITARY SEWER SERVICE STUDY
WESTERN GROWTH CORRIDOR
Basin 1, Phase 3
City of North Liberty, IA

LAST UPDATE:11/18/2010
FOX PN: 2489-10A.300

			Engineer's Opinion of Probable Cost	Sub Basin 1-M		Sub basins B, C, G, D, F, K, J		Force Main and Lift Station	
ITEM NO.	DESCRIPTION	UNITS	UNIT PRICE	QUANTITY	TOTAL PRICE	QUANTITY	TOTAL PRICE	QUANTITY	TOTAL PRICE
1	Mobilization, Bonds, Insurance	LS	3.5%	1	$10,200.00	1	$19,100.00	1	$169,000.00
2	Clearing and Grubbing	LF	$30		$0.00		$0.00	1,520	$45,600.00
3	Stabilization Material/Special Backfill	LS	2.5%	1	$7,300.00	1	$13,700.00	1	$120,700.00
4	**8" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$45		$0.00		$0.00		$0.00
5	8" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$60		$0.00		$0.00		$0.00
6	8" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$75		$0.00		$0.00		$0.00
7	**10" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$50		$0.00		$0.00		$0.00
8	10" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$65		$0.00		$0.00		$0.00
9	10" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$80		$0.00		$0.00		$0.00
10	**12" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$55	1,449	$79,695.00	1,433	$78,815.00		$0.00
11	12" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$70		$0.00		$0.00		$0.00
12	12" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$85		$0.00		$0.00		$0.00
13	**15" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$60	1,886	$113,160.00	2,398	$143,880.00		$0.00
14	15" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$75		$0.00		$0.00		$0.00
15	15" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$90		$0.00		$0.00		$0.00
16	**18" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$65		$0.00	1,800	$117,000.00		$0.00
17	18" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$80		$0.00		$0.00		$0.00
18	18" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$95		$0.00		$0.00		$0.00
19	**21" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$70		$0.00		$0.00		$0.00
20	21" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$85		$0.00		$0.00		$0.00
21	21" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$100		$0.00		$0.00		$0.00
22	**24" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$75		$0.00		$0.00		$0.00
23	24" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$90		$0.00		$0.00		$0.00
24	24" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$105		$0.00		$0.00		$0.00
25	**27" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$80		$0.00		$0.00		$0.00
26	27" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$95		$0.00		$0.00		$0.00
27	27" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$110		$0.00		$0.00		$0.00
28	**30" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$90		$0.00		$0.00		$0.00
29	30" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$105		$0.00		$0.00		$0.00
30	30" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$120		$0.00		$0.00		$0.00
31	**36" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$110		$0.00		$0.00		$0.00
32	36" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$125		$0.00		$0.00		$0.00
33	36" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$140		$0.00		$0.00		$0.00
34	**48" Sanitary Sewer Manholes (0-15 ft)**	EA	$3,000	9	$27,000.00	16	$48,000.00		$0.00
35	48" Sanitary Sewer Manholes (15-25 ft)	EA	$5,000		$0.00		$0.00		$0.00
36	48" Sanitary Sewer Manholes (>25 ft)	EA	$10,000		$0.00		$0.00		$0.00
37	**60" Sanitary Sewer Manholes (0-15 ft)**	EA	$5,000		$0.00		$0.00		$0.00
38	60" Sanitary Sewer Manholes (15-25 ft)	EA	$10,000		$0.00		$0.00		$0.00
39	60" Sanitary Sewer Manholes (>25 ft)	EA	$15,000		$0.00		$0.00		$0.00
40	Connect to Existing Manhole	EA	$1,500		$0.00		$0.00		$0.00
41	8" & 12" Parallel Force Mains (C900)	LF	$42		$0.00		$0.00		$0.00
42	6" Force Main (C900)	LF	$15		$0.00		$0.00		$0.00
43	8" Force Main (C900)	LF	$19		$0.00		$0.00		$0.00
44	21" Force main (C900)	LF	$61		$0.00		$0.00	32,100	$1,958,100.00
45	24" Force Main (C900)	LF	$81		$0.00		$0.00		$0.00
46	36" Force Main (DI)	LF	$144		$0.00		$0.00		$0.00
47	Connect to Existing Forcemain	EA	$3,000		$0.00		$0.00		$0.00
48	Force Main Air Release/Cleanout Manholes	EA	$56,400		$0.00		$0.00		$0.00
49	8" to 15" Bored Road Crossing and Casing	LF	$300	110	$33,000.00	300	$90,000.00	2,735	$820,500.00
50	18" to 27" Bored Road Crossing and Casing	LF	$600		$0.00		$0.00		$0.00
51	Stream Crossing	EA	$20,000		$0.00		$0.00	2	$40,000.00
52	Submersible Duplex Pump Station	LS	$250,000		$0.00		$0.00		$0.00
53	Trench Type Wet Well Pump Station	LS	$1,500,000		$0.00		$0.00	1	$1,500,000.00
54	Sanitary Sewer and Manhole Testing	EA	$500	9	$4,500.00	16	$8,000.00	0	$0.00
55	Type 5 Rural Seeding	LF	$2	3,335	$7,670.50	5,631	$12,951.30	32,100	$73,830.00
56	Erosion Control	LS	1%	1	$2,903.32	1	$5,443.33	1	$48,262.55
57	Field Tile Repair	LS	1%	1	$2,903.32	1	$5,443.33	1	$48,262.55
58	Traffic Control	LS	$2,000	1	$2,000.00	1	$2,000.00	1	$2,000.00
	Subtotal				$290,332		$544,333		$4,826,255
	20% CONTINGENCIES				$58,066		$108,867		$965,251
	SUBTOTAL				$348,399		$653,200		$5,791,506
	10% ENGINEERING				$34,840		$65,320		$579,151
	10% OBSERVATION/STAKING				$34,840		$65,320		$579,151
	Pipe Run Total				***$418,100***		***$783,900***		***$6,949,900***
	Phase Total						***$1,202,000***		***$6,949,900***

GENERAL NOTES AND ASSUMPTION:
1. Land acquisition is not included in the opinion of costs presented.
2. Geotechnical Exploration costs are not included in the opinion of costs presented.

PREPARED BY:
FOX ENGINEERING ASSOCIATES, INC.
AMES, IOWA

W. BASIN 1
PHASE 3

Western Growth Corridor

North Liberty, Iowa
Sanitary Sewer Service Study, 2010

FOX engineering

0 400 800
SCALE

NORTH

NOTES:

1) Entire Growth Corridor consists of agricultural and industrial land use.

2) For agricultural land use, assumed ultimate build out of single family residential.
   - -10 people per acre
   - -100 gallons per capita per day
   - -Peaking factor of 4.0
   - -Resulting peak flow of 4,000 gallons per acre per day

3) For industrial land use, assumed 5,000 gallons per acre per day.

4) Area of floodplain is not included in basin areas.

LEGEND

- CURRENT PHASE
- PREVIOUS PHASES
- COMBINED SERVICE BOUNDARY

Phase 3
811 Acres Add'l
1111 Acres Net
637 Ac Industrial Use,
174 Ac Residential

Trench Wet Well Lift Station,
Force Main, and Gravity Sewer
$8,151,900

REMOVE SUBMERSIBLE LIFT STATION

PHASE 1&2

TRENCH WET WELL LIFT STATION

15" SAN

15" SAN

12" SAN

24" FORCE MAIN

15" SAN

10" SAN

18" SAN

18" SAN

10" SAN

15" SAN

12" SAN

24" FORCE MAIN

NEW 24" FM TO EX TREATMENT PLANT

BASIN 2

BASIN 2 LIFT STATION

BASIN 1

EXISTING WEST PENN LIFT STATION

NORTH LIBERTY CORPORATE LIMITS

AGRICULTURAL (RESIDENTIAL) LAND USE

INDUSTRIAL LAND USE

LAND USE BOUNDARY LINE

ENGINEER'S PRELIMINARY OPINION OF PROBABLE COST
NORTH LIBERTY SANITARY SEWER SERVICE STUDY
WESTERN GROWTH CORRIDOR
Phase 4, Basin 2
City of North Liberty, IA

LAST UPDATE:3/11/2011
FOX PN: 2489-10A.300

			Engineer's Opinion of Probable Cost	Basin 2 Gravity Sewer		Force Main and Lift Station for Wester Corridor to Existing WWTP	
ITEM NO.	DESCRIPTION	UNITS	UNIT PRICE	QUANTITY	TOTAL PRICE	QUANTITY	TOTAL PRICE
1	Mobilization, Bonds, Insurance	LS	3.5%	1	$77,200.00	1	$483,900.00
2	Clearing and Grubbing	LF	$30		$0.00	1,520	$45,600.00
3	Stabilization Material/Special Backfill	LS	2.5%	1	$55,100.00	1	$345,700.00
4	**8" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$45		$0.00		$0.00
5	8" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$60		$0.00		$0.00
6	8" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$75		$0.00		$0.00
7	**10" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$50		$0.00		$0.00
8	10" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$65		$0.00		$0.00
9	10" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$80		$0.00		$0.00
10	**12" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$55	1,882	$103,510.00		$0.00
11	12" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$70		$0.00		$0.00
12	12" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$85		$0.00		$0.00
13	**15" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$60		$0.00		$0.00
14	15" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$75		$0.00		$0.00
15	15" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$90		$0.00		$0.00
16	**18" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$65	200	$13,000.00		$0.00
17	18" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$80	375	$30,000.00		$0.00
18	18" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$95		$0.00		$0.00
19	**21" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$70		$0.00		$0.00
20	21" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$85	2,034	$172,890.00		$0.00
21	21" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$100		$0.00		$0.00
22	**24" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$75		$0.00		$0.00
23	24" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$90		$0.00		$0.00
24	24" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$105		$0.00		$0.00
25	**27" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$80		$0.00		$0.00
26	27" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$95		$0.00		$0.00
27	27" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$110		$0.00		$0.00
28	**30" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$90		$0.00		$0.00
29	30" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$105		$0.00		$0.00
30	30" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$120		$0.00		$0.00
31	**36" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$110		$0.00		$0.00
32	36" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$125	5,299	$662,375.00		$0.00
33	36" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$140	850	$119,000.00		$0.00
34	**48" Sanitary Sewer Manholes (0-15 ft)**	EA	$3,000	7	$21,000.00		$0.00
35	48" Sanitary Sewer Manholes (15-25 ft)	EA	$5,000	1	$5,000.00		$0.00
36	48" Sanitary Sewer Manholes (>25 ft)	EA	$10,000		$0.00		$0.00
37	**60" Sanitary Sewer Manholes (0-15 ft)**	EA	$5,000		$0.00		$0.00
38	60" Sanitary Sewer Manholes (15-25 ft)	EA	$10,000	23	$230,000.00		$0.00
39	60" Sanitary Sewer Manholes (>25 ft)	EA	$15,000	2	$30,000.00		$0.00
40	Connect to Existing Manhole	EA	$1,500		$0.00		$0.00
41	8" & 12" Parallel Force Mains (C900)	LF	$42		$0.00		$0.00
42	6" Force Main (C900)	LF	$15		$0.00		$0.00
43	8" Force Main (C900)	LF	$19		$0.00		$0.00
44	24" Force Main (C900)	LF	$81		$0.00	23,376	$1,893,456.00
45	36" Force Main	LF	$144		$0.00	14,125	$2,034,000.00
47	Connect to Existing Forcemain	EA	$3,000		$0.00		$0.00
48	Force Main Air Release/Cleanout Manholes	EA	$56,400		$0.00	3	$169,200.00
49	8" to 15" Bored Road Crossing and Casing	LF	$300		$0.00		$0.00
50	18" to 27" Bored Road Crossing and Casing	LF	$600	400	$240,000.00		$0.00
51	27"+ Bored Road Crossing and Casing	LF	$900	375	$337,500.00	2,735	$2,461,500.00
52	Stream Crossing	EA	$20,000	1	$20,000.00	4	$80,000.00
53	Submersible Duplex Pump Station	LS	$250,000		$0.00		$0.00
54	Trench Type Wet Well Pump Station	LS	$6,000,000		$0.00	1	$6,000,000.00
55	Sanitary Sewer and Manhole Testing	EA	$500	33	$16,500.00	0	$0.00
56	Type 5 Rural Seeding	LF	$2	10,640	$24,472.00	14,125	$32,487.50
57	Erosion Control	LS	1%	1	$22,036.19	1	$138,243.30
58	Field Tile Repair	LS	1%	1	$22,036.19	1	$138,243.30
59	Traffic Control	LS	$2,000	1	$2,000.00	1	$2,000.00
	Subtotal				$2,203,619		$13,824,330
	20% CONTINGENCIES				$440,724		$2,764,866
	SUBTOTAL				$2,644,343		$16,589,196
	10% ENGINEERING				$264,434		$1,658,920
	10% OBSERVATION/STAKING				$264,434		$1,658,920
	Pipe Run Total				***$3,173,300***		***$19,907,100***
	Phase Total				***$3,173,300***		***$19,907,100***

GENERAL NOTES AND ASSUMPTION:

1. Land acquisition is not included in the opinion of costs presented.
2. Geotechnical Exploration costs are not included in the opinion of costs presented.

PREPARED BY:
FOX ENGINEERING ASSOCIATES, INC.
AMES, IOWA

W. BASIN 2
PHASE 4

Western Growth Corridor

North Liberty, Iowa
Sanitary Sewer Service Study, 2010

FOX engineering

0 400 800
SCALE

NORTH

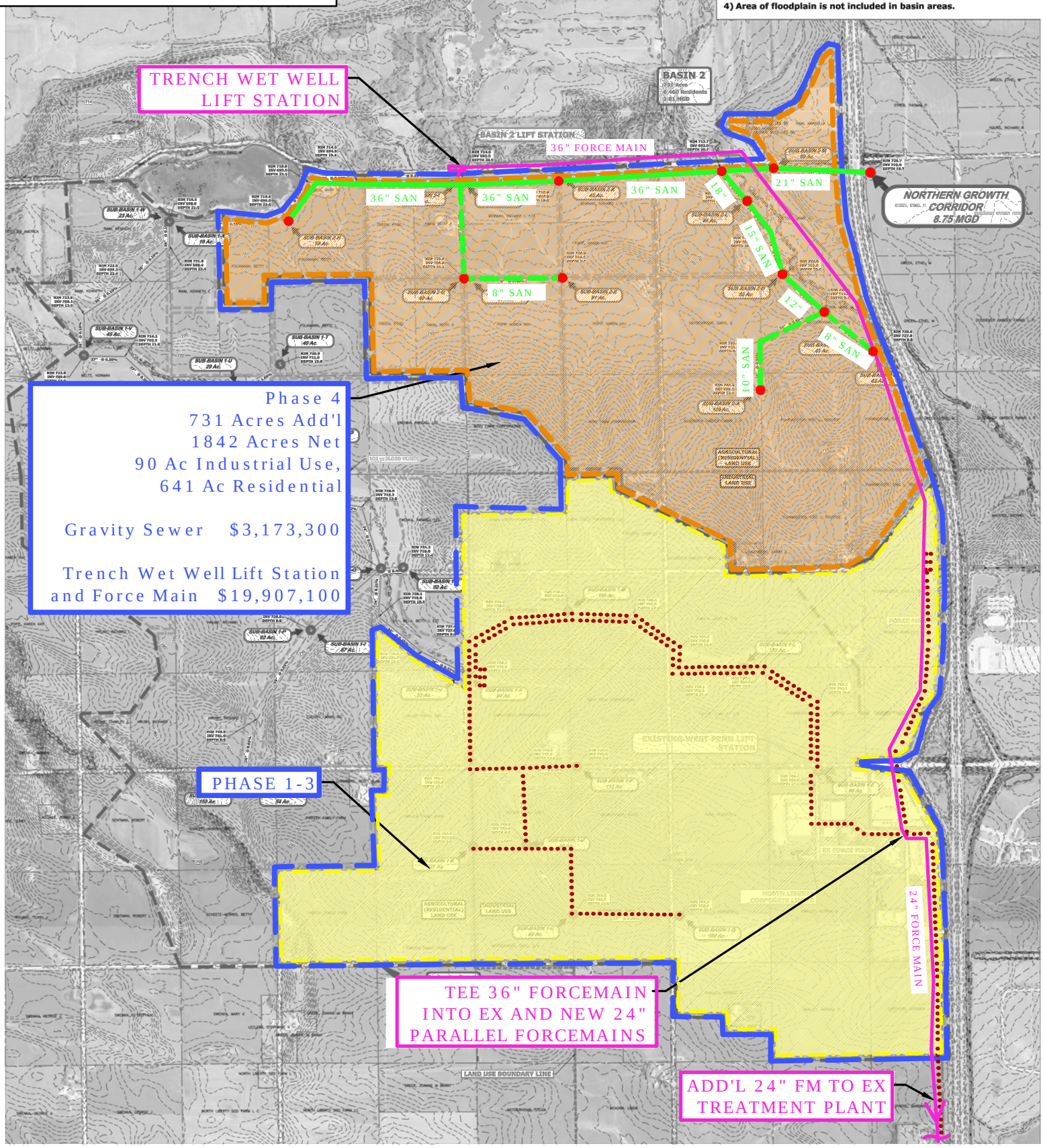
NOTES:

1) Entire Growth Corridor consists of agricultural and industrial land use.

2) For agricultural land use, assumed ultimate build out of single family residential.
   - -10 people per acre
   - -100 gallons per capita per day
   - -Peaking factor of 4.0
   - -Resulting peak flow of 4,000 gallons per acre per day

3) For industrial land use, assumed 5,000 gallons per acre per day.

4) Area of floodplain is not included in basin areas.



ENGINEER'S PRELIMINARY OPINION OF PROBABLE COST
NORTH LIBERTY SANITARY SEWER SERVICE STUDY
WESTERN GROWTH CORRIDOR
Phase 5, Basin 1 Gravity Sewer
City of North Liberty, IA

LAST UPDATE:11/18/2010
FOX PN: 2489-10A.300

			Engineer's Opinion of Probable Cost	Remaining Basin 1 Gravity Sewer (>10")		Phase 1- Sub-basin 1-L Gravity Sewer		Phase 3- Sub Basin 1-M		Phase 3- Sub basins B, C, G, D, F, K, J	
ITEM NO.	DESCRIPTION	UNITS	UNIT PRICE	QUANTITY	TOTAL PRICE	QUANTITY	TOTAL PRICE	QUANTITY	TOTAL PRICE	QUANTITY	TOTAL PRICE
1	Mobilization, Bonds, Insurance	LS	3.5%	1	$74,500.00	1	$12,700.00	1	$10,200.00	1	$22,500.00
2	Clearing and Grubbing	LF	$30		$0.00		$0.00		$0.00		$0.00
3	Stabilization Material/Special Backfill	LS	2.5%	1	$53,300.00	1	$9,100.00	1	$7,300.00	1	$16,100.00
4	**8" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$45		$0.00		$0.00		$0.00		$0.00
5	8" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$60		$0.00		$0.00		$0.00		$0.00
6	8" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$75		$0.00		$0.00		$0.00		$0.00
7	**10" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$50		$0.00		$0.00		$0.00	1,438	$71,900.00
8	10" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$65		$0.00	1,781	$115,765.00		$0.00		$0.00
9	10" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$80		$0.00		$0.00		$0.00		$0.00
10	**12" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$55	1,264	$69,520.00	200	$11,000.00	1,449	$79,695.00	1,433	$78,815.00
11	12" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$70		$0.00	1,439	$100,730.00		$0.00		$0.00
12	12" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$85		$0.00		$0.00		$0.00		$0.00
13	**15" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$60		$0.00		$0.00	1,886	$113,160.00	2,398	$143,880.00
14	15" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$75		$0.00		$0.00		$0.00		$0.00
15	15" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$90		$0.00		$0.00		$0.00		$0.00
16	**18" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$65		$0.00		$0.00		$0.00	1,800	$117,000.00
17	18" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$80		$0.00		$0.00		$0.00		$0.00
18	18" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$95		$0.00		$0.00		$0.00		$0.00
19	**21" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$70		$0.00		$0.00		$0.00		$0.00
20	21" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$85		$0.00		$0.00		$0.00		$0.00
21	21" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$100		$0.00		$0.00		$0.00		$0.00
22	**24" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$75	3,967	$297,525.00		$0.00		$0.00		$0.00
23	24" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$90	500	$45,000.00		$0.00		$0.00		$0.00
24	24" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$105		$0.00		$0.00		$0.00		$0.00
25	**27" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$80	3,143	$251,440.00		$0.00		$0.00		$0.00
26	27" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$95		$0.00		$0.00		$0.00		$0.00
27	27" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$110		$0.00		$0.00		$0.00		$0.00
28	**30" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$90		$0.00		$0.00		$0.00		$0.00
29	30" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$105		$0.00		$0.00		$0.00		$0.00
30	30" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$120		$0.00		$0.00		$0.00		$0.00
31	**36" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$110	560	$61,600.00		$0.00		$0.00		$0.00
32	36" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$125	5,894	$736,750.00		$0.00		$0.00		$0.00
33	36" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$140	180	$25,200.00		$0.00		$0.00		$0.00
34	**48" Sanitary Sewer Manholes (0-15 ft)**	EA	$3,000	3	$9,000.00		$0.00	9	$27,000.00	20	$60,000.00
35	48" Sanitary Sewer Manholes (15-25 ft)	EA	$5,000	2	$10,000.00	10	$50,000.00		$0.00		$0.00
36	48" Sanitary Sewer Manholes (>25 ft)	EA	$10,000		$0.00		$0.00		$0.00		$0.00

37	**60" Sanitary Sewer Manholes (0-15 ft)**	EA	$5,000	25	$125,000.00		$0.00		$0.00		$0.00
38	60" Sanitary Sewer Manholes (15-25 ft)	EA	$10,000	17	$170,000.00		$0.00		$0.00		$0.00
39	60" Sanitary Sewer Manholes (>25 ft)	EA	$15,000	1	$15,000.00		$0.00		$0.00		$0.00
40	Connect to Existing Manhole	EA	$1,500		$0.00		$0.00		$0.00		$0.00
41	8" & 12" Parallel Force Mains (C900)	LF	$42		$0.00		$0.00		$0.00		$0.00
42	6" Force Main (C900)	LF	$15		$0.00		$0.00		$0.00		$0.00
43	8" Force Main (C900)	LF	$19		$0.00		$0.00		$0.00		$0.00
44	24" Force Main (C900)	LF	$81		$0.00		$0.00		$0.00		$0.00
45	36" Force Main (DI)	LF	$144		$0.00		$0.00		$0.00		$0.00
46	Connect to Existing Forcemain	EA	$3,000		$0.00		$0.00		$0.00		$0.00
47	Force Main Air Release/Cleanout Manholes	EA	$56,400		$0.00		$0.00		$0.00		$0.00
48	8" to 15" Bored Road Crossing and Casing	LF	$300		$0.00	130	$39,000.00	110	$33,000.00	300	$90,000.00
49	18" to 27" Bored Road Crossing and Casing	LF	$600	100	$60,000.00		$0.00		$0.00		$0.00
50	Stream Crossing	EA	$20,000	1	$20,000.00		$0.00		$0.00		$0.00
51	Submersible Duplex Pump Station	LS	$250,000		$0.00		$0.00		$0.00		$0.00
52	Trench Type Wet Well Pump Station	LS	$1,000,000		$0.00		$0.00		$0.00		$0.00
53	Sanitary Sewer and Manhole Testing	EA	$500	48	$24,000.00	10	$5,000.00	9	$4,500.00	20	$10,000.00
54	Type 5 Rural Seeding	LF	$2	15,508	$35,668.40	3,420	$7,866.00	3,335	$7,670.50	7,069	$16,258.70
55	Erosion Control	LS	1%	1	$21,280.65	1	$3,603.68	1	$2,903.32	1	$6,412.79
56	Field Tile Repair	LS	1%	1	$21,280.65	1	$3,603.68	1	$2,903.32	1	$6,412.79
57	Traffic Control	LS	$2,000	1	$2,000.00	1	$2,000.00	1	$2,000.00	1	$2,000.00
	Subtotal				$2,128,065		$360,368		$290,332		$641,279
	20% CONTINGENCIES				$425,613		$72,074		$58,066		$128,256
	SUBTOTAL				$2,553,678		$432,442		$348,399		$769,535
	10% ENGINEERING				$255,368		$43,244		$34,840		$76,954
	10% OBSERVATION/STAKING				$255,368		$43,244		$34,840		$76,954
	Pipe Run Total				***$3,064,500***		***$519,000***		***$418,100***		***$923,500***
	Total										***$4,925,100***

GENERAL NOTES AND ASSUMPTION:

1. Land acquisition is not included in the opinion of costs presented.
2. Geotechnical Exploration costs are not included in the opinion of costs presented.

PREPARED BY:
FOX ENGINEERING ASSOCIATES, INC.
AMES, IOWA

W. BASIN 1
PHASE 5

Western Growth Corridor

North Liberty, Iowa
Sanitary Sewer Service Study, 2010

FOX engineering

0 400 800 SCALE

NORTH

NOTES:

1) Entire Growth Corridor consists of agricultural and industrial land use.

2) For agricultural land use, assumed ultimate build out of single family residential.
   - -10 people per acre
   - -100 gallons per capita per day
   - -Peaking factor of 4.0
   - -Resulting peak flow of 4,000 gallons per acre per day

3) For industrial land use, assumed 5,000 gallons per acre per day.

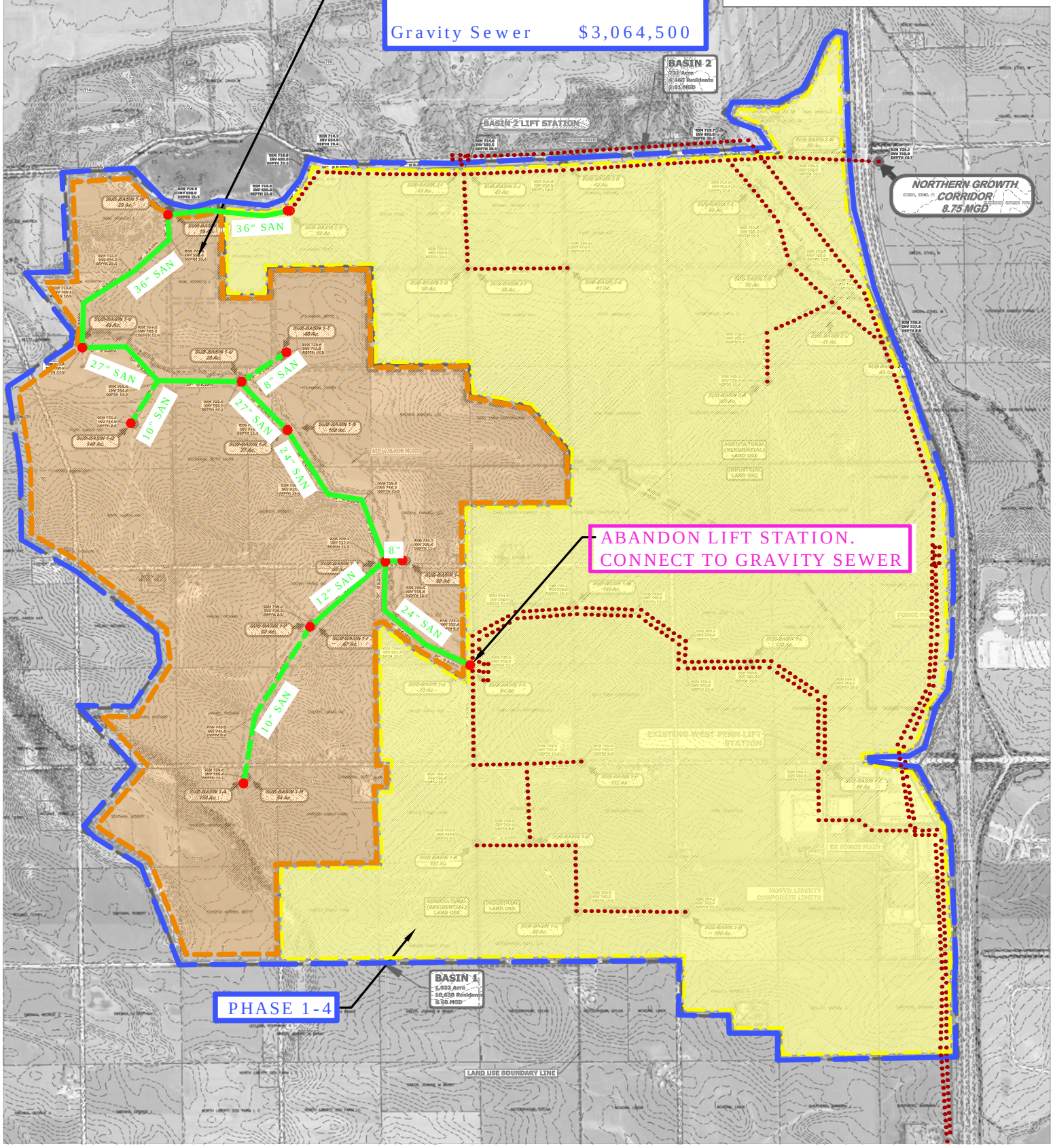
4) Area of floodplain is not included in basin areas.

LEGEND

- CURRENT PHASE
- PREVIOUS PHASES
- COMBINED SERVICE BOUNDARY

Phase 5
900 Acres Add'l
2742 Acres Net
16 Ac Industrial Use,
884 Ac Residential

Gravity Sewer $3,064,500



ENGINEER'S PRELIMINARY OPINION OF PROBABLE COST
NORTH LIBERTY SANITARY SEWER SERVICE STUDY
WESTERN GROWTH CORRIDOR
Basin 2, New WWTP
City of North Liberty, IA

LAST UPDATE:12/6/2010
FOX PN: 2489-10A.300

			Engineer's Opinion of Probable Cost	Basin 2 Gravity Sewer (>10")		Lift Station and Force Main to New WWTP	
ITEM NO.	DESCRIPTION	UNITS	UNIT PRICE	QUANTITY	TOTAL PRICE	QUANTITY	TOTAL PRICE
1	Mobilization, Bonds, Insurance	LS	3.5%	1	$65,600.00	1	$129,800.00
2	Clearing and Grubbing	LF	$30		$0.00		$0.00
3	Stabilization Material/Special Backfill	LS	2.5%	1	$46,900.00	1	$92,800.00
4	**8" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$45		$0.00		$0.00
5	8" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$60		$0.00		$0.00
6	8" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$75		$0.00		$0.00
7	**10" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$50		$0.00		$0.00
8	10" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$65		$0.00		$0.00
9	10" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$80		$0.00		$0.00
10	**12" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$55	1,882	$103,510.00		$0.00
11	12" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$70	1,315	$92,050.00		$0.00
12	12" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$85		$0.00		$0.00
13	**15" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$60		$0.00		$0.00
14	15" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$75		$0.00		$0.00
15	15" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$90		$0.00		$0.00
16	**18" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$65	200	$13,000.00		$0.00
17	18" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$80	375	$30,000.00		$0.00
18	18" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$95		$0.00		$0.00
19	**21" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$70		$0.00		$0.00
20	21" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$85	2,034	$172,890.00		$0.00
21	21" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$100		$0.00		$0.00
22	**24" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$75		$0.00		$0.00
23	24" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$90		$0.00		$0.00
24	24" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$105		$0.00		$0.00
25	**27" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$80		$0.00		$0.00
26	27" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$95		$0.00		$0.00
27	27" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$110		$0.00		$0.00
28	**30" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$90		$0.00		$0.00
29	30" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$105		$0.00		$0.00
30	30" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$120		$0.00		$0.00
31	**36" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$110		$0.00		$0.00
32	36" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$125	2,647	$330,875.00		$0.00
33	36" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$140	850	$119,000.00		$0.00
34	**48" Sanitary Sewer Manholes (0-15 ft)**	EA	$3,000	7	$21,000.00		$0.00
35	48" Sanitary Sewer Manholes (15-25 ft)	EA	$5,000	5	$25,000.00		$0.00
36	48" Sanitary Sewer Manholes (>25 ft)	EA	$10,000		$0.00		$0.00
37	**60" Sanitary Sewer Manholes (0-15 ft)**	EA	$5,000		$0.00		$0.00
38	60" Sanitary Sewer Manholes (15-25 ft)	EA	$10,000	15	$150,000.00		$0.00
39	60" Sanitary Sewer Manholes (>25 ft)	EA	$15,000	2	$30,000.00		$0.00
40	Connect to Existing Manhole	EA	$1,500		$0.00		$0.00
41	8" & 12" Parallel Force Mains (C900)	LF	$42		$0.00		$0.00
42	6" Force Main (C900)	LF	$15		$0.00		$0.00
43	8" Force Main (C900)	LF	$19		$0.00		$0.00
44	24" Force Main (C900)	LF	$81		$0.00	4,820	$390,420.00
45	36" Force Main	LF	$144		$0.00		$0.00
47	Connect to Existing Forcemain	EA	$3,000		$0.00		$0.00
48	Force Main Air Release/Cleanout Manholes	EA	$8,000		$0.00	1	$8,000.00
49	8" to 15" Bored Road Crossing and Casing	LF	$300		$0.00		$0.00
50	18" to 27" Bored Road Crossing and Casing	LF	$600	400	$240,000.00		$0.00
51	27"+ Bored Road Crossing and Casing	LF	$900	375	$337,500.00		$0.00
52	Stream Crossing	EA	$20,000	1	$20,000.00		$0.00
53	Submersible Duplex Pump Station	LS	$250,000		$0.00		$0.00
54	Trench Type Wet Well Pump Station	LS	$3,000,000		$0.00	1	$3,000,000.00
55	Sanitary Sewer and Manhole Testing	EA	$500	29	$14,500.00	0	$0.00
56	Type 5 Rural Seeding	LF	$2	9,303	$21,396.90	4,820	$11,086.00
57	Erosion Control	LS	1%	1	$18,726.75	1	$37,082.71
58	Field Tile Repair	LS	1%	1	$18,726.75	1	$37,082.71
59	Traffic Control	LS	$2,000	1	$2,000.00	1	$2,000.00
	Subtotal				$1,872,675		$3,708,271
	20% CONTINGENCIES				$374,535		$741,654
	SUBTOTAL				$2,247,210		$4,449,926
	10% ENGINEERING				$224,721		$444,993
	10% OBSERVATION/STAKING				$224,721		$444,993
	Pipe Run Total				***$2,696,700***		***$5,340,000***
	Phase Total				***$2,696,700***		***$5,340,000***

GENERAL NOTES AND ASSUMPTION:

1. Land acquisition is not included in the opinion of costs presented.
2. Geotechnical Exploration costs are not included in the opinion of costs presented.

PREPARED BY:
FOX ENGINEERING ASSOCIATES, INC.
AMES, IOWA

W. BASIN 2
PHASE 4
NEW WWTP

Western Growth Corridor

North Liberty, Iowa
Sanitary Sewer Service Study, 2010

FOX engineering

0 400 800 SCALE NORTH

NOTES:

1) Entire Growth Corridor consists of agricultural and industrial land use.

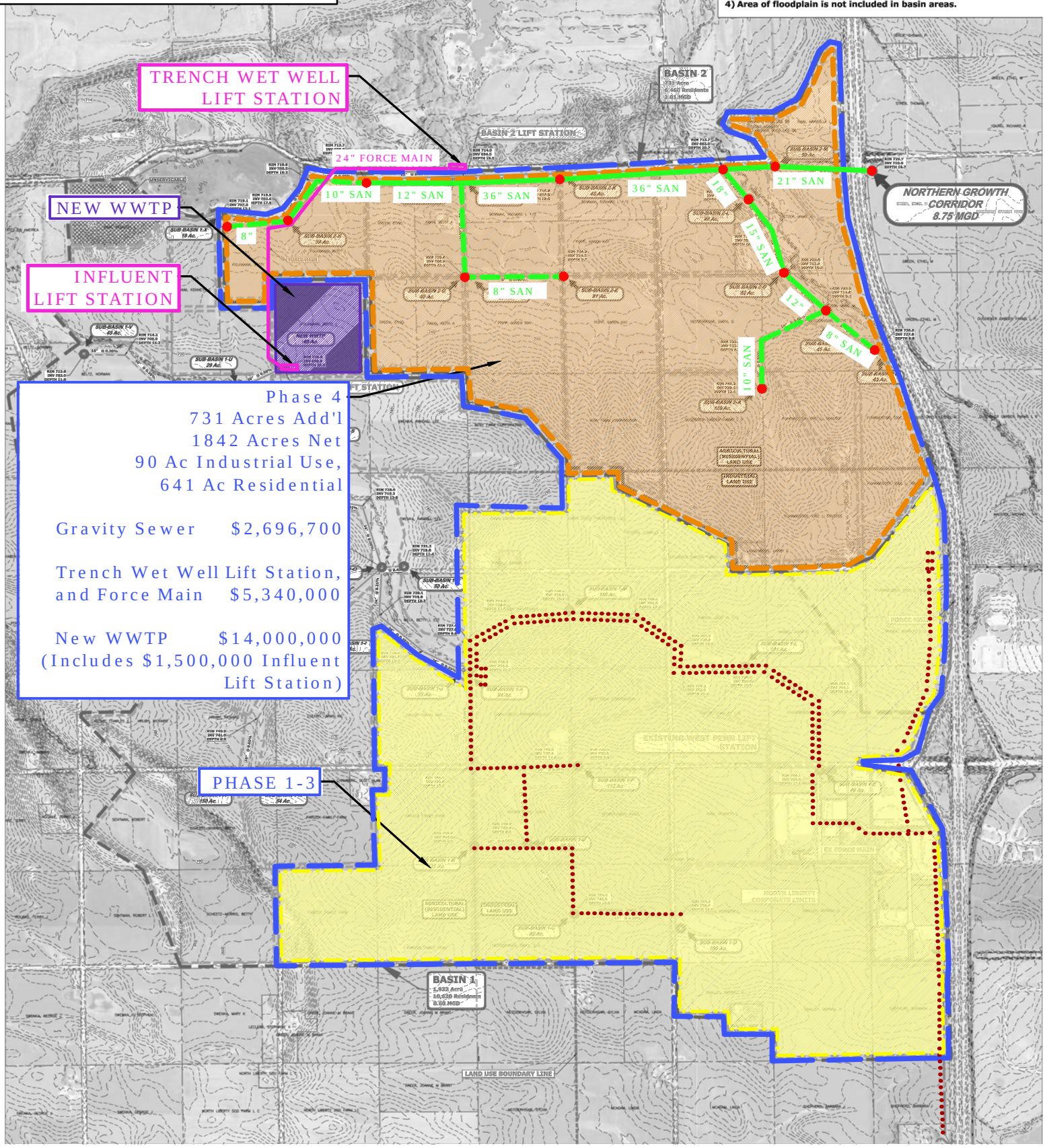
2) For agricultural land use, assumed ultimate build out of single family residential.
   - -10 people per acre
   - -100 gallons per capita per day
   - -Peaking factor of 4.0
   - -Resulting peak flow of 4,000 gallons per acre per day

3) For industrial land use, assumed 5,000 gallons per acre per day.

4) Area of floodplain is not included in basin areas.

LEGEND

- CURRENT PHASE
- PREVIOUS PHASES
- COMBINED SERVICE BOUNDARY



Phase 4
731 Acres Add'l
1842 Acres Net
90 Ac Industrial Use,
641 Ac Residential

Gravity Sewer $2,696,700

Trench Wet Well Lift Station, and Force Main $5,340,000

New WWTP $14,000,000
(Includes $1,500,000 Influent Lift Station)

ENGINEER'S PRELIMINARY OPINION OF PROBABLE COST
NORTH LIBERTY SANITARY SEWER SERVICE STUDY
WESTERN GROWTH CORRIDOR
Basin 1, Gravity Sewer to WWTP
City of North Liberty, IA

LAST UPDATE:11/18/2010
FOX PN: 2489-10A.300

			Engineer's Opinion of Probable Cost	Remaining Basin 1 Gravity Sewer		Phase 1- Sub-basin 1-L Gravity Sewer		Phase 3- Sub Basin 1-M		Phase 3- Sub basins B, C, G, D, F, K, J	
ITEM NO.	DESCRIPTION	UNITS	UNIT PRICE	QUANTITY	TOTAL PRICE	QUANTITY	TOTAL PRICE	QUANTITY	TOTAL PRICE	QUANTITY	TOTAL PRICE
1	Mobilization, Bonds, Insurance	LS	3.5%	1	$33,700	1	$12,700	1	$10,200	1	$22,500
2	Clearing and Grubbing	LF	$30		$0		$0		$0		$0
3	Stabilization Material/Special Backfill	LS	2.5%	1	$24,100	1	$9,100	1	$7,300	1	$16,100
4	**8" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$45		$0		$0		$0		$0
5	8" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$60		$0		$0		$0		$0
6	8" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$75		$0		$0		$0		$0
7	**10" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$50		$0		$0		$0	1,438	$71,900
8	10" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$65		$0	1,781	$115,765		$0		$0
9	10" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$80		$0		$0		$0		$0
10	**12" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$55	1,264	$69,520	200	$11,000	1,449	$79,695	1,433	$78,815
11	12" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$70	1,062	$74,340	1,439	$100,730		$0		$0
12	12" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$85		$0		$0		$0		$0
13	**15" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$60		$0		$0	1,886	$113,160	2,398	$143,880
14	15" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$75		$0		$0		$0		$0
15	15" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$90		$0		$0		$0		$0
16	**18" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$65		$0		$0		$0	1,800	$117,000
17	18" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$80		$0		$0		$0		$0
18	18" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$95		$0		$0		$0		$0
19	**21" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$70		$0		$0		$0		$0
20	21" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$85		$0		$0		$0		$0
21	21" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$100		$0		$0		$0		$0
22	**24" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$75	3,967	$297,525		$0		$0		$0
23	24" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$90	500	$45,000		$0		$0		$0
24	24" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$105		$0		$0		$0		$0
25	**27" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$80	869	$69,520		$0		$0		$0
26	27" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$95		$0		$0		$0		$0
27	27" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$110		$0		$0		$0		$0
28	**30" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$90		$0		$0		$0		$0
29	30" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$105		$0		$0		$0		$0
30	30" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$120	652	$78,240		$0		$0		$0
31	**36" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$110		$0		$0		$0		$0
32	36" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$125		$0		$0		$0		$0
33	36" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$140		$0		$0		$0		$0

34	**48" Sanitary Sewer Manholes (0-15 ft)**	EA	$3,000	3	$9,000		$0	9	$27,000	20	$60,000
35	48" Sanitary Sewer Manholes (15-25 ft)	EA	$5,000	2	$10,000	10	$50,000		$0		$0
36	48" Sanitary Sewer Manholes (>25 ft)	EA	$10,000		$0		$0		$0		$0
37	**60" Sanitary Sewer Manholes (0-15 ft)**	EA	$5,000	17	$85,000		$0		$0		$0
38	60" Sanitary Sewer Manholes (15-25 ft)	EA	$10,000	2	$20,000		$0		$0		$0
39	60" Sanitary Sewer Manholes (>25 ft)	EA	$15,000		$0		$0		$0		$0
40	Connect to Existing Manhole	EA	$1,500		$0		$0		$0		$0
41	8" & 12" Parallel Force Mains (C900)	LF	$42		$0		$0		$0		$0
42	6" Force Main (C900)	LF	$15		$0		$0		$0		$0
43	8" Force Main (C900)	LF	$19		$0		$0		$0		$0
44	24" Force Main (C900)	LF	$81		$0		$0		$0		$0
45	36" Force Main (DI)	LF	$144		$0		$0		$0		$0
46	Connect to Existing Forcemain	EA	$3,000		$0		$0		$0		$0
47	Force Main Air Release/Cleanout Manholes	EA	$56,400		$0		$0		$0		$0
48	8" to 15" Bored Road Crossing and Casing	LF	$300	110	$33,000	130	$39,000	110	$33,000	300	$90,000
49	18" to 27" Bored Road Crossing and Casing	LF	$600	100	$60,000		$0		$0		$0
50	Stream Crossing	EA	$20,000		$0		$0		$0		$0
51	Submersible Duplex Pump Station	LS	$250,000		$0		$0		$0		$0
52	Trench Wet Well Pump Station	LS	$1,500,000		$0		$0		$0		$0
53	Sanitary Sewer and Manhole Testing	EA	$500	24	$12,000	10	$5,000	9	$4,500	20	$10,000
54	Type 5 Rural Seeding	LF	$2	8,314	$19,122	3,420	$7,866	3,335	$7,671	7,069	$16,259
55	Erosion Control	LS	1%	1	$9,613	1	$3,604	1	$2,903	1	$6,413
56	Field Tile Repair	LS	1%	1	$9,613	1	$3,604	1	$2,903	1	$6,413
57	Traffic Control	LS	$2,000	1	$2,000	1	$2,000	1	$2,000	1	$2,000
	Subtotal				$961,293		$360,368		$290,332		$641,279
	20% CONTINGENCIES				$192,259		$72,074		$58,066		$128,256
	SUBTOTAL				$1,153,552		$432,442		$348,399		$769,535
	10% ENGINEERING				$115,355		$43,244		$34,840		$76,954
	10% OBSERVATION/STAKING				$115,355		$43,244		$34,840		$76,954
	Pipe Run Total				***$1,384,300***		***$519,000***		***$418,100***		***$923,500***
	Phase Total										***$3,244,900***

GENERAL NOTES AND ASSUMPTION:

1. Land acquisition is not included in the opinion of costs presented.
2. Geotechnical Exploration costs are not included in the opinion of costs presented.

PREPARED BY:
FOX ENGINEERING ASSOCIATES, INC.
AMES, IOWA

W. BASIN 1
PHASE 5
NEW WWTP

Western Growth Corridor

North Liberty, Iowa
Sanitary Sewer Service Study, 2010

FOX engineering

0 400 800 SCALE NORTH

NOTES:

1) Entire Growth Corridor consists of agricultural and industrial land use.

2) For agricultural land use, assumed ultimate build out of single family residential.
   - -10 people per acre
   - -100 gallons per capita per day
   - -Peaking factor of 4.0
   - -Resulting peak flow of 4,000 gallons per acre per day

3) For industrial land use, assumed 5,000 gallons per acre per day.

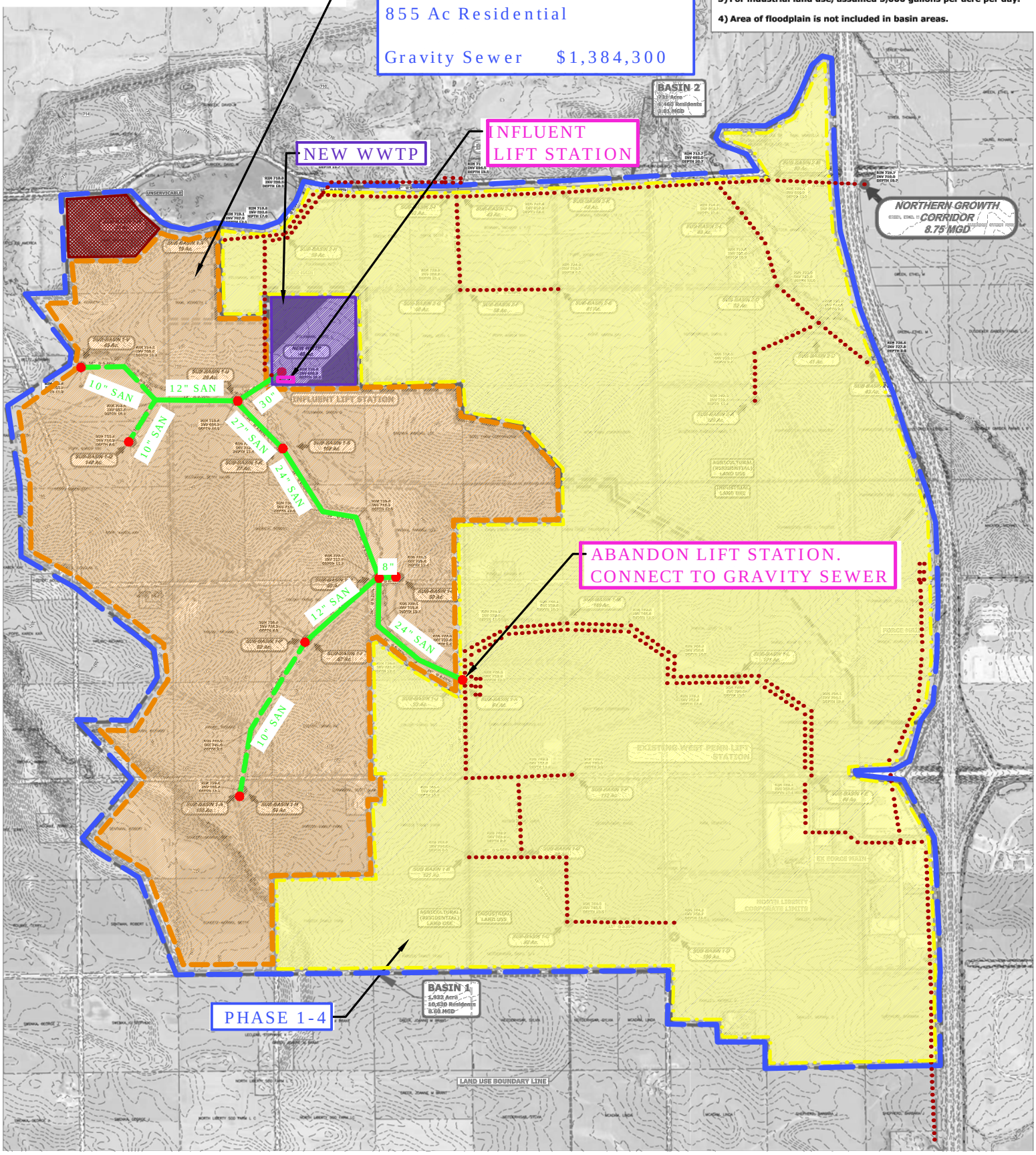
4) Area of floodplain is not included in basin areas.

LEGEND

- CURRENT PHASE
- PREVIOUS PHASES
- COMBINED SERVICE BOUNDARY
- UNSERVICEABLE AREA

Phase 5
877 Acres Add'l
2719 Acres Net
16 Ac Industrial Use,
855 Ac Residential

Gravity Sewer $1,384,300



ENGINEER'S PRELIMINARY OPINION OF PROBABLE COST
NORTH LIBERTY SANITARY SEWER SERVICE STUDY
Northern Growth Corridor Probable Cost Summary
City of North Liberty, IA

Northern Growth Corridor	Gravity Sewer Cost	Lift Station and Force Main Costs	Phase Total
Phase 1			
Partial Basin 1 Development	$503,800	$6,725,500	$7,229,300
Phase 2**			
*Service Extended to Entire Basin 1, Lift Station and Force Main to Existing WWTP**	$1,024,900	$7,639,100	$8,664,000
Phase 3			
Service Extended to Basin 2	$597,600	$822,200	$1,419,800
Phase 4			
Service Extended to Basin 3	$0	$1,124,800	$1,124,800
Phased Total Probable Cost			***$18,837,900***

*Does not include any improvements to Existing WWTP

**Subtract $7,639,100 from the total phase cost if Trench Wet Well is not required and sanitary connects to gravity in Western Corridor.*

ENGINEER'S PRELIMINARY OPINION OF PROBABLE COST
NORTH LIBERTY SANITARY SEWER SERVICE STUDY
Northern Growth Corridor Probable Cost/Acre Summary
City of North Liberty, IA

Total Western Corridor Cost per Acre for Sanitary Sewer

Total Basin Cost/Acre	Total Area Served in Corridor (Acres)	Total Corridor Cost	Total Corridor Cost/Acre
*Basin 1 Total**	*1028*	*$15,893,300*	*$15,460*
Basin 2 Total	*307*	*$1,419,800*	*$4,625*
Basin 3 Total	*176*	*$1,124,800*	*$6,391*
Total Northern Corridor	***1511***	***$18,437,900***	***$12,202***

**Subtract $7,639,100 from the total phase cost if Trench Wet Well is not required and Basin 1 gravity sewer connects to gravity sewer in Western Corridor.*

Northern Growth Corridor

North Liberty, Iowa
Sanitary Sewer Service Study, 2010

FOX engineering

0 400 800 SCALE

NORTH

LEGEND

- NEW SERVICE AREA
- EXIST. SERVICE AREA
- SERVICE BOUNDARY

N. CORRIDOR $12,202/AC

NOTES:

1) Flow is based upon zoning within city limits and land use designation outside city limits. Zoning and land use are not indicated outside the basins shown.

2) All basins shown outside city limits consist of industrial, parks and recreation, public, and residential land use. Residential land use is prevalent, other uses are indicated on the map.

3) For industrial land use and zoning, assumed 5,000 gallons per acre per day.

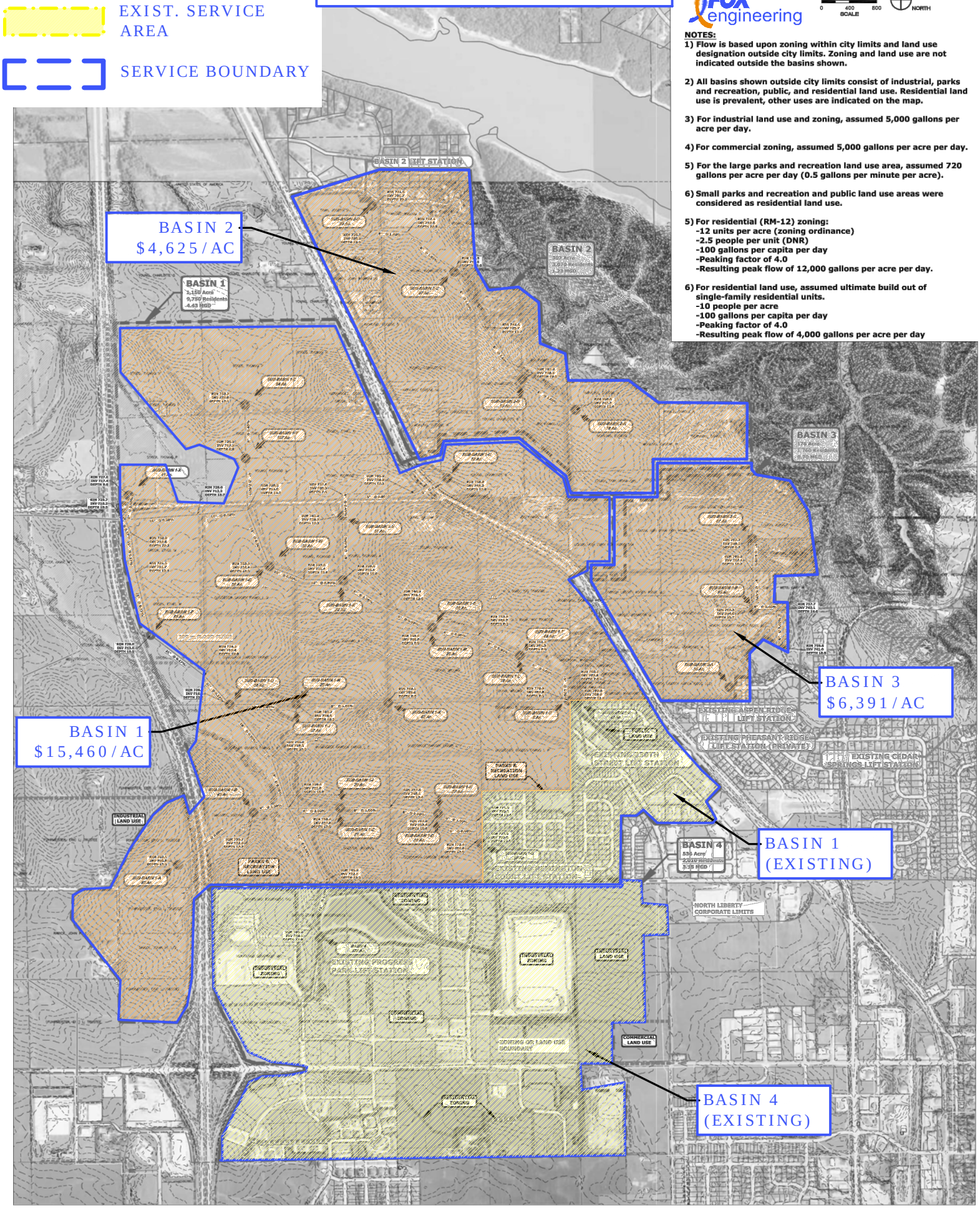
4) For commercial zoning, assumed 5,000 gallons per acre per day.

5) For the large parks and recreation land use area, assumed 720 gallons per acre per day (0.5 gallons per minute per acre).

6) Small parks and recreation and public land use areas were considered as residential land use.

5) For residential (RM-12) zoning:
-12 units per acre (zoning ordinance)
-2.5 people per unit (DNR)
-100 gallons per capita per day
-Peaking factor of 4.0
-Resulting peak flow of 12,000 gallons per acre per day.

6) For residential land use, assumed ultimate build out of single-family residential units.
-10 people per acre
-100 gallons per capita per day
-Peaking factor of 4.0
-Resulting peak flow of 4,000 gallons per acre per day



ENGINEER'S PRELIMINARY OPINION OF PROBABLE COST
NORTH LIBERTY SANITARY SEWER SERVICE STUDY
NORTHERN GROWTH CORRIDOR
Phase 1
City of North Liberty, IA

LAST UPDATE:11/18/2010
FOX PN: 2489-10A.300

			Engineer's Opinion of Probable Cost	Sub-basins A, B, C, D, E, H, I, J, K, N, O, BASIN 4 Gravity Sewer		Sub-basin 1-L Gravity, Force Main, PS (4.773 MGD)	
ITEM NO.	DESCRIPTION	UNITS	UNIT PRICE	QUANTITY	TOTAL PRICE	QUANTITY	TOTAL PRICE
1	Mobilization, Bonds, Insurance	LS	3.5%	1	$12,300.00	1	$163,500.00
2	Clearing and Grubbing	LF	$30		$0.00	1,300	$39,000.00
3	Stabilization Material/Special Backfill	LS	2.5%	1	$8,800.00	1	$116,800.00
4	**8" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$45		$0.00		$0.00
5	8" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$60		$0.00		$0.00
6	8" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$75		$0.00		$0.00
7	**10" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$50		$0.00		$0.00
8	10" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$65		$0.00		$0.00
9	10" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$80		$0.00		$0.00
10	**12" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$55	1,057	$58,135.00		$0.00
11	12" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$70	803	$56,210.00		$0.00
12	12" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$85		$0.00		$0.00
13	**15" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$60		$0.00		$0.00
14	15" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$75		$0.00		$0.00
15	15" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$90		$0.00		$0.00
16	**18" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$65		$0.00		$0.00
17	18" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$80	1,763	$141,040.00		$0.00
18	18" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$95		$0.00		$0.00
19	**21" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$70		$0.00		$0.00
20	21" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$85		$0.00		$0.00
21	21" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$100		$0.00		$0.00
22	**24" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$75		$0.00		$0.00
23	24" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$90		$0.00		$0.00
24	24" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$105		$0.00		$0.00
25	**27" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$80		$0.00		$0.00
26	27" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$95		$0.00		$0.00
27	27" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$110		$0.00		$0.00
28	**30" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$90		$0.00		$0.00
29	30" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$105		$0.00		$0.00
30	30" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$120		$0.00		$0.00
31	**36" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$110		$0.00		$0.00
32	36" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$125		$0.00		$0.00
33	36" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$140		$0.00		$0.00
34	**48" Sanitary Sewer Manholes (0-15 ft)**	EA	$3,000	3	$9,000.00		$0.00
35	48" Sanitary Sewer Manholes (15-25 ft)	EA	$5,000	7	$35,000.00		$0.00
36	48" Sanitary Sewer Manholes (>25 ft)	EA	$10,000		$0.00		$0.00
37	**60" Sanitary Sewer Manholes (0-15 ft)**	EA	$5,000	1	$5,000.00		$0.00
38	60" Sanitary Sewer Manholes (15-25 ft)	EA	$10,000		$0.00		$0.00
39	60" Sanitary Sewer Manholes (>25 ft)	EA	$15,000		$0.00		$0.00
40	Connect to Existing Manhole	EA	$1,500	1	$1,500.00	1	$1,500.00
41	8" & 12" Parallel Force Mains (C900)	LF	$42		$0.00		$0.00
42	6" Force Main (C900)	LF	$15		$0.00		$0.00
43	8" Force Main (C900)	LF	$19		$0.00		$0.00
44	18" Force Main (C900)	LF	$50		$0.00	30,578	$1,528,900.00
45	24" Force Main (C900)	LF	$81		$0.00		$0.00
46	36" Force Main (DI)	LF	$144		$0.00		$0.00
47	Connect to Existing Forcemain	EA	$3,000		$0.00		$0.00
48	Force Main Air Release/Cleanout Manholes	EA	$48,000		$0.00	4	$192,000.00
49	8" to 15" Bored Road Crossing and Casing	LF	$300		$0.00		$0.00
50	18" to 27" Bored Road Crossing and Casing	LF	$600		$0.00	1,605	$963,000.00
51	Stream Crossing	EA	$20,000		$0.00		$0.00
52	Submersible Duplex Pump Station	LS	$250,000		$0.00		$0.00
53	Trench Type Wet Well Pump Station	LS	$1,500,000		$0.00	1	$1,500,000.00
54	Sanitary Sewer and Manhole Testing	EA	$500	11	$5,500.00		$0.00
55	Type 5 Rural Seeding	LF	$2	3,623	$8,332.90	30,578	$70,329.40
56	Erosion Control	LS	1%	1	$3,498.14	1	$46,704.38
57	Field Tile Repair	LS	1%	1	$3,498.14	1	$46,704.38
58	Traffic Control	LS	$2,000	1	$2,000.00	1	$2,000.00
	Subtotal				$349,814		$4,670,438
	20% CONTINGENCIES				$69,963		$934,088
	SUBTOTAL				$419,777		$5,604,526
	10% ENGINEERING				$41,978		$560,453
	10% OBSERVATION/STAKING				$41,978		$560,453
	Pipe Run Total				***$503,800***		***$6,725,500***
	Phase Total						***$7,229,300***

GENERAL NOTES AND ASSUMPTION:
1. Land acquisition is not included in the opinion of costs presented.
2. Geotechnical Exploration costs are not included in the opinion of costs presented.

PREPARED BY:
FOX ENGINEERING ASSOCIATES, INC.
AMES, IOWA

N. BASIN 1 PHASE 1

LEGEND

- CURRENT PHASE
- PREVIOUS PHASES
- COMBINED SERVICE BOUNDARY

Northern Growth Corridor

North Liberty, Iowa
Sanitary Sewer Service Study, 2010

FOX engineering

0 400 800 SCALE NORTH

NOTES:

1) Flow is based upon growth within city limits and land use designation outside city limits. Zoning and land use are not indicated outside the basins shown.

2) All basins shown outside city limits consist of industrial, parks and recreation, public, and residential land use. Residential land use is prevalent, other uses are indicated on the map.

3) For industrial land use and zoning, assumed 5,000 gallons per acre per day.

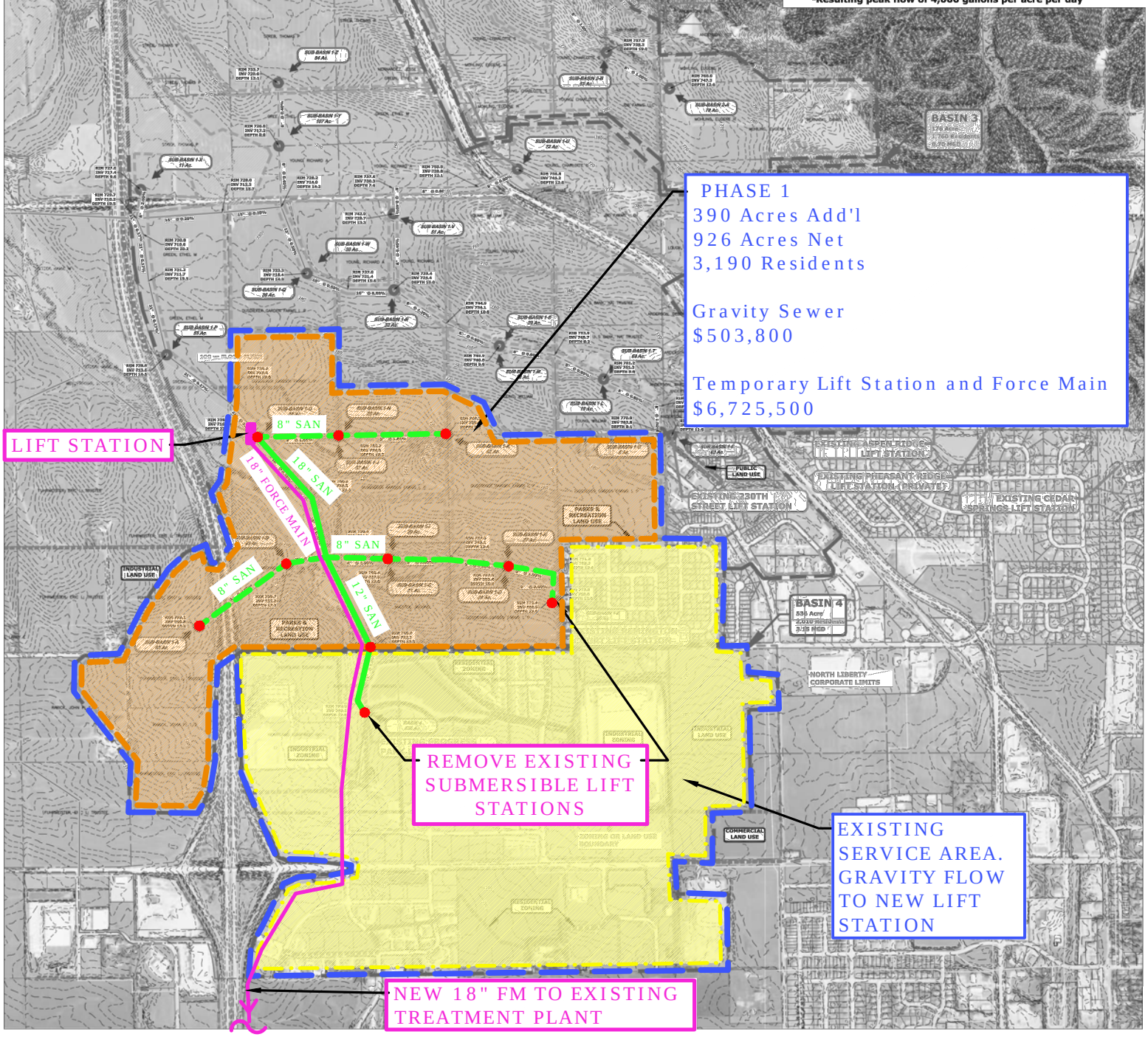
4) For commercial zoning, assumed 5,000 gallons per acre per day.

5) For the large parks and recreation land use area, assumed 720 gallons per acre per day (0.5 gallons per minute per acre).

6) Small parks and recreation and public land use areas were considered as residential land use.

5) For residential (RM-12) zoning:
-12 units per acre (zoning ordinance)
-2.5 people per unit (DNR)
-100 gallons per capita per day
-Peaking factor of 4.0
-Resulting peak flow of 12,000 gallons per acre per day.

6) For residential land use, assumed ultimate build out of single-family residential units.
-10 people per acre
-100 gallons per capita per day
-Peaking factor of 4.0
-Resulting peak flow of 4,000 gallons per acre per day



ENGINEER'S PRELIMINARY OPINION OF PROBABLE COST
NORTH LIBERTY SANITARY SEWER SERVICE STUDY
NORTHERN GROWTH CORRIDOR
Phase 2
City of North Liberty, IA

LAST UPDATE:11/18/2010
FOX PN: 2489-10A.300

			Engineer's Opinion of Probable Cost	Remaining Basin 1 gravity		Lift Station (4.773 MGD), And Additional Force Main to WWTP	
ITEM NO.	DESCRIPTION	UNITS	UNIT PRICE	QUANTITY	TOTAL PRICE	QUANTITY	TOTAL PRICE
1	Mobilization, Bonds, Insurance	LS	3.5%	1	$25,000	1	$185,700
2	Clearing and Grubbing	LF	$30		$0	1,500	$45,000
3	Stabilization Material/Special Backfill	LS	2.5%	1	$17,800	1	$132,700
4	**8" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$45		$0		$0
5	8" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$60		$0		$0
6	8" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$75		$0		$0
7	**10" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$50		$0		$0
8	10" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$65	1,105	$71,825		$0
9	10" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$80		$0		$0
10	**12" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$55	877	$48,235		$0
11	12" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$70		$0		$0
12	12" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$85		$0		$0
13	**15" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$60	366	$21,960		$0
14	15" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$75	1,422	$106,650		$0
15	15" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$90		$0		$0
16	**18" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$65		$0		$0
17	18" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$80		$0		$0
18	18" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$95		$0		$0
19	**21" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$70		$0		$0
20	21" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$85	2,707	$230,095		$0
21	21" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$100		$0		$0
22	**24" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$75		$0		$0
23	24" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$90		$0		$0
24	24" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$105		$0		$0
25	**27" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$80		$0		$0
26	27" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$95		$0		$0
27	27" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$110		$0		$0
28	**30" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$90		$0		$0
29	30" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$105		$0		$0
30	30" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$120		$0		$0
31	**36" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$110		$0		$0
32	36" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$125		$0		$0
33	36" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$140		$0		$0
34	**48" Sanitary Sewer Manholes (0-15 ft)**	EA	$3,000	12	$36,000		$0
35	48" Sanitary Sewer Manholes (15-25 ft)	EA	$5,000		$0		$0
36	48" Sanitary Sewer Manholes (>25 ft)	EA	$10,000		$0		$0
37	**60" Sanitary Sewer Manholes (0-15 ft)**	EA	$5,000		$0		$0
38	60" Sanitary Sewer Manholes (15-25 ft)	EA	$10,000	11	$110,000		$0
39	60" Sanitary Sewer Manholes (>25 ft)	EA	$15,000		$0		$0
40	Connect to Existing Manhole	EA	$1,500	1	$1,500	1	$1,500
41	8" & 12" Parallel Force Mains (C900)	LF	$42		$0		$0
42	6" Force Main (C900)	LF	$15		$0		$0
43	8" Force Main (C900)	LF	$19		$0		$0
44	16" Force Main (C900)	LF	$42		$0	36,250	$1,522,500
44	18" Force Main (C900)	LF	$50		$0		$0
45	24" Force Main (C900)	LF	$81		$0		$0
46	36" Force Main (DI)	LF	$144		$0		$0
47	Connect to Existing Forcemain	EA	$3,000		$0	1	$3,000
48	Force Main Air Release/Cleanout Manholes	EA	$48,000		$0	5	$240,000
49	8" to 15" Bored Road Crossing and Casing	LF	$300		$0		$0
50	18" to 27" Bored Road Crossing and Casing	LF	$600		$0	1,605	$963,000
51	Stream Crossing	EA	$20,000		$0	1	$20,000
52	Submersible Duplex Pump Station	LS	$250,000		$0		$0
53	Trench Type Wet Well Pump Station	LS	$2,000,000		$0	1	$2,000,000
54	Sanitary Sewer and Manhole Testing	EA	$500	23	$11,500		$0
55	Type 5 Rural Seeding	LF	$2	6,477	$14,897	36,250	$83,375
56	Erosion Control	LS	1%	1	$7,117	1	$53,049
57	Field Tile Repair	LS	1%	1	$7,117	1	$53,049
58	Traffic Control	LS	$2,000	1	$2,000	1	$2,000
	Subtotal				$711,696		$5,304,872
	20% CONTINGENCIES				$142,339		$1,060,974
	SUBTOTAL				$854,035		$6,365,847
	10% ENGINEERING				$85,404		$636,585
	10% OBSERVATION/STAKING				$85,404		$636,585
	Pipe Run Total				***$1,024,900***		***$7,639,100***
	Phase Total						***$8,664,000***

GENERAL NOTES AND ASSUMPTION:
1. Land acquisition is not included in the opinion of costs presented.
2. Geotechnical Exploration costs are not included in the opinion of costs presented.

PREPARED BY:
FOX ENGINEERING ASSOCIATES, INC.
AMES, IOWA

N. BASIN 1
PHASE 2

LEGEND

- CURRENT PHASE
- PREVIOUS PHASES
- COMBINED SERVICE BOUNDARY

Northern Growth Corridor

North Liberty, Iowa
Sanitary Sewer Service Study, 2010

FOX engineering

0 400 800 SCALE

NORTH

NOTES:

1) Flow is based upon growing within city limits and land use designation outside city limits. Zoning and land use are not indicated outside the basins shown.

2) All basins shown outside city limits consist of industrial, parks and recreation, public, and residential land use. Residential land use is prevalent, other uses are indicated on the map.

3) For industrial land use and zoning, assumed 5,000 gallons per acre per day.

4) For commercial zoning, assumed 5,000 gallons per acre per day.

5) For the large parks and recreation land use area, assumed 720 gallons per acre per day (0.5 gallons per minute per acre).

6) Small parks and recreation and public land use areas were considered as residential land use.

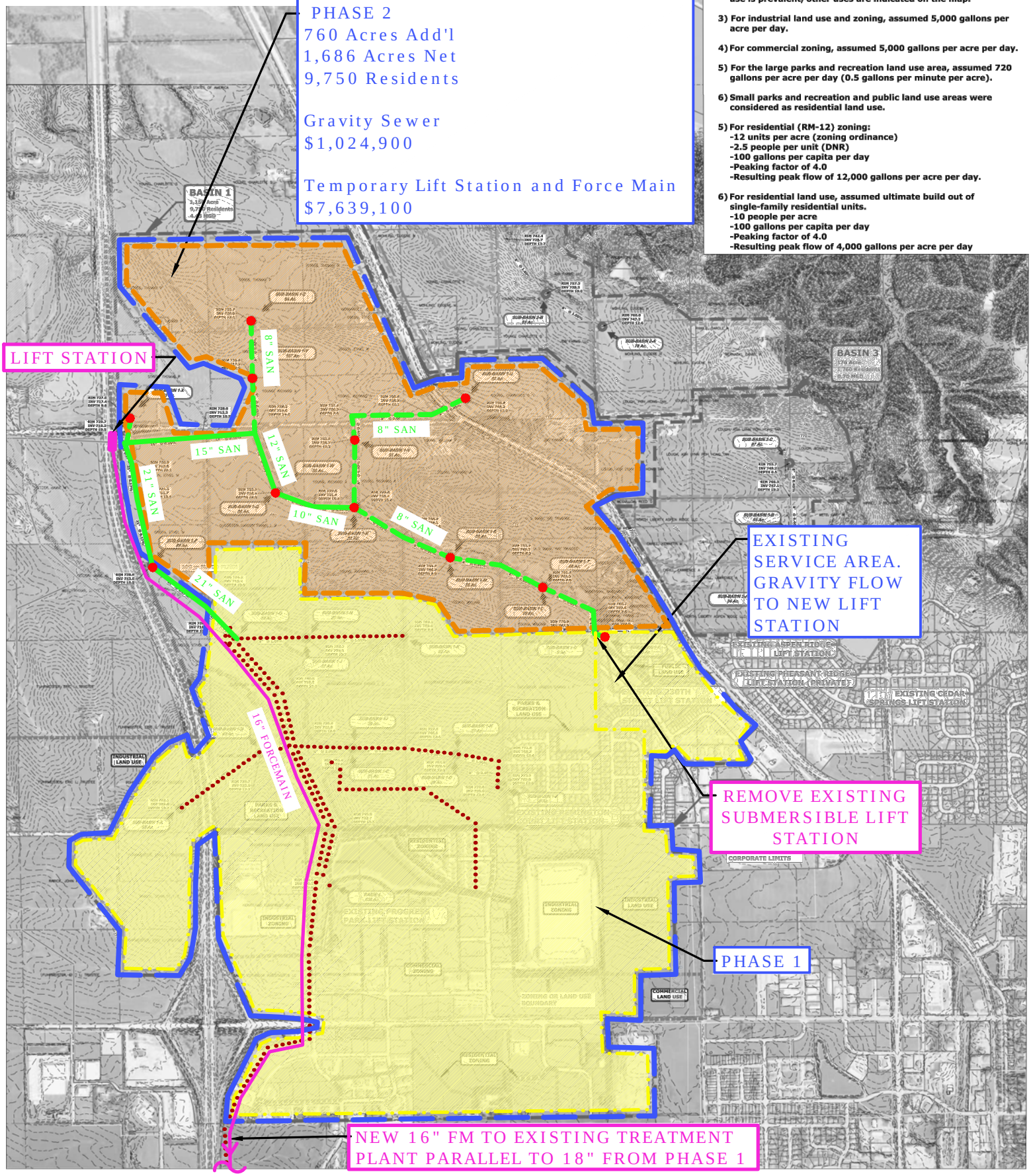
5) For residential (RM-12) zoning:
-12 units per acre (zoning ordinance)
-2.5 people per unit (DNR)
-100 gallons per capita per day
-Peaking factor of 4.0
-Resulting peak flow of 12,000 gallons per acre per day.

6) For residential land use, assumed ultimate build out of single-family residential units.
-10 people per acre
-100 gallons per capita per day
-Peaking factor of 4.0
-Resulting peak flow of 4,000 gallons per acre per day

PHASE 2
760 Acres Add'l
1,686 Acres Net
9,750 Residents

Gravity Sewer
$1,024,900

Temporary Lift Station and Force Main
$7,639,100



ENGINEER'S PRELIMINARY OPINION OF PROBABLE COST
NORTH LIBERTY SANITARY SEWER SERVICE STUDY
NORTHERN GROWTH CORRIDOR
Phase 3
City of North Liberty, IA

LAST UPDATE:11/18/2010
FOX PN: 2489-10A.300

			Engineer's Opinion of Probable Cost	Sub-basin Force Main, lift station (1.23 MGD)	
ITEM NO.	DESCRIPTION	UNITS	UNIT PRICE	QUANTITY	TOTAL PRICE
1	Mobilization, Bonds, Insurance	LS	3.5%	1	$20,000.00
2	Clearing and Grubbing	LF	$30		$0.00
3	Stabilization Material/Special Backfill	LS	2.5%	1	$14,300.00
4	**8" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$45		$0.00
5	8" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$60		$0.00
6	8" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$75		$0.00
7	**10" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$50		$0.00
8	10" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$65		$0.00
9	10" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$80		$0.00
10	**12" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$55		$0.00
11	12" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$70		$0.00
12	12" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$85		$0.00
13	**15" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$60		$0.00
14	15" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$75		$0.00
15	15" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$90		$0.00
16	**18" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$65		$0.00
17	18" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$80		$0.00
18	18" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$95		$0.00
19	**21" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$70		$0.00
20	21" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$85		$0.00
21	21" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$100		$0.00
22	**24" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$75		$0.00
23	24" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$90		$0.00
24	24" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$105		$0.00
25	**27" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$80		$0.00
26	27" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$95		$0.00
27	27" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$110		$0.00
28	**30" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$90		$0.00
29	30" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$105		$0.00
30	30" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$120		$0.00
31	**36" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$110		$0.00
32	36" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$125		$0.00
33	36" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$140		$0.00
34	**48" Sanitary Sewer Manholes (0-15 ft)**	EA	$3,000		$0.00
35	48" Sanitary Sewer Manholes (15-25 ft)	EA	$5,000		$0.00
36	48" Sanitary Sewer Manholes (>25 ft)	EA	$10,000		$0.00
37	**60" Sanitary Sewer Manholes (0-15 ft)**	EA	$5,000		$0.00
38	60" Sanitary Sewer Manholes (15-25 ft)	EA	$10,000		$0.00
39	60" Sanitary Sewer Manholes (>25 ft)	EA	$15,000		$0.00
40	Connect to Existing Manhole	EA	$1,500	1	$1,500.00
41	8" & 12" Parallel Force Mains (C900)	LF	$42		$0.00
42	6" Force Main (C900)	LF	$15		$0.00
43	8" Force Main (C900)	LF	$19	5,432	$103,208.00
44	18" Force Main (C900)	LF	$50		$0.00
45	24" Force Main (C900)	LF	$81		$0.00
46	36" Force Main (DI)	LF	$144		$0.00
47	Connect to Existing Forcemain	EA	$3,000		$0.00
48	Force Main Air Release/Cleanout Manholes	EA	$48,000	1	$48,000.00
49	8" to 15" Bored Road Crossing and Casing	LF	$300	360	$108,000.00
50	18" to 27" Bored Road Crossing and Casing	LF	$600		$0.00
51	Stream Crossing	EA	$20,000		$0.00
52	Submersible Duplex Pump Station	LS	$250,000	1	$250,000.00
53	Trench Type Wet Well Pump Station	LS	$2,000,000		$0.00
54	Sanitary Sewer and Manhole Testing	EA	$500		$0.00
55	Type 5 Rural Seeding	LF	$2	5,432	$12,493.60
56	Erosion Control	LS	1%	1	$5,709.20
57	Field Tile Repair	LS	1%	1	$5,709.20
58	Traffic Control	LS	$2,000	1	$2,000.00
	Subtotal				$570,920
	20% CONTINGENCIES				$114,184
	SUBTOTAL				$685,104
	10% ENGINEERING				$68,510
	10% OBSERVATION/STAKING				$68,510
	Pipe Run Total				***$822,200***

GENERAL NOTES AND ASSUMPTION:
1. Land acquisition is not included in the opinion of costs presented.
2. Geotechnical Exploration costs are not included in the opinion of costs presented.

PREPARED BY:
FOX ENGINEERING ASSOCIATES, INC.
AMES, IOWA

N. BASIN 2 PHASE 3

Northern Growth Corridor

North Liberty, Iowa
Sanitary Sewer Service Study, 2010

FOX engineering

0 400 800 SCALE

NORTH

NOTES:

1) Flow is based upon zoning within city limits and land use designation outside city limits. Zoning and land use are not indicated outside the basins shown.

2) All basins shown outside city limits consist of industrial, parks and recreation, public, and residential land use. Residential land use is prevalent, other uses are indicated on the map.

3) For industrial land use and zoning, assumed 5,000 gallons per acre per day.

4) For commercial zoning, assumed 5,000 gallons per acre per day.

5) For the large parks and recreation land use area, assumed 720 gallons per acre per day (0.5 gallons per minute per acre).

6) Small parks and recreation and public land use areas were considered as residential land use.

5) For residential (RM-12) zoning:
-12 units per acre (zoning ordinance)
-2.5 people per unit (DNR)
-100 gallons per capita per day
-Peaking factor of 4.0
-Resulting peak flow of 12,000 gallons per acre per day.

6) For residential land use, assumed ultimate build out of single-family residential units.
-10 people per acre
-100 gallons per capita per day
-Peaking factor of 4.0
-Resulting peak flow of 4,000 gallons per acre per day

LEGEND

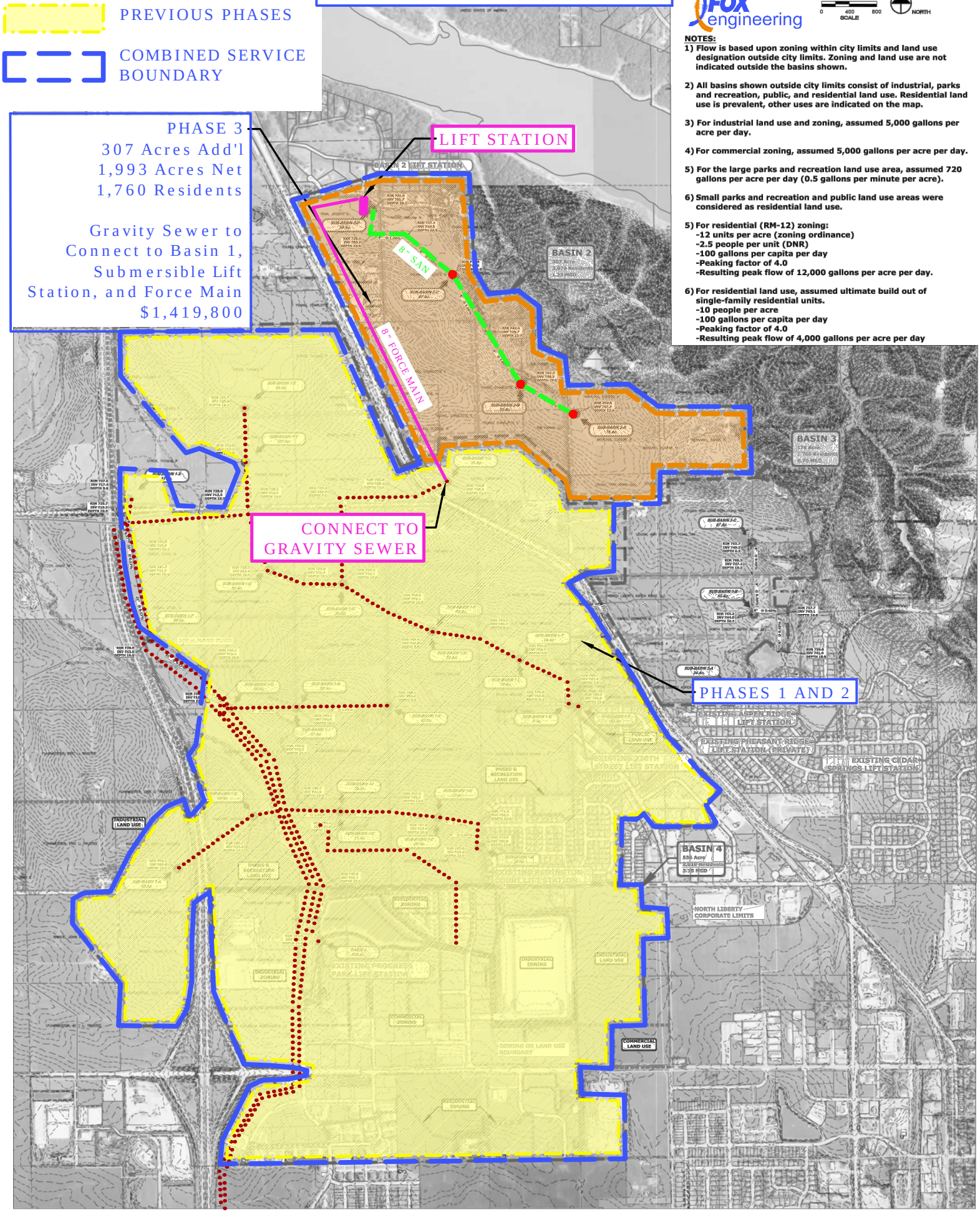
CURRENT PHASE

PREVIOUS PHASES

COMBINED SERVICE BOUNDARY

PHASE 3
307 Acres Add'l
1,993 Acres Net
1,760 Residents

Gravity Sewer to Connect to Basin 1, Submersible Lift Station, and Force Main
$1,419,800



ENGINEER'S PRELIMINARY OPINION OF PROBABLE COST
NORTH LIBERTY SANITARY SEWER SERVICE STUDY
NORTHERN GROWTH CORRIDOR
Phase 4
City of North Liberty, IA

LAST UPDATE:11/18/2010
FOX PN: 2489-10A.300

			Engineer's Opinion of Probable Cost	Aspen Ridge Lift Station Replacement and Force Main	
ITEM NO.	DESCRIPTION	UNITS	UNIT PRICE	QUANTITY	TOTAL PRICE
1	Mobilization, Bonds, Insurance	LS	3.5%	1	$27,400.00
2	Clearing and Grubbing	LF	$30		$0.00
3	Stabilization Material/Special Backfill	LS	2.5%	1	$19,600.00
4	**8" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$45		$0.00
5	8" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$60		$0.00
6	8" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$75		$0.00
7	**10" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$50		$0.00
8	10" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$65		$0.00
9	10" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$80		$0.00
10	**12" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$55		$0.00
11	12" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$70		$0.00
12	12" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$85		$0.00
13	**15" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$60		$0.00
14	15" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$75		$0.00
15	15" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$90		$0.00
16	**18" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$65		$0.00
17	18" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$80		$0.00
18	18" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$95		$0.00
19	**21" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$70		$0.00
20	21" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$85		$0.00
21	21" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$100		$0.00
22	**24" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$75		$0.00
23	24" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$90		$0.00
24	24" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$105		$0.00
25	**27" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$80		$0.00
26	27" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$95		$0.00
27	27" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$110		$0.00
28	**30" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$90		$0.00
29	30" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$105		$0.00
30	30" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$120		$0.00
31	**36" Gravity Sanitary Sewer, Trenched (0-15 ft)**	LF	$110		$0.00
32	36" Gravity Sanitary Sewer, Trenched (15-25 ft)	LF	$125		$0.00
33	36" Gravity Sanitary Sewer, Trenched (>25 ft)	LF	$140		$0.00
34	**48" Sanitary Sewer Manholes (0-15 ft)**	EA	$3,000		$0.00
35	48" Sanitary Sewer Manholes (15-25 ft)	EA	$5,000		$0.00
36	48" Sanitary Sewer Manholes (>25 ft)	EA	$10,000		$0.00
37	**60" Sanitary Sewer Manholes (0-15 ft)**	EA	$5,000		$0.00
38	60" Sanitary Sewer Manholes (15-25 ft)	EA	$10,000		$0.00
39	60" Sanitary Sewer Manholes (>25 ft)	EA	$15,000		$0.00
40	Connect to Existing Manhole	EA	$1,500	1	$1,500.00
41	8" & 12" Parallel Force Mains (C900)	LF	$42		$0.00
42	6" Force Main (C900)	LF	$15		$0.00
43	8" Force Main (C900)	LF	$19		$0.00
44	10" Force Main (C900)	LF	$25	6,592	$164,800.00
45	18" Force Main (C900)	LF	$50		$0.00
46	24" Force Main (C900)	LF	$81		$0.00
47	36" Force Main	LF	$144		$0.00
48	Connect to Existing Forcemain	EA	$3,000		$0.00
49	Force Main Air Release/Cleanout Manholes	EA	$48,000		$0.00
50	8" to 15" Bored Road Crossing and Casing	LF	$300	950	$285,000.00
51	18" to 27" Bored Road Crossing and Casing	LF	$600		$0.00
52	Stream Crossing	EA	$20,000		$0.00
53	Submersible Duplex Pump Station	LS	$250,000	1	$250,000.00
54	Trench Type Wet Well Pump Station	LS	$2,000,000		$0.00
55	Sanitary Sewer and Manhole Testing	EA	$500		$0.00
56	Type 5 Rural Seeding	LF	$2	6,592	$15,161.60
57	Erosion Control	LS	1%	1	$7,810.83
58	Field Tile Repair	LS	1%	1	$7,810.83
59	Traffic Control	LS	$2,000	1	$2,000.00
	Subtotal				$781,083
	20% CONTINGENCIES				$156,217
	SUBTOTAL				$937,300
	10% ENGINEERING				$93,730
	10% OBSERVATION/STAKING				$93,730
	Pipe Run Total				***$1,124,800***
	Phase Total				

GENERAL NOTES AND ASSUMPTION:
1. Land acquisition is not included in the opinion of costs presented.
2. Geotechnical Exploration costs are not included in the opinion of costs presented.

PREPARED BY:
FOX ENGINEERING ASSOCIATES, INC.
AMES, IOWA

N. BASIN 3
PHASE 4

Northern Growth Corridor

North Liberty, Iowa
Sanitary Sewer Service Study, 2010

FOX engineering

0 400 800 SCALE NORTH

NOTES:

1) Flow is based upon zoning within city limits and land use designation outside city limits. Zoning and land use are not indicated outside the basins shown.

2) All basins shown outside city limits consist of industrial, parks and recreation, public, and residential land use. Residential land use is prevalent, other uses are indicated on the map.

3) For industrial land use and zoning, assumed 5,000 gallons per acre per day.

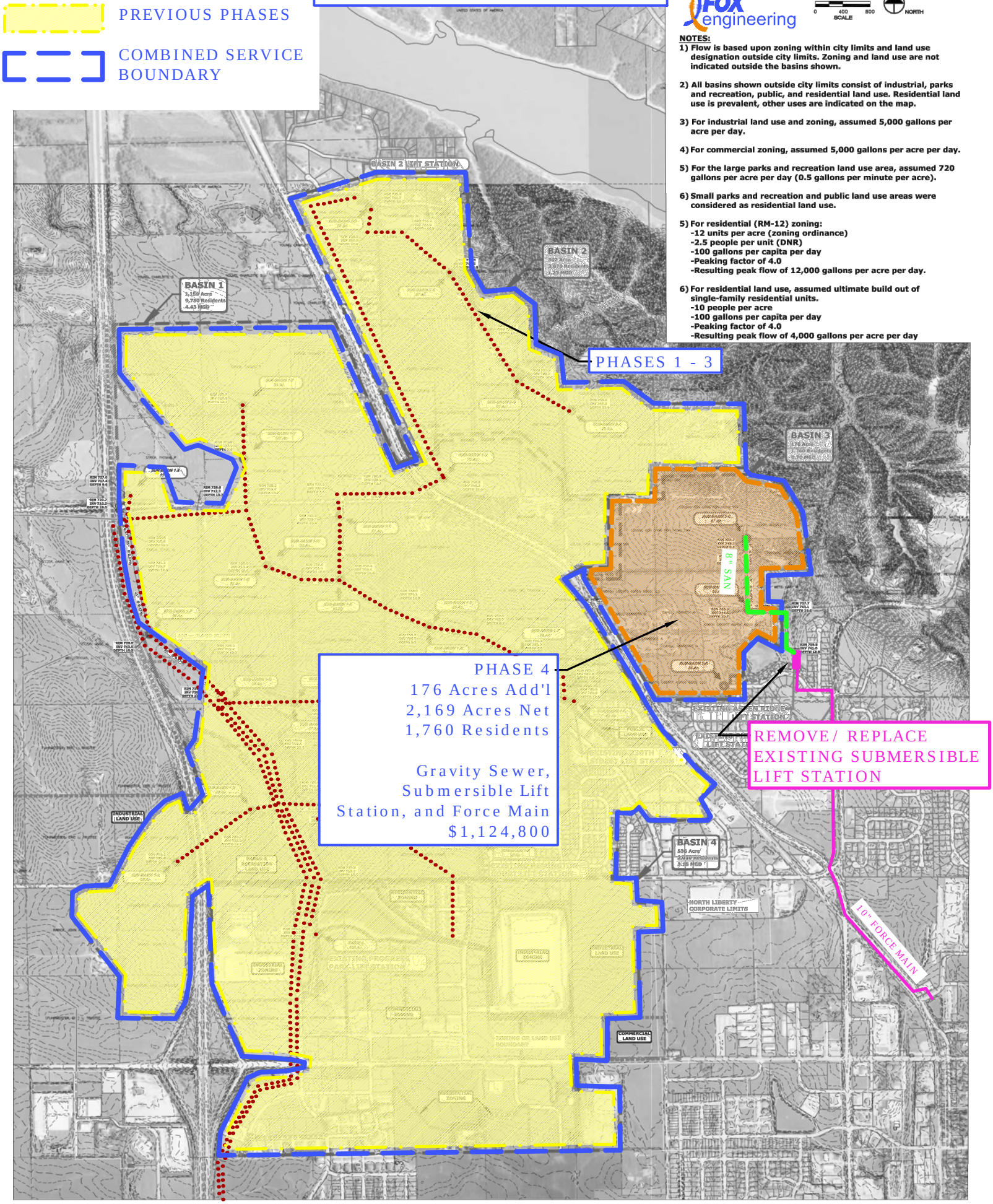
4) For commercial zoning, assumed 5,000 gallons per acre per day.

5) For the large parks and recreation land use area, assumed 720 gallons per acre per day (0.5 gallons per minute per acre).

6) Small parks and recreation and public land use areas were considered as residential land use.

5) For residential (RM-12) zoning:
-12 units per acre (zoning ordinance)
-2.5 people per unit (DNR)
-100 gallons per capita per day
-Peaking factor of 4.0
-Resulting peak flow of 12,000 gallons per acre per day.

6) For residential land use, assumed ultimate build out of single-family residential units.
-10 people per acre
-100 gallons per capita per day
-Peaking factor of 4.0
-Resulting peak flow of 4,000 gallons per acre per day



North Liberty Sanitary Sewer Study
Capital Improvement Cost Comparison

FOX PN: 2489-10A.300
Date: 3/11/2011

Phase 2 Upgrades

PHWW Flow (Serving ~22,000 Pop.)			15.8	MGD	
MBR Capacity	3.95	to	4.74	MGD	
Plant Hyd. Capacity	18.95	to	18.95	MGD	(EQ PS 1 = 15 MGD, MBR = 3.95 MGD)
New Equipment				$ (M)	
1/4" screen rated (7 MGD rating)				0.2	
EQ PS 1 Pump Upgrades (15 MGD rating)				0.5	
Buildout of MBR 1 System (3.95 MGD rating)				5.5	
Sludge Storage Tank				0.5	
Solids Handling Building				2.0	
Sludge Loadout				0.25	
				8.95	$ Million

Alternative 1 - NW pumping station back to existing WWTP site.

Phase 3 Upgrades (w/NW Pumping Station)

PHWW Flow (Serving ~44,000 Pop.)			31.6	MGD	
MBR Capacity	7.90	to	9.48	MGD	
Plant Hyd. Capacity	42.77	to	42.77	MGD	(EQ PS 1 = 15 MGD, EQ PS 2 = 19.87 MGD, MBR 1 = 3.95 MGD, MBR 2 = 3.95 MGD)
New Equipment				$ (M)	
New Pretreat and RWW PS 2 (12 MGD rating)				1.0	
New EQ Basin 2 (10 MG)				2.0	
New EQ PS 2 (19.87 MGD rating)				2.0	
New MBR 2 System (3.95 MGD rating)				9.0	
Aerobic Digesters or Cannibal System				3.0	
Sludge Storage Tank				0.5	
				17.50	$ Million

Northwest Pumping Station and Force Main

NW Pumping Station (20.4 MGD rating) & FM	19.91	Included in Western Growth Corridor

Phase 4 Upgrades (w/NW Pumping Station)

PHWW Flow (Serving ~78,000 Pop.)			44.26	MGD	
MBR Capacity	11.90	to	14.28	MGD	
Plant Hyd. Capacity	46.77	to	46.77	MGD	(EQ PS 1 = 15 MGD, EQ PS 2 = 19.87 MGD, MBR 1 = 3.95 MGD, MBR 2 = 3.95 MGD, MBR 3 = 4.00 MGD)
New Equipment				$ (M)	
New MBR 3 System (4 MGD)				9.0	
Sludge Storage Tank				0.5	
				9.50	$ Million

Total Cost	**55.86**	**$ Million (Including Phase 2)**
Total Treatment Cost	**35.95**	**$ Million (Including Phase 2)**

Alternative 2 - NW WWTP site discharging to the headwaters of Coralville Lake/Iowa River

Phase 3 Upgrades (w/NW WWTP)

PHWW Flow to MBR (Serving ~78,000)			26.41	MGD	
PHWW Flow to SBR (Serving ~78,000)			20.36	MGD	
			46.77	MGD	
MBR Capacity	6.00	to	7.20	MGD	
Plant 1 Hyd. Capacity	26.41	to	26.41	MGD	(EQ PS 1 = 10 MGD, EQ PS 2 = 9.81 MGD, MBR 1 = 3.95 MGD, MBR 2 = 2.65 MGD)
SBR Capacity	5.00	to	5.00	MGD	
Plant 2 Hyd. Capacity	20.36	to	20.36	MGD	(NW EQ PS = 15.36 MGD, SBR = 5 MGD)
New Equipment				$ (M)	
NW WWTP (5 MGD rating)				14.0	
Upgrade Raw WW Pumps (6 MGD)				0.3	
New EQ PS 2 (9.81 MGD rating)				0.3	
New EQ Basin (5 MG)				1.0	
New MBR 2 System (2.65 MGD rating)				6.0	
Aerobic Digesters or Cannibal System				2.5	
Sludge Storage Tank				0.5	
				24.60	$ Million

Northwest Pumping Station and Force Main

NW Pumping Station (11 MGD rating) & FM	5.34	Included in Western Growth Corridor

Phase 4 Upgrades (N/A with NW WWTP)

Total Cost	**38.89**	**$ Million (Including Phase 2)**
Total Treatment Cost	**33.55**	**$ Million (Including Phase 2)**

North Liberty Sanitary Sewer Study
Operation and Maintenance Cost Comparison

FOX PN: 2489-10A.300
Date: 3/11/2011

Phase 2 Upgrades (from Facility Plan)

MBR Capacity	3.95	to	4.74	MGD	
Plant Hyd. Capacity	18.95	to	18.95	MGD	(EQ PS = 15 MGD, MBR = 3.95 MGD)

New Equipment	$ / year
1/4" screen rated (7 MGD)	250
EQ PS 1 Pump Upgrades (15 MGD)	15,000
Buildout of MBR 1 System (3.95 MGD rating)	50,000
Sludge Storage Tank w/disposal	22,500
Solids Handling Building	20,000
Sludge Loadout	5,500
	113,250 $ / year

Alternative 1 - NW pumping station back to existing WWTP site.

Phase 3 Upgrades (w/NE Pumping Station)

MBR Capacity	7.90	to	9.48	MGD	
Plant Hyd. Capacity	41.65	to	41.65	MGD	(EQ PS 1 = 15 MGD, EQ PS 2 = 18.75 MGD, MBR 1 = 3.95 MGD, MBR 2 = 3.95 MGD)

New Equipment	$ / year
New Pretreat and Raw PS 2 (12 MGD rating)	35,000
New EQ PS 2 (18.75 MGD rating)	20,000
New EQ Basin 2 (10 MG)	2,000
New MBR 2 System (3.95 MGD rating)	215,000
Aerobic Digesters or Cannibal System	30,000
Sludge Storage Tank w/ disposal	22,500
	324,500 $ / year

Northwest Pumping Station and Force Main

NW Pumping Station (20.3 MGD rating)	156,000
24-inch Force Main (7 Miles)	15,000
	171,000 $ / year

Phase 4 Upgrades (w/NW Pumping Station)

MBR Capacity	11.90	to	14.28	MGD	
Plant Hyd. Capacity	45.65	to	45.65	MGD	(EQ PS 1 = 15 MGD, EQ PS 2 = 18.75, MGD MBR 1 = 3.95 MGD, MBR 2 = 3.95 MGD, MBR 3 = 4.00 MGD)

New Equipment	$ / year
New MBR 3 System (4 MGD rating)	215,000
Sludge Storage Tank w/disposal	22,500
	237,500 $ / year

Total Cost	**846,250**	**$ / year (Including Phase 2)**
Total Treatment Cost	**675,250**	**$ / year (Including Phase 2)**

Alternative 2 - NW WWTP site discharging to the headwaters of Coralville Lake/Iowa River

Phase 3 Upgrades (w/NW WWTP)

PHWW Flow at MBR (~44,000)
PHWW Flow at SBR (~44,000)

MBR Treatment Capacity	6.00	to	7.20	MGD	
MBR Hyd. Capacity	24.00	to	24.00	MGD	(EQ PS 1 = 8 MGD, EQ PS 2 = 10 MGD, MBR 1 = 3.95 MGD, MBR 2 = 2.05 MGD)
SBR Treatment Capacity	5.00	to	5.00	MGD	
SBR Hyd. Capacity	21.00	to	21.00	MGD	(EQ PS = 16 MGD, SBR = 5 MGD)

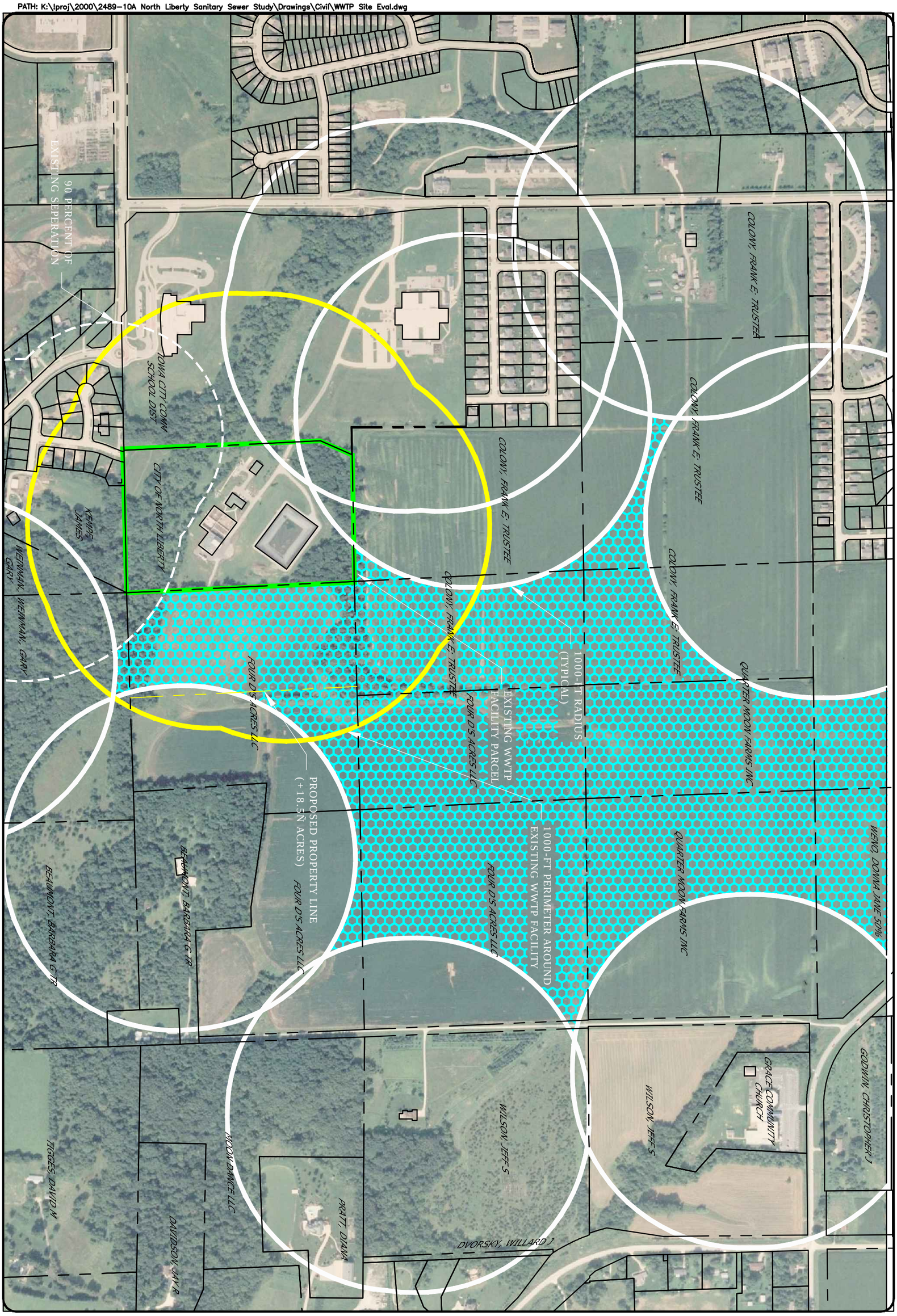
New Equipment	$ / year
NW WWTP w/ SBR and EQ (5 MGD rating)	210,000
Upgraded Raw WW Pumps (7 MGD)	15,000
New EQ PS 2 (10 MGD)	10,000
New EQ Basin 2 (5 MG)	1,000
New MBR 2 System (2.05 MGD rating)	115,000
Aerobic Digesters or Cannibal System	20,000
Sludge Storage Tank w/ disposal	22,500
	393,500 $ / year

Northwest Pumping Station and Force Main

NW Collection System Pumps (11 MGD)	30,000
	30,000 $ / year

Total Cost	**536,750**	**$ / year (Including Phase 2)**
Total Treatment Cost	**506,750**	**$ / year (Including Phase 2)**

PATH: K:\lproj\2000\2489-10A North Liberty Sanitary Sewer Study\Drawings\Civil\WWTP Site Eval.dwg



FOX engineering

FOX Engineering Associates, Inc.
1601 Golden Aspen Drive, Suite 103
Ames, Iowa 50010
Phone: (515) 233-0000
FAX: (515) 233-0103

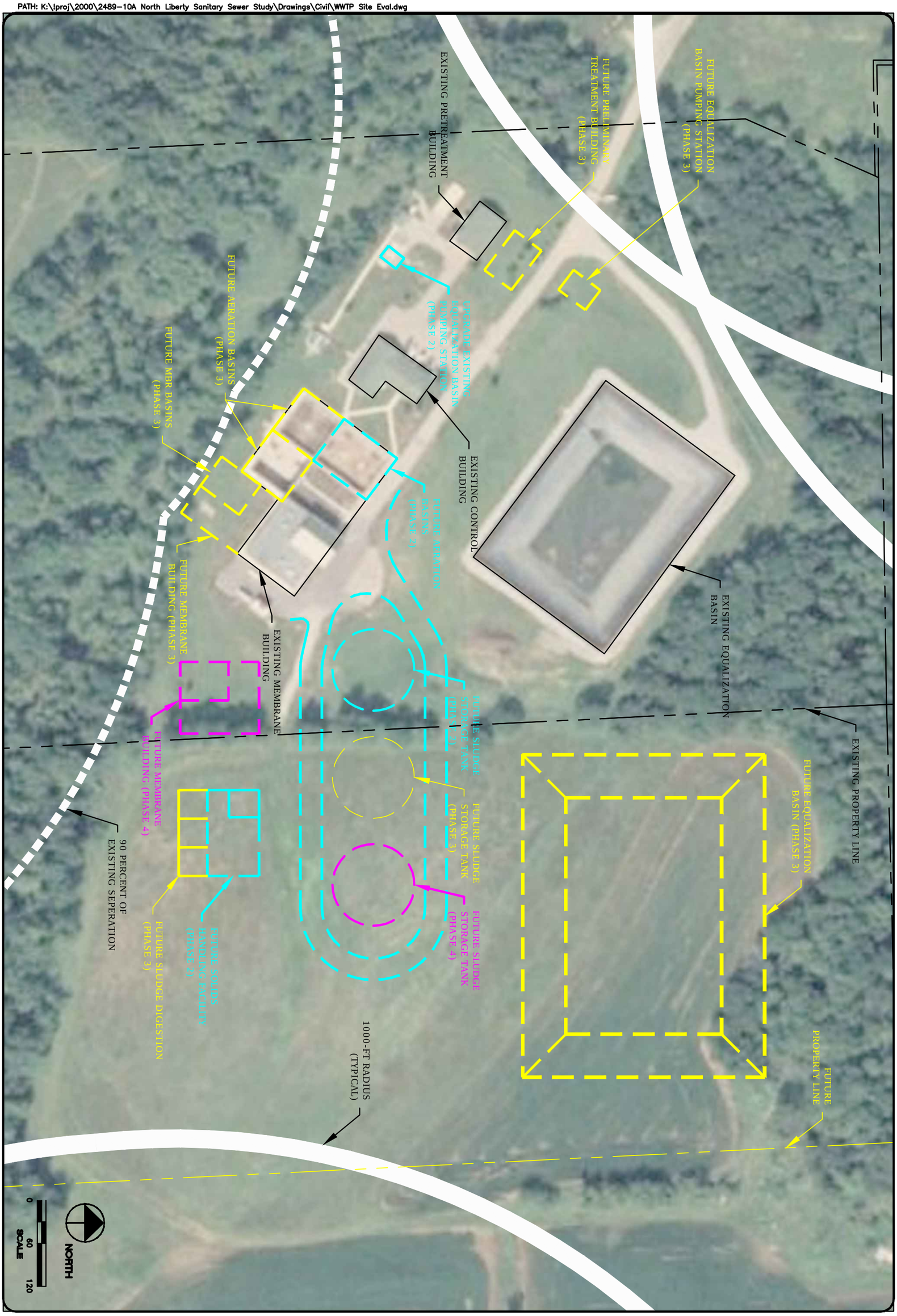
WWTP EXPANSION EVALUATION

2010 SANITARY SEWER STUDY
CITY OF NORTH LIBERTY
NORTH LIBERTY, IOWA
2010

FIGURE:

REVISION	NO.	DATE
DRAWN MRK	PROJECT NO. 2489-10A	DATE 3/10/11

PATH: K:\Iproj\2000\2489-10A North Liberty Sanitary Sewer Study\Drawings\Civil\WWTP Site Eval.dwg



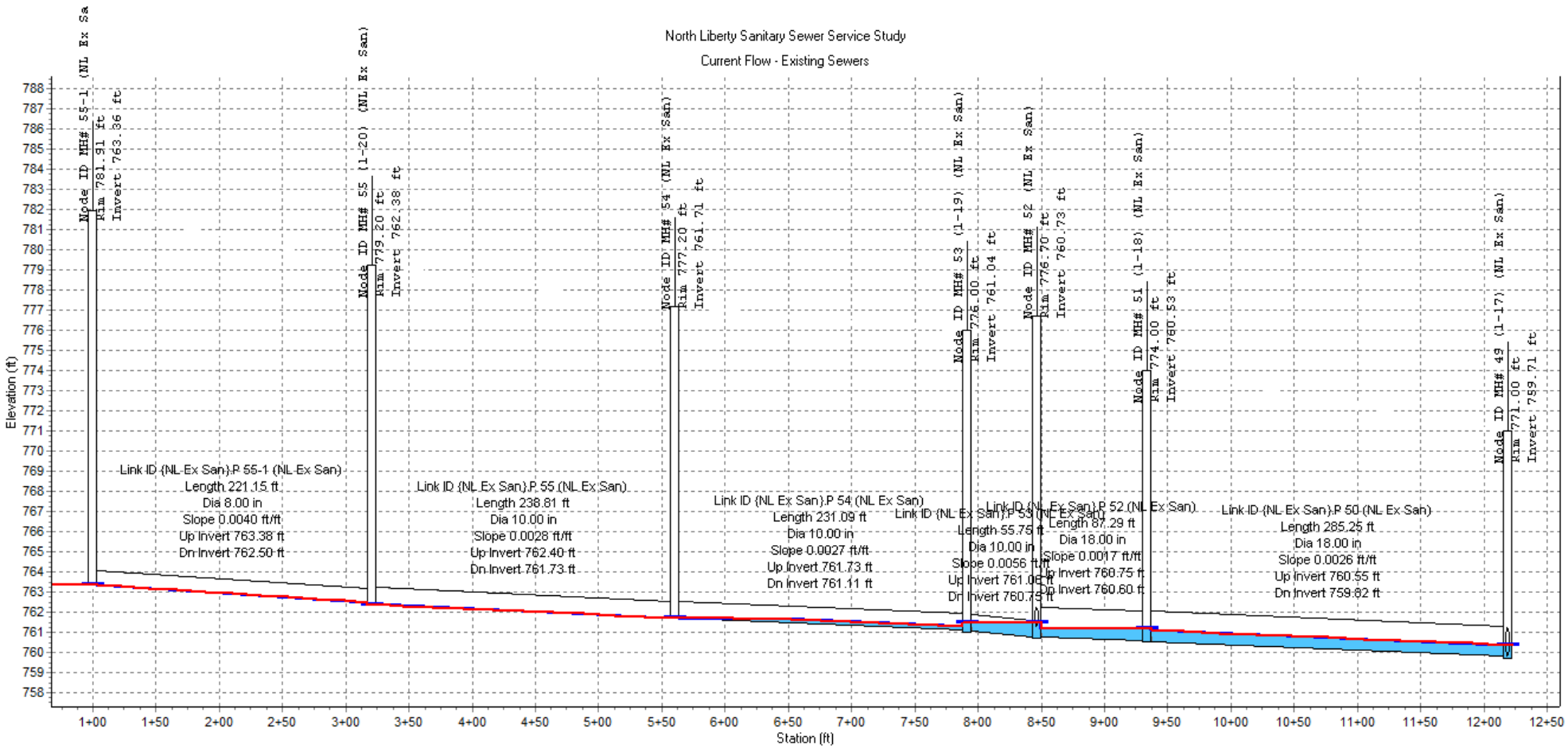
FOX engineering
FOX Engineering Associates, Inc.
1601 Golden Aspen Drive, Suite 103
Ames, Iowa 50010
Phone: (515) 233-0000
FAX: (515) 233-0103

WWTP EXPANSION EVALUATION

2010 SANITARY SEWER STUDY
CITY OF NORTH LIBERTY
NORTH LIBERTY, IOWA
2010

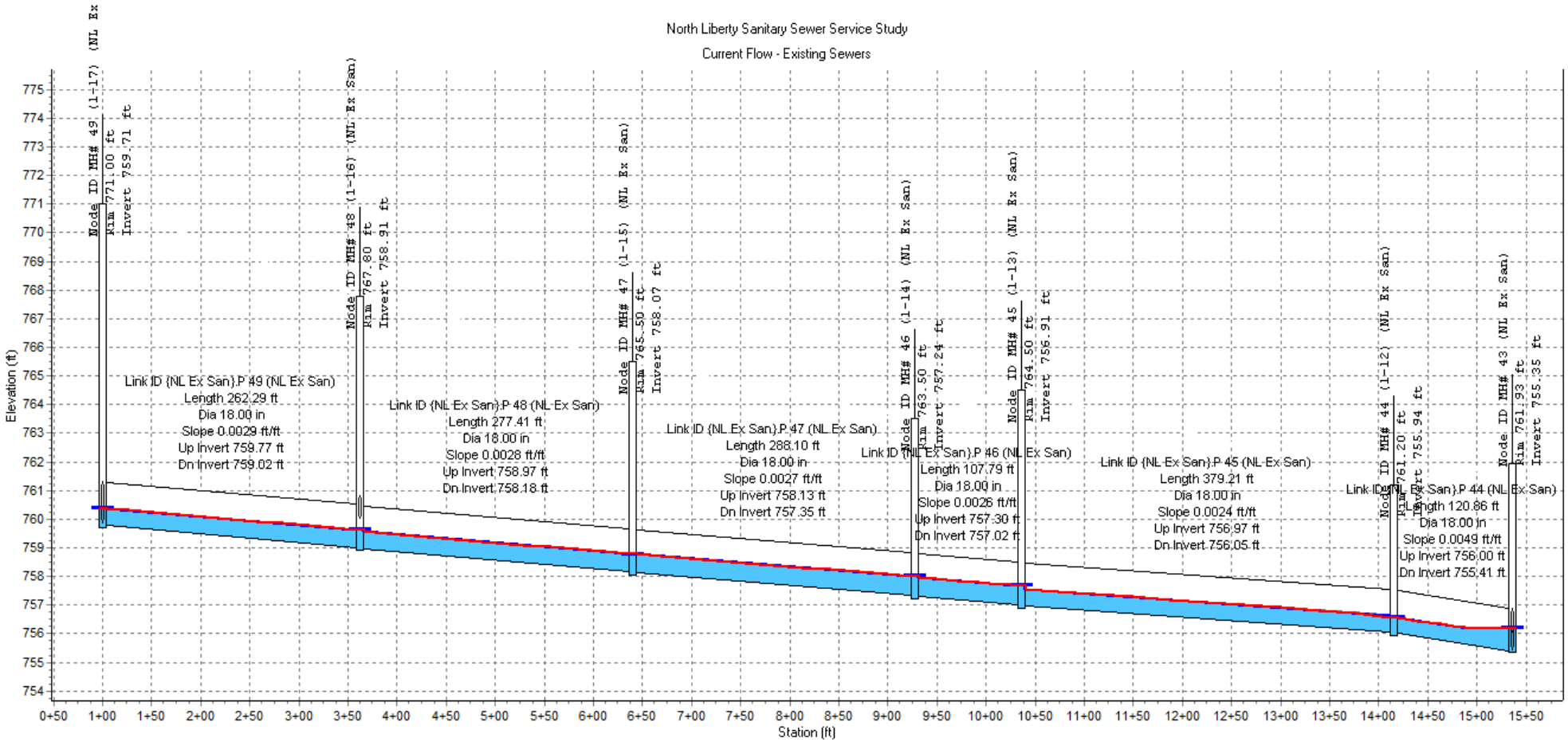
FIGURE:

REVISION	NO.	DATE
DRAWN MRK	PROJECT NO. 2489-10A	DATE 3/10/11



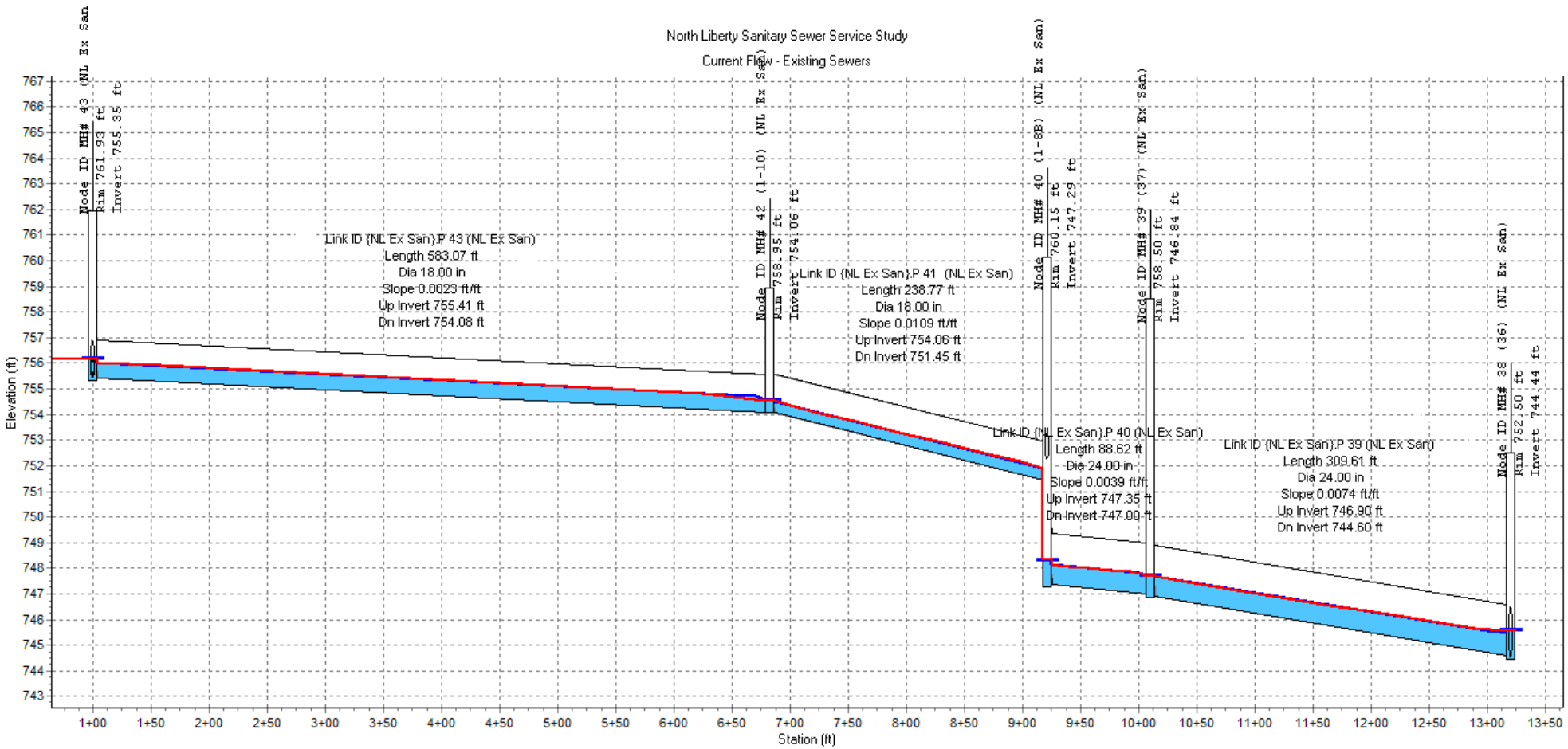
Node ID:		MH# 55 (1-20) (NL Ex San)	MH# 54 (NL Ex San)	MH# 53 (1-19) (NL Ex San)	MH# 52 (NL Ex San)	MH# 51 (1-18) (NL Ex San)	
Rim (ft):	781.91	779.20	777.20	776.00	776.70	774.00	771.00
Invert (ft):	763.36	762.38	761.71	761.04	760.73	760.53	759.71
Min Pipe Cover (ft):	17.86	15.97	14.64	14.06	14.43	11.90	9.68
Max HGL (ft):	763.36	762.38	761.71	761.47	761.47	761.20	760.38

Link ID:	(NL Ex San).P 55-1 (NL Ex San)	(NL Ex San).P 55 (NL Ex San)	(NL Ex San).P 54 (NL Ex San)	(NL Ex San).P 53 (NL Ex San)	(NL Ex San).P 52 (NL Ex San)	(NL Ex San).P 50 (NL Ex San)
Length (ft):	221.15	238.81	231.09	55.75	87.29	285.25
Dia (in):	8.00	10.00	10.00	10.00	18.00	18.00
Slope (ft/ft):	0.0040	0.0028	0.0027	0.0056	0.0017	0.0026
Up Invert (ft):	763.38	762.40	761.73	761.06	760.75	760.55
Dn Invert (ft):	762.50	761.73	761.11	760.75	760.60	759.82
Max Q (mgd):	0.00	0.00	0.00	0.00	1.14	1.18
Max Vel (ft/s):	0.00	0.00	0.00	0.00	2.37	2.72
Max Depth (ft):	0.00	0.00	0.18	0.56	0.66	0.61



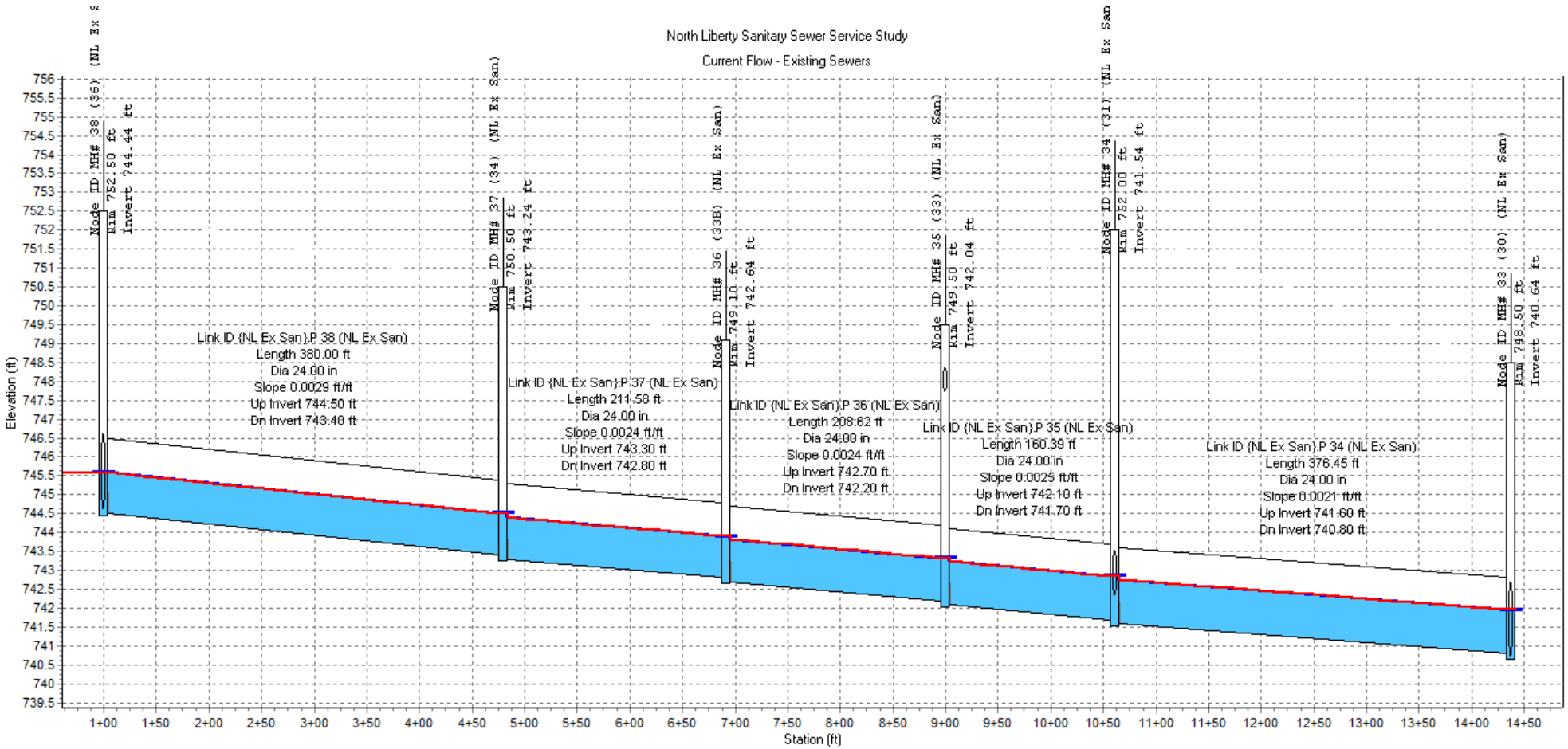
Node ID:		MH# 48 (1-16) (NL Ex San)	MH# 47 (1-15) (NL Ex San)	MH# 46 (1-14) (NL Ex San)	MH# 45 (1-13) (NL Ex San)	MH# 44 (1-12) (NL Ex San)	
Rim (ft):	771.00	767.80	765.50	763.50	764.50	761.20	761.93
Invert (ft):	759.71	758.91	758.07	757.24	756.91	755.94	755.35
Min Pipe Cover (ft):	9.68	6.97	5.82	4.65	5.98	3.65	5.02
Max HGL (ft):	760.38	759.63	758.78	758.00	757.67	756.55	756.18

Link ID:	{NL Ex San}.P 49 (NL Ex San)	{NL Ex San}.P 48 (NL Ex San)	{NL Ex San}.P 47 (NL Ex San)	{NL Ex San}.P 46 (NL Ex San)	{NL Ex San}.P 45 (NL Ex San)	{NL Ex San}.P 44 (NL Ex San)
Length (ft):	262.29	277.41	288.10	107.79	379.21	120.86
Dia (in):	18.00	18.00	18.00	18.00	18.00	18.00
Slope (ft/ft):	0.0029	0.0028	0.0027	0.0026	0.0024	0.0049
Up Invert (ft):	759.77	758.97	758.13	757.30	756.97	756.00
Dn Invert (ft):	759.02	758.18	757.35	757.02	756.05	755.41
Max Q (mgd):	1.18	1.29	1.29	1.29	1.29	1.29
Max Vel (ft/s):	2.69	2.83	2.69	2.56	2.90	2.68
Max Depth (ft):	0.61	0.63	0.66	0.68	0.62	0.66



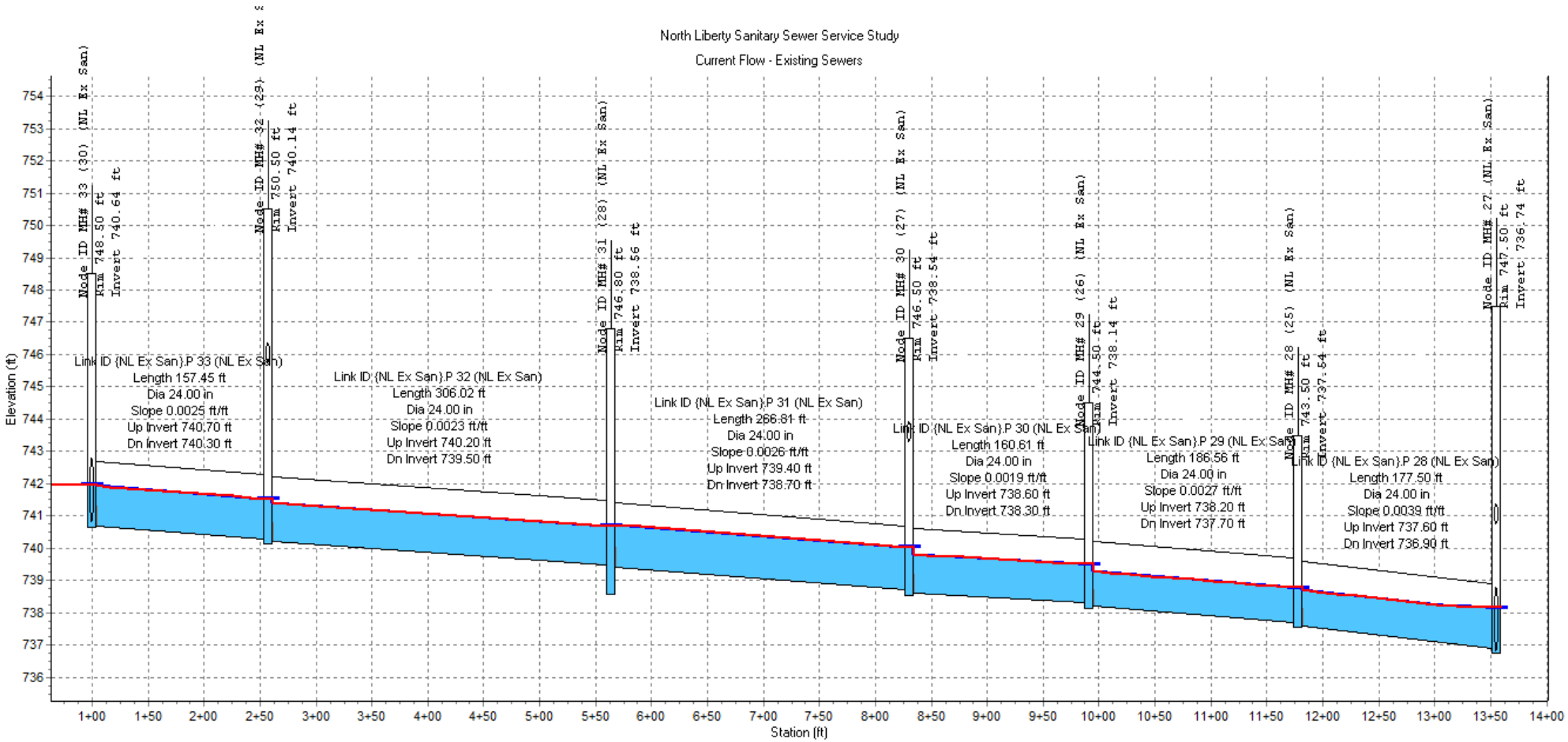
Node ID:		MH# 42 (1-10) (NL Ex San)	MH# 40 (1-8B) (NL Ex San)	MH# 39 (37) (NL Ex San)	
Rim (ft):	761.93	758.95	760.15	758.50	752.50
Invert (ft):	755.35	754.06	747.29	746.84	744.44
Min Pipe Cover (ft):	5.02	3.37	6.90	9.50	5.90
Max HGL (ft):	756.18	754.53	748.32	747.71	745.58

Link ID:	(NL Ex San).P 43 (NL Ex San)	(NL Ex San).P 41 (NL Ex San)	(NL Ex San).P 40 (NL Ex San)	(NL Ex San).P 39 (NL Ex San)
Length (ft):	583.07	238.77	88.62	309.61
Dia (in):	18.00	18.00	24.00	24.00
Slope (ft/ft):	0.0023	0.0109	0.0039	0.0074
Up Invert (ft):	755.41	754.06	747.35	746.90
Dn Invert (ft):	754.08	751.45	747.00	744.60
Max Q (mgd):	1.43	1.43	3.42	4.07
Max Vel (ft/s):	2.92	4.72	3.91	4.63
Max Depth (ft):	0.66	0.47	0.89	0.90



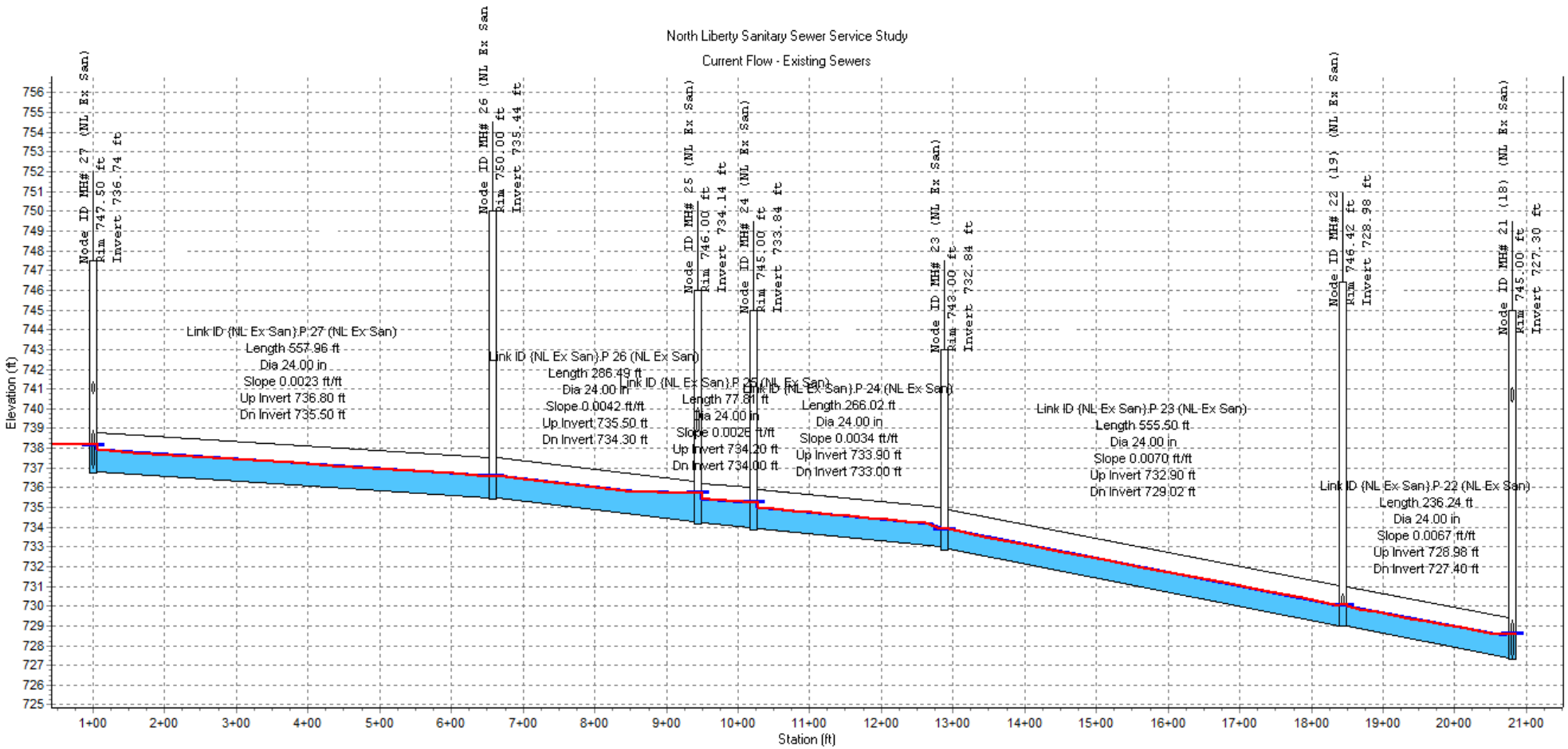
Node ID:		MH# 37 (34) (NL Ex San)	MH# 36 (33B) (NL Ex San)	MH# 35 (33) (NL Ex San)	MH# 34 (31) (NL Ex San)	
Rim (ft):	752.50	750.50	749.10	749.50	752.00	748.50
Invert (ft):	744.44	743.24	742.64	742.04	741.54	740.64
Min Pipe Cover (ft):	5.90	5.10	4.30	1.13	8.30	5.70
Max HGL (ft):	745.58	744.51	743.90	743.32	742.84	741.96

Link ID:		{NL Ex San}.P 38 (NL Ex San)	{NL Ex San}.P 37 (NL Ex San)	{NL Ex San}.P 36 (NL Ex San)	{NL Ex San}.P 35 (NL Ex San	{NL Ex San}.P 34 (NL Ex San)	
Length (ft):		380.00	211.58	208.62	160.39	376.45	
Dia (in):		24.00	24.00	24.00	24.00	24.00	
Slope (ft/ft):		0.0029	0.0024	0.0024	0.0025	0.0021	
Up Invert (ft):		744.50	743.30	742.70	742.10	741.60	
Dn Invert (ft):		743.40	742.80	742.20	741.70	740.80	
Max Q (mgd):		4.07	4.07	4.07	4.12	4.23	
Max Vel (ft/s):		3.58	3.35	3.31	3.29	3.32	
Max Depth (ft):		1.09	1.16	1.16	1.18	1.20	



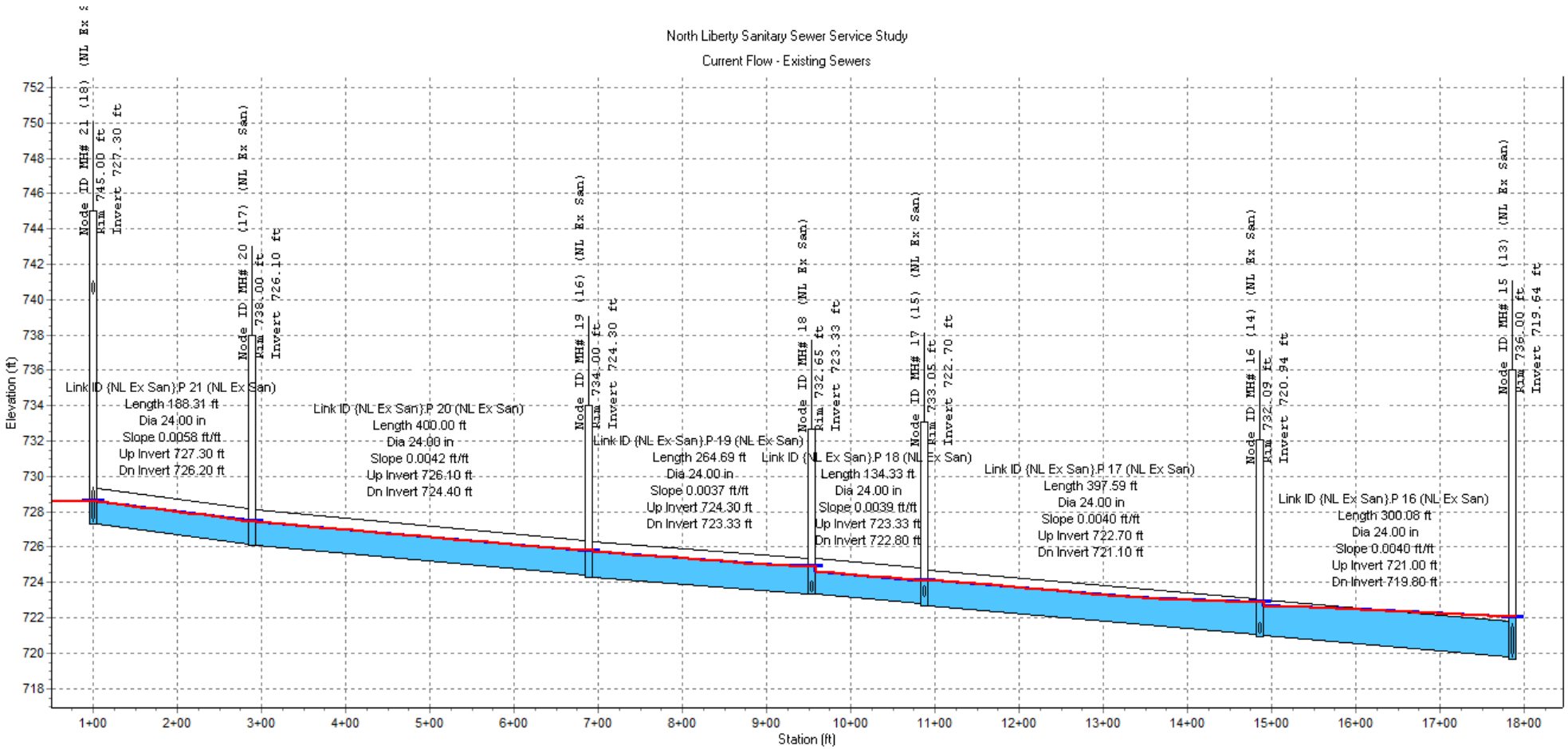
Node ID:		MH# 32 (29) (NL Ex San)	MH# 31 (28) (NL Ex San)	MH# 30 (27) (NL Ex San)	MH# 29 (26) (NL Ex San)	MH# 28 (25) (NL Ex San)	
Rim (ft):	748.50	750.50	746.80	746.50	744.50	743.50	747.50
Invert (ft):	740.64	740.14	738.56	738.54	738.14	737.54	736.74
Min Pipe Cover (ft):	5.70	4.13	5.30	2.56	4.20	3.80	6.12
Max HGL (ft):	741.96	741.53	740.69	740.04	739.50	738.78	738.16

Link ID:		(NL Ex San).P 33 (NL Ex San)	(NL Ex San).P 32 (NL Ex San)	(NL Ex San).P 31 (NL Ex San)	(NL Ex San).P 30 (NL Ex San)	(NL Ex San).P 29 (NL Ex San)	(NL Ex San).P 28 (NL Ex San)	
Length (ft):		157.45	306.02	266.81	160.61	186.56	177.50	
Dia (in):		24.00	24.00	24.00	24.00	24.00	24.00	
Slope (ft/ft):		0.0025	0.0023	0.0026	0.0019	0.0027	0.0039	
Up Invert (ft):		740.70	740.20	739.40	738.60	738.20	737.60	
Dn Invert (ft):		740.30	739.50	738.70	738.30	737.70	736.90	
Max Q (mgd):		4.23	4.78	4.78	4.85	4.85	4.85	
Max Vel (ft/s):		3.18	3.54	3.38	3.41	3.85	3.73	
Max Depth (ft):		1.25	1.26	1.31	1.32	1.19	1.22	



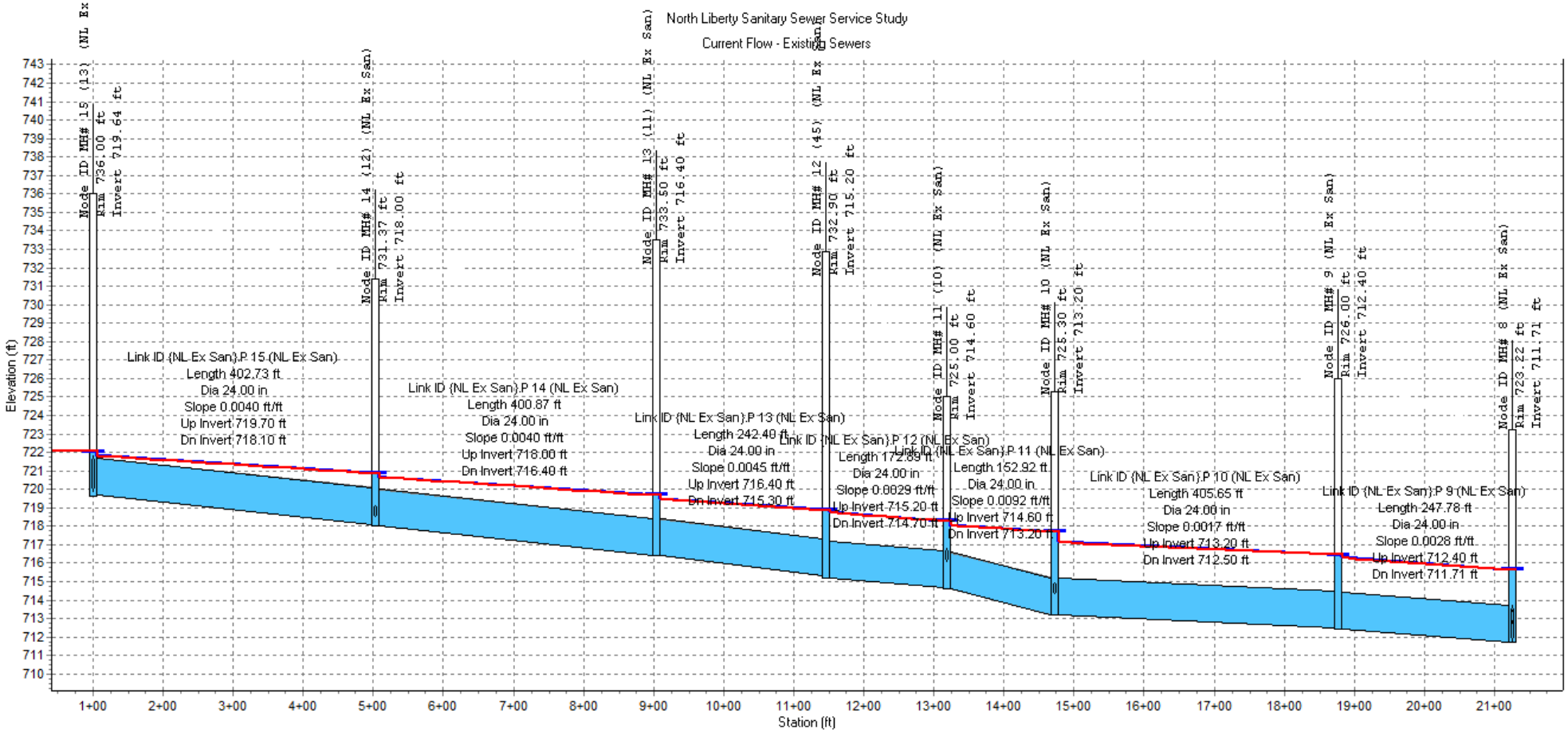
Node ID:		MH# 26 (NL Ex San)	MH# 25 (NL Ex San)	MH# 24 (NL Ex San)	MH# 23 (NL Ex San)	MH# 22 (19) (NL Ex San)	
Rim (ft):	747.50	750.00	746.00	745.00	743.00	746.42	745.00
Invert (ft):	736.74	735.44	734.14	733.84	732.84	728.98	727.30
Min Pipe Cover (ft):	6.12	12.50	5.95	9.00	8.00	15.40	3.91
Max HGL (ft):	738.16	736.57	735.72	735.24	733.90	730.05	728.59

Link ID:		{NL Ex San}.P 27 (NL Ex San)	{NL Ex San}.P 26 (NL Ex San)	{NL Ex San}.P 25 (NL Ex San)	{NL Ex San}.P 24 (NL Ex San)	{NL Ex San}.P 23 (NL Ex San)	{NL Ex San}.P 22 (NL Ex San)	
Length (ft):		557.96	286.49	77.81	266.02	555.50	236.24	
Dia (in):		24.00	24.00	24.00	24.00	24.00	24.00	
Slope (ft/ft):		0.0023	0.0042	0.0026	0.0034	0.0070	0.0067	
Up Invert (ft):		736.80	735.50	734.20	733.90	732.90	728.98	
Dn Invert (ft):		735.50	734.30	734.00	733.00	729.02	727.40	
Max Q (mgd):		4.99	4.99	5.75	5.75	5.78	5.84	
Max Vel (ft/s):		3.86	3.76	3.85	4.51	5.55	4.92	
Max Depth (ft):		1.22	1.24	1.38	1.20	1.02	1.13	



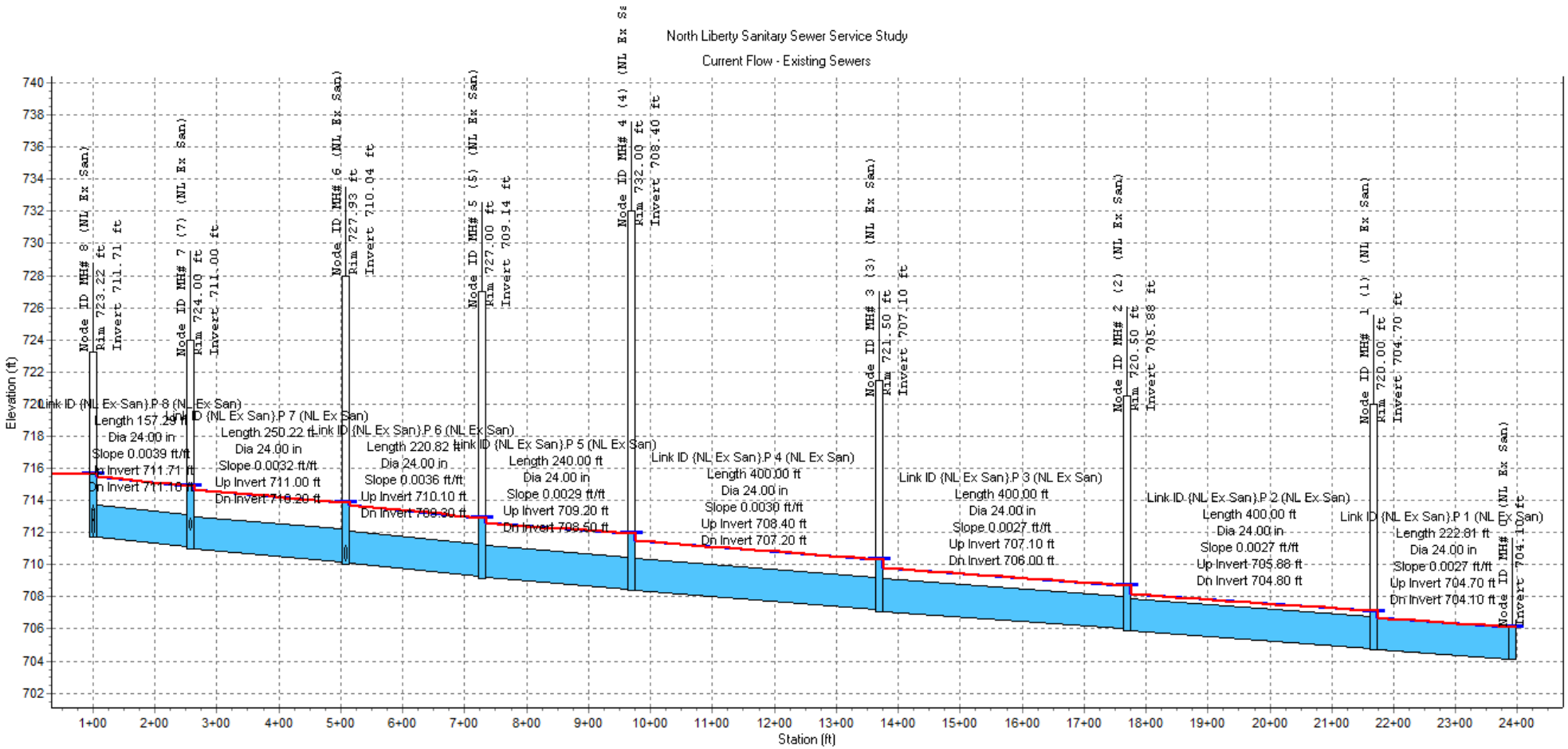
Node ID:		MH# 20 (17) (NL Ex San)	MH# 19 (16) (NL Ex San)	MH# 18 (NL Ex San)	MH# 17 (15) (NL Ex San)	MH# 16 (14) (NL Ex San)	
Rim (ft):	745.00	738.00	734.00	732.65	733.05	732.09	736.00
Invert (ft):	727.30	726.10	724.30	723.33	722.70	720.94	719.64
Min Pipe Cover (ft):	3.91	9.80	7.60	7.32	8.25	8.99	14.20
Max HGL (ft):	728.59	727.44	725.80	724.91	724.10	722.87	722.04

Link ID:	(NL Ex San).P 21 (NL Ex San)	(NL Ex San).P 20 (NL Ex San)	(NL Ex San).P 19 (NL Ex San)	(NL Ex San).P 18 (NL Ex San)	(NL Ex San).P 17 (NL Ex San)	(NL Ex San).P 16 (NL Ex San)
Length (ft):	188.31	400.00	264.69	134.33	397.59	300.08
Dia (in):	24.00	24.00	24.00	24.00	24.00	24.00
Slope (ft/ft):	0.0058	0.0042	0.0037	0.0039	0.0040	0.0040
Up Invert (ft):	727.30	726.10	724.30	723.33	722.70	721.00
Dn Invert (ft):	726.20	724.40	723.33	722.80	721.10	719.80
Max Q (mgd):	6.82	6.82	6.82	7.16	7.20	7.20
Max Vel (ft/s):	5.02	4.59	4.07	4.58	4.17	3.58
Max Depth (ft):	1.27	1.37	1.54	1.44	1.59	1.94



Node ID:		MH# 14 (12) (NL Ex San)	MH# 13 (11) (NL Ex San)	MH# 12 (45) (NL Ex San)	MH# 11 (10) (NL Ex San)	MH# 10 (NL Ex San)	MH# 9 (NL Ex San)	
Rim (ft):	736.00	731.37	733.50	732.90	725.00	725.30	726.00	723.22
Invert (ft):	719.64	718.00	716.40	715.20	714.60	713.20	712.40	711.71
Min Pipe Cover (ft):	14.20	11.27	15.10	15.60	8.17	10.10	11.50	9.51
Max HGL (ft):	722.04	720.87	719.68	718.89	718.26	717.68	716.45	715.63

Link ID:		{NL Ex San}.P 15 (NL Ex San)	{NL Ex San}.P 14 (NL Ex San)	{NL Ex San}.P 13 (NL Ex San)	{NL Ex San}.P 12 (NL Ex San)	{NL Ex San}.P 11 (NL Ex San)	{NL Ex San}.P 10 (NL Ex San)	{NL Ex San}.P 9 (NL Ex San)	
Length (ft):		402.73	400.87	242.40	172.89	152.92	405.65	247.78	
Dia (in):		24.00	24.00	24.00	24.00	24.00	24.00	24.00	
Slope (ft/ft):		0.0040	0.0040	0.0045	0.0029	0.0092	0.0017	0.0028	
Up Invert (ft):		719.70	718.00	716.40	715.20	714.60	713.20	712.40	
Dn Invert (ft):		718.10	716.40	715.30	714.70	713.20	712.50	711.71	
Max Q (mgd):		7.20	7.26	7.26	7.26	7.33	7.34	7.34	
Max Vel (ft/s):		3.55	3.57	3.57	3.57	3.61	3.61	3.61	
Max Depth (ft):		2.00	2.00	2.00	2.00	2.00	2.00	2.00	

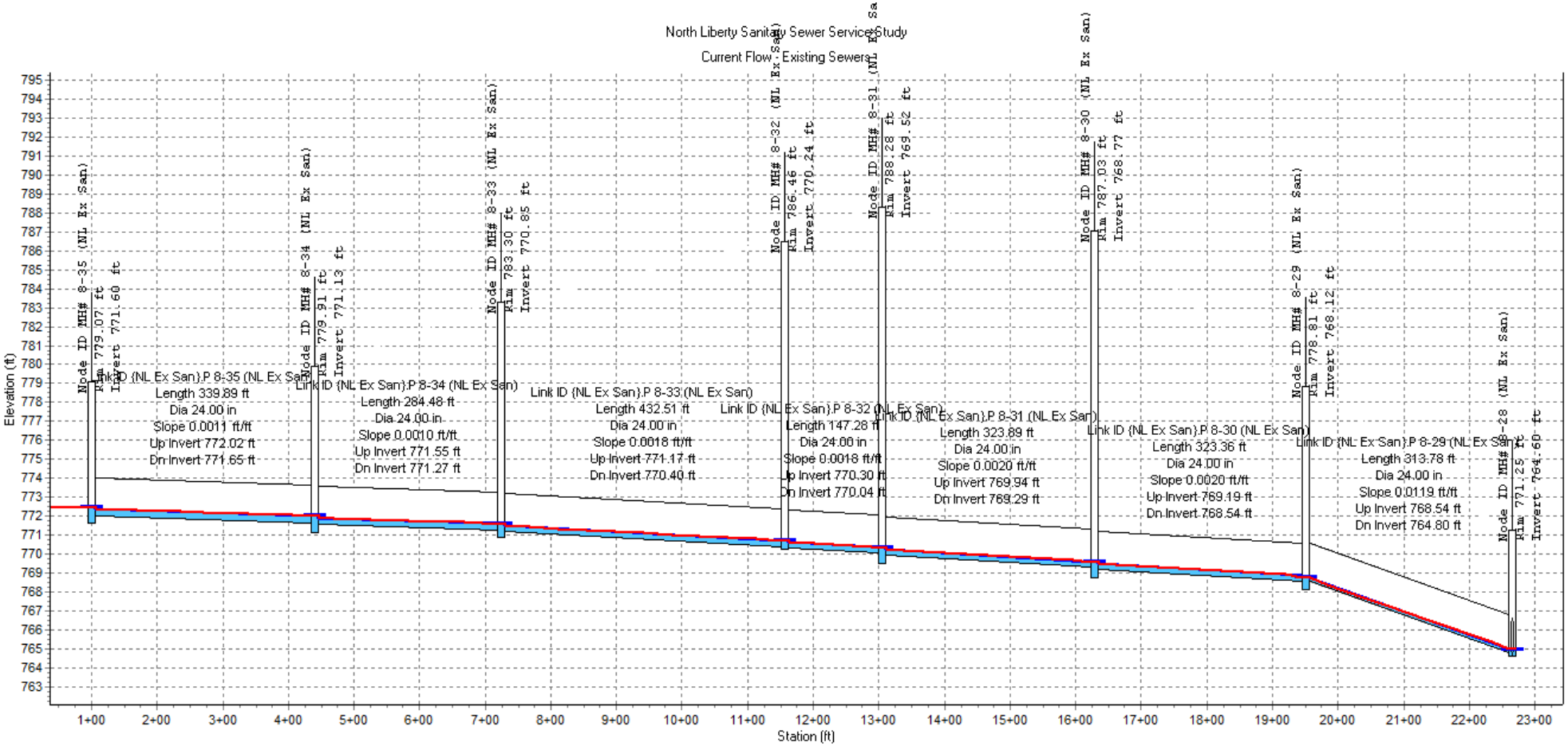


Node ID:		MH# 7 (7) (NL Ex San)	MH# 6 (NL Ex San)	MH# 5 (5) (NL Ex San)	MH# 4 (4) (NL Ex San)	MH# 3 (3) (NL Ex San)	MH# 2 (2) (NL Ex San)	MH# 1 (1) (NL Ex San)	
Rim (ft):	723.22	724.00	727.93	727.00	732.00	721.50	720.50	720.00	
Invert (ft):	711.71	711.00	710.04	709.14	708.40	707.10	705.88	704.70	704.10
Min Pipe Cover (ft):	9.51	10.90	15.73	15.70	21.50	12.30	12.50	13.20	
Max HGL (ft):	715.63	714.89	713.87	712.92	711.92	710.32	708.71	707.11	706.10

Link ID:	{NL Ex San}.P 8 (NL Ex San)	{NL Ex San}.P 7 (NL Ex San)	{NL Ex San}.P 6 (NL Ex San)	{NL Ex San}.P 5 (NL Ex San)	{NL Ex San}.P 4 (NL Ex San)	{NL Ex San}.P 3 (NL Ex San)	{NL Ex San}.P 2 (NL Ex San)	{NL Ex San}.P 1 (NL Ex San)
Length (ft):	157.29	250.22	220.82	240.00	400.00	400.00	400.00	222.81
Dia (in):	24.00	24.00	24.00	24.00	24.00	24.00	24.00	24.00
Slope (ft/ft):	0.0039	0.0032	0.0036	0.0029	0.0030	0.0027	0.0027	0.0027
Up Invert (ft):	711.71	711.00	710.10	709.20	708.40	707.10	705.88	704.70
Dn Invert (ft):	711.10	710.20	709.30	708.50	707.20	706.00	704.80	704.10
Max Q (mgd):	8.14	8.14	8.23	8.32	8.45	8.45	8.45	8.45
Max Vel (ft/s):	4.01	4.01	4.05	4.10	4.16	4.16	4.16	4.16
Max Depth (ft):	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00

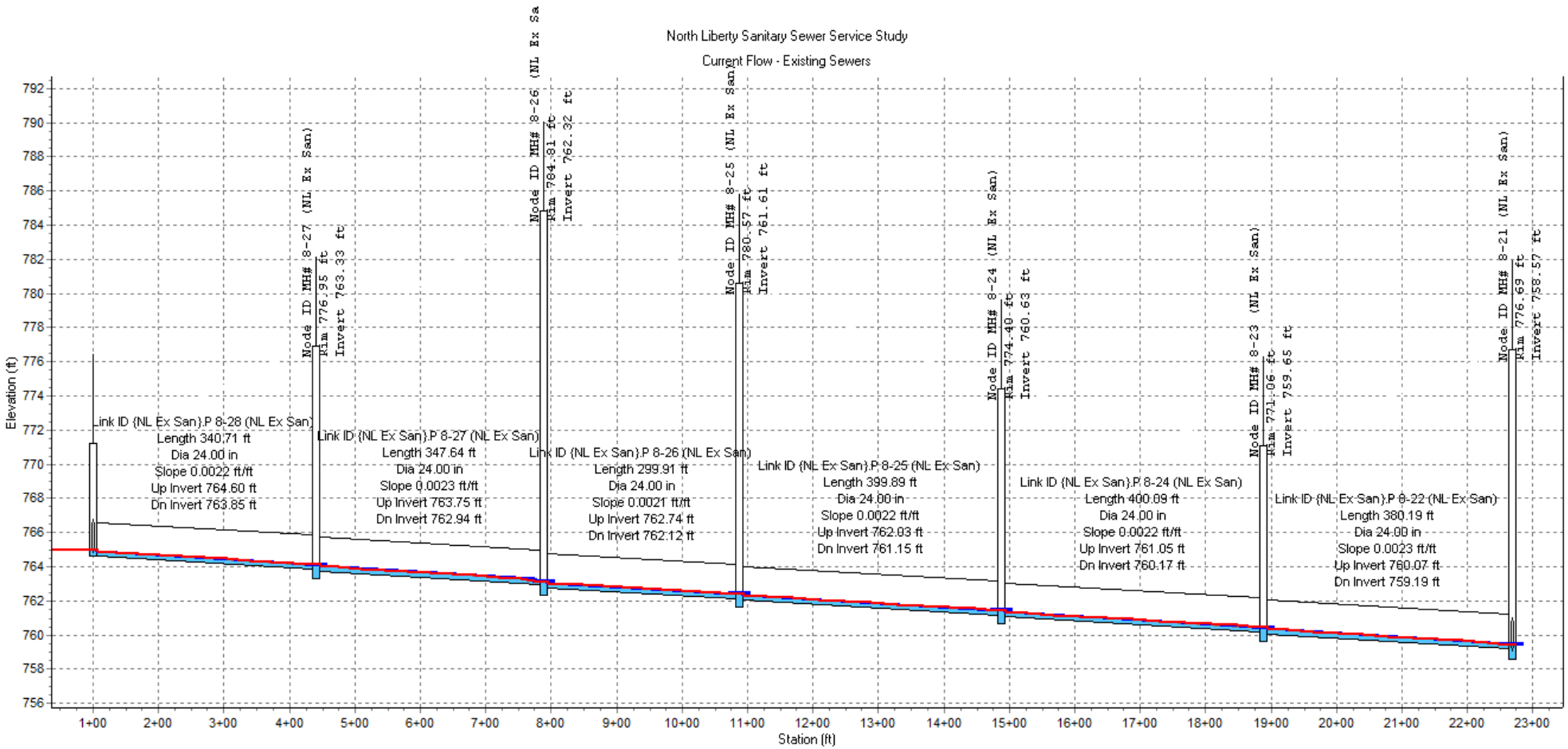
North Liberty Sanitary Sewer Service Study

Current Flow - Existing Sewers



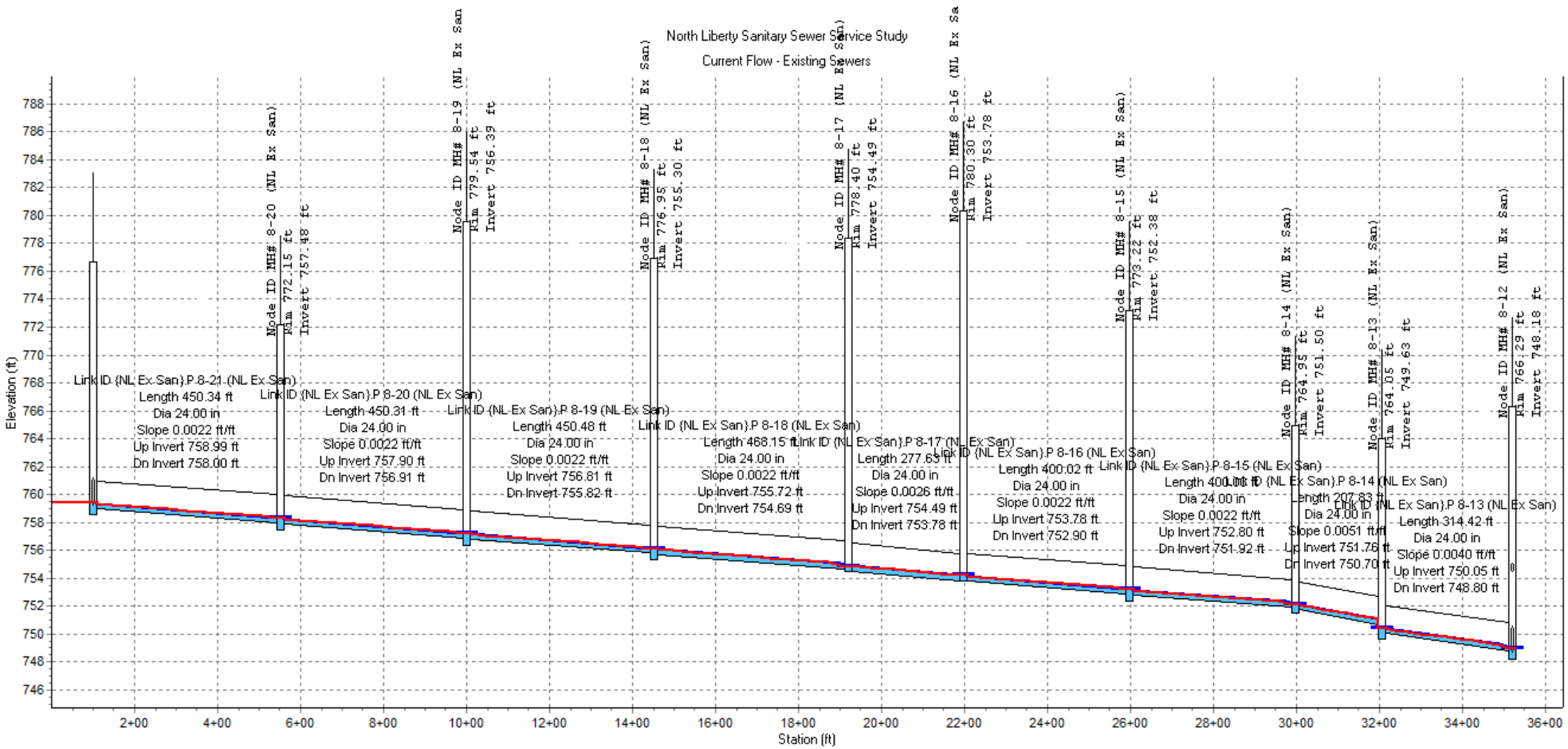
Node ID:		MH# 8-34 (NL Ex San)	MH# 8-33 (NL Ex San)	MH# 8-32 (NL Ex San)	MH# 8-31 (NL Ex San)	MH# 8-30 (NL Ex San)	MH# 8-29 (NL Ex San)	
Rim (ft):	779.07	779.91	783.30	786.46	788.28	787.03	778.81	771.25
Invert (ft):	771.60	771.13	770.85	770.24	769.52	768.77	768.12	764.60
Min Pipe Cover (ft):	5.05	6.26	10.03	14.06	16.24	15.74	8.27	4.45
Max HGL (ft):	772.44	772.01	771.56	770.68	770.31	769.56	768.76	764.96

Link ID:	{NL Ex San}.P 8-35 (NL Ex San)	{NL Ex San}.P 8-34 (NL Ex San)	{NL Ex San}.P 8-33 (NL Ex San)	{NL Ex San}.P 8-32 (NL Ex San)	{NL Ex San}.P 8-31 (NL Ex San)	{NL Ex San}.P 8-30 (NL Ex San)	{NL Ex San}.P 8-29 (NL Ex San)
Length (ft):	339.89	284.48	432.51	147.28	323.89	323.36	313.78
Dia (in):	24.00	24.00	24.00	24.00	24.00	24.00	24.00
Slope (ft/ft):	0.0011	0.0010	0.0018	0.0018	0.0020	0.0020	0.0119
Up Invert (ft):	772.02	771.55	771.17	770.30	769.94	769.19	768.54
Dn Invert (ft):	771.65	771.27	770.40	770.04	769.29	768.54	764.80
Max Q (mgd):	0.41	0.41	0.41	0.41	0.41	0.41	0.41
Max Vel (ft/s):	1.47	1.57	1.83	1.89	1.93	1.94	3.32
Max Depth (ft):	0.39	0.37	0.34	0.33	0.32	0.32	0.22



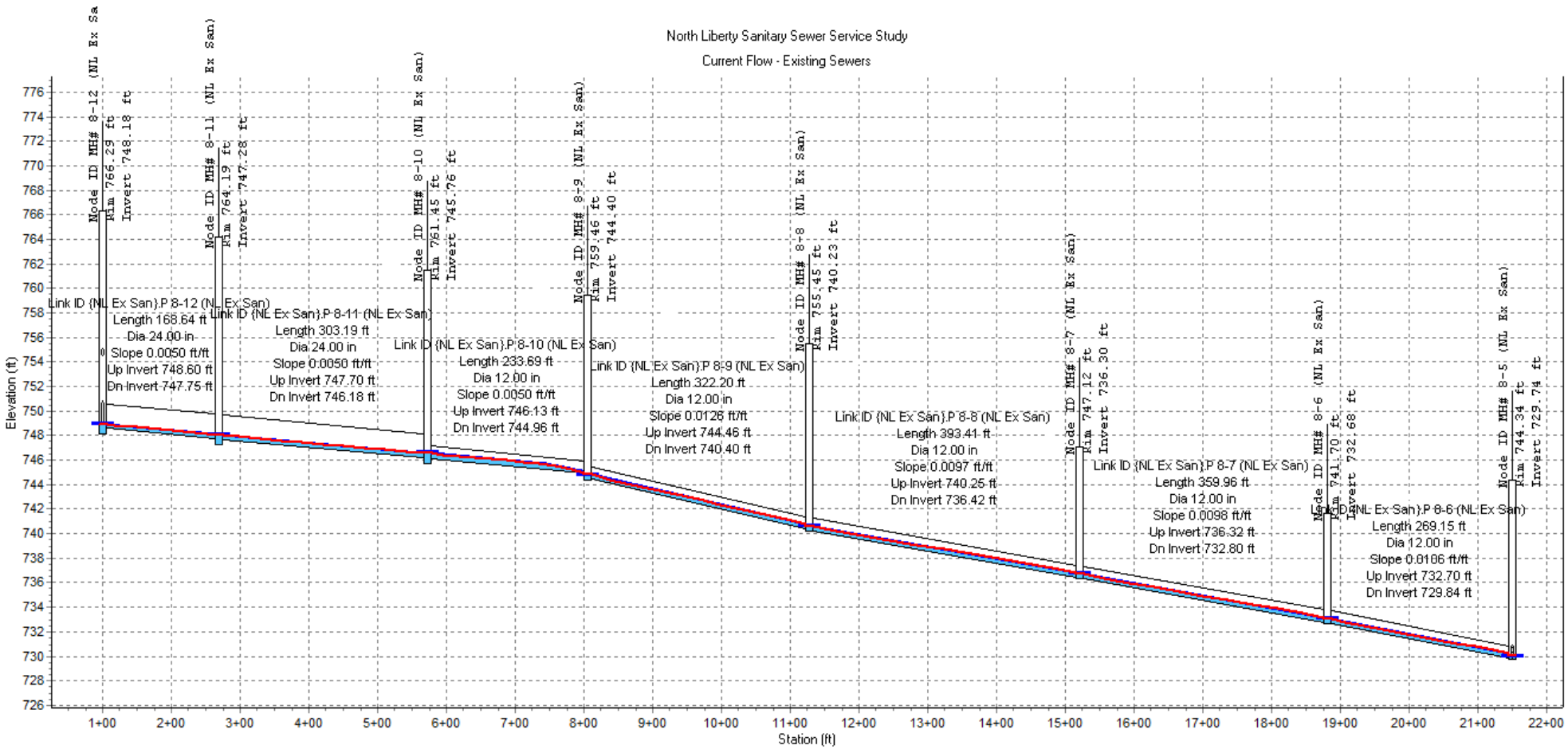
Node ID:		MH# 8-27 (NL Ex San)	MH# 8-26 (NL Ex San)	MH# 8-25 (NL Ex San)	MH# 8-24 (NL Ex San)	MH# 8-23 (NL Ex San)	
Rim (ft):	771.25	776.95	784.81	780.57	774.40	771.06	776.69
Invert (ft):	764.60	763.33	762.32	761.61	760.63	759.65	758.57
Min Pipe Cover (ft):	4.45	11.10	19.87	16.45	11.25	8.89	15.50
Max HGL (ft):	764.96	764.10	763.11	762.39	761.41	760.42	759.42

Link ID:		(NL Ex San).P 8-28 (NL Ex San)	(NL Ex San).P 8-27 (NL Ex San)	(NL Ex San).P 8-26 (NL Ex San)	(NL Ex San).P 8-25 (NL Ex San)	(NL Ex San).P 8-24 (NL Ex San)	(NL Ex San).P 8-22 (NL Ex San)	
Length (ft):		340.71	347.64	299.91	399.89	400.09	380.19	
Dia (in):		24.00	24.00	24.00	24.00	24.00	24.00	
Slope (ft/ft):		0.0022	0.0023	0.0021	0.0022	0.0022	0.0023	
Up Invert (ft):		764.60	763.75	762.74	762.03	761.05	760.07	
Dn Invert (ft):		763.85	762.94	762.12	761.15	760.17	759.19	
Max Q (mgd):		0.41	0.41	0.41	0.41	0.41	0.41	
Max Vel (ft/s):		1.99	2.03	1.95	1.99	1.99	2.02	
Max Depth (ft):		0.32	0.31	0.32	0.32	0.32	0.31	



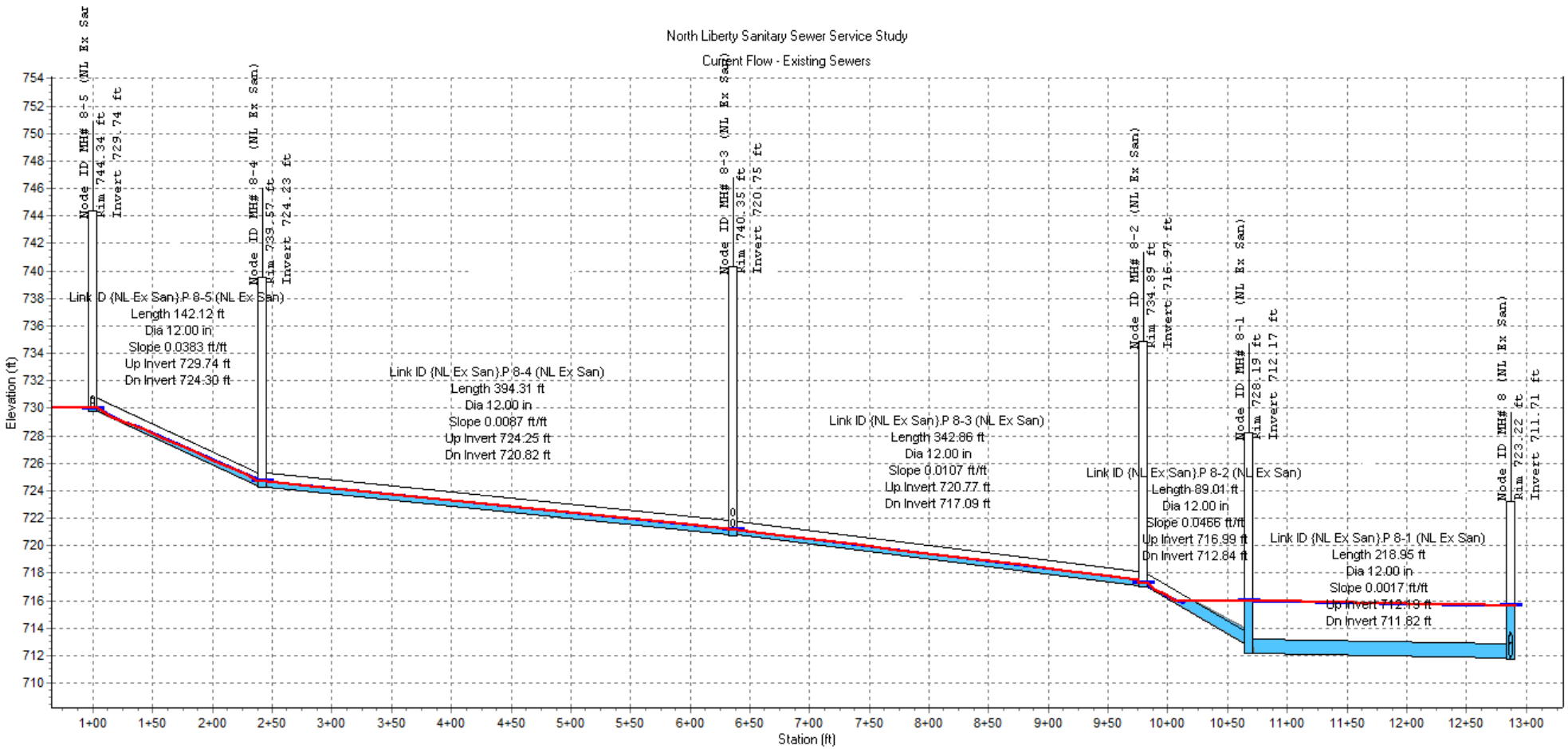
Node ID:		MH# 8-20 (NL Ex San)	MH# 8-19 (NL Ex San)	MH# 8-18 (NL Ex San)	MH# 8-17 (NL Ex San)	MH# 8-16 (NL Ex San)	MH# 8-15 (NL Ex San)	MH# 8-14 (NL Ex San)	MH# 8-13 (NL Ex San)	
Rim (ft):	776.69	772.15	779.54	776.95	778.40	780.30	773.22	764.95	764.05	766.29
Invert (ft):	758.57	757.48	756.39	755.30	754.49	753.78	752.38	751.50	749.63	748.18
Min Pipe Cover (ft):	15.50	12.15	20.63	19.13	21.71	24.52	18.32	11.03	11.35	11.18
Max HGL (ft):	759.42	758.33	757.24	756.15	754.87	754.21	753.23	752.11	750.42	748.95

Link ID:	{NL Ex San}.P 8-21 (NL Ex San)	{NL Ex San}.P 8-20 (NL Ex San)	{NL Ex San}.P 8-19 (NL Ex San)	{NL Ex San}.P 8-18 (NL Ex San)	{NL Ex San}.P 8-17 (NL Ex San)	{NL Ex San}.P 8-16 (NL Ex San)	{NL Ex San}.P 8-15 (NL Ex San)	{NL Ex San}.P 8-14 (NL Ex San)	{NL Ex San}.P 8-13 (NL Ex San)	
Length (ft):	450.34	450.31	450.48	468.15	277.63	400.02	400.03	207.83	314.42	
Dia (in):	24.00	24.00	24.00	24.00	24.00	24.00	24.00	24.00	24.00	
Slope (ft/ft):	0.0022	0.0022	0.0022	0.0022	0.0026	0.0022	0.0022	0.0051	0.0040	
Up Invert (ft):	758.99	757.90	756.81	755.72	754.49	753.78	752.80	751.76	750.05	
Dn Invert (ft):	758.00	756.91	755.82	754.69	753.78	752.90	751.92	750.70	748.80	
Max Q (mgd):	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.66	0.66	
Max Vel (ft/s):	2.19	2.19	2.19	2.20	1.99	2.19	2.20	2.80	2.66	
Max Depth (ft):	0.38	0.38	0.38	0.38	0.40	0.38	0.38	0.35	0.36	



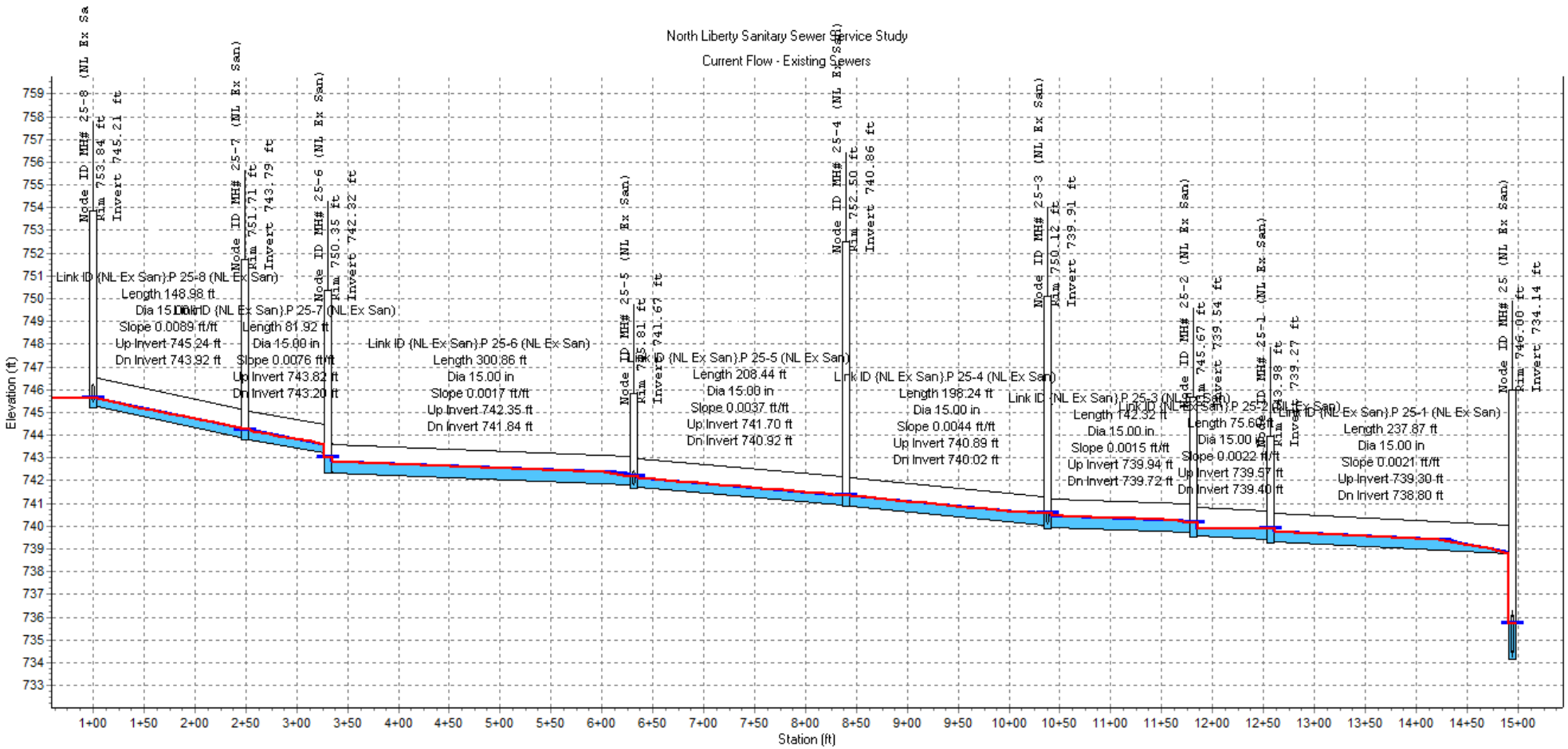
Node ID:	MH# 8-11 (NL Ex San)	MH# 8-10 (NL Ex San)	MH# 8-9 (NL Ex San)	MH# 8-8 (NL Ex San)	MH# 8-7 (NL Ex San)	MH# 8-6 (NL Ex San)	
Rim (ft):	766.29	764.19	761.45	759.46	755.45	747.12	741.70	744.34
Invert (ft):	748.18	747.28	745.76	744.40	740.23	736.30	732.68	729.74
Min Pipe Cover (ft):	11.18	14.44	13.27	13.50	14.05	9.70	7.90	13.42
Max HGL (ft):	748.95	748.04	746.59	744.81	740.62	736.70	733.07	730.00

Link ID:	{NL Ex San}.P 8-12 (NL Ex San)	{NL Ex San}.P 8-11 (NL Ex San)	{NL Ex San}.P 8-10 (NL Ex San)	{NL Ex San}.P 8-9 (NL Ex San)	{NL Ex San}.P 8-8 (NL Ex San)	{NL Ex San}.P 8-7 (NL Ex San)	{NL Ex San}.P 8-6 (NL Ex San)	
Length (ft):	168.64	303.19	233.69	322.20	393.41	359.96	269.15	
Dia (in):	24.00	24.00	12.00	12.00	12.00	12.00	12.00	
Slope (ft/ft):	0.0050	0.0050	0.0050	0.0126	0.0097	0.0098	0.0106	
Up Invert (ft):	748.60	747.70	746.13	744.46	740.25	736.32	732.70	
Dn Invert (ft):	747.75	746.18	744.96	740.40	736.42	732.80	729.84	
Max Q (mgd):	0.66	0.66	0.66	0.66	0.66	0.66	0.66	
Max Vel (ft/s):	2.77	2.47	3.03	4.20	3.83	3.83	3.93	
Max Depth (ft):	0.35	0.38	0.44	0.35	0.37	0.37	0.37	



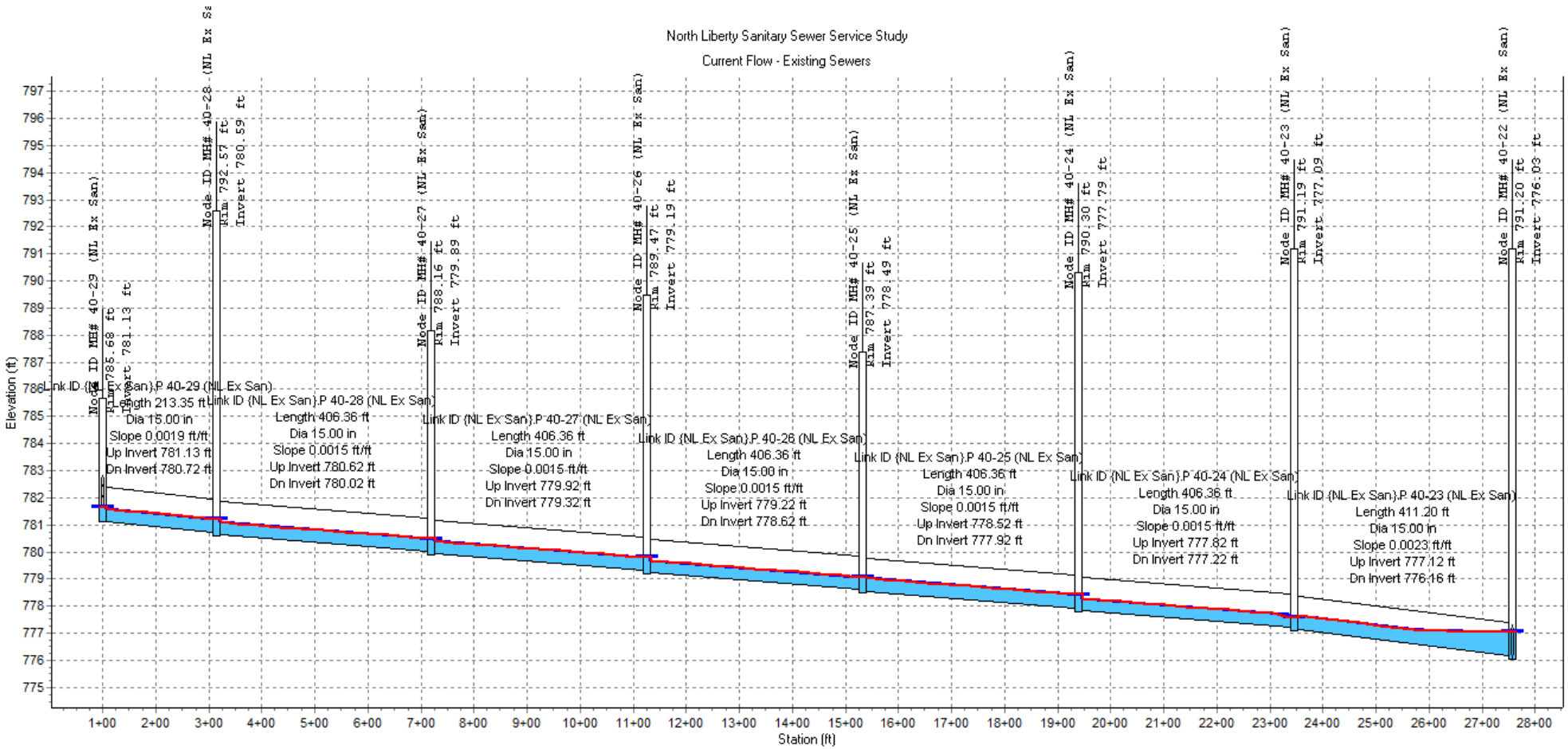
Node ID:		MH# 8-4 (NL Ex San)	MH# 8-3 (NL Ex San)	MH# 8-2 (NL Ex San)	MH# 8-1 (NL Ex San)	
Rim (ft):	744.34	739.57	740.35	734.89	728.19	723.22
Invert (ft):	729.74	724.23	720.75	716.97	712.17	711.71
Min Pipe Cover (ft):	13.42	14.27	17.63	16.80	14.35	9.51
Max HGL (ft):	730.00	724.65	721.18	717.26	715.93	715.63

Link ID:	{NL Ex San}.P 8-5 (NL Ex San)	{NL Ex San}.P 8-4 (NL Ex San)	{NL Ex San}.P 8-3 (NL Ex San)	{NL Ex San}.P 8-2 (NL Ex San)	{NL Ex San}.P 8-1 (NL Ex San)
Length (ft):	142.12	394.31	342.86	89.01	218.95
Dia (in):	12.00	12.00	12.00	12.00	12.00
Slope (ft/ft):	0.0383	0.0087	0.0107	0.0466	0.0017
Up Invert (ft):	729.74	724.25	720.77	716.99	712.19
Dn Invert (ft):	724.30	720.82	717.09	712.84	711.82
Max Q (mgd):	0.69	0.69	0.80	0.80	0.80
Max Vel (ft/s):	5.24	3.71	4.17	2.35	1.58
Max Depth (ft):	0.31	0.39	0.40	0.64	1.00



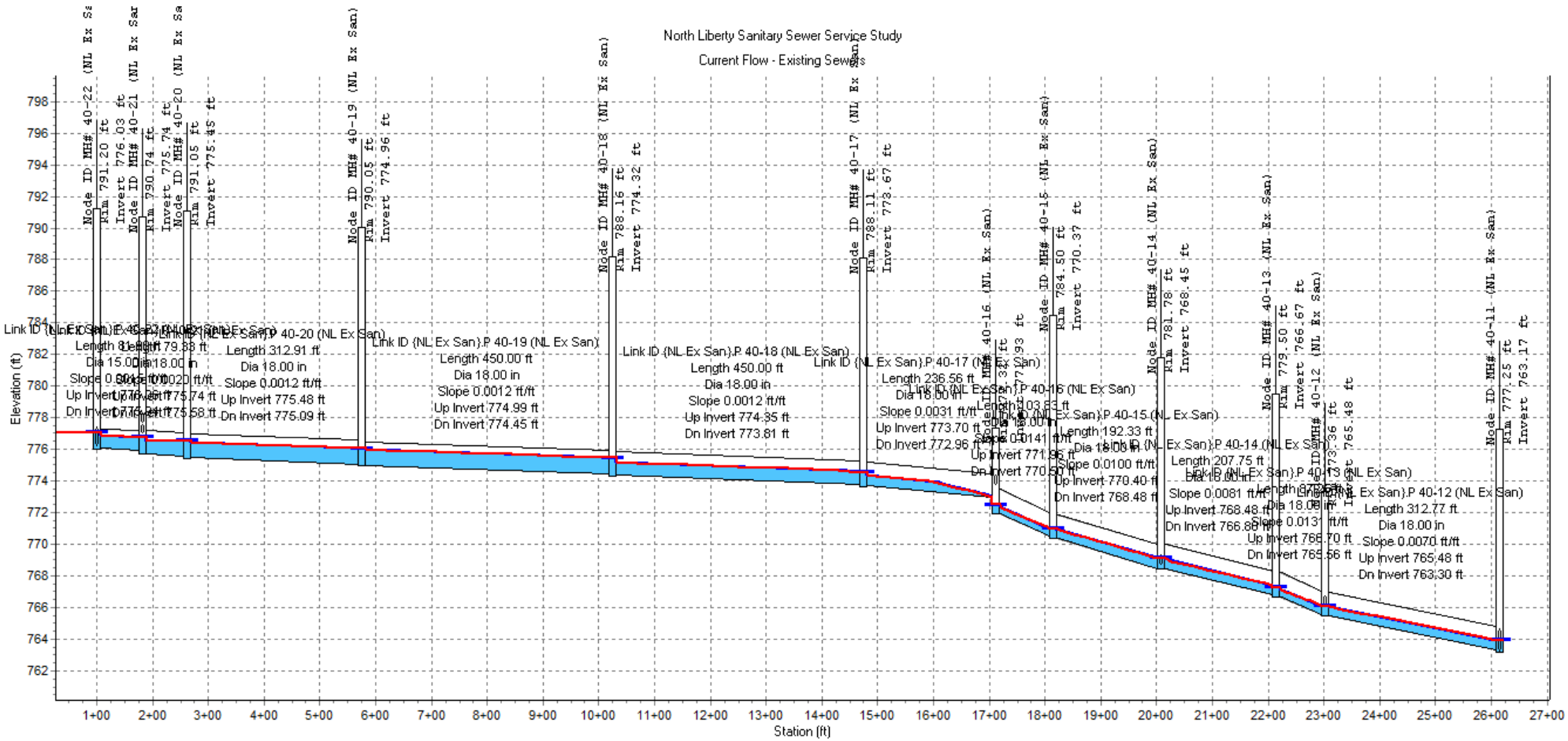
Node ID:		MH# 25-7 (NL Ex San)	MH# 25-6 (NL Ex San)	MH# 25-5 (NL Ex San)	MH# 25-4 (NL Ex San)	MH# 25-3 (NL Ex San)	MH# 25-2 (NL Ex San)	MH# 25-1 (NL Ex San)	
Rim (ft):	753.84	751.71	750.35	745.81	752.50	750.12	745.67	743.98	746.00
Invert (ft):	745.21	743.79	742.32	741.67	740.86	739.91	739.54	739.27	734.14
Min Pipe Cover (ft):	7.35	6.54	5.90	2.72	10.33	8.85	4.70	3.33	5.95
Max HGL (ft):	745.63	744.24	743.00	742.20	741.34	740.58	740.16	739.90	735.72

Link ID:	(NL Ex San).P 25-8 (NL Ex San)	(NL Ex San).P 25-7 (NL Ex San)	(NL Ex San).P 25-6 (NL Ex San)	(NL Ex San).P 25-5 (NL Ex San)	(NL Ex San).P 25-4 (NL Ex San)	(NL Ex San).P 25-3 (NL Ex San)	(NL Ex San).P 25-2 (NL Ex San)	(NL Ex San).P 25-1 (NL Ex San)	
Length (ft):	148.98	81.92	300.86	208.44	198.24	142.32	75.60	237.87	
Dia (in):	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	
Slope (ft/ft):	0.0089	0.0076	0.0017	0.0037	0.0044	0.0015	0.0022	0.0021	
Up Invert (ft):	745.24	743.82	742.35	741.70	740.89	739.94	739.57	739.30	
Dn Invert (ft):	743.92	743.20	741.84	740.92	740.02	739.72	739.40	738.80	
Max Q (mgd):	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	
Max Vel (ft/s):	3.72	3.42	2.32	2.86	2.54	2.32	2.28	2.47	
Max Depth (ft):	0.38	0.41	0.54	0.46	0.50	0.54	0.55	0.52	



Node ID:		MH# 40-28 (NL Ex San)	MH# 40-27 (NL Ex San)	MH# 40-26 (NL Ex San)	MH# 40-25 (NL Ex San)	MH# 40-24 (NL Ex San)	MH# 40-23 (NL Ex San)	
Rim (ft):	785.68	792.57	788.16	789.47	787.39	790.30	791.19	791.20
Invert (ft):	781.13	780.59	779.89	779.19	778.49	777.79	777.09	776.03
Min Pipe Cover (ft):	2.86	10.60	6.89	8.90	7.52	11.13	12.72	13.79
Max HGL (ft):	781.66	781.20	780.49	779.80	779.08	778.43	777.59	777.04

Link ID:	(NL Ex San).P 40-29 (NL Ex San)	(NL Ex San).P 40-28 (NL Ex San)	(NL Ex San).P 40-27 (NL Ex San)	(NL Ex San).P 40-26 (NL Ex San)	(NL Ex San).P 40-25 (NL Ex San)	(NL Ex San).P 40-24 (NL Ex San)	(NL Ex San).P 40-23 (NL Ex San)
Length (ft):	213.35	406.36	406.36	406.36	406.36	406.36	411.20
Dia (in):	15.00	15.00	15.00	15.00	15.00	15.00	15.00
Slope (ft/ft):	0.0019	0.0015	0.0015	0.0015	0.0015	0.0015	0.0023
Up Invert (ft):	781.13	780.62	779.92	779.22	778.52	777.82	777.12
Dn Invert (ft):	780.72	780.02	779.32	778.62	777.92	777.22	776.16
Max Q (mgd):	0.61	0.61	0.61	0.61	0.61	0.61	0.61
Max Vel (ft/s):	2.03	1.92	1.90	1.93	1.86	2.07	1.39
Max Depth (ft):	0.50	0.53	0.53	0.52	0.54	0.50	0.68

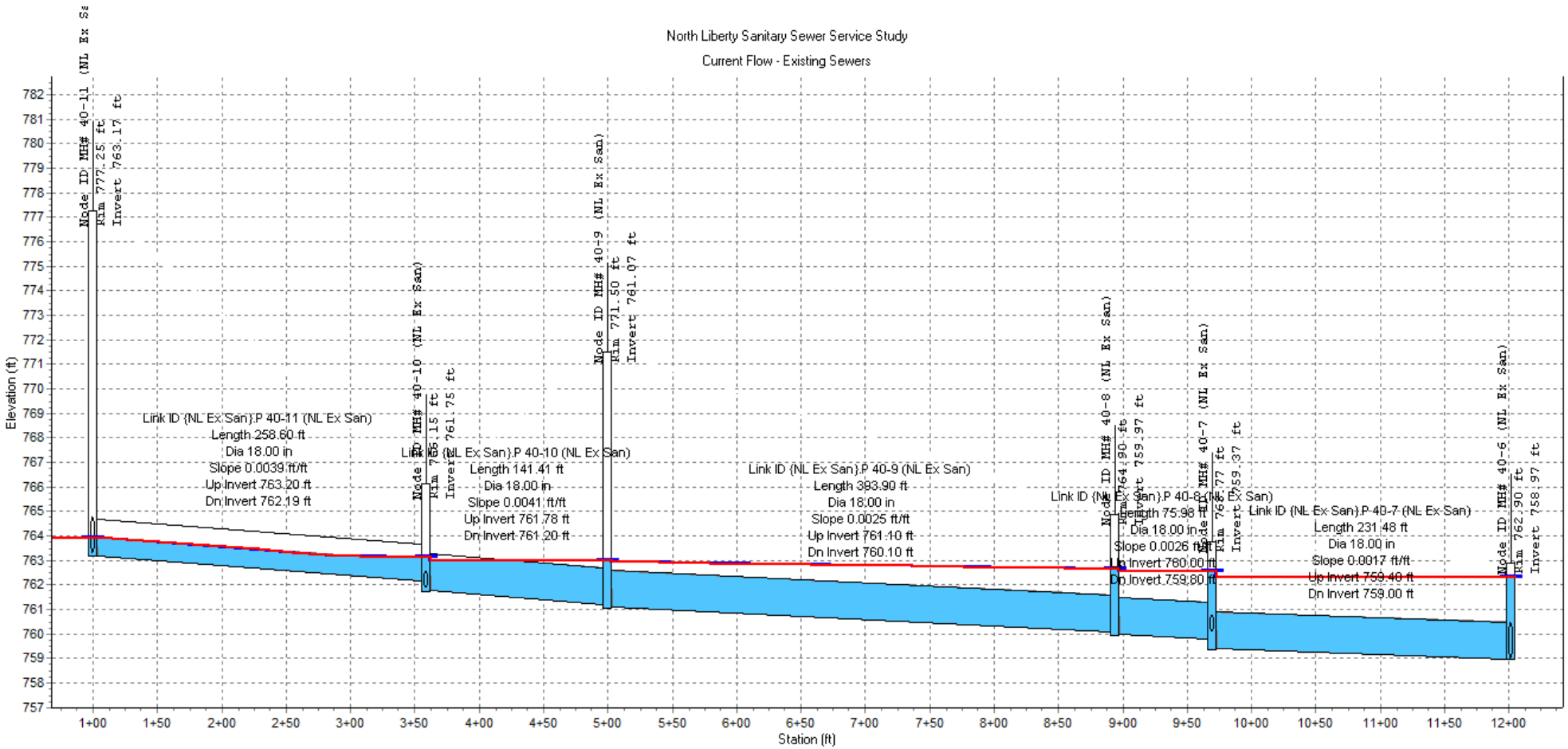


Node ID:	MH# 40-22 (NL Ex San)	MH# 40-21 (NL Ex San)	MH# 40-20 (NL Ex San)	MH# 40-19 (NL Ex San)	MH# 40-18 (NL Ex San)	MH# 40-17 (NL Ex San)	MH# 40-16 (NL Ex San)	MH# 40-15 (NL Ex San)	MH# 40-14 (NL Ex San)	MH# 40-13 (NL Ex San)	MH# 40-12 (NL Ex San)	MH# 40-11 (NL Ex San)
Rim (ft):	791.20	790.74	791.05	790.05	788.16	788.11	777.32	784.50	781.78	779.50	773.36	777.25
Invert (ft):	776.03	775.74	775.45	774.96	774.32	773.67	771.93	770.37	768.45	766.67	765.48	763.17
Min Pipe Cover (ft):	13.79	12.41	13.97	13.46	12.21	12.80	2.87	12.50	11.80	11.20	6.30	12.45
Max HGL (ft):	777.04	776.74	776.54	776.06	775.46	774.51	772.50	770.96	769.09	767.26	766.10	763.90

Link ID:	(NL Ex San).P 40-21 (NL Ex San)	(NL Ex San).P 40-20 (NL Ex San)	(NL Ex San).P 40-19 (NL Ex San)	(NL Ex San).P 40-18 (NL Ex San)	(NL Ex San).P 40-17 (NL Ex San)	(NL Ex San).P 40-16 (NL Ex San)	(NL Ex San).P 40-15 (NL Ex San)	(NL Ex San).P 40-14 (NL Ex San)	(NL Ex San).P 40-13 (NL Ex San)	(NL Ex San).P 40-12 (NL Ex San)
Length (ft):	81.90	79.33	312.91	450.00	450.00	236.56	103.83	192.33	207.75	87.25	312.77
Dia (in):	15.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00
Slope (ft/ft):	0.0015	0.0020	0.0012	0.0012	0.0012	0.0031	0.0141	0.0100	0.0081	0.0131	0.0070
Up Invert (ft):	776.06	775.74	775.48	774.99	774.35	773.70	771.96	770.40	768.48	766.70	765.48
Dn Invert (ft):	775.94	775.58	775.09	774.45	773.81	772.96	770.50	768.48	766.80	765.56	763.30
Max Q (mgd):	1.56	1.89	1.89	1.89	1.89	1.89	1.89	1.89	1.89	1.89	1.89
Max Vel (ft/s):	2.57	2.39	2.30	2.23	2.60	3.41	5.38	4.56	4.53	4.97	4.32
Max Depth (ft):	0.89	0.98	1.01	1.04	0.91	0.73	0.52	0.59	0.59	0.55	0.61

North Liberty Sanitary Sewer Service Study

Current Flow - Existing Sewers

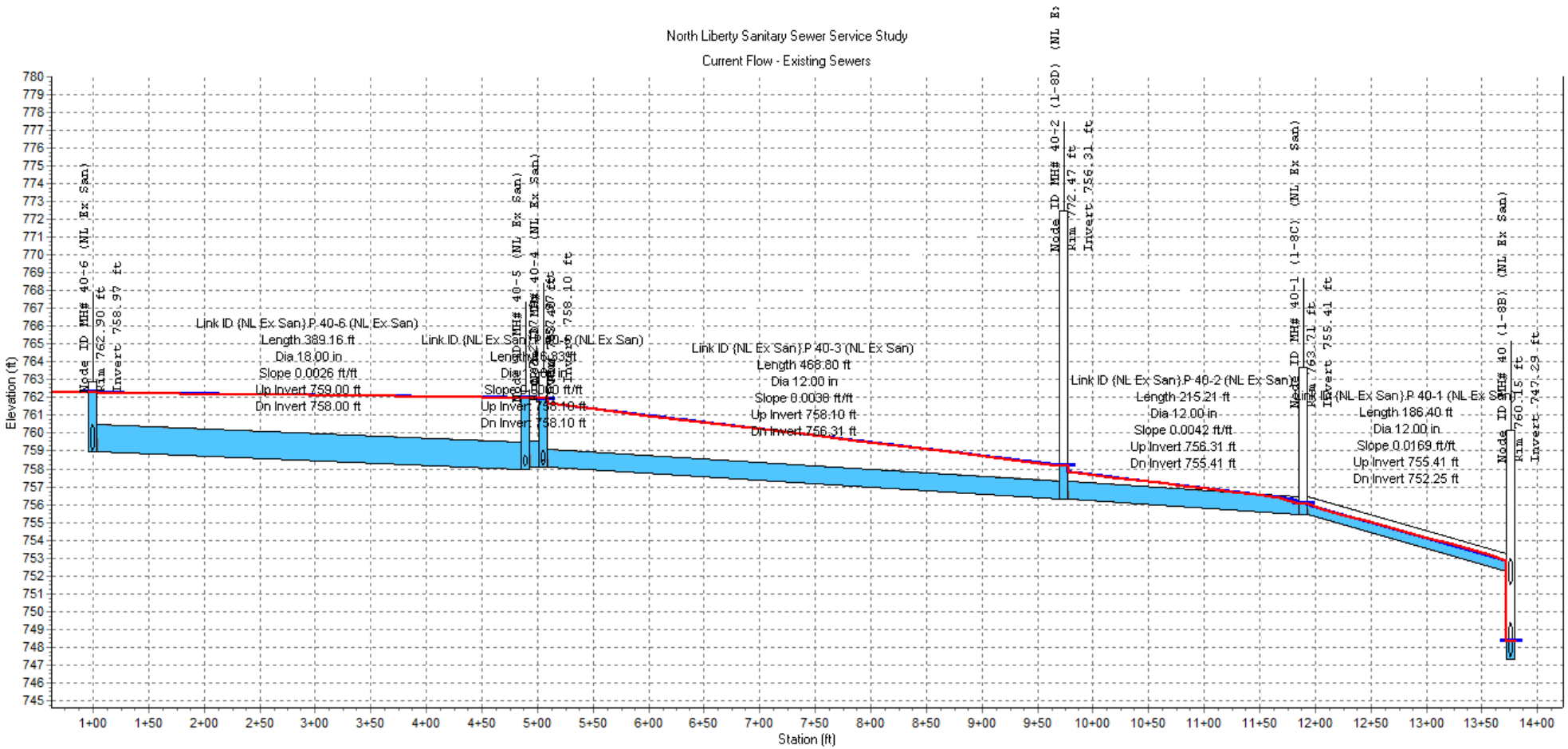


Node ID:		MH# 40-10 (NL Ex San)	MH# 40-9 (NL Ex San)	MH# 40-8 (NL Ex San)	MH# 40-7 (NL Ex San)	
Rim (ft):	777.25	766.15	771.50	764.90	763.77	762.90
Invert (ft):	763.17	761.75	761.07	759.97	759.37	758.97
Min Pipe Cover (ft):	12.45	2.46	8.80	3.30	2.47	2.40
Max HGL (ft):	763.90	763.13	763.00	762.65	762.55	762.33

Link ID:	(NL Ex San).P 40-11 (NL Ex San)	(NL Ex San).P 40-10 (NL Ex San)	(NL Ex San).P 40-9 (NL Ex San)	(NL Ex San).P 40-8 (NL Ex San)	(NL Ex San).P 40-7 (NL Ex San)
Length (ft):	258.60	141.41	393.90	75.98	231.48
Dia (in):	18.00	18.00	18.00	18.00	18.00
Slope (ft/ft):	0.0039	0.0041	0.0025	0.0026	0.0017
Up Invert (ft):	763.20	761.78	761.10	760.00	759.40
Dn Invert (ft):	762.19	761.20	760.10	759.80	759.00
Max Q (mgd):	1.89	1.89	1.89	1.89	1.89
Max Vel (ft/s):	2.94	1.68	1.65	1.65	1.65
Max Depth (ft):	0.82	1.43	1.50	1.50	1.50

North Liberty Sanitary Sewer Service Study

Current Flow - Existing Sewers

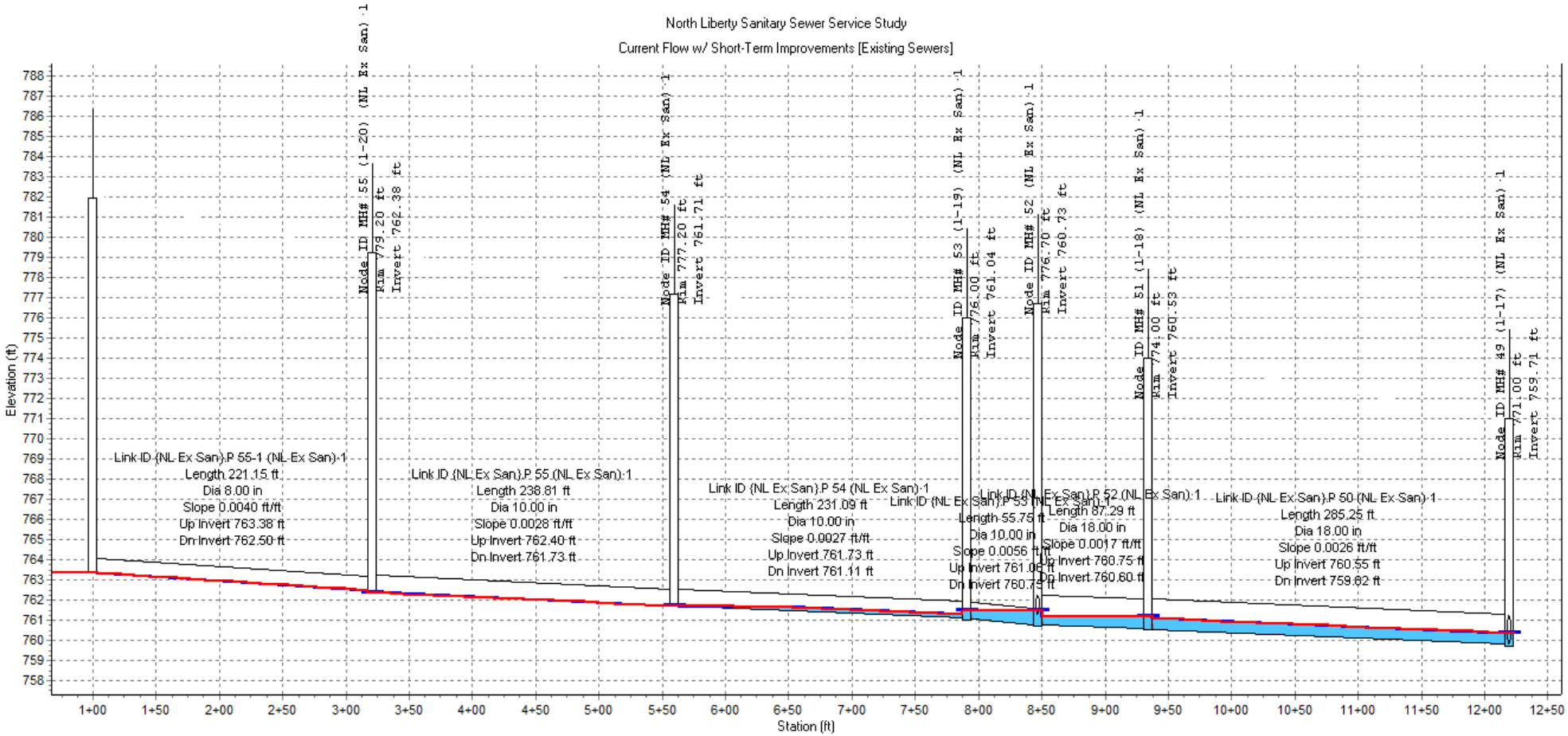


Node ID:		MH# 40-6 (NL Ex San)	MH# 40-5 (NL Ex San)	MH# 40-2 (1-8D) (NL Ex San)	MH# 40-1 (1-8C) (NL Ex San)	
Rim (ft):	762.90	762.90	763.40	772.47	763.71	760.15
Invert (ft):	758.97	757.98	758.10	756.31	755.41	747.29
Min Pipe Cover (ft):	2.40	2.72	2.80	15.16	7.30	6.90
Max HGL (ft):	762.33	761.61	761.94	758.18	756.05	748.32

Link ID:	{NL Ex San}.P 40-6 (NL Ex San)	{NL Ex San}.P 40-5 (NL Ex San)	{NL Ex San}.P 40-3 (NL Ex San)	{NL Ex San}.P 40-2 (NL Ex San)	{NL Ex San}.P 40-1 (NL Ex San)
Length (ft):	389.16	16.33	468.80	215.21	186.40
Dia (in):	18.00	18.00	12.00	12.00	12.00
Slope (ft/ft):	0.0026	0.0000	0.0038	0.0042	0.0169
Up Invert (ft):	759.00	758.10	758.10	756.31	755.41
Dn Invert (ft):	758.00	758.10	756.31	755.41	752.25
Max Q (mgd):	1.90	1.85	2.00	2.00	2.00
Max Vel (ft/s):	1.66	1.62	3.93	4.48	6.05
Max Depth (ft):	1.50	1.50	1.00	0.82	0.62

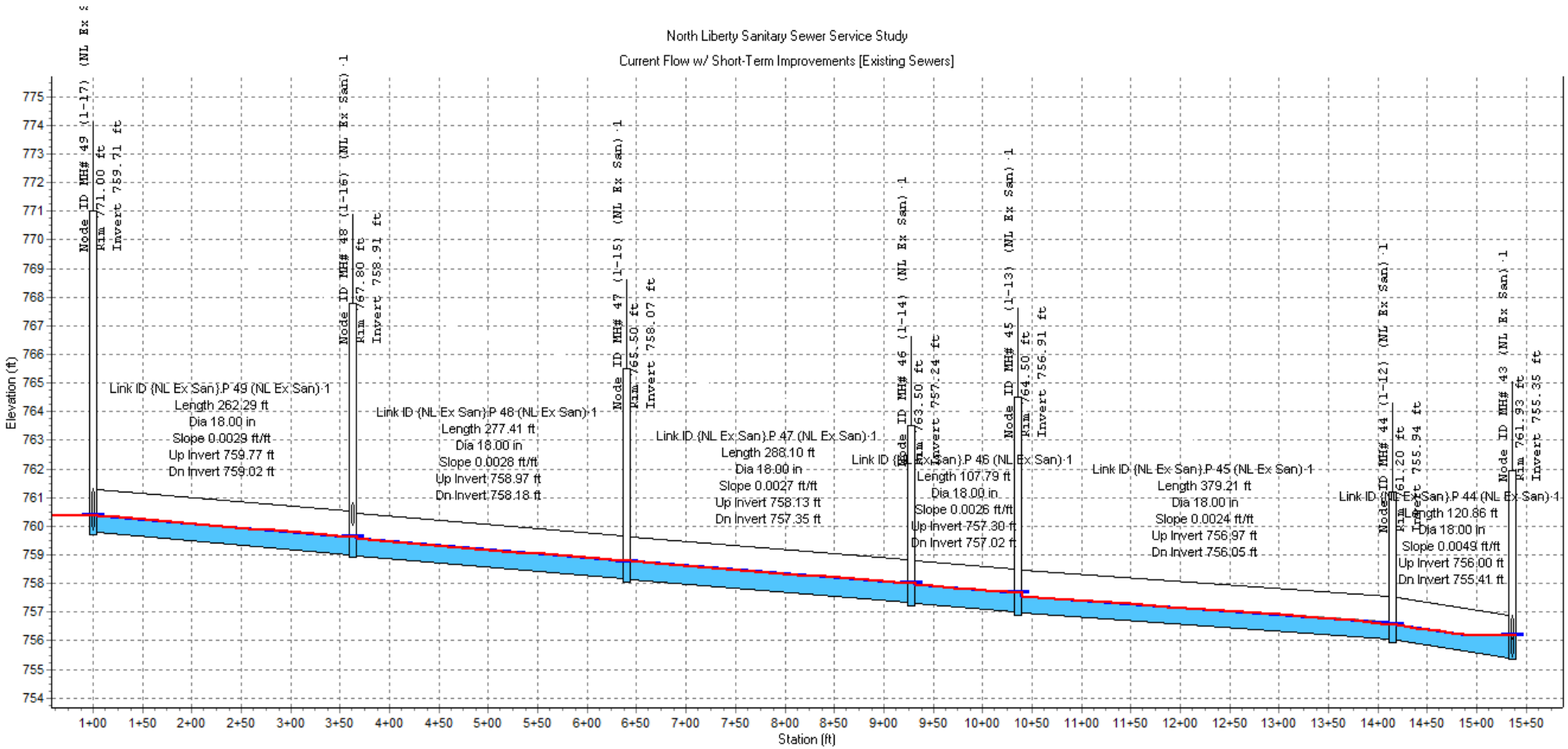
North Liberty Sanitary Sewer Service Study

Current Flow w/ Short-Term Improvements [Existing Sewers]



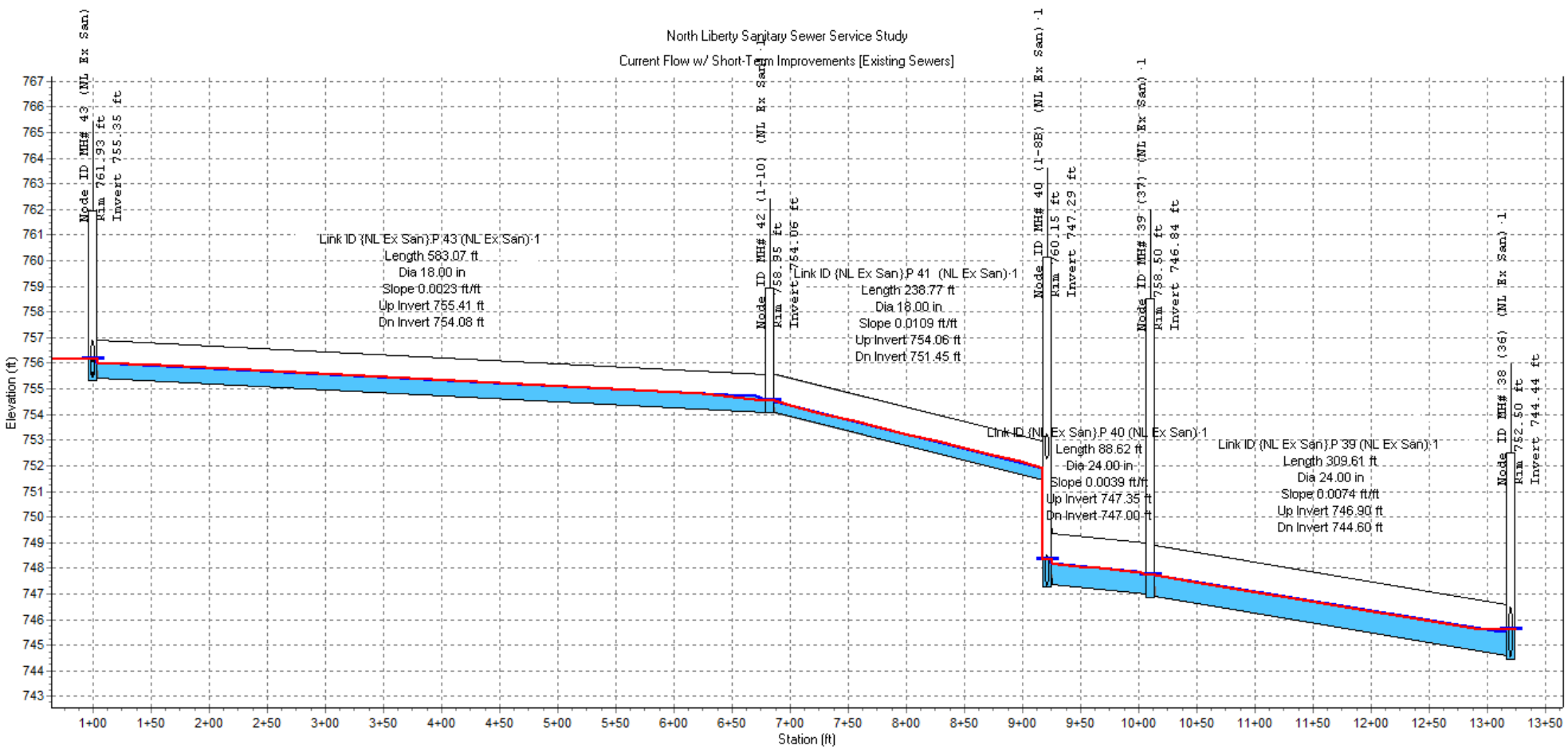
Node ID:		MH# 55 (1-20) (NL Ex San) 1	MH# 54 (NL Ex San) 1	MH# 53 (1-19) (NL Ex San) 1	MH# 52 (NL Ex San) 1	MH# 51 (1-18) (NL Ex San) 1	
Rim (ft):	781.91	779.20	777.20	776.00	776.70	774.00	771.00
Invert (ft):	763.36	762.38	761.71	761.04	760.73	760.53	759.71
Min Pipe Cover (ft):	17.86	15.97	14.64	14.06	14.43	11.90	9.68
Max HGL (ft):	763.36	762.38	761.71	761.47	761.47	761.20	760.38

Link ID:	(NL Ex San).P 55-1 (NL Ex San) 1	(NL Ex San).P 55 (NL Ex San) 1	(NL Ex San).P 54 (NL Ex San) 1	(NL Ex San).P 53 (NL Ex San) 1	(NL Ex San).P 52 (NL Ex San) 1	(NL Ex San).P 50 (NL Ex San) 1
Length (ft):	221.15	238.81	231.09	55.75	87.29	285.25
Dia (in):	8.00	10.00	10.00	10.00	18.00	18.00
Slope (ft/ft):	0.0040	0.0028	0.0027	0.0056	0.0017	0.0026
Up Invert (ft):	763.38	762.40	761.73	761.06	760.75	760.55
Dn Invert (ft):	762.50	761.73	761.11	760.75	760.60	759.82
Max Q (mgd):	0.00	0.00	0.00	0.00	1.14	1.18
Max Vel (ft/s):	0.00	0.00	0.00	0.00	2.37	2.72
Max Depth (ft):	0.00	0.00	0.18	0.56	0.66	0.61



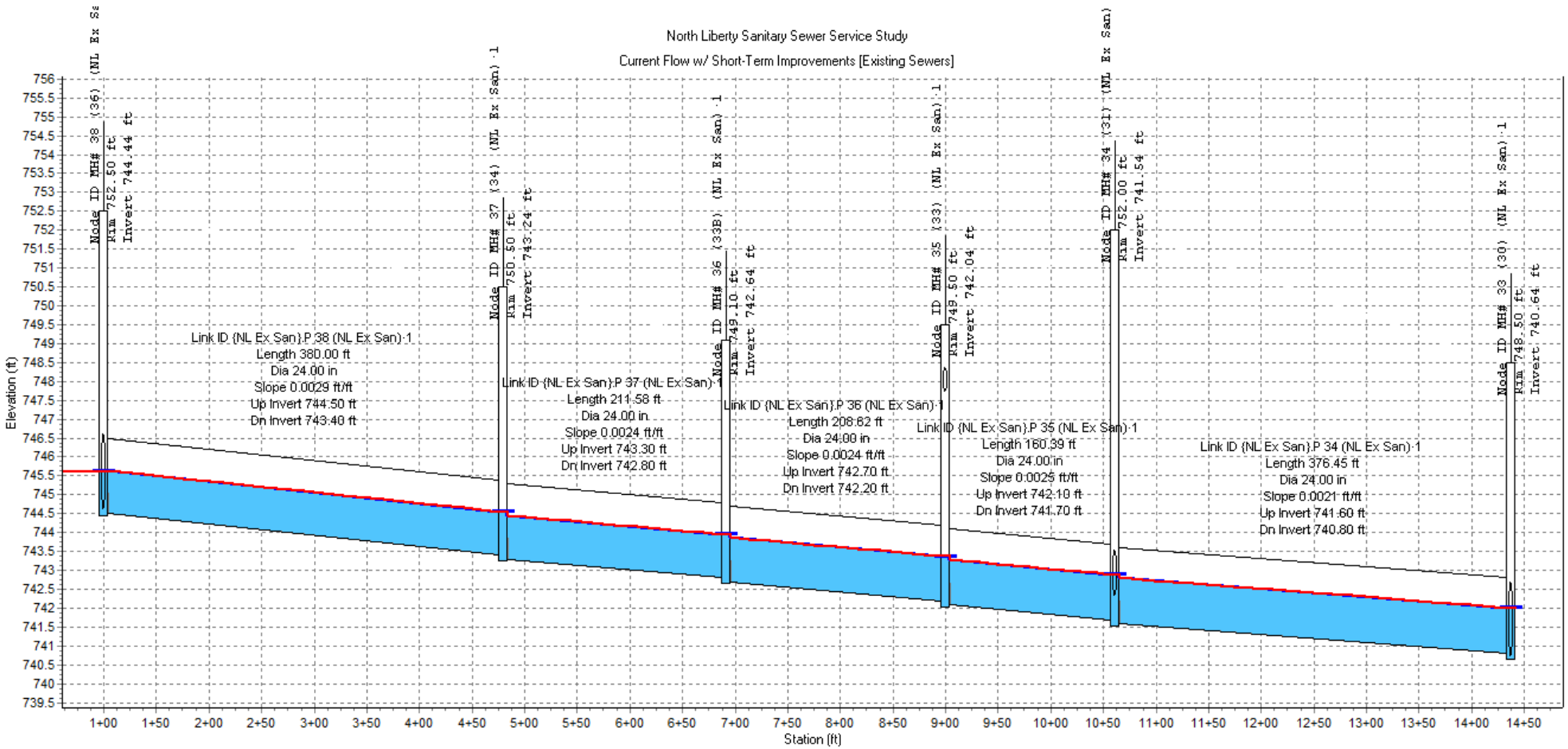
Node ID:		MH# 48 (1-16) (NL Ex San)·1	MH# 47 (1-15) (NL Ex San)·1	MH# 46 (1-14) (NL Ex San)·1	MH# 45 (1-13) (NL Ex San)·1	MH# 44 (1-12) (NL Ex San)·1	
Rim (ft):	771.00	767.80	765.50	763.50	764.50	761.20	761.93
Invert (ft):	759.71	758.91	758.07	757.24	756.91	755.94	755.35
Min Pipe Cover (ft):	9.68	6.97	5.82	4.65	5.98	3.65	5.02
Max HGL (ft):	760.38	759.63	758.78	758.00	757.67	756.55	756.18

Link ID:	(NL Ex San).P 49 (NL Ex San)·1	(NL Ex San).P 48 (NL Ex San)·1	(NL Ex San).P 47 (NL Ex San)·1	(NL Ex San).P 46 (NL Ex San)·1	(NL Ex San).P 45 (NL Ex San)·1	(NL Ex San).P 44 (NL Ex San)·1
Length (ft):	262.29	277.41	288.10	107.79	379.21	120.86
Dia (in):	18.00	18.00	18.00	18.00	18.00	18.00
Slope (ft/ft):	0.0029	0.0028	0.0027	0.0026	0.0024	0.0049
Up Invert (ft):	759.77	758.97	758.13	757.30	756.97	756.00
Dn Invert (ft):	759.02	758.18	757.35	757.02	756.05	755.41
Max Q (mgd):	1.18	1.29	1.29	1.29	1.29	1.29
Max Vel (ft/s):	2.69	2.83	2.69	2.56	2.90	2.68
Max Depth (ft):	0.61	0.63	0.66	0.68	0.62	0.66



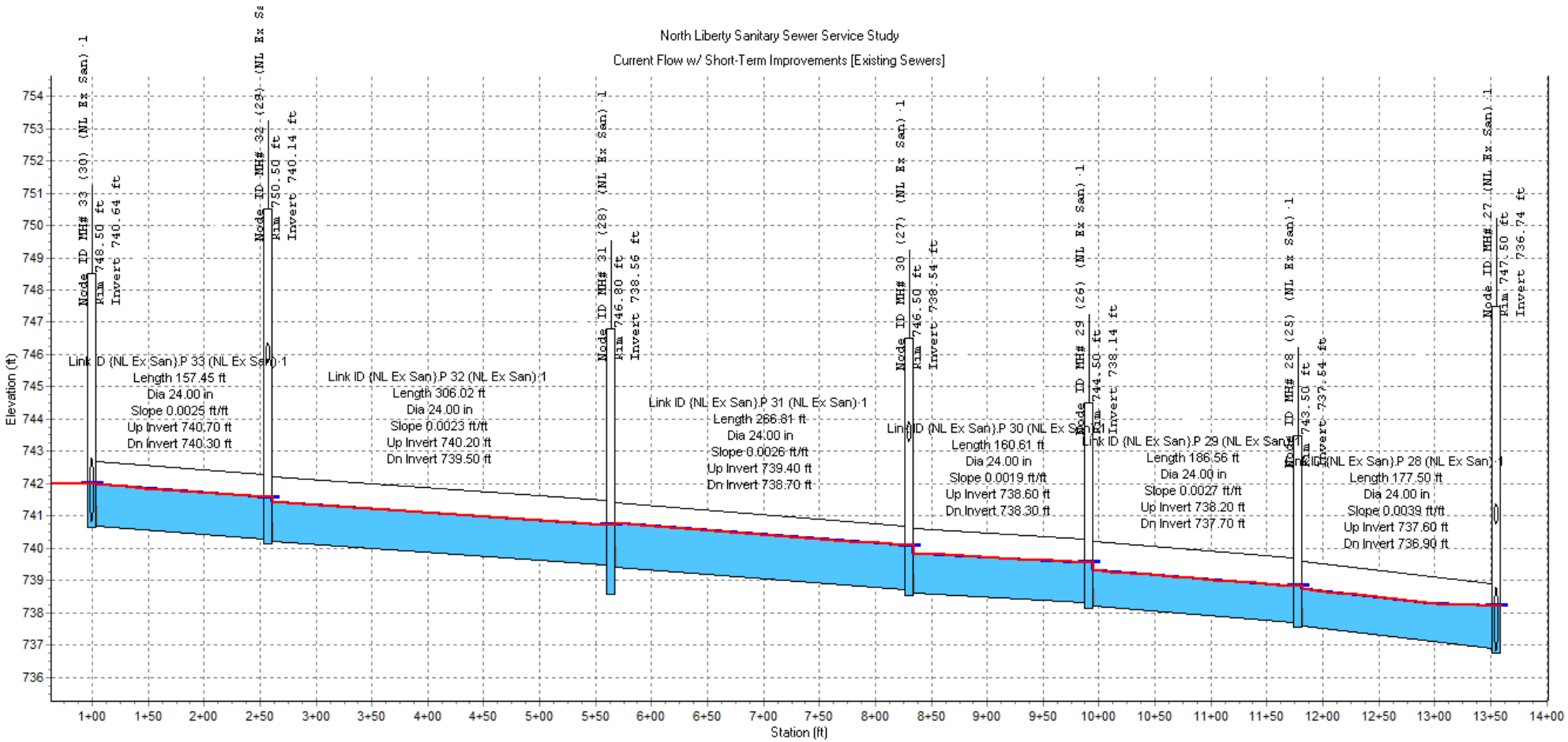
Node ID:		MH# 42 (1-10) (NL Ex San)·1	MH# 40 (1-8B) (NL Ex San)·1	MH# 39 (37) (NL Ex San)·1	
Rim (ft):	761.93	758.95	760.15	758.50	752.50
Invert (ft):	755.35	754.06	747.29	746.84	744.44
Min Pipe Cover (ft):	5.02	3.37	6.90	9.50	5.90
Max HGL (ft):	756.18	754.53	748.36	747.73	745.62

Link ID:	{NL Ex San}.P 43 (NL Ex San)·1	{NL Ex San}.P 41 (NL Ex San)·1	{NL Ex San}.P 40 (NL Ex San)·1	{NL Ex San}.P 39 (NL Ex San)·1
Length (ft):	583.07	238.77	88.62	309.61
Dia (in):	18.00	18.00	24.00	24.00
Slope (ft/ft):	0.0023	0.0109	0.0039	0.0074
Up Invert (ft):	755.41	754.06	747.35	746.90
Dn Invert (ft):	754.08	751.45	747.00	744.60
Max Q (mgd):	1.43	1.43	3.65	4.30
Max Vel (ft/s):	2.92	4.72	3.98	4.67
Max Depth (ft):	0.66	0.47	0.92	0.93



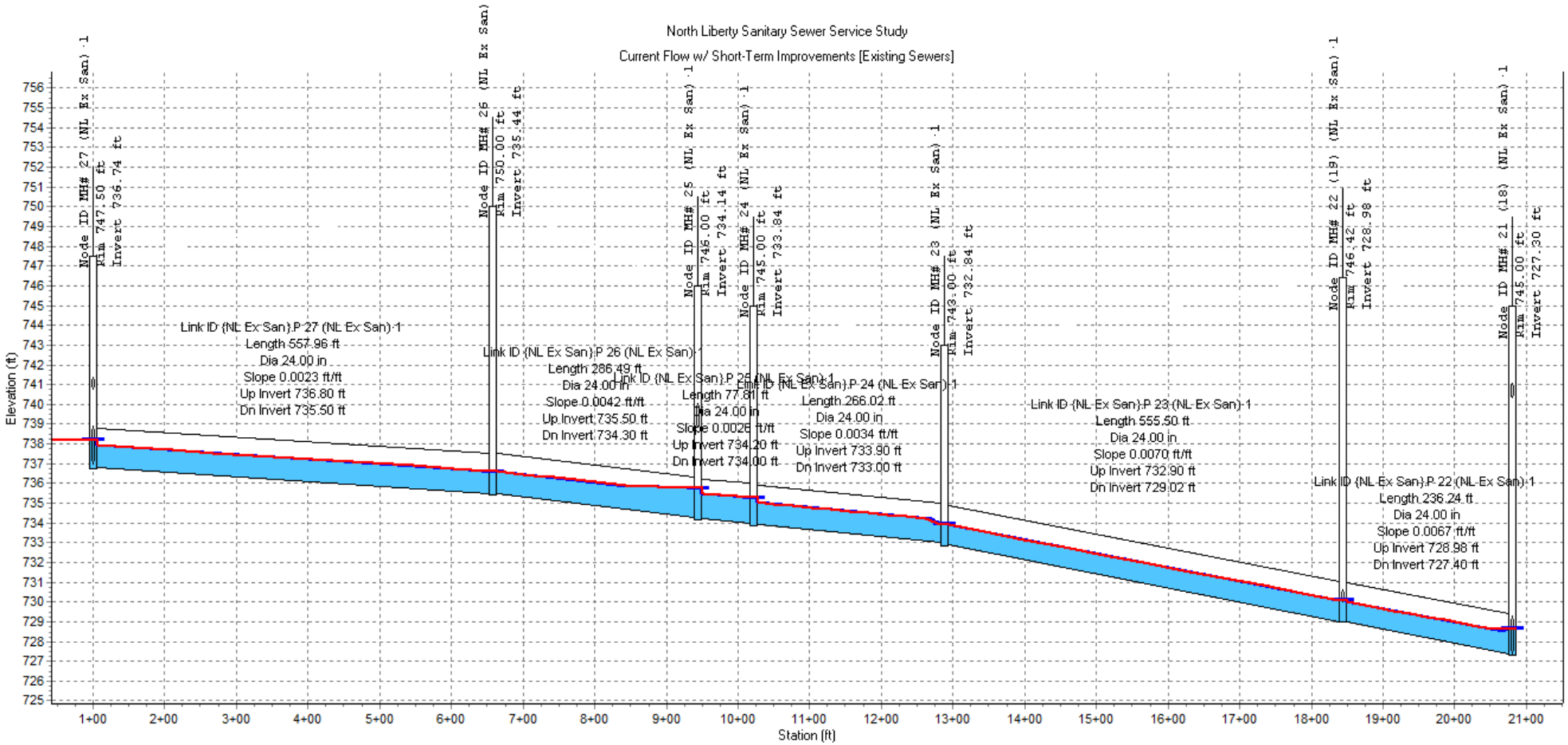
Node ID:		MH# 37 (34) (NL Ex San) 1	MH# 36 (33B) (NL Ex San) 1	MH# 35 (33) (NL Ex San) 1	MH# 34 (31) (NL Ex San) 1	
Rim (ft):	752.50	750.50	749.10	749.50	752.00	748.50
Invert (ft):	744.44	743.24	742.64	742.04	741.54	740.64
Min Pipe Cover (ft):	5.90	5.10	4.30	1.13	8.30	5.70
Max HGL (ft):	745.62	744.55	743.95	743.37	742.89	742.00

Link ID:	(NL Ex San).P 38 (NL Ex San) 1	(NL Ex San).P 37 (NL Ex San) 1	(NL Ex San).P 36 (NL Ex San) 1	(NL Ex San).P 35 (NL Ex San) 1	(NL Ex San).P 34 (NL Ex San) 1
Length (ft):	380.00	211.58	208.62	160.39	376.45
Dia (in):	24.00	24.00	24.00	24.00	24.00
Slope (ft/ft):	0.0029	0.0024	0.0024	0.0025	0.0021
Up Invert (ft):	744.50	743.30	742.70	742.10	741.60
Dn Invert (ft):	743.40	742.80	742.20	741.70	740.80
Max Q (mgd):	4.30	4.30	4.30	4.35	4.46
Max Vel (ft/s):	3.61	3.37	3.34	3.32	3.35
Max Depth (ft):	1.14	1.20	1.21	1.23	1.25



Node ID:		MH# 32 (29) (NL Ex San)-1	MH# 31 (28) (NL Ex San)-1	MH# 30 (27) (NL Ex San)-1	MH# 29 (26) (NL Ex San)-1	MH# 28 (25) (NL Ex San)-1	
Rim (ft):	748.50	750.50	746.80	746.50	744.50	743.50	747.50
Invert (ft):	740.64	740.14	738.56	738.54	738.14	737.54	736.74
Min Pipe Cover (ft):	5.70	4.13	5.30	2.56	4.20	3.80	6.12
Max HGL (ft):	742.00	741.58	740.73	740.09	739.55	738.82	738.21

Link ID:	(NL Ex San).P 33 (NL Ex San)-1	(NL Ex San).P 32 (NL Ex San)-1	(NL Ex San).P 31 (NL Ex San)-1	(NL Ex San).P 30 (NL Ex San)-1	(NL Ex San).P 29 (NL Ex San)-1	(NL Ex San).P 28 (NL Ex San)-1
Length (ft):	157.45	306.02	266.81	160.61	186.56	177.50
Dia (in):	24.00	24.00	24.00	24.00	24.00	24.00
Slope (ft/ft):	0.0025	0.0023	0.0026	0.0019	0.0027	0.0039
Up Invert (ft):	740.70	740.20	739.40	738.60	738.20	737.60
Dn Invert (ft):	740.30	739.50	738.70	738.30	737.70	736.90
Max Q (mgd):	4.46	5.01	5.01	5.08	5.08	5.08
Max Vel (ft/s):	3.21	3.56	3.40	3.44	3.87	3.76
Max Depth (ft):	1.29	1.31	1.36	1.37	1.23	1.26

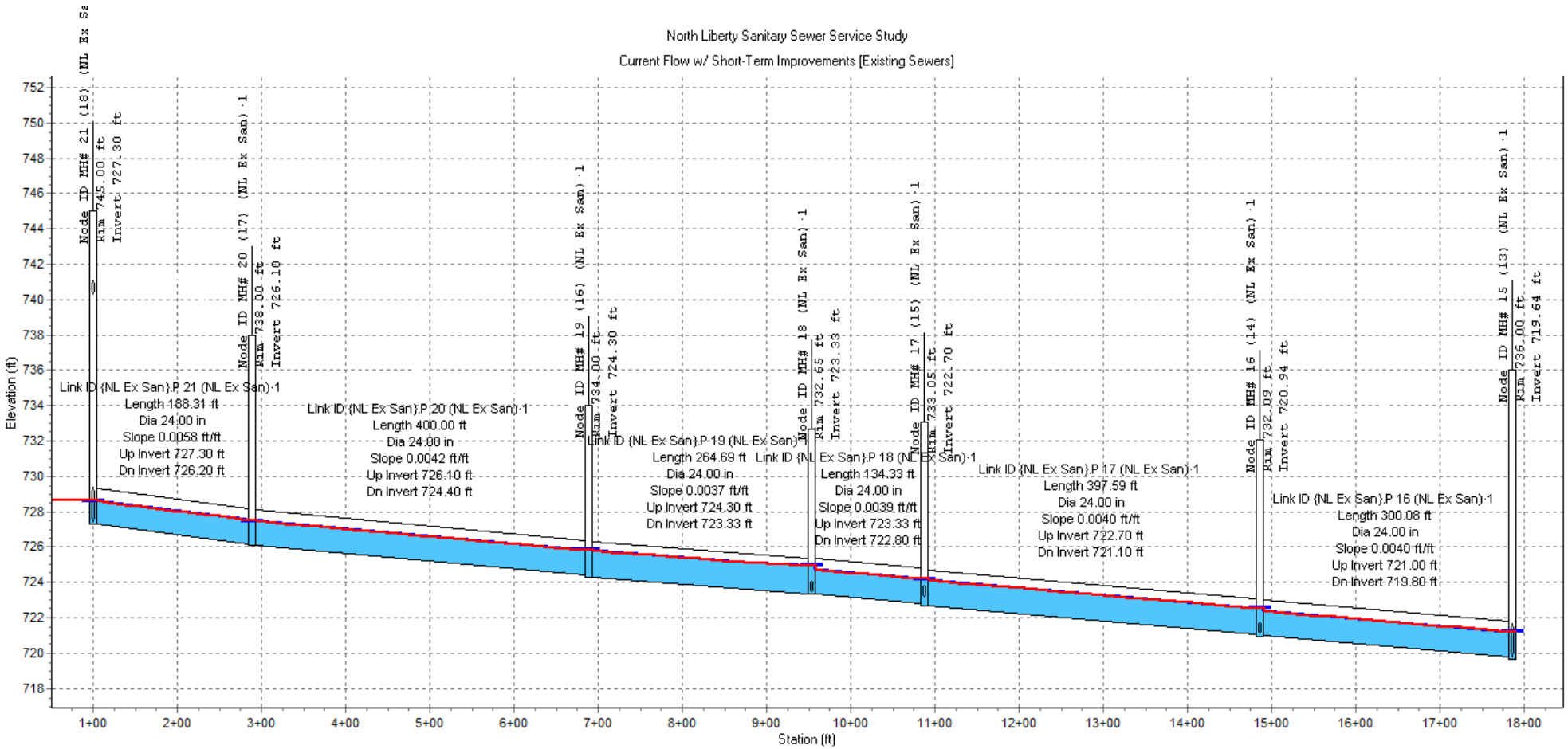


Node ID:		MH# 26 (NL Ex San) 1	MH# 25 (NL Ex San) 1	MH# 24 (NL Ex San) 1	MH# 23 (NL Ex San) 1	MH# 22 (19) (NL Ex San) 1	
Rim (ft):	747.50	750.00	746.00	745.00	743.00	746.42	745.00
Invert (ft):	736.74	735.44	734.14	733.84	732.84	728.98	727.30
Min Pipe Cover (ft):	6.12	12.50	5.95	9.00	8.00	15.40	3.91
Max HGL (ft):	738.21	736.60	735.76	735.28	733.93	730.08	728.62

Link ID:		(NL Ex San).P 27 (NL Ex San) 1	(NL Ex San).P 26 (NL Ex San)	(NL Ex San).P 25 (NL Ex San) 1	(NL Ex San).P 24 (NL Ex San) 1	(NL Ex San).P 23 (NL Ex San) 1	(NL Ex San).P 22 (NL Ex San) 1	
Length (ft):		557.96	286.49	77.81	266.02	555.50	236.24	
Dia (in):		24.00	24.00	24.00	24.00	24.00	24.00	
Slope (ft/ft):		0.0023	0.0042	0.0026	0.0034	0.0070	0.0067	
Up Invert (ft):		736.80	735.50	734.20	733.90	732.90	728.98	
Dn Invert (ft):		735.50	734.30	734.00	733.00	729.02	727.40	
Max Q (mgd):		5.22	5.22	5.98	5.98	6.01	6.07	
Max Vel (ft/s):		3.88	3.79	3.88	4.56	5.59	4.95	
Max Depth (ft):		1.26	1.29	1.42	1.23	1.05	1.16	

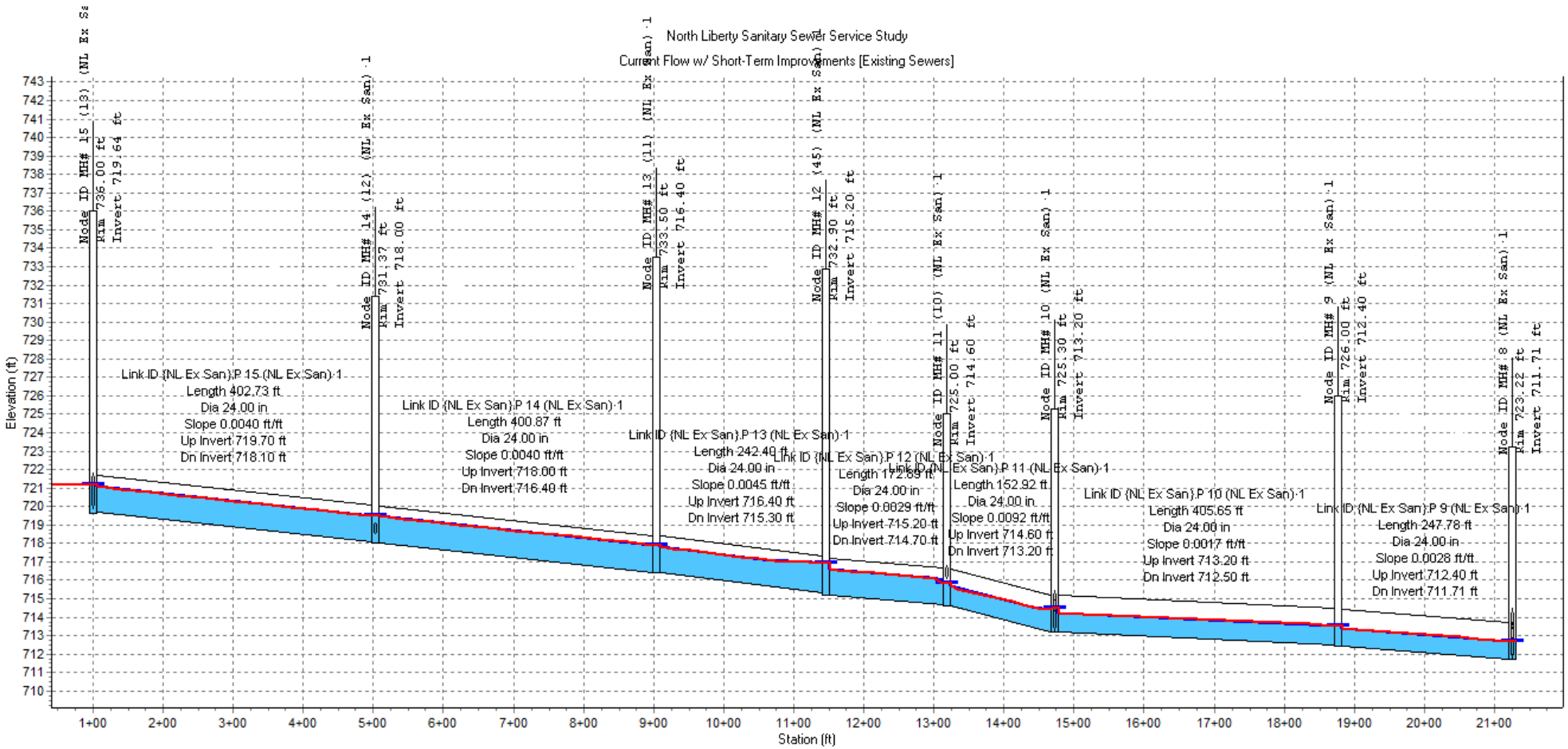
North Liberty Sanitary Sewer Service Study

Current Flow w/ Short-Term Improvements [Existing Sewers]



Node ID:		MH# 20 (17) (NL Ex San) 1	MH# 19 (16) (NL Ex San) 1	MH# 18 (NL Ex San) 1	MH# 17 (15) (NL Ex San) 1	MH# 16 (14) (NL Ex San) 1	
Rim (ft):	745.00	738.00	734.00	732.65	733.05	732.09	736.00
Invert (ft):	727.30	726.10	724.30	723.33	722.70	720.94	719.64
Min Pipe Cover (ft):	3.91	9.80	7.60	7.32	8.25	8.99	14.20
Max HGL (ft):	728.62	727.48	725.85	724.96	724.19	722.53	721.20

Link ID:	(NL Ex San).P 21 (NL Ex San) 1	(NL Ex San).P 20 (NL Ex San) 1	(NL Ex San).P 19 (NL Ex San) 1	(NL Ex San).P 18 (NL Ex San) 1	(NL Ex San).P 17 (NL Ex San) 1	(NL Ex San).P 16 (NL Ex San) 1
Length (ft):	188.31	400.00	264.69	134.33	397.59	300.08
Dia (in):	24.00	24.00	24.00	24.00	24.00	24.00
Slope (ft/ft):	0.0058	0.0042	0.0037	0.0039	0.0040	0.0040
Up Invert (ft):	727.30	726.10	724.30	723.33	722.70	721.00
Dn Invert (ft):	726.20	724.40	723.33	722.80	721.10	719.80
Max Q (mgd):	7.04	7.04	7.04	7.39	7.43	7.43
Max Vel (ft/s):	5.04	4.59	4.07	4.49	4.68	4.66
Max Depth (ft):	1.30	1.41	1.59	1.51	1.46	1.47

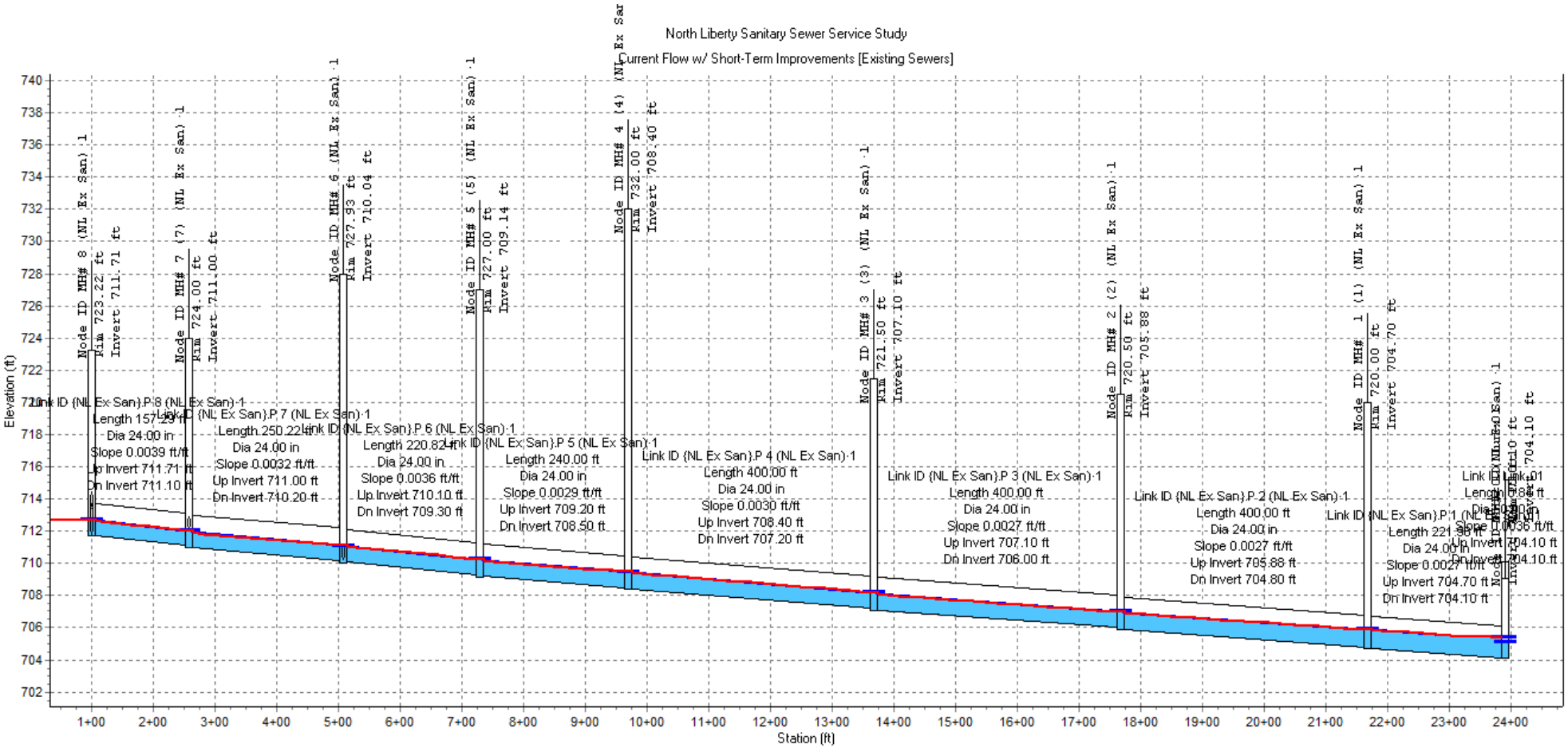


Node ID:		MH# 14 (12) (NL Ex San)·1	MH# 13 (11) (NL Ex San)·1	MH# 12 (45) (NL Ex San)·1	MH# 11 (10) (NL Ex San)·1	MH# 10 (NL Ex San)·1	MH# 9 (NL Ex San)·1	
Rim (ft):	736.00	731.37	733.50	732.90	725.00	725.30	726.00	723.22
Invert (ft):	719.64	718.00	716.40	715.20	714.60	713.20	712.40	711.71
Min Pipe Cover (ft):	14.20	11.27	15.10	15.60	8.17	9.85	11.50	8.76
Max HGL (ft):	721.20	719.50	717.90	716.93	715.82	714.52	713.55	712.71

Link ID:	(NL Ex San).P 15 (NL Ex San)·1	(NL Ex San).P 14 (NL Ex San)·1	(NL Ex San).P 13 (NL Ex San)·1	(NL Ex San).P 12 (NL Ex San)·1	(NL Ex San).P 11 (NL Ex San)·1	(NL Ex San).P 10 (NL Ex San)·1	(NL Ex San).P 9 (NL Ex San)·1
Length (ft):	402.73	400.87	242.40	172.89	152.92	405.65	247.78
Dia (in):	24.00	24.00	24.00	24.00	24.00	24.00	24.00
Slope (ft/ft):	0.0040	0.0040	0.0045	0.0029	0.0092	0.0017	0.0028
Up Invert (ft):	719.70	718.00	716.40	715.20	714.60	713.20	712.40
Dn Invert (ft):	718.10	716.40	715.30	714.70	713.20	712.50	711.71
Max Q (mgd):	7.43	7.49	7.49	7.49	7.56	4.14	4.14
Max Vel (ft/s):	4.72	4.59	4.40	4.67	5.56	3.30	3.72
Max Depth (ft):	1.45	1.50	1.56	1.47	1.27	1.18	1.07

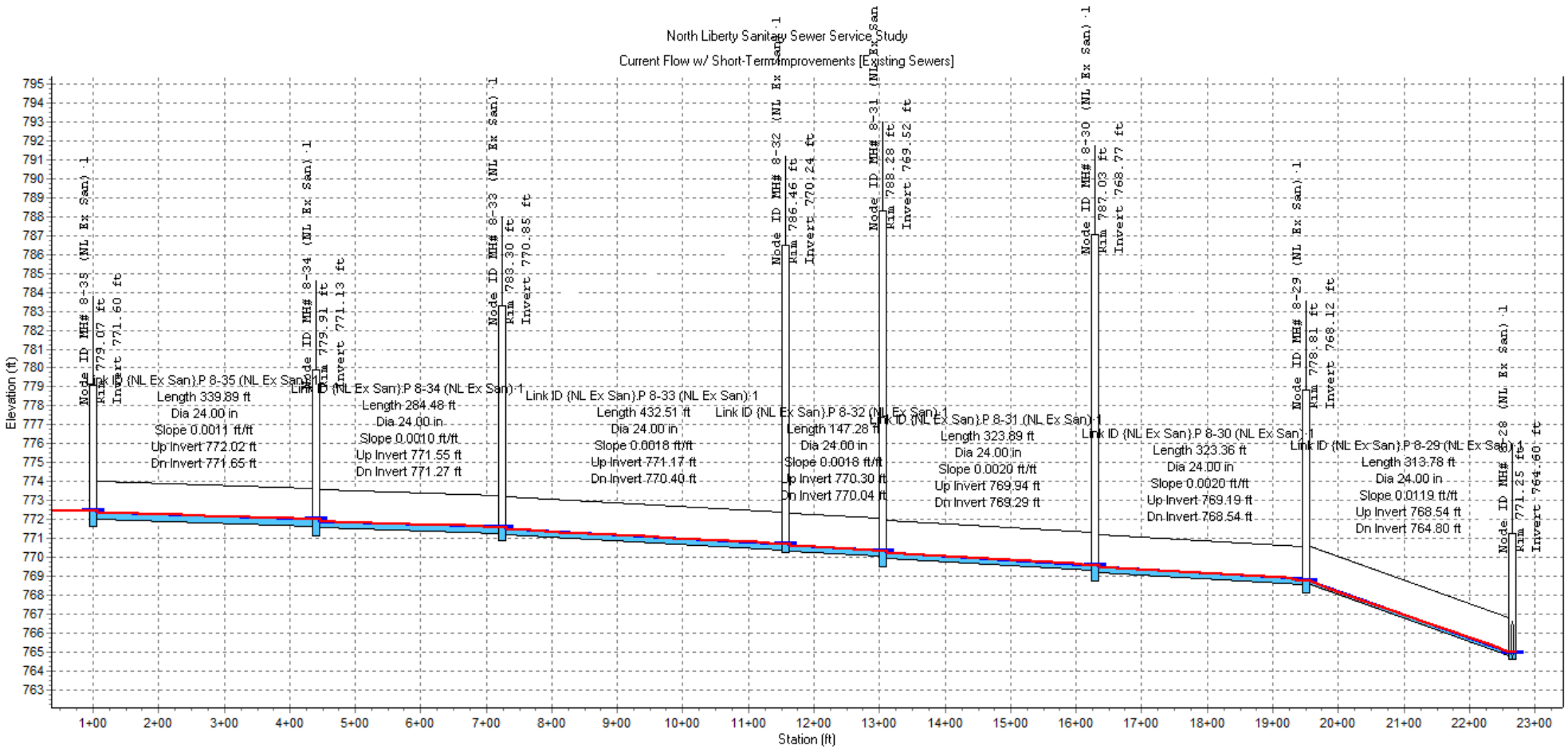
North Liberty Sanitary Sewer Service Study

Current Flow w/ Short-Term Improvements [Existing Sewers]



Node ID:		MH# 7 (7) (NL Ex San) 1	MH# 6 (NL Ex San) 1	MH# 5 (5) (NL Ex San) 1	MH# 4 (4) (NL Ex San) 1	MH# 3 (3) (NL Ex San) 1	MH# 2 (2) (NL Ex San) 1	MH# 1 (1) (NL Ex San) 1	Jun-01
Rim (ft):	723.22	724.00	727.93	727.00	732.00	721.50	720.50	720.00	710.10
Invert (ft):	711.71	711.00	710.04	709.14	708.40	707.10	705.88	704.70	704.10
Min Pipe Cover (ft):	8.76	10.90	15.73	15.70	21.50	12.30	12.50	13.20	1.00
Max HGL (ft):	712.71	712.03	711.10	710.26	709.47	708.21	706.98	705.86	705.89

Link ID:	(NL Ex San).P 8 (NL Ex San) 1	(NL Ex San).P 7 (NL Ex San) 1	(NL Ex San).P 6 (NL Ex San) 1	(NL Ex San).P 5 (NL Ex San) 1	(NL Ex San).P 4 (NL Ex San) 1	(NL Ex San).P 3 (NL Ex San) 1	(NL Ex San).P 2 (NL Ex San) 1	(NL Ex San).P 1 (NL Ex San) 1	Jun-01
Length (ft):	157.29	250.22	220.82	240.00	400.00	400.00	400.00	221.96	0.84
Dia (in):	24.00	24.00	24.00	24.00	24.00	24.00	24.00	24.00	60.00
Slope (ft/ft):	0.0039	0.0032	0.0036	0.0029	0.0030	0.0027	0.0027	0.0027	0.0036
Up Invert (ft):	711.71	711.00	710.10	709.20	708.40	707.10	705.88	704.70	704.10
Dn Invert (ft):	711.10	710.20	709.30	708.50	707.20	706.00	704.80	704.10	704.10
Max Q (mgd):	3.71	3.71	3.75	3.75	4.01	4.01	4.01	4.01	8.68
Max Vel (ft/s):	3.83	3.83	3.78	3.61	3.76	3.73	3.58	3.08	3.97
Max Depth (ft):	0.96	0.96	0.98	1.02	1.04	1.05	1.08	1.22	1.14

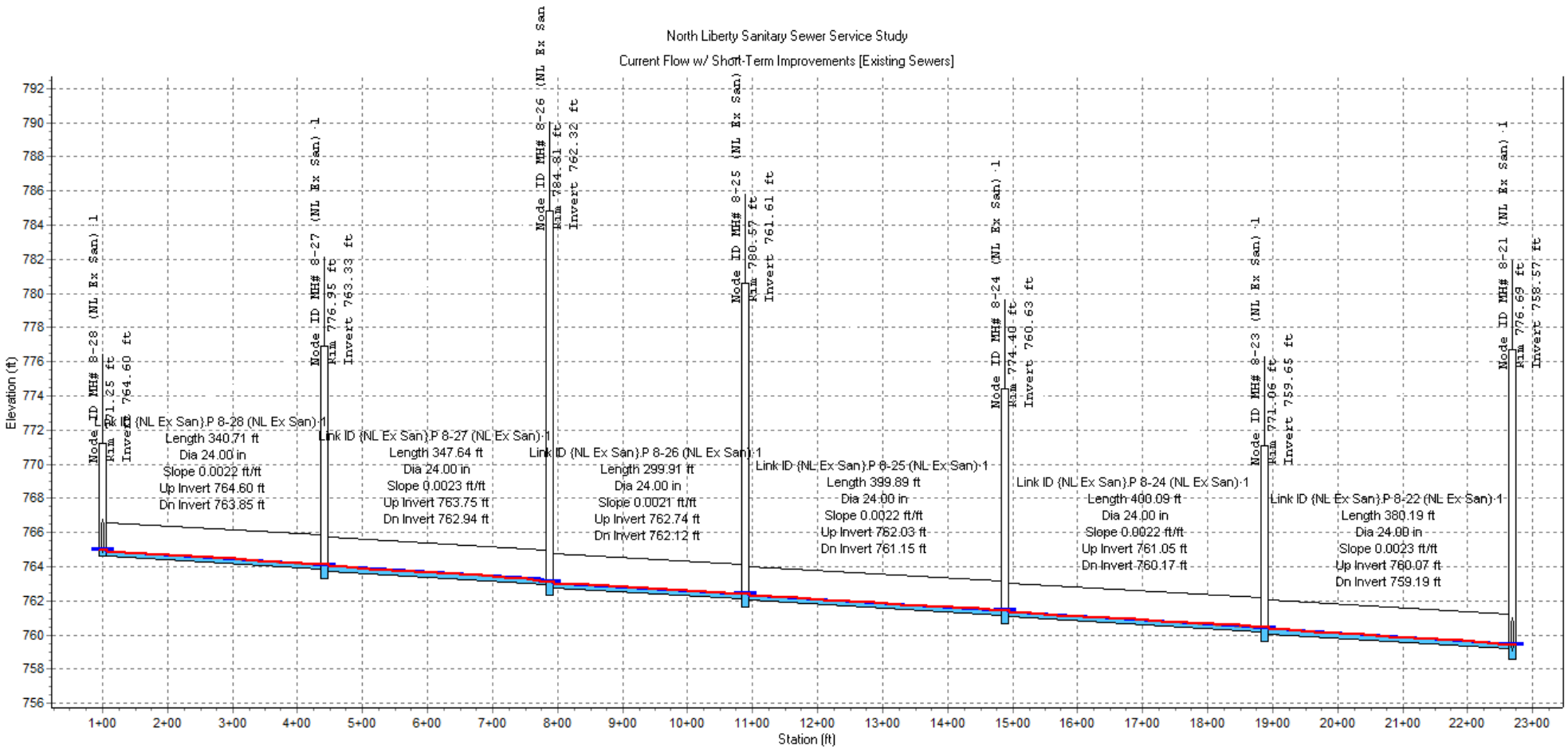


Node ID:		MH# 8-34 (NL Ex San) 1	MH# 8-33 (NL Ex San) 1	MH# 8-32 (NL Ex San) 1	MH# 8-31 (NL Ex San) 1	MH# 8-30 (NL Ex San) 1	MH# 8-29 (NL Ex San) 1	
Rim (ft):	779.07	779.91	783.30	786.46	788.28	787.03	778.81	771.25
Invert (ft):	771.60	771.13	770.85	770.24	769.52	768.77	768.12	764.60
Min Pipe Cover (ft):	5.05	6.26	10.03	14.06	16.24	15.74	8.27	4.45
Max HGL (ft):	772.44	772.01	771.56	770.68	770.31	769.56	768.76	764.96

Link ID:	(NL Ex San).P 8-35 (NL Ex San) 1	(NL Ex San).P 8-34 (NL Ex San) 1	(NL Ex San).P 8-33 (NL Ex San) 1	(NL Ex San).P 8-32 (NL Ex San) 1	(NL Ex San).P 8-31 (NL Ex San) 1	(NL Ex San).P 8-30 (NL Ex San) 1	(NL Ex San).P 8-29 (NL Ex San) 1
Length (ft):	339.89	284.48	432.51	147.28	323.89	323.36	313.78
Dia (in):	24.00	24.00	24.00	24.00	24.00	24.00	24.00
Slope (ft/ft):	0.0011	0.0010	0.0018	0.0018	0.0020	0.0020	0.0119
Up Invert (ft):	772.02	771.55	771.17	770.30	769.94	769.19	768.54
Dn Invert (ft):	771.65	771.27	770.40	770.04	769.29	768.54	764.80
Max Q (mgd):	0.41	0.41	0.41	0.41	0.41	0.41	0.41
Max Vel (ft/s):	1.47	1.57	1.83	1.89	1.93	1.94	3.32
Max Depth (ft):	0.39	0.37	0.34	0.33	0.32	0.32	0.22

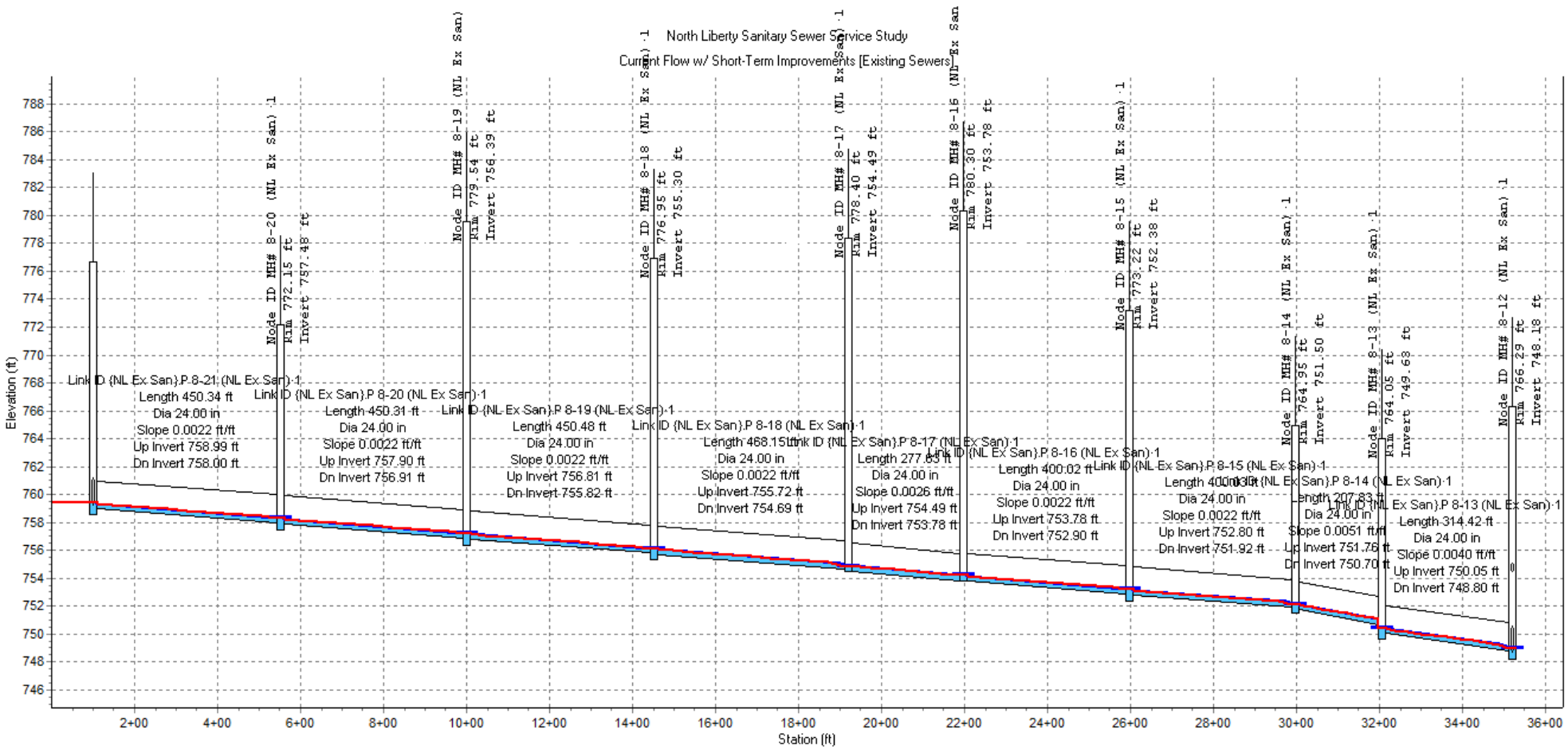
North Liberty Sanitary Sewer Service Study

Current Flow w/ Short-Term Improvements [Existing Sewers]



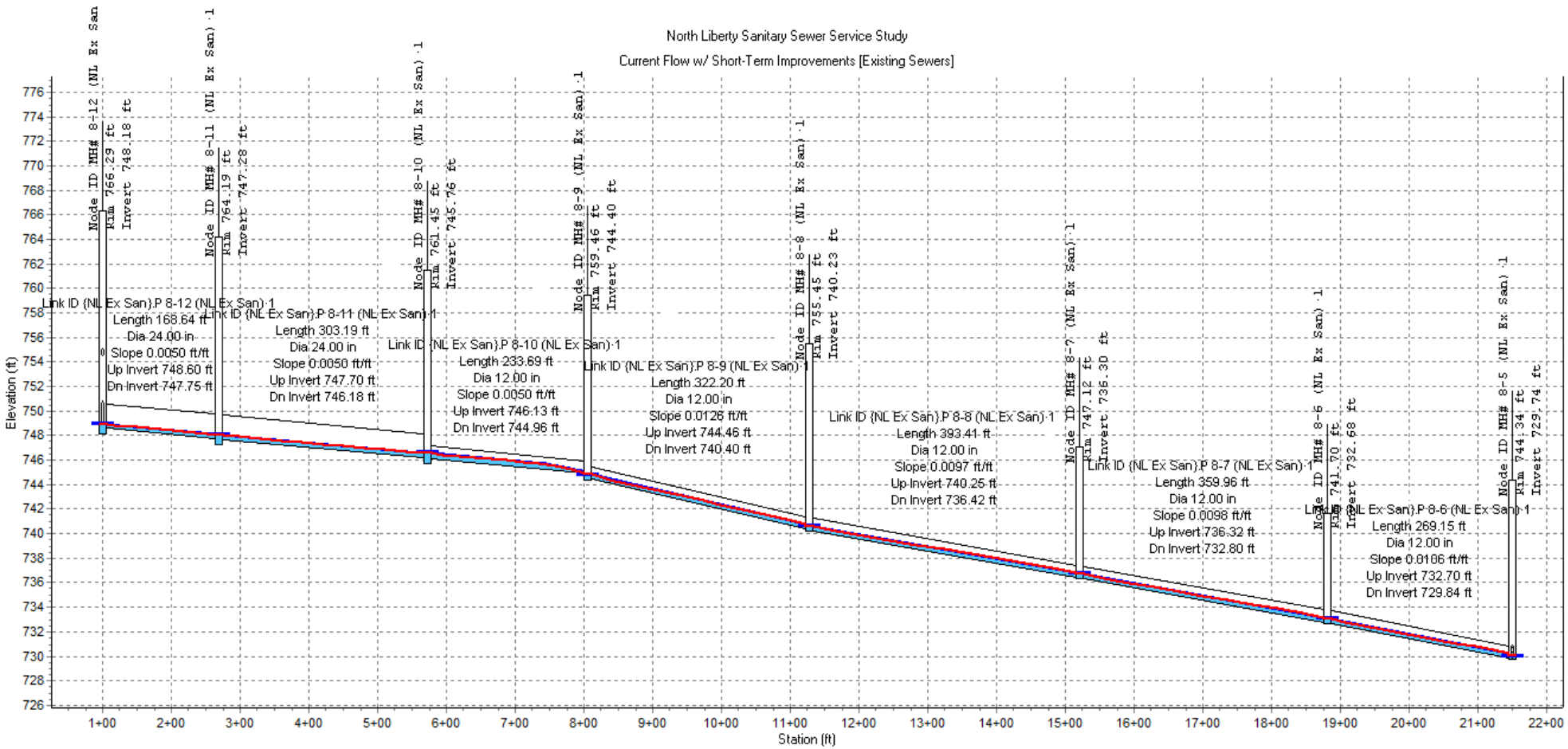
Node ID:		MH# 8-27 (NL Ex San)·1	MH# 8-26 (NL Ex San)·1	MH# 8-25 (NL Ex San)·1	MH# 8-24 (NL Ex San)·1	MH# 8-23 (NL Ex San)·1	
Rim (ft):	771.25	776.95	784.81	780.57	774.40	771.06	776.69
Invert (ft):	764.60	763.33	762.32	761.61	760.63	759.65	758.57
Min Pipe Cover (ft):	4.45	11.10	19.87	16.45	11.25	8.89	15.50
Max HGL (ft):	764.96	764.10	763.11	762.39	761.41	760.42	759.42

Link ID:	{NL Ex San}.P 8-28 (NL Ex San)·1	{NL Ex San}.P 8-27 (NL Ex San)·1	{NL Ex San}.P 8-26 (NL Ex San)·1	{NL Ex San}.P 8-25 (NL Ex San)·1	{NL Ex San}.P 8-24 (NL Ex San)·1	{NL Ex San}.P 8-22 (NL Ex San)·1
Length (ft):	340.71	347.64	299.91	399.89	400.09	380.19
Dia (in):	24.00	24.00	24.00	24.00	24.00	24.00
Slope (ft/ft):	0.0022	0.0023	0.0021	0.0022	0.0022	0.0023
Up Invert (ft):	764.60	763.75	762.74	762.03	761.05	760.07
Dn Invert (ft):	763.85	762.94	762.12	761.15	760.17	759.19
Max Q (mgd):	0.41	0.41	0.41	0.41	0.41	0.41
Max Vel (ft/s):	1.99	2.03	1.95	1.99	1.99	2.02
Max Depth (ft):	0.32	0.31	0.32	0.32	0.32	0.31



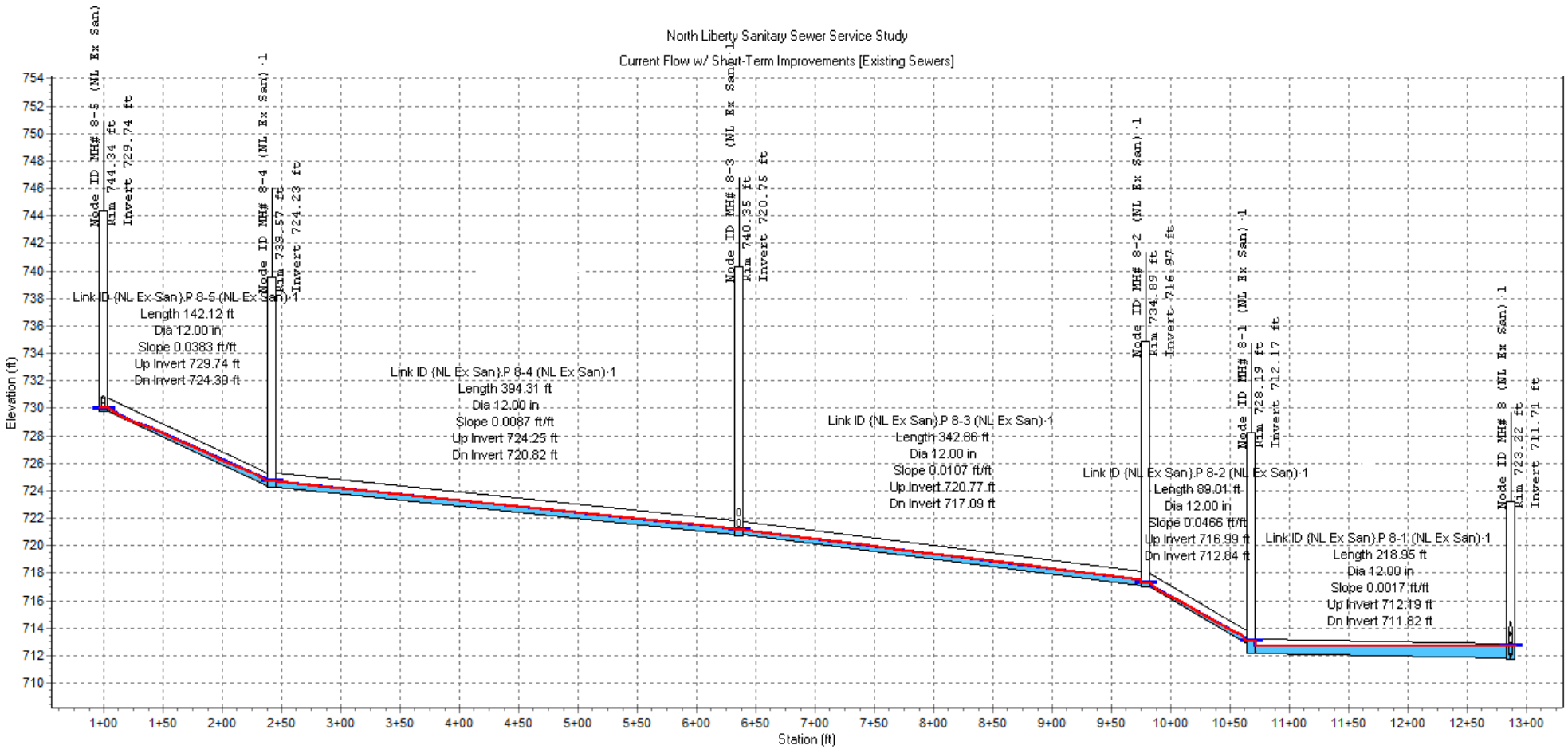
Node ID:		MH# 8-20 (NL Ex San)·1	MH# 8-19 (NL Ex San)·1	MH# 8-18 (NL Ex San)·1	MH# 8-17 (NL Ex San)·1	MH# 8-16 (NL Ex San)·1	MH# 8-15 (NL Ex San)·1	MH# 8-14 (NL Ex San)·1	MH# 8-13 (NL Ex San)·1	
Rim (ft):	776.69	772.15	779.54	776.95	778.40	780.30	773.22	764.95	764.05	766.29
Invert (ft):	758.57	757.48	756.39	755.30	754.49	753.78	752.38	751.50	749.63	748.18
Min Pipe Cover (ft):	15.50	12.15	20.63	19.13	21.71	24.52	18.32	11.03	11.35	11.18
Max HGL (ft):	759.42	758.33	757.24	756.15	754.87	754.21	753.23	752.11	750.42	748.95

Link ID:	(NL Ex San).P 8-21 (NL Ex San)·1	(NL Ex San).P 8-20 (NL Ex San)·1	(NL Ex San).P 8-19 (NL Ex San)·1	(NL Ex San).P 8-18 (NL Ex San)·1	(NL Ex San).P 8-17 (NL Ex San)·1	(NL Ex San).P 8-16 (NL Ex San)·1	(NL Ex San).P 8-15 (NL Ex San)·1	(NL Ex San).P 8-14 (NL Ex San)·1	(NL Ex San).P 8-13 (NL Ex San)·1	
Length (ft):	450.34	450.31	450.48	468.15	277.63	400.02	400.03	207.83	314.42	
Dia (in):	24.00	24.00	24.00	24.00	24.00	24.00	24.00	24.00	24.00	
Slope (ft/ft):	0.0022	0.0022	0.0022	0.0022	0.0026	0.0022	0.0022	0.0051	0.0040	
Up Invert (ft):	758.99	757.90	756.81	755.72	754.49	753.78	752.80	751.76	750.05	
Dn Invert (ft):	758.00	756.91	755.82	754.69	753.78	752.90	751.92	750.70	748.80	
Max Q (mgd):	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.66	0.66	
Max Vel (ft/s):	2.19	2.19	2.19	2.20	1.99	2.19	2.20	2.80	2.66	
Max Depth (ft):	0.38	0.38	0.38	0.38	0.40	0.38	0.38	0.35	0.36	



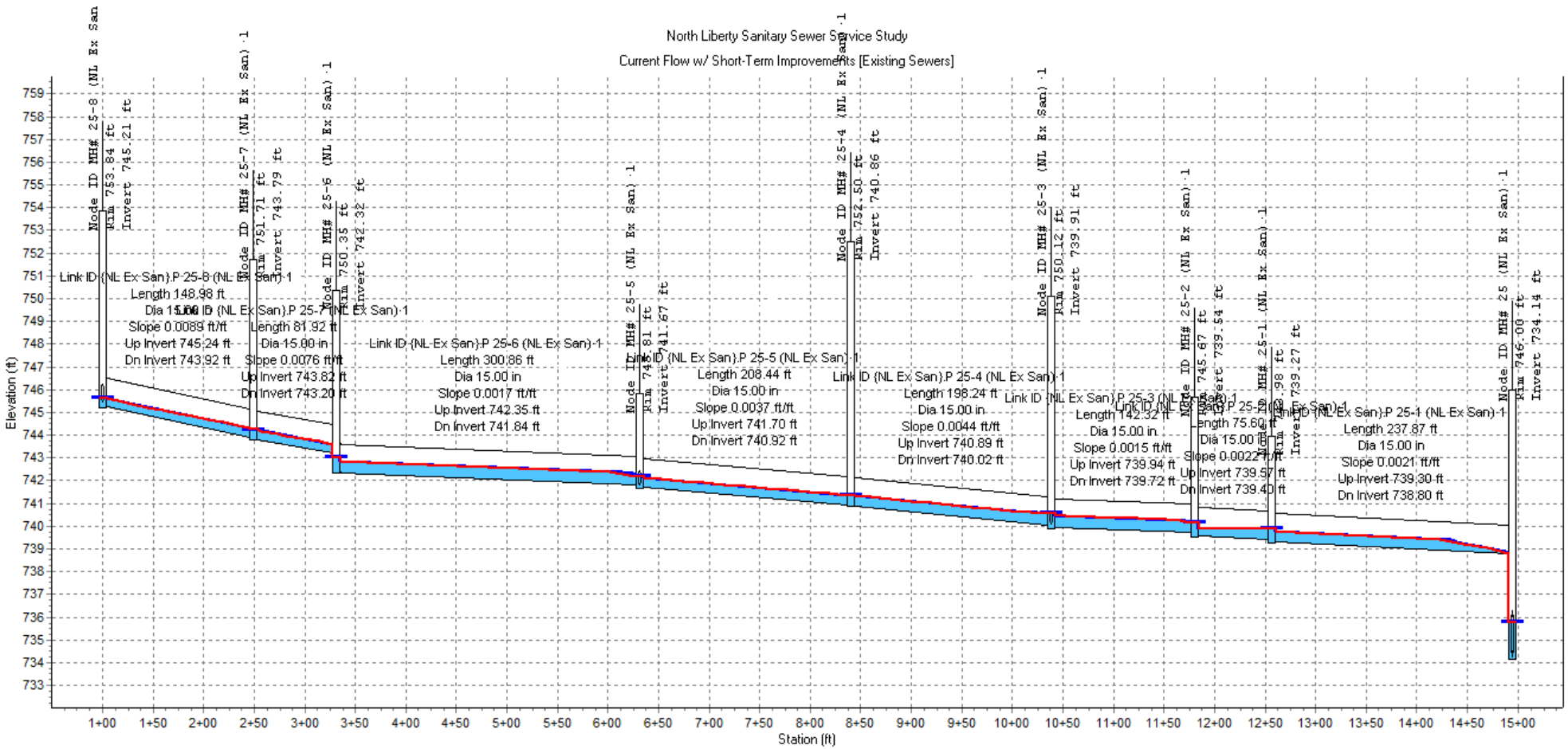
Node ID:		MH# 8-11 (NL Ex San)·1	MH# 8-10 (NL Ex San)·1	MH# 8-9 (NL Ex San)·1	MH# 8-8 (NL Ex San)·1	MH# 8-7 (NL Ex San)·1	MH# 8-6 (NL Ex San)·1	
Rim (ft):	766.29	764.19	761.45	759.46	755.45	747.12	741.70	744.34
Invert (ft):	748.18	747.28	745.76	744.40	740.23	736.30	732.68	729.74
Min Pipe Cover (ft):	11.18	14.44	13.27	13.50	14.05	9.70	7.90	13.42
Max HGL (ft):	748.95	748.04	746.59	744.81	740.62	736.70	733.07	730.00

Link ID:	{NL Ex San}.P 8-12 (NL Ex San)·1	{NL Ex San}.P 8-11 (NL Ex San)·1	{NL Ex San}.P 8-10 (NL Ex San)·1	{NL Ex San}.P 8-9 (NL Ex San)·1	{NL Ex San}.P 8-8 (NL Ex San)·1	{NL Ex San}.P 8-7 (NL Ex San)·1	{NL Ex San}.P 8-6 (NL Ex San)·1
Length (ft):	168.64	303.19	233.69	322.20	393.41	359.96	269.15
Dia (in):	24.00	24.00	12.00	12.00	12.00	12.00	12.00
Slope (ft/ft):	0.0050	0.0050	0.0050	0.0126	0.0097	0.0098	0.0106
Up Invert (ft):	748.60	747.70	746.13	744.46	740.25	736.32	732.70
Dn Invert (ft):	747.75	746.18	744.96	740.40	736.42	732.80	729.84
Max Q (mgd):	0.66	0.66	0.66	0.66	0.66	0.66	0.66
Max Vel (ft/s):	2.77	2.47	3.03	4.20	3.83	3.83	3.93
Max Depth (ft):	0.35	0.38	0.44	0.35	0.37	0.37	0.37



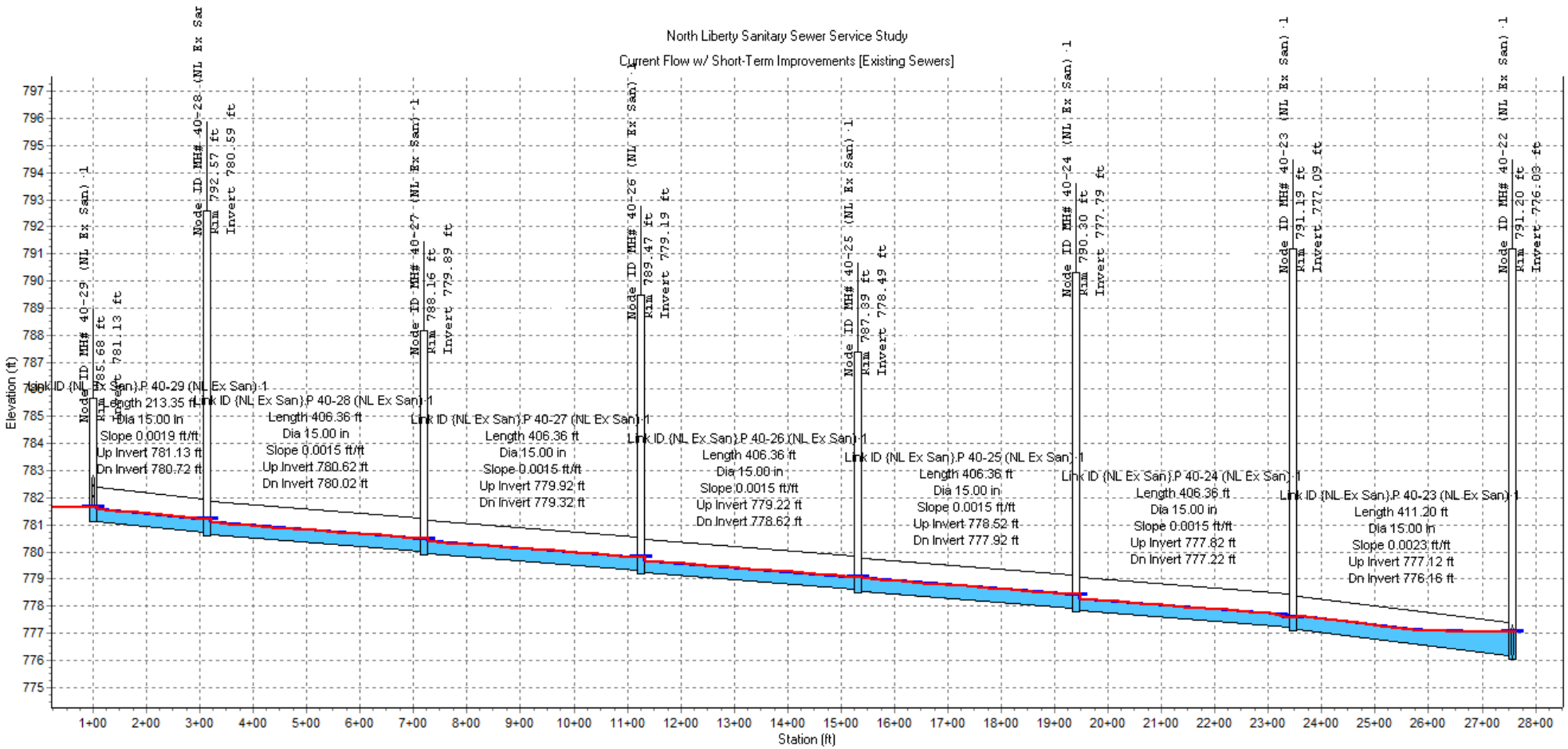
Node ID:		MH# 8-4 (NL Ex San)·1	MH# 8-3 (NL Ex San)·1	MH# 8-2 (NL Ex San)·1	MH# 8-1 (NL Ex San)·1	
Rim (ft):	744.34	739.57	740.35	734.89	728.19	723.22
Invert (ft):	729.74	724.23	720.75	716.97	712.17	711.71
Min Pipe Cover (ft):	13.42	14.27	17.63	16.80	14.35	8.76
Max HGL (ft):	730.00	724.65	721.18	717.28	713.00	712.71

Link ID:	{NL Ex San}.P 8-5 (NL Ex San)·1	{NL Ex San}.P 8-4 (NL Ex San)·1	{NL Ex San}.P 8-3 (NL Ex San)·1	{NL Ex San}.P 8-2 (NL Ex San)·1	{NL Ex San}.P 8-1 (NL Ex San)·1	
Length (ft):	142.12	394.31	342.86	89.01	218.95	
Dia (in):	12.00	12.00	12.00	12.00	12.00	
Slope (ft/ft):	0.0383	0.0087	0.0107	0.0466	0.0017	
Up Invert (ft):	729.74	724.25	720.77	716.99	712.19	
Dn Invert (ft):	724.30	720.82	717.09	712.84	711.82	
Max Q (mgd):	0.69	0.69	0.80	0.80	0.80	
Max Vel (ft/s):	5.24	3.71	4.17	6.90	1.74	
Max Depth (ft):	0.31	0.39	0.40	0.28	0.85	



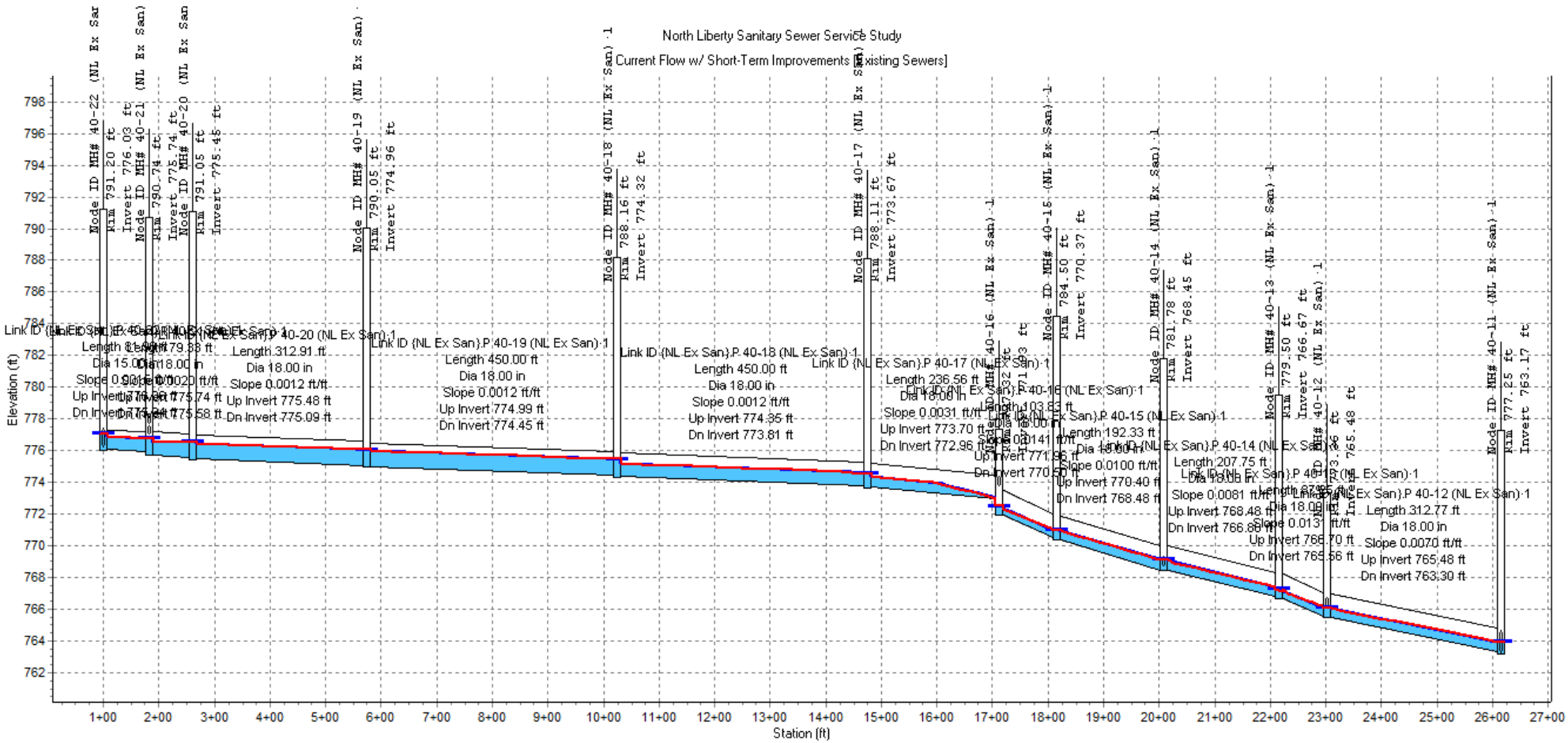
Node ID:		MH# 25-7 (NL Ex San)-1	MH# 25-6 (NL Ex San)-1	MH# 25-5 (NL Ex San)-1	MH# 25-4 (NL Ex San)-1	MH# 25-3 (NL Ex San)-1	MH# 25-2 (NL Ex San)-1	MH# 25-1 (NL Ex San)-1	
Rim (ft):	753.84	751.71	750.35	745.81	752.50	750.12	745.67	743.98	746.00
Invert (ft):	745.21	743.79	742.32	741.67	740.86	739.91	739.54	739.27	734.14
Min Pipe Cover (ft):	7.35	6.54	5.90	2.72	10.33	8.85	4.70	3.33	5.95
Max HGL (ft):	745.63	744.24	743.00	742.20	741.34	740.58	740.16	739.90	735.76

Link ID:	(NL Ex San).P 25-8 (NL Ex San)-1	(NL Ex San).P 25-7 (NL Ex San)-1	(NL Ex San).P 25-6 (NL Ex San)-1	(NL Ex San).P 25-5 (NL Ex San)-1	(NL Ex San).P 25-4 (NL Ex San)-1	(NL Ex San).P 25-3 (NL Ex San)-1	(NL Ex San).P 25-2 (NL Ex San)-1	(NL Ex San).P 25-1 (NL Ex San)-1
Length (ft):	148.98	81.92	300.86	208.44	198.24	142.32	75.60	237.87
Dia (in):	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00
Slope (ft/ft):	0.0089	0.0076	0.0017	0.0037	0.0044	0.0015	0.0022	0.0021
Up Invert (ft):	745.24	743.82	742.35	741.70	740.89	739.94	739.57	739.30
Dn Invert (ft):	743.92	743.20	741.84	740.92	740.02	739.72	739.40	738.80
Max Q (mgd):	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76
Max Vel (ft/s):	3.71	3.42	2.32	2.86	2.54	2.32	2.28	2.47
Max Depth (ft):	0.38	0.41	0.54	0.46	0.50	0.54	0.55	0.52



Node ID:	MH# 40-28 (NL Ex San)-1	MH# 40-27 (NL Ex San)-1	MH# 40-26 (NL Ex San)-1	MH# 40-25 (NL Ex San)-1	MH# 40-24 (NL Ex San)-1	MH# 40-23 (NL Ex San)-1	
Rim (ft):	785.68	792.57	788.16	789.47	787.39	790.30	791.19	791.20
Invert (ft):	781.13	780.59	779.89	779.19	778.49	777.79	777.09	776.03
Min Pipe Cover (ft):	2.86	10.60	6.89	8.90	7.52	11.13	12.72	13.79
Max HGL (ft):	781.66	781.20	780.49	779.80	779.08	778.43	777.59	777.04

Link ID:		(NL Ex San).P 40-28 (NL Ex San)-1	(NL Ex San).P 40-27 (NL Ex San)-1	(NL Ex San).P 40-26 (NL Ex San)-1	(NL Ex San).P 40-25 (NL Ex San)-1	(NL Ex San).P 40-24 (NL Ex San)-1	(NL Ex San).P 40-23 (NL Ex San)-1	
Length (ft):	213.35	406.36	406.36	406.36	406.36	406.36	411.20	
Dia (in):	15.00	15.00	15.00	15.00	15.00	15.00	15.00	
Slope (ft/ft):	0.0019	0.0015	0.0015	0.0015	0.0015	0.0015	0.0023	
Up Invert (ft):	781.13	780.62	779.92	779.22	778.52	777.82	777.12	
Dn Invert (ft):	780.72	780.02	779.32	778.62	777.92	777.22	776.16	
Max Q (mgd):	0.61	0.61	0.61	0.61	0.61	0.61	0.61	
Max Vel (ft/s):	2.03	1.92	1.90	1.93	1.86	2.07	1.39	
Max Depth (ft):	0.50	0.53	0.53	0.52	0.54	0.50	0.68	

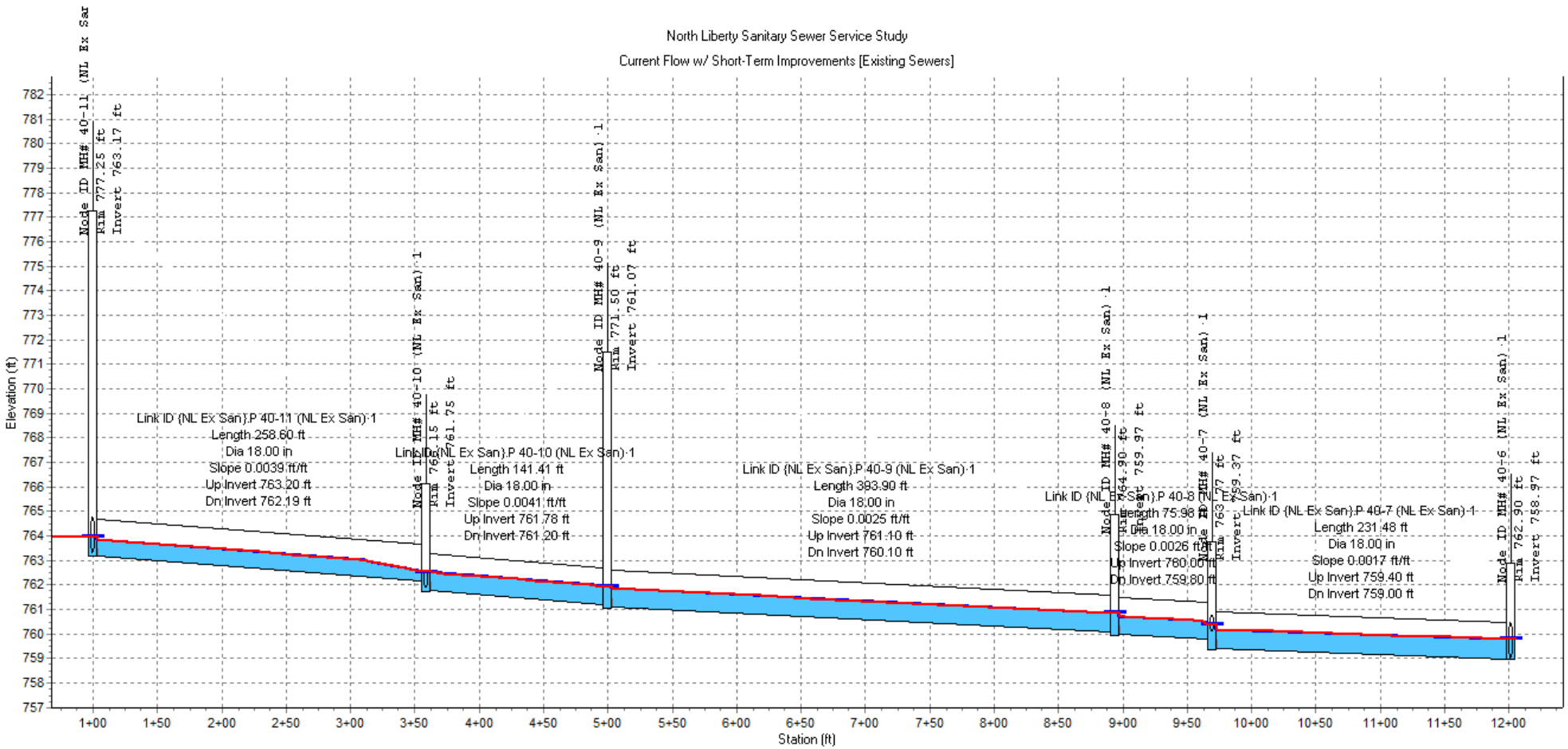


Node ID:	MH# 40-22 (NL Ex San)	MH# 40-21 (NL Ex San)	MH# 40-20 (NL Ex San)	MH# 40-19 (NL Ex San)	MH# 40-18 (NL Ex San)	MH# 40-17 (NL Ex San)	MH# 40-16 (NL Ex San)	MH# 40-15 (NL Ex San)	MH# 40-14 (NL Ex San)	MH# 40-13 (NL Ex San)	MH# 40-12 (NL Ex San)	MH# 40-11 (NL Ex San)
Rim (ft):	791.20	790.74	791.05	790.05	788.16	788.11	777.32	784.50	781.78	779.50	773.36	777.25
Invert (ft):	776.03	775.74	775.45	774.96	774.32	773.67	771.93	770.37	768.45	766.67	765.48	763.17
Min Pipe Cover (ft):	13.79	12.41	13.97	13.46	12.21	12.80	2.87	12.50	11.80	11.20	6.30	12.45
Max HGL (ft):	777.04	776.74	776.54	776.06	775.46	774.51	772.50	770.96	769.09	767.26	766.09	763.95

Link ID:	(NL Ex San).P 40-21 (NL Ex San)	(NL Ex San).P 40-20 (NL Ex San)	(NL Ex San).P 40-19 (NL Ex San)	(NL Ex San).P 40-18 (NL Ex San)	(NL Ex San).P 40-17 (NL Ex San)	(NL Ex San).P 40-16 (NL Ex San)	(NL Ex San).P 40-15 (NL Ex San)	(NL Ex San).P 40-14 (NL Ex San)	(NL Ex San).P 40-13 (NL Ex San)	(NL Ex San).P 40-12 (NL Ex San)
Length (ft):	81.90	79.33	312.91	450.00	450.00	236.56	103.83	192.33	207.75	87.25	312.77
Dia (in):	15.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00
Slope (ft/ft):	0.0015	0.0020	0.0012	0.0012	0.0012	0.0031	0.0141	0.0100	0.0081	0.0131	0.0070
Up Invert (ft):	776.06	775.74	775.48	774.99	774.35	773.70	771.96	770.40	768.48	766.70	765.48
Dn Invert (ft):	775.94	775.58	775.09	774.45	773.81	772.96	770.50	768.48	766.80	765.56	763.30
Max Q (mgd):	1.56	1.89	1.89	1.89	1.89	1.89	1.89	1.89	1.89	1.89	1.89
Max Vel (ft/s):	2.57	2.39	2.30	2.23	2.60	3.41	5.38	4.56	4.53	5.00	4.11
Max Depth (ft):	0.89	0.98	1.01	1.04	0.91	0.73	0.52	0.59	0.59	0.55	0.63

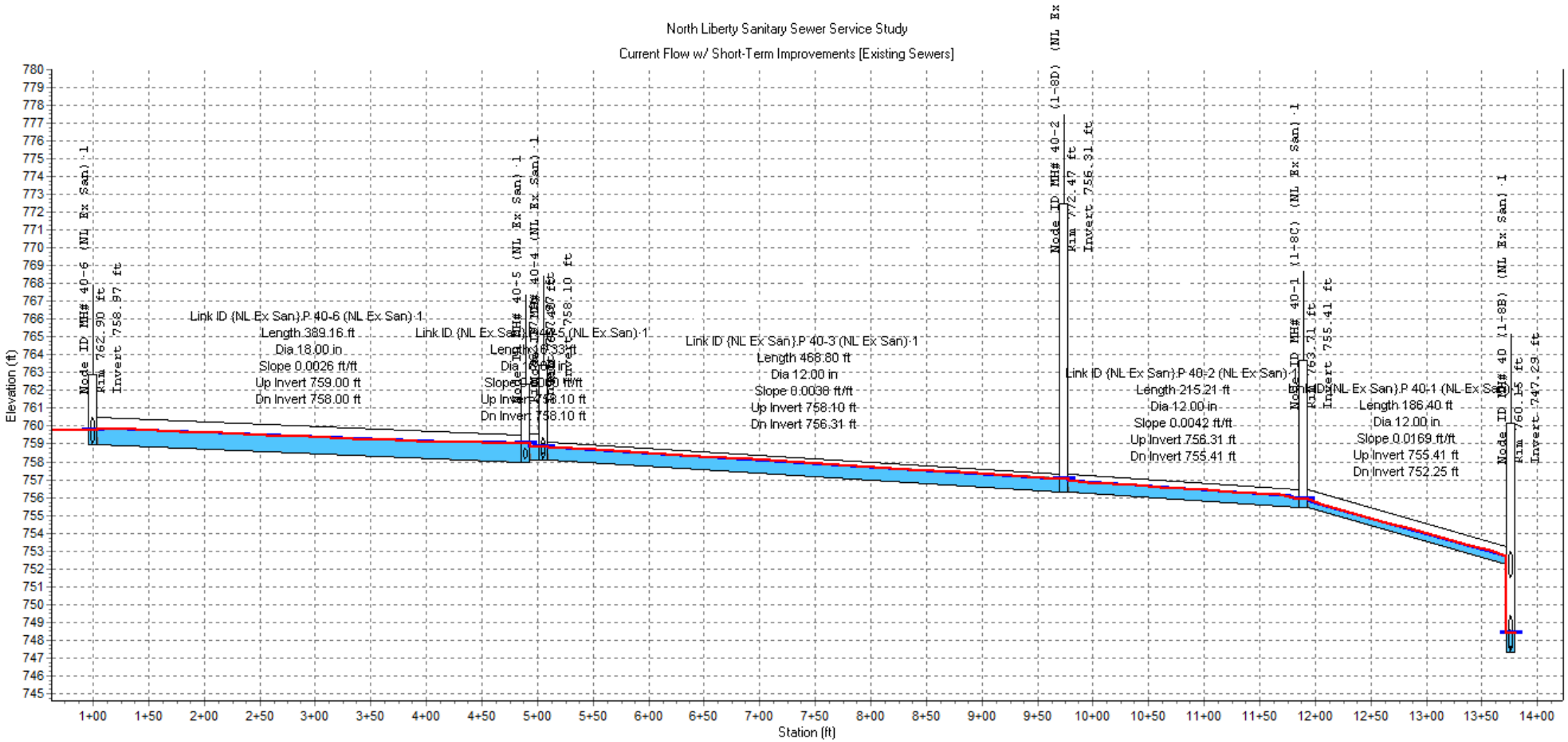
North Liberty Sanitary Sewer Service Study

Current Flow w/ Short-Term Improvements [Existing Sewers]



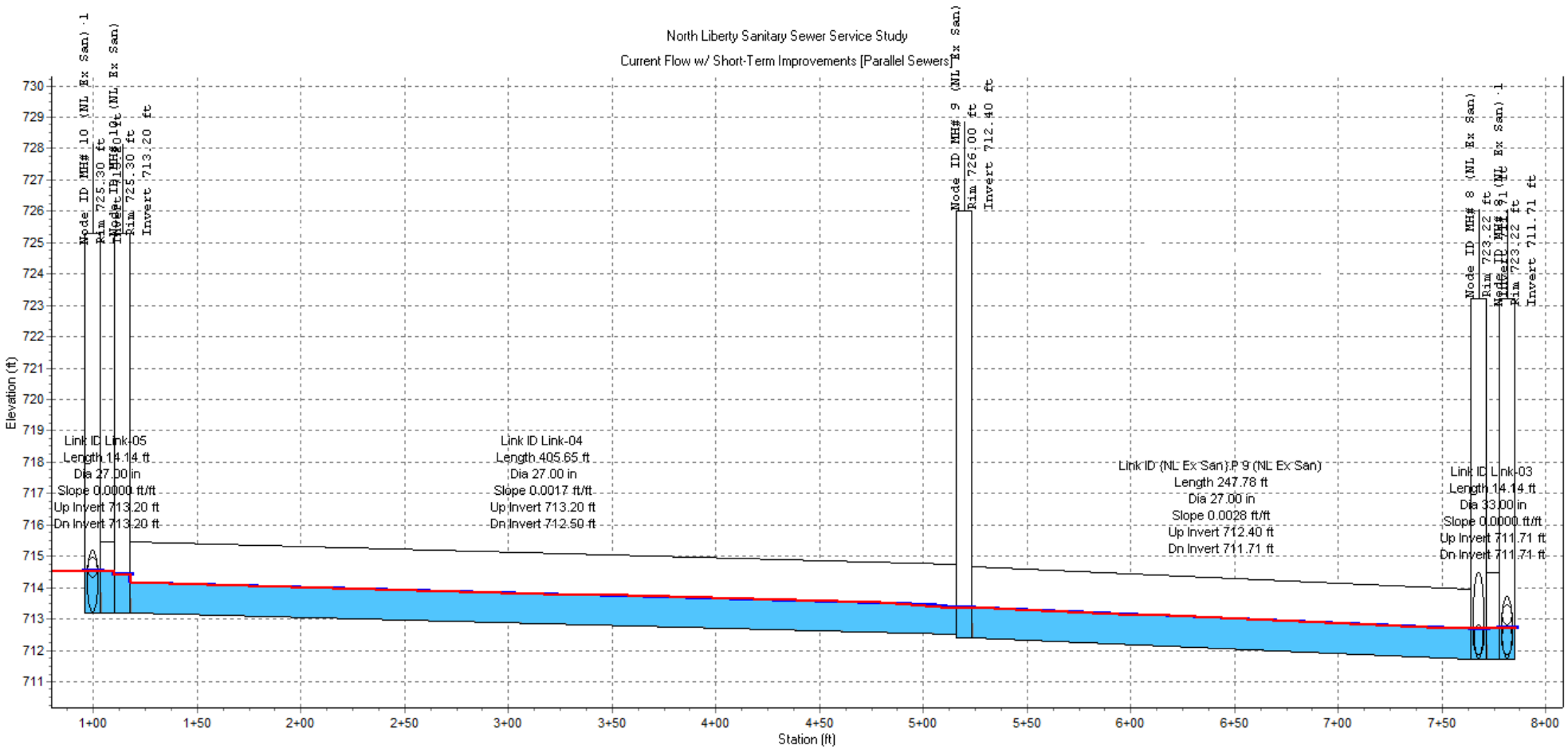
Node ID:		MH# 40-10 (NL Ex San)-1	MH# 40-9 (NL Ex San)-1	MH# 40-8 (NL Ex San)-1	MH# 40-7 (NL Ex San)-1	
Rim (ft):	777.25	766.15	771.50	764.90	763.77	762.90
Invert (ft):	763.17	761.75	761.07	759.97	759.37	758.97
Min Pipe Cover (ft):	12.45	2.46	8.80	3.30	2.47	2.40
Max HGL (ft):	763.95	762.54	761.95	760.86	760.37	759.79

Link ID:	{NL Ex San}.P 40-11 (NL Ex San)-1	{NL Ex San}.P 40-10 (NL Ex San)-1	{NL Ex San}.P 40-9 (NL Ex San)-1	{NL Ex San}.P 40-8 (NL Ex San)-1	{NL Ex San}.P 40-7 (NL Ex San)-1
Length (ft):	258.60	141.41	393.90	75.98	231.48
Dia (in):	18.00	18.00	18.00	18.00	18.00
Slope (ft/ft):	0.0039	0.0041	0.0025	0.0026	0.0017
Up Invert (ft):	763.20	761.78	761.10	760.00	759.40
Dn Invert (ft):	762.19	761.20	760.10	759.80	759.00
Max Q (mgd):	1.89	1.89	1.89	1.89	1.89
Max Vel (ft/s):	3.61	3.27	3.02	3.28	2.71
Max Depth (ft):	0.70	0.76	0.81	0.76	0.88



Node ID:		MH# 40-6 (NL Ex San)·1	MH# 40-2 (1-8D) (NL Ex San)·1	MH# 40-1 (1-8C) (NL Ex San)·1	
Rim (ft):	762.90	762.90	772.47	763.71	760.15
Invert (ft):	758.97	757.98	756.31	755.41	747.29
Min Pipe Cover (ft):	2.40	2.72	15.16	7.30	6.90
Max HGL (ft):	759.79	759.84	757.07	755.88	748.36

Link ID:	{NL Ex San}.P 40-6 (NL Ex San)·1	{NL Ex San}.P 40-5 (NL Ex San)·1	{NL Ex San}.P 40-3 (NL Ex San)·1	{NL Ex San}.P 40-2 (NL Ex San)·1	{NL Ex San}.P 40-1 (NL Ex San)·1
Length (ft):	389.16	16.33	468.80	215.21	186.40
Dia (in):	18.00	18.00	12.00	12.00	12.00
Slope (ft/ft):	0.0026	0.0000	0.0038	0.0042	0.0169
Up Invert (ft):	759.00	758.10	758.10	756.31	755.41
Dn Invert (ft):	758.00	758.10	756.31	755.41	752.25
Max Q (mgd):	1.89	1.89	1.23	1.23	1.23
Max Vel (ft/s):	2.56	2.84	3.02	3.78	5.43
Max Depth (ft):	0.92	0.85	0.74	0.61	0.46

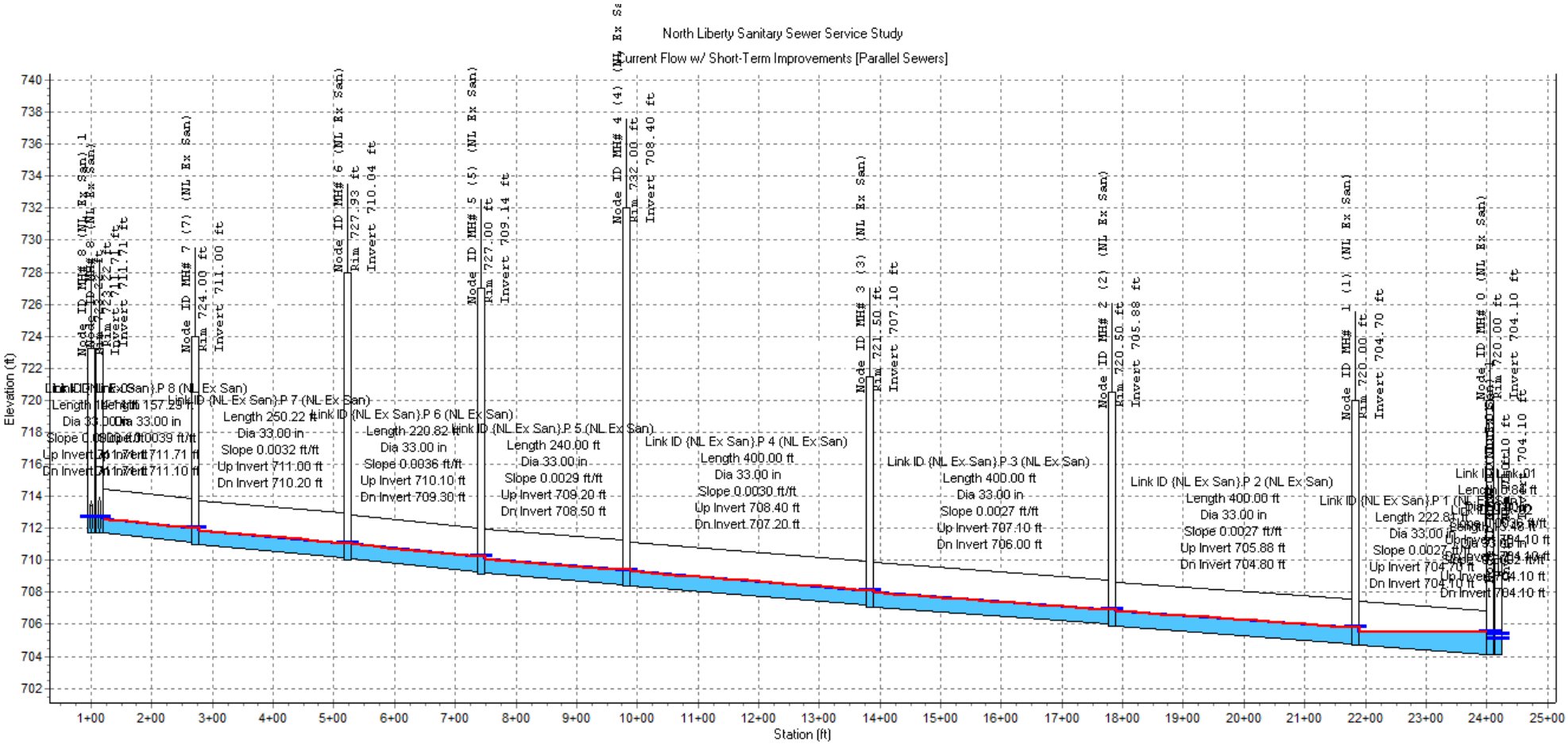


Node ID:	MH# 10 (NL Ex San)		MH# 9 (NL Ex San)	MH# 8 (NL Ex San)	
Rim (ft):	725.30	725.30	726.00	723.22	723.22
Invert (ft):	713.20	713.20	712.40	711.71	711.71
Min Pipe Cover (ft):	9.85	9.85	11.25	8.76	8.76
Max HGL (ft):	714.50	714.40	713.35	712.65	712.71

Link ID:	Link-05	Link-04	(NL Ex San).P 9 (NL Ex San)	Link-03
Length (ft):	14.14	405.65	247.78	14.14
Dia (in):	27.00	27.00	27.00	33.00
Slope (ft/ft):	0.0000	0.0017	0.0028	0.0000
Up Invert (ft):	713.20	713.20	712.40	711.71
Dn Invert (ft):	713.20	712.50	711.71	711.71
Max Q (mgd):	3.43	3.43	3.43	1.23
Max Vel (ft/s):	2.31	3.01	3.26	0.99
Max Depth (ft):	1.26	1.03	0.96	0.99

North Liberty Sanitary Sewer Service Study

Current Flow w/ Short-Term Improvements [Parallel Sewers]

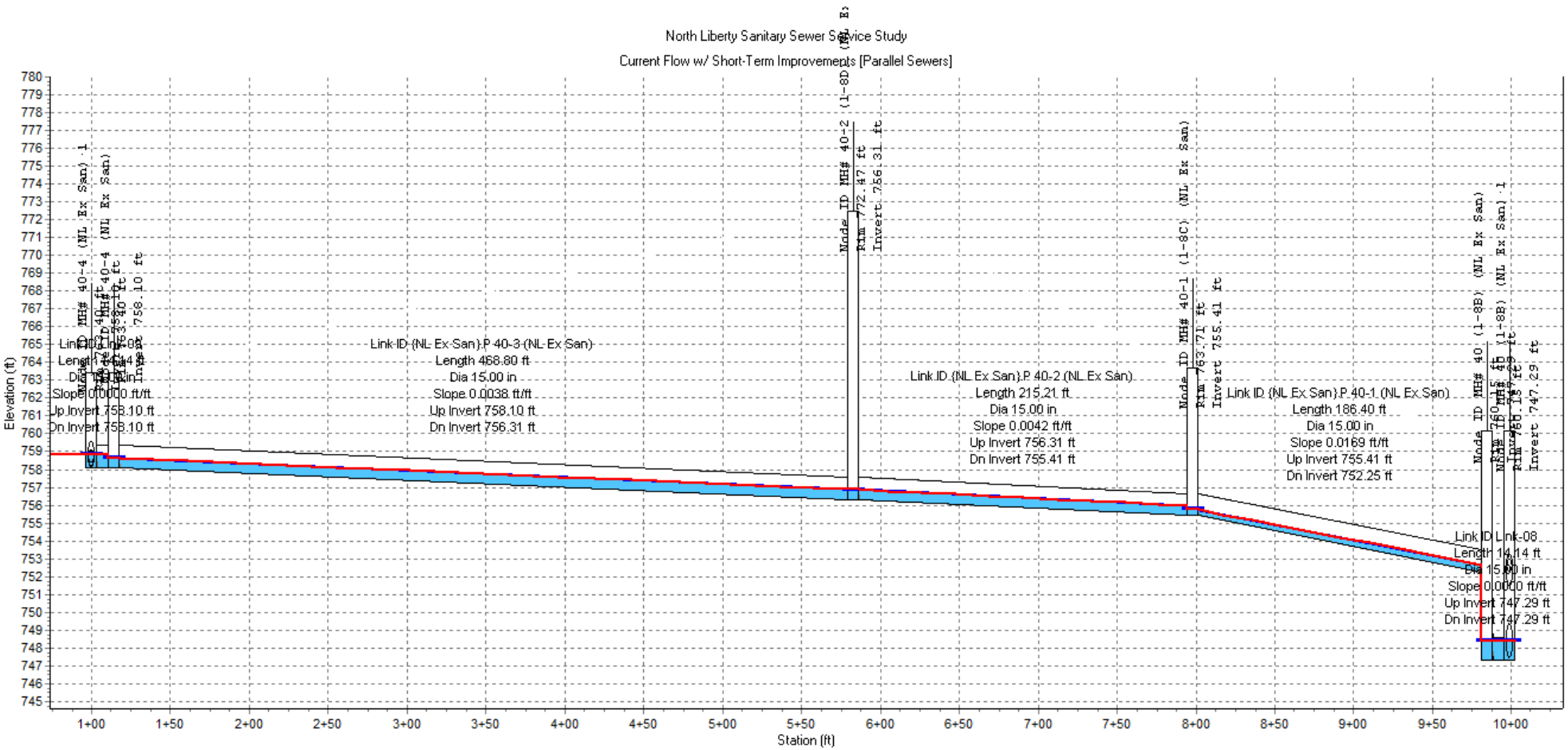


Node ID:		MH# 7 (7) (NL Ex San)	MH# 6 (NL Ex San)	MH# 5 (5) (NL Ex San)	MH# 4 (4) (NL Ex San)	MH# 3 (3) (NL Ex San)	MH# 2 (2) (NL Ex San)	MH# 1 (1) (NL Ex San)	MH# 0 (NL Ex San)
Rim (ft):	723.22	724.00	727.93	727.00	732.00	721.50	720.50	720.00	720.00
Invert (ft):	711.71	711.00	710.04	709.14	708.40	707.10	705.88	704.70	704.10
Min Pipe Cover (ft):	8.66	10.15	14.98	14.95	20.75	11.55	11.75	12.45	13.50
Max HGL (ft):	712.69	712.00	711.07	710.23	709.39	708.13	706.90	705.79	705.29

Link ID:	(NL Ex San).P 8 (NL Ex San)	(NL Ex San).P 7 (NL Ex San)	(NL Ex San).P 6 (NL Ex San)	(NL Ex San).P 5 (NL Ex San)	(NL Ex San).P 4 (NL Ex San)	(NL Ex San).P 3 (NL Ex San)	(NL Ex San).P 2 (NL Ex San)	(NL Ex San).P 1 (NL Ex San)	[illegible]
Length (ft):	14.14	157.29	250.22	220.82	240.00	400.00	400.00	222.81	18.44
Dia (in):	33.00	33.00	33.00	33.00	33.00	33.00	33.00	33.00	33.00
Slope (ft/ft):	0.0000	0.0039	0.0032	0.0036	0.0029	0.0030	0.0027	0.0027	-0.0035
Up Invert (ft):	711.71	711.71	711.00	710.10	709.20	708.40	707.10	705.88	704.70
Dn Invert (ft):	711.71	711.10	710.20	709.30	708.50	707.20	706.00	704.80	704.10
Max Q (mgd):	1.23	4.66	4.66	4.66	4.66	4.66	4.66	4.66	4.66
Max Vel (ft/s):	0.99	4.02	4.04	3.95	3.89	3.90	3.88	3.67	2.72
Max Depth (ft):	0.99	0.94	0.94	0.95	0.96	0.96	0.96	1.01	1.26

North Liberty Sanitary Sewer Service Study

Current Flow w/ Short-Term Improvements [Parallel Sewers]

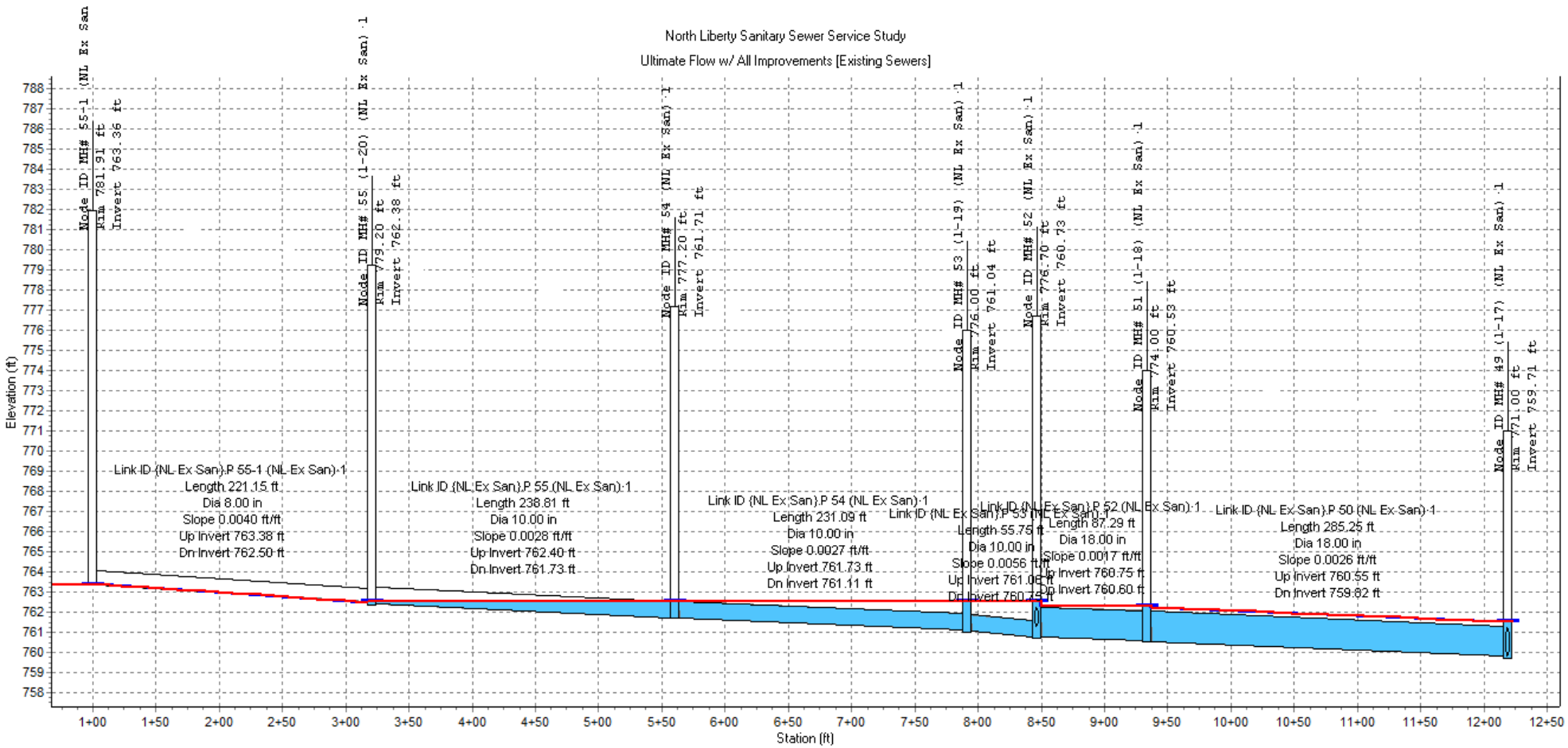


Node ID:	MH# 40-4 (NL Ex San)		MH# 40-2 (1-8D) (NL Ex San)	MH# 40-1 (1-8C) (NL Ex San)		
Rim (ft):	763.71	768.40	772.47	763.71	760.15	760.15
Invert (ft):	758.10	758.10	756.31	755.41	747.29	747.29
Min Pipe Cover (ft):	3.80	4.05	14.91	7.05	6.65	5.90
Max HGL (ft):	758.73	758.65	756.87	755.79	748.74	748.36

Link ID:	Link-09	{NL Ex San}.P 40-3 (NL Ex San)	{NL Ex San}.P 40-2 (NL Ex San)	{NL Ex San}.P 40-1 (NL Ex San)	Link-08
Length (ft):	14.14	468.80	215.21	186.40	14.14
Dia (in):	15.00	15.00	15.00	15.00	15.00
Slope (ft/ft):	0.0000	0.0038	0.0042	0.0169	0.0000
Up Invert (ft):	758.10	758.10	756.31	755.41	747.29
Dn Invert (ft):	758.10	756.31	755.41	752.25	747.29
Max Q (mgd):	1.00	1.00	1.00	1.00	1.00
Max Vel (ft/s):	2.43	2.94	3.67	5.08	1.36
Max Depth (ft):	0.64	0.56	0.47	0.37	1.09

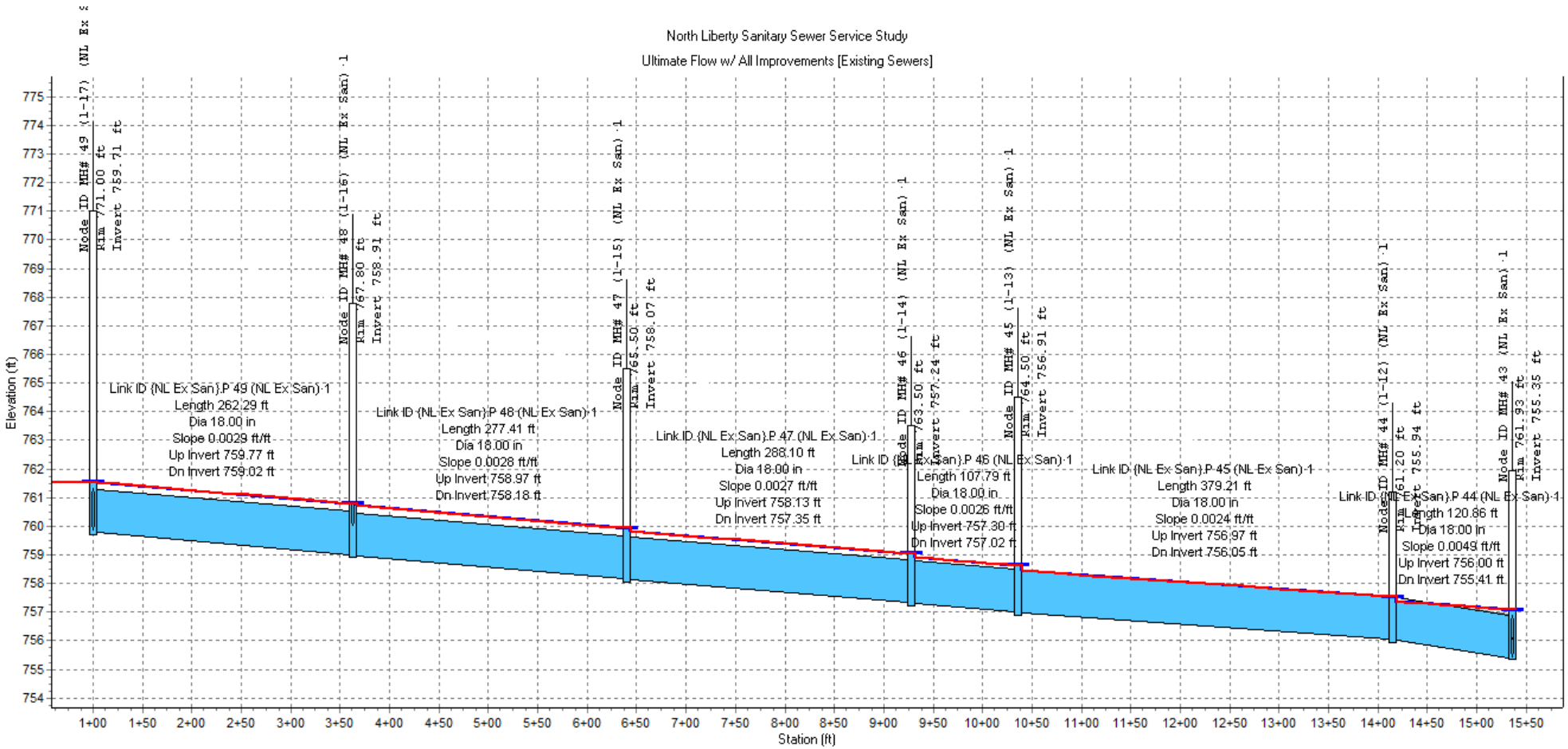
North Liberty Sanitary Sewer Service Study

Ultimate Flow w/ All Improvements [Existing Sewers]



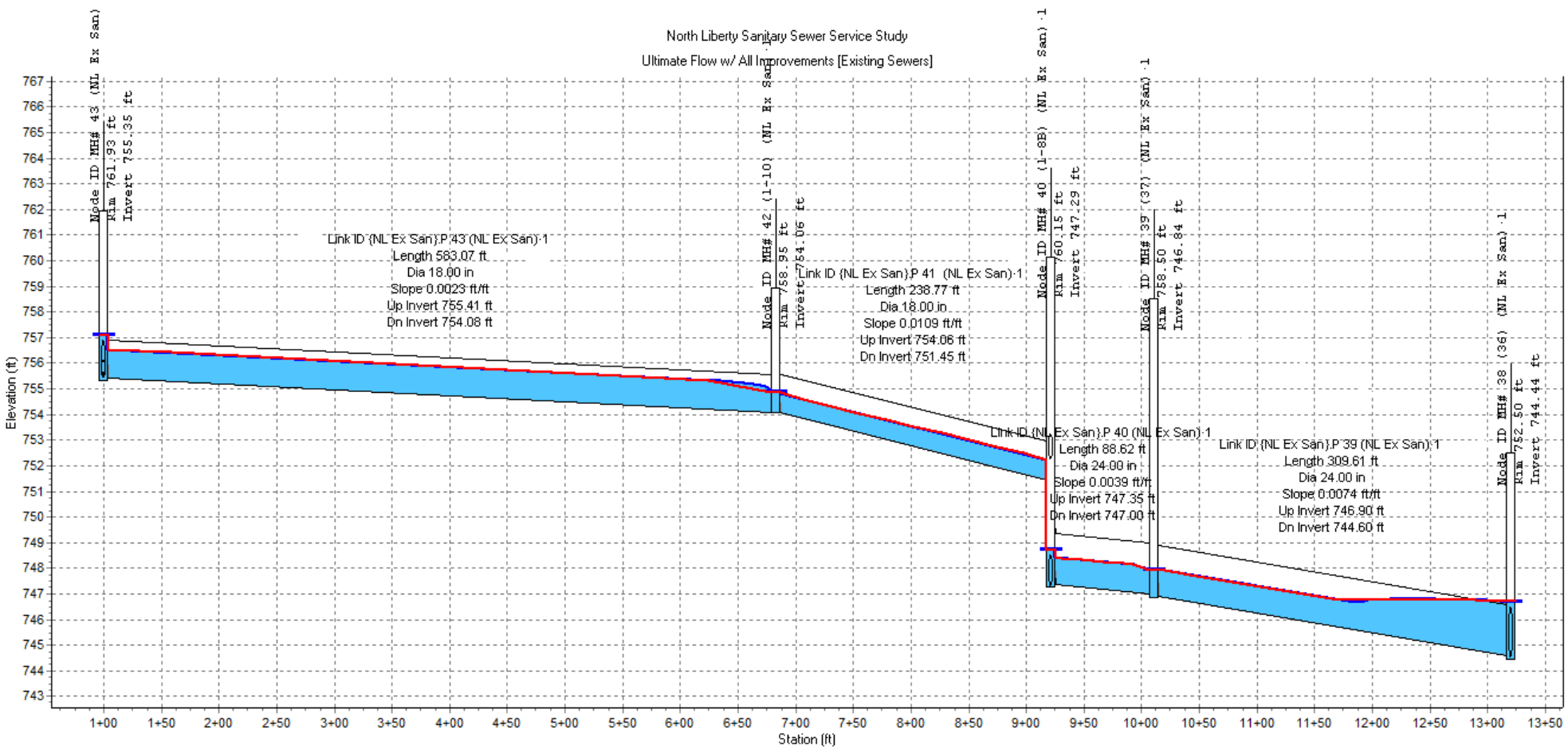
Node ID:		MH# 55 (1-20) (NL Ex San) 1	MH# 54 (NL Ex San) 1	MH# 53 (1-19) (NL Ex San) 1	MH# 52 (NL Ex San) 1	MH# 51 (1-18) (NL Ex San) 1	
Rim (ft):	781.91	779.20	777.20	776.00	776.70	774.00	771.00
Invert (ft):	763.36	762.38	761.71	761.04	760.73	760.53	759.71
Min Pipe Cover (ft):	17.86	15.97	14.64	14.06	14.43	11.90	9.68
Max HGL (ft):	763.36	762.52	762.52	762.52	762.52	762.33	761.53

Link ID:	(NL Ex San).P 55-1 (NL Ex San) 1	(NL Ex San).P 55 (NL Ex San) 1	(NL Ex San).P 54 (NL Ex San) 1	(NL Ex San).P 53 (NL Ex San) 1	(NL Ex San).P 52 (NL Ex San) 1	(NL Ex San).P 50 (NL Ex San) 1
Length (ft):	221.15	238.81	231.09	55.75	87.29	285.25
Dia (in):	8.00	10.00	10.00	10.00	18.00	18.00
Slope (ft/ft):	0.0040	0.0028	0.0027	0.0056	0.0017	0.0026
Up Invert (ft):	763.38	762.40	761.73	761.06	760.75	760.55
Dn Invert (ft):	762.50	761.73	761.11	760.75	760.60	759.82
Max Q (mgd):	0.00	0.00	0.00	0.01	2.48	3.28
Max Vel (ft/s):	0.00	0.00	0.00	0.03	2.17	2.87
Max Depth (ft):	0.01	0.45	0.81	0.83	1.50	1.50



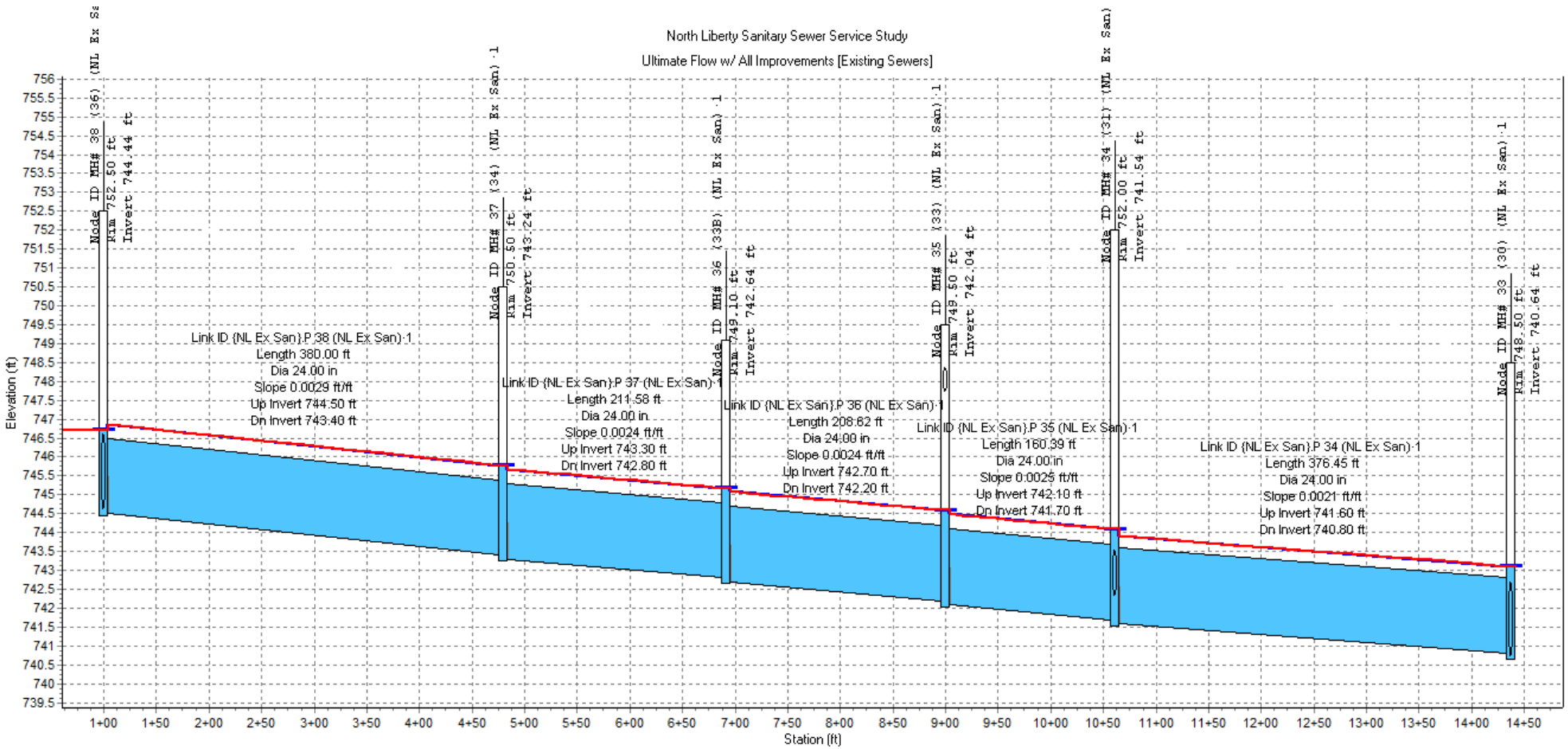
Node ID:		MH# 48 (1-16) (NL Ex San)·1	MH# 47 (1-15) (NL Ex San)·1	MH# 46 (1-14) (NL Ex San)·1	MH# 45 (1-13) (NL Ex San)·1	MH# 44 (1-12) (NL Ex San)·1	
Rim (ft):	771.00	767.80	765.50	763.50	764.50	761.20	761.93
Invert (ft):	759.71	758.91	758.07	757.24	756.91	755.94	755.35
Min Pipe Cover (ft):	9.68	6.97	5.82	4.65	5.98	3.65	5.02
Max HGL (ft):	761.53	760.79	759.93	759.05	758.63	757.53	757.08

Link ID:	(NL Ex San).P 49 (NL Ex San)·1	(NL Ex San).P 48 (NL Ex San)·1	(NL Ex San).P 47 (NL Ex San)·1	(NL Ex San).P 46 (NL Ex San)·1	(NL Ex San).P 45 (NL Ex San)·1	(NL Ex San).P 44 (NL Ex San)·1
Length (ft):	262.29	277.41	288.10	107.79	379.21	120.86
Dia (in):	18.00	18.00	18.00	18.00	18.00	18.00
Slope (ft/ft):	0.0029	0.0028	0.0027	0.0026	0.0024	0.0049
Up Invert (ft):	759.77	758.97	758.13	757.30	756.97	756.00
Dn Invert (ft):	759.02	758.18	757.35	757.02	756.05	755.41
Max Q (mgd):	3.28	3.45	3.45	3.45	3.45	3.45
Max Vel (ft/s):	2.87	3.02	3.02	3.02	3.03	3.02
Max Depth (ft):	1.50	1.50	1.50	1.50	1.49	1.50



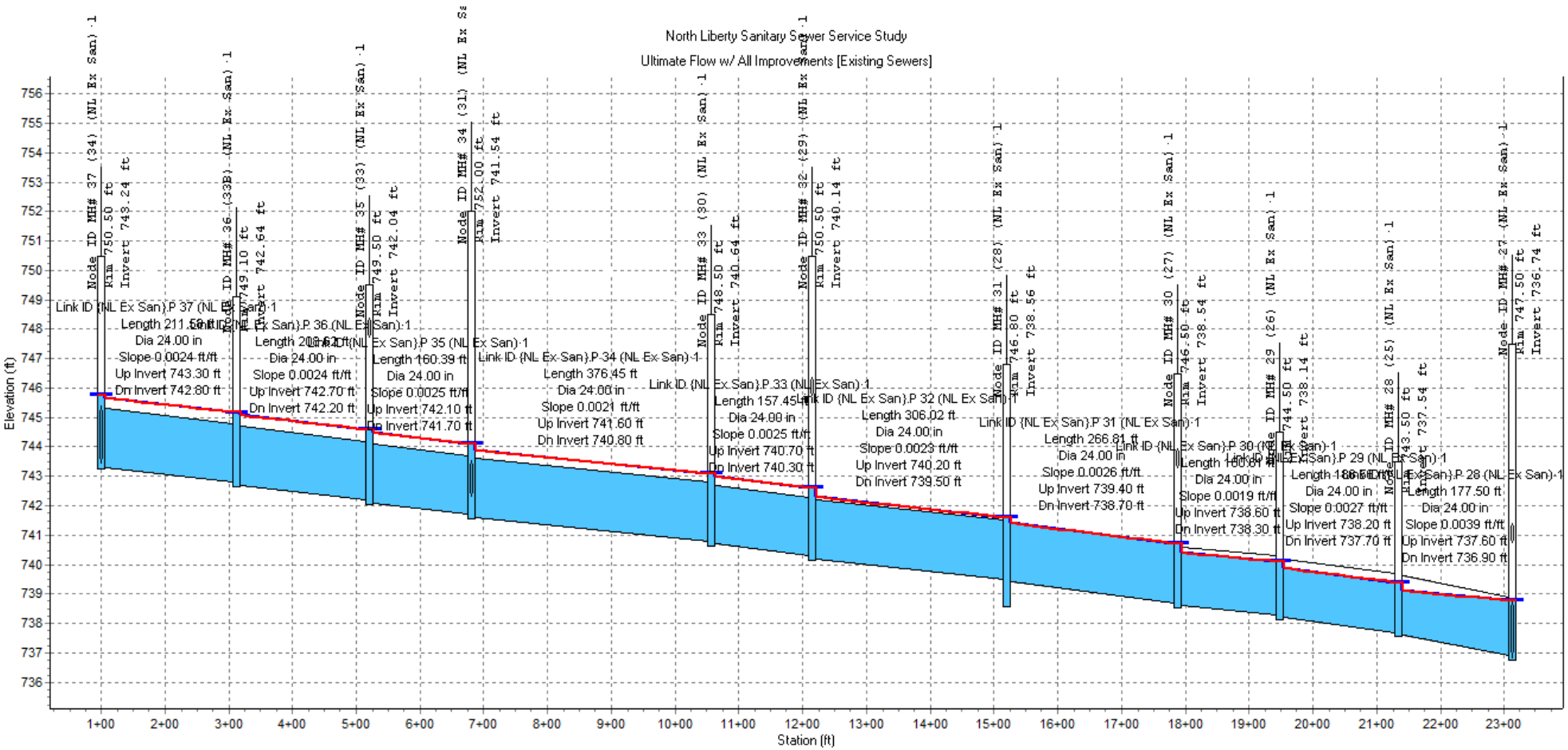
Node ID:		MH# 42 (1-10) (NL Ex San)·1	MH# 40 (1-8B) (NL Ex San)·1	MH# 39 (37) (NL Ex San)·1	
Rim (ft):	761.93	758.95	760.15	758.50	752.50
Invert (ft):	755.35	754.06	747.29	746.84	744.44
Min Pipe Cover (ft):	5.02	3.37	6.90	9.50	5.90
Max HGL (ft):	757.08	754.87	748.71	747.93	746.70

Link ID:	{NL Ex San}.P 43 (NL Ex San)·1	{NL Ex San}.P 41 (NL Ex San)·1	{NL Ex San}.P 40 (NL Ex San)·1	{NL Ex San}.P 39 (NL Ex San)·1
Length (ft):	583.07	238.77	88.62	309.61
Dia (in):	18.00	18.00	24.00	24.00
Slope (ft/ft):	0.0023	0.0109	0.0039	0.0074
Up Invert (ft):	755.41	754.06	747.35	746.90
Dn Invert (ft):	754.08	751.45	747.00	744.60
Max Q (mgd):	3.59	3.59	5.83	6.59
Max Vel (ft/s):	3.66	5.95	4.51	4.00
Max Depth (ft):	1.20	0.78	1.21	1.51



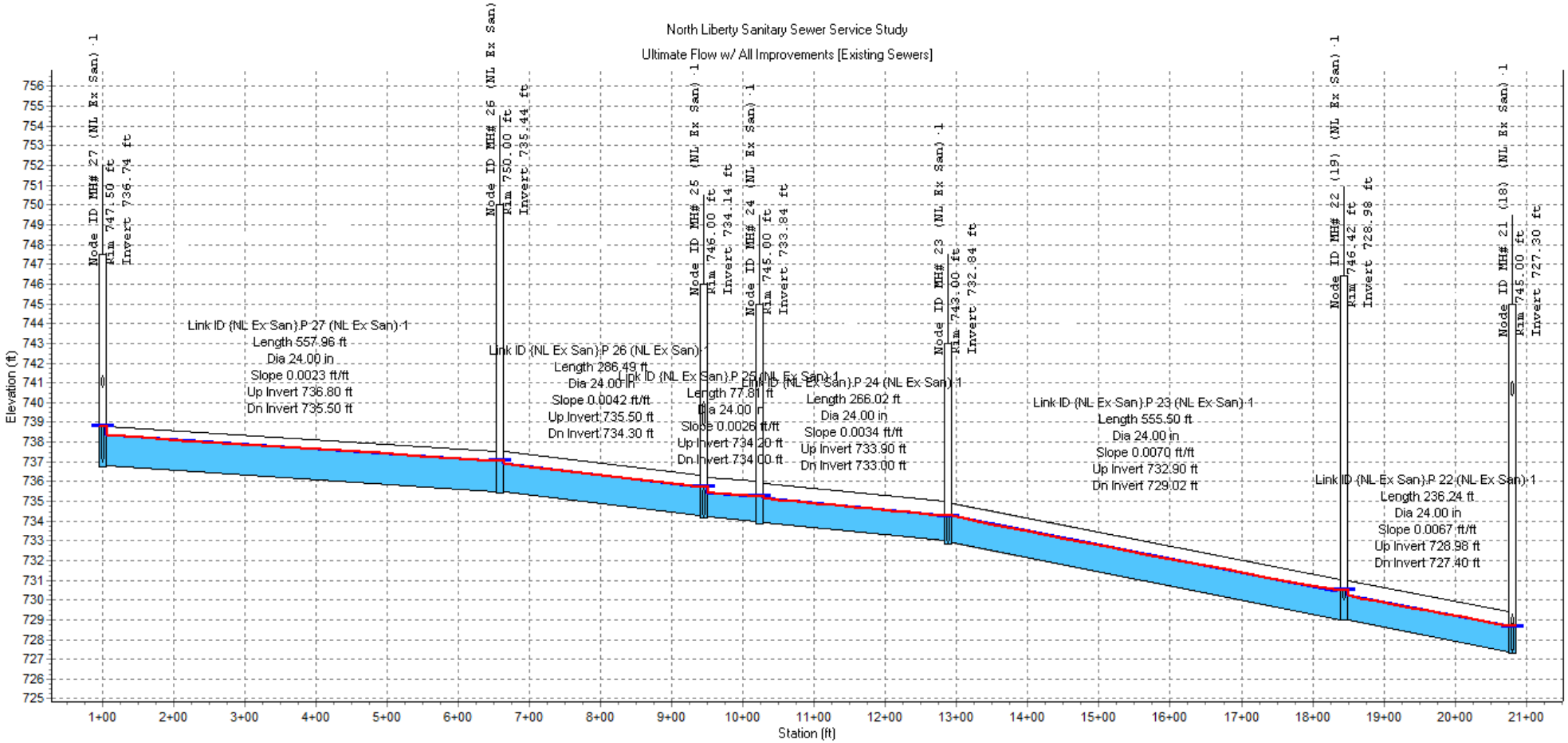
Node ID:		MH# 37 (34) (NL Ex San) 1	MH# 36 (33B) (NL Ex San) 1	MH# 35 (33) (NL Ex San) 1	MH# 34 (31) (NL Ex San) 1	
Rim (ft):	752.50	750.50	749.10	749.50	752.00	748.50
Invert (ft):	744.44	743.24	742.64	742.04	741.54	740.64
Min Pipe Cover (ft):	5.90	5.10	4.30	1.13	8.30	5.70
Max HGL (ft):	746.70	745.77	745.17	744.59	744.09	743.11

Link ID:	(NL Ex San).P 38 (NL Ex San) 1	(NL Ex San).P 37 (NL Ex San) 1	(NL Ex San).P 36 (NL Ex San) 1	(NL Ex San).P 35 (NL Ex San) 1	(NL Ex San).P 34 (NL Ex San) 1
Length (ft):	380.00	211.58	208.62	160.39	376.45
Dia (in):	24.00	24.00	24.00	24.00	24.00
Slope (ft/ft):	0.0029	0.0024	0.0024	0.0025	0.0021
Up Invert (ft):	744.50	743.30	742.70	742.10	741.60
Dn Invert (ft):	743.40	742.80	742.20	741.70	740.80
Max Q (mgd):	6.59	6.59	6.59	6.66	6.77
Max Vel (ft/s):	3.24	3.24	3.24	3.28	3.33
Max Depth (ft):	2.00	2.00	2.00	2.00	2.00



Node ID:	MH# 36 (33B) (NL Ex San) 1	MH# 35 (33) (NL Ex San) 1	MH# 34 (31) (NL Ex San) 1	MH# 33 (30) (NL Ex San) 1	MH# 32 (29) (NL Ex San) 1	MH# 31 (28) (NL Ex San) 1	MH# 30 (27) (NL Ex San) 1	MH# 29 (26) (NL Ex San) 1	MH# 28 (25) (NL Ex San) 1	
Rim (ft):	750.50	749.10	749.50	752.00	748.50	750.50	746.80	746.50	744.50	743.50	747.50
Invert (ft):	743.24	742.64	742.04	741.54	740.64	740.14	738.56	738.54	738.14	737.54	736.74
Min Pipe Cover (ft):	5.10	4.30	1.13	8.30	5.70	4.13	5.30	2.56	4.20	3.80	6.12
Max HGL (ft):	745.77	745.17	744.59	744.09	743.11	742.60	741.60	740.71	740.10	739.39	738.77

Link ID:	(NL Ex San).P 37 (NL Ex San) 1	(NL Ex San).P 36 (NL Ex San) 1	(NL Ex San).P 35 (NL Ex San) 1	(NL Ex San).P 34 (NL Ex San) 1	(NL Ex San).P 33 (NL Ex San) 1	(NL Ex San).P 32 (NL Ex San) 1	(NL Ex San).P 31 (NL Ex San) 1	(NL Ex San).P 30 (NL Ex San) 1	(NL Ex San).P 29 (NL Ex San) 1	(NL Ex San).P 28 (NL Ex San) 1	
Length (ft):	211.58	208.62	160.39	376.45	157.45	306.02	266.81	160.61	186.56	177.50	
Dia (in):	24.00	24.00	24.00	24.00	24.00	24.00	24.00	24.00	24.00	24.00	
Slope (ft/ft):	0.0024	0.0024	0.0025	0.0021	0.0025	0.0023	0.0026	0.0019	0.0027	0.0039	
Up Invert (ft):	743.30	742.70	742.10	741.60	740.70	740.20	739.40	738.60	738.20	737.60	
Dn Invert (ft):	742.80	742.20	741.70	740.80	740.30	739.50	738.70	738.30	737.70	736.90	
Max Q (mgd):	6.59	6.59	6.66	6.77	6.77	7.42	7.42	7.49	7.49	7.49	
Max Vel (ft/s):	3.24	3.24	3.28	3.33	3.33	3.65	3.65	3.76	3.90	3.84	
Max Depth (ft):	2.00	2.00	2.00	2.00	2.00	2.00	2.00	1.90	1.80	1.83	

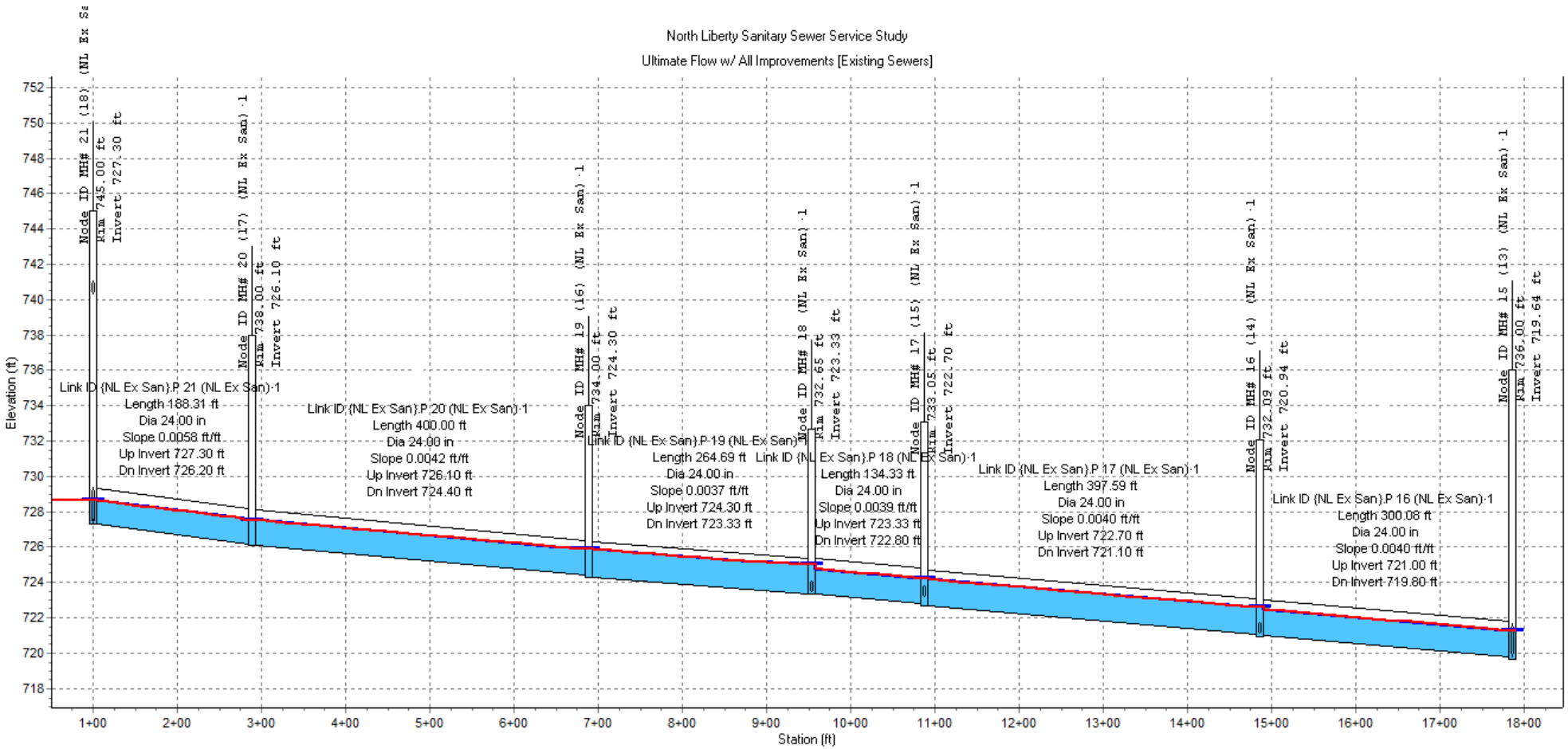


Node ID:		MH# 26 (NL Ex San) 1	MH# 25 (NL Ex San) 1	MH# 24 (NL Ex San) 1	MH# 23 (NL Ex San) 1	MH# 22 (19) (NL Ex San) 1	
Rim (ft):	747.50	750.00	746.00	745.00	743.00	746.42	745.00
Invert (ft):	736.74	735.44	734.14	733.84	732.84	728.98	727.30
Min Pipe Cover (ft):	6.12	12.50	5.95	9.00	8.00	15.40	3.91
Max HGL (ft):	738.77	737.05	735.72	735.24	734.26	730.49	728.67

Link ID:		(NL Ex San).P 27 (NL Ex San) 1	(NL Ex San).P 26 (NL Ex San) 1	(NL Ex San).P 25 (NL Ex San) 1	(NL Ex San).P 24 (NL Ex San) 1	(NL Ex San).P 23 (NL Ex San) 1	(NL Ex San).P 22 (NL Ex San) 1	
Length (ft):		557.96	286.49	77.81	266.02	555.50	236.24	
Dia (in):		24.00	24.00	24.00	24.00	24.00	24.00	
Slope (ft/ft):		0.0023	0.0042	0.0026	0.0034	0.0070	0.0067	
Up Invert (ft):		736.80	735.50	734.20	733.90	732.90	728.98	
Dn Invert (ft):		735.50	734.30	734.00	733.00	729.02	727.40	
Max Q (mgd):		7.64	7.64	5.73	5.73	9.20	9.26	
Max Vel (ft/s):		4.04	4.74	3.83	4.10	5.98	6.02	
Max Depth (ft):		1.76	1.48	1.38	1.30	1.42	1.42	

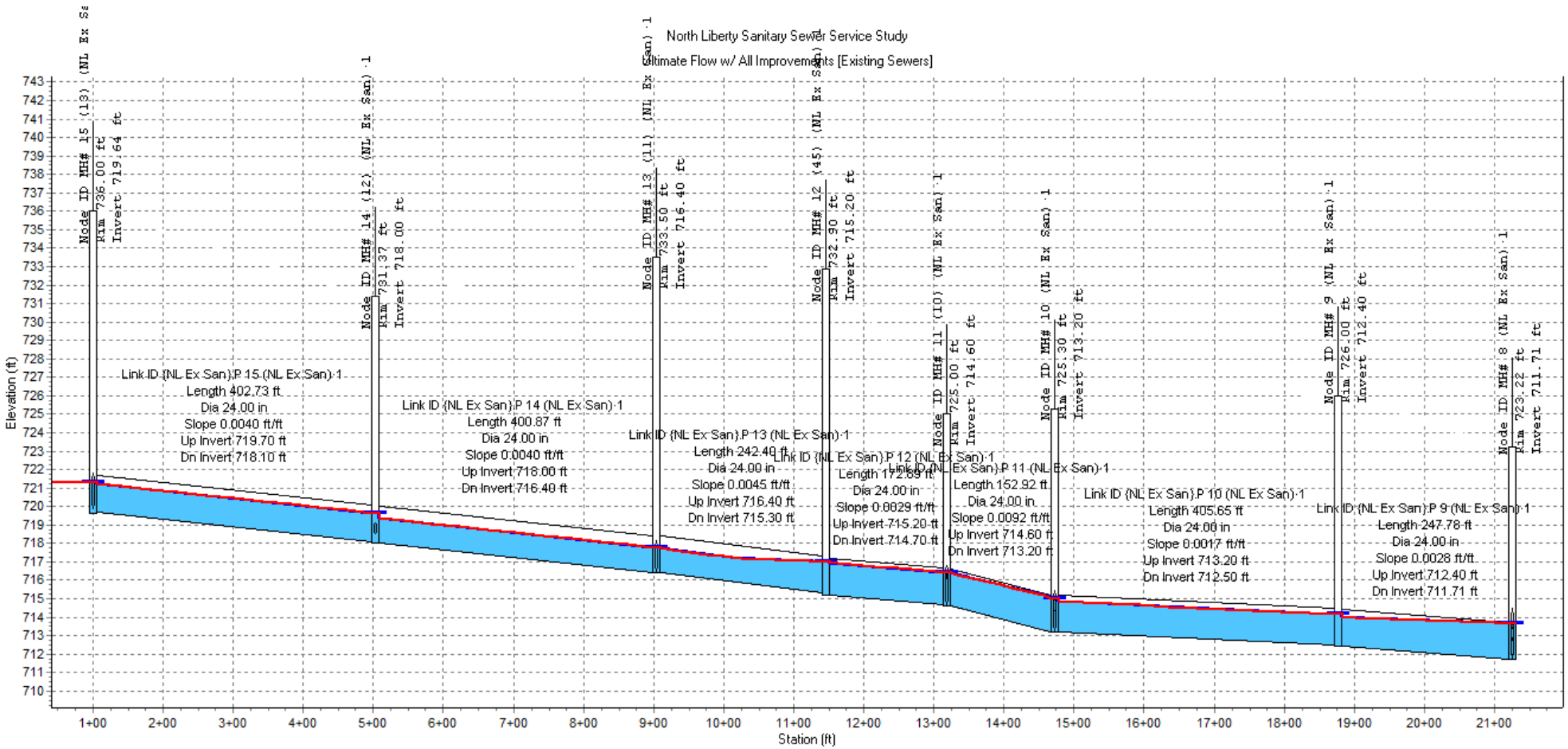
North Liberty Sanitary Sewer Service Study

Ultimate Flow w/ All Improvements [Existing Sewers]



Node ID:		MH# 20 (17) (NL Ex San) 1	MH# 19 (16) (NL Ex San) 1	MH# 18 (NL Ex San) 1	MH# 17 (15) (NL Ex San) 1	MH# 16 (14) (NL Ex San) 1	
Rim (ft):	745.00	738.00	734.00	732.65	733.05	732.09	736.00
Invert (ft):	727.30	726.10	724.30	723.33	722.70	720.94	719.64
Min Pipe Cover (ft):	3.91	9.80	7.60	7.32	8.25	8.99	14.20
Max HGL (ft):	728.67	727.52	725.93	725.03	724.25	722.60	721.30

Link ID:	(NL Ex San).P 21 (NL Ex San) 1	(NL Ex San).P 20 (NL Ex San) 1	(NL Ex San).P 19 (NL Ex San) 1	(NL Ex San).P 18 (NL Ex San) 1	(NL Ex San).P 17 (NL Ex San) 1	(NL Ex San).P 16 (NL Ex San) 1
Length (ft):	188.31	400.00	264.69	134.33	397.59	300.08
Dia (in):	24.00	24.00	24.00	24.00	24.00	24.00
Slope (ft/ft):	0.0058	0.0042	0.0037	0.0039	0.0040	0.0040
Up Invert (ft):	727.30	726.10	724.30	723.33	722.70	721.00
Dn Invert (ft):	726.20	724.40	723.33	722.80	721.10	719.80
Max Q (mgd):	7.38	7.38	7.38	7.74	7.80	7.80
Max Vel (ft/s):	5.06	4.59	4.08	4.50	4.69	4.62
Max Depth (ft):	1.35	1.48	1.67	1.58	1.53	1.55

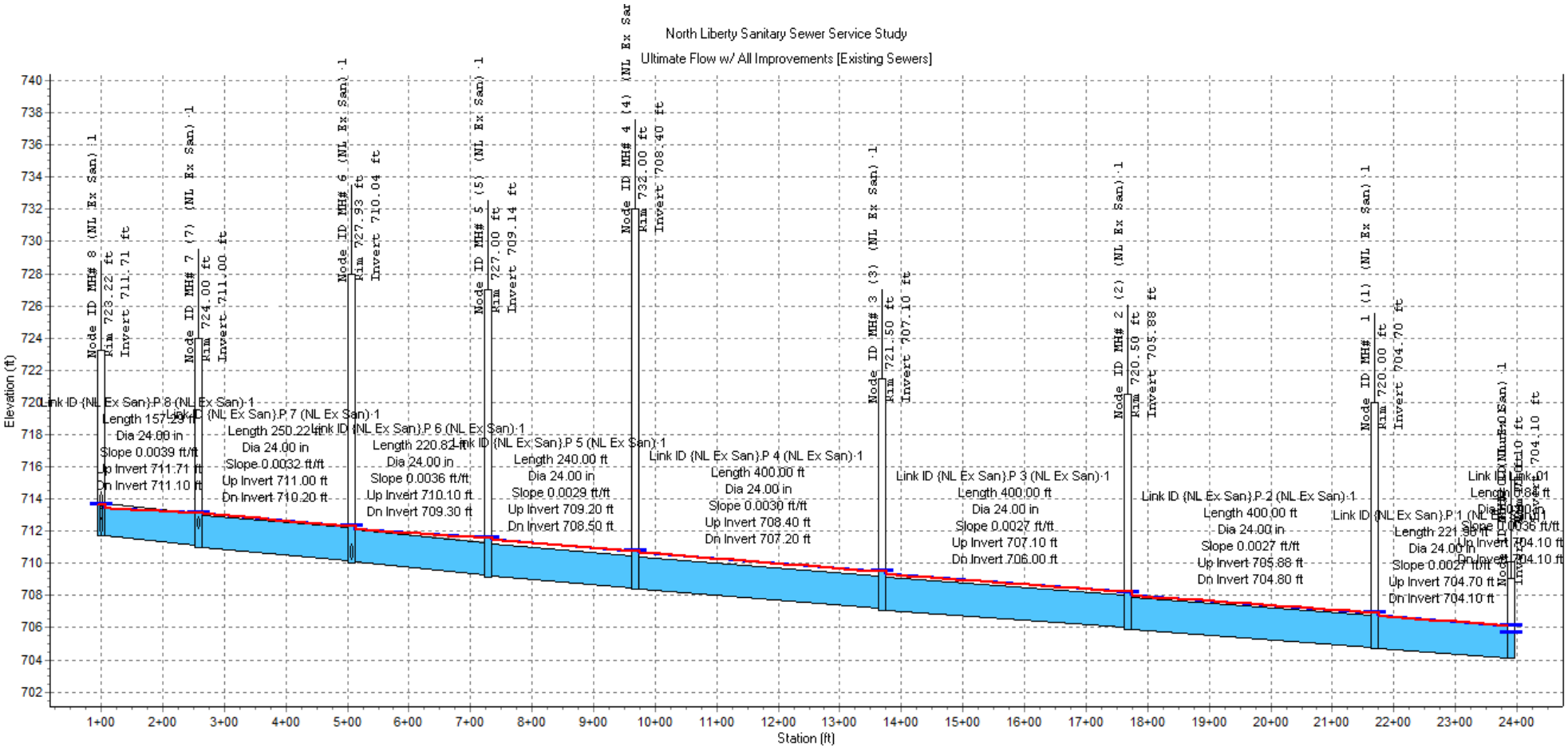


Node ID:		MH# 14 (12) (NL Ex San)·1	MH# 13 (11) (NL Ex San)·1	MH# 12 (45) (NL Ex San)·1	MH# 11 (10) (NL Ex San)·1	MH# 10 (NL Ex San)·1	MH# 9 (NL Ex San)·1	
Rim (ft):	736.00	731.37	733.50	732.90	725.00	725.30	726.00	723.22
Invert (ft):	719.64	718.00	716.40	715.20	714.60	713.20	712.40	711.71
Min Pipe Cover (ft):	14.20	11.27	15.10	15.60	8.17	9.85	11.50	8.76
Max HGL (ft):	721.30	719.63	717.79	717.00	716.45	714.98	714.15	713.65

Link ID:	(NL Ex San).P 15 (NL Ex San)·1	(NL Ex San).P 14 (NL Ex San)·1	(NL Ex San).P 13 (NL Ex San)·1	(NL Ex San).P 12 (NL Ex San)·1	(NL Ex San).P 11 (NL Ex San)·1	(NL Ex San).P 10 (NL Ex San)·1	(NL Ex San).P 9 (NL Ex San)·1
Length (ft):	402.73	400.87	242.40	172.89	152.92	405.65	247.78
Dia (in):	24.00	24.00	24.00	24.00	24.00	24.00	24.00
Slope (ft/ft):	0.0040	0.0040	0.0045	0.0029	0.0092	0.0017	0.0028
Up Invert (ft):	719.70	718.00	716.40	715.20	714.60	713.20	712.40
Dn Invert (ft):	718.10	716.40	715.30	714.70	713.20	712.50	711.71
Max Q (mgd):	8.00	8.12	6.88	6.88	11.80	6.05	6.05
Max Vel (ft/s):	4.69	4.92	4.08	3.61	6.09	3.26	3.09
Max Depth (ft):	1.57	1.51	1.55	1.77	1.82	1.72	1.85

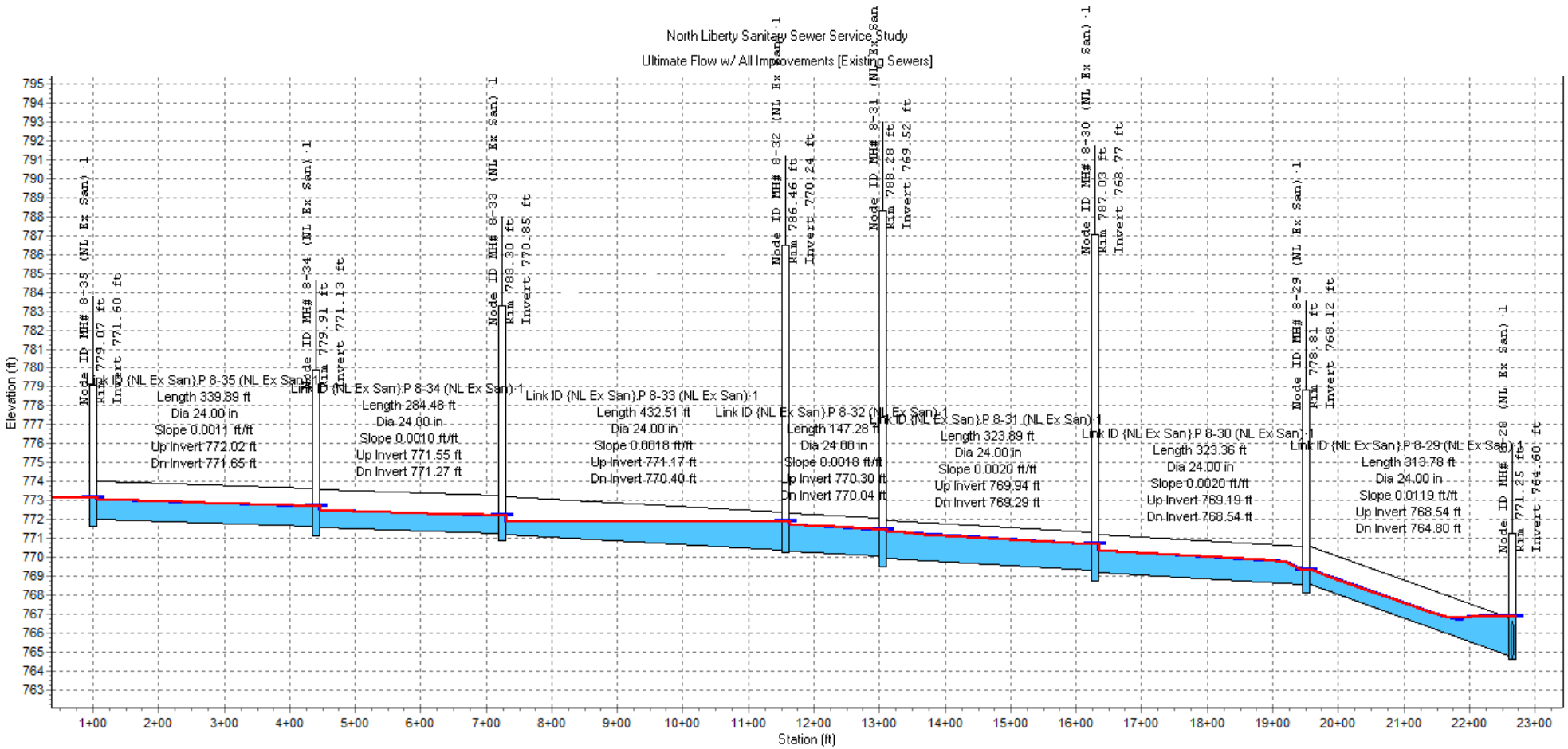
North Liberty Sanitary Sewer Service Study

Ultimate Flow w/ All Improvements [Existing Sewers]



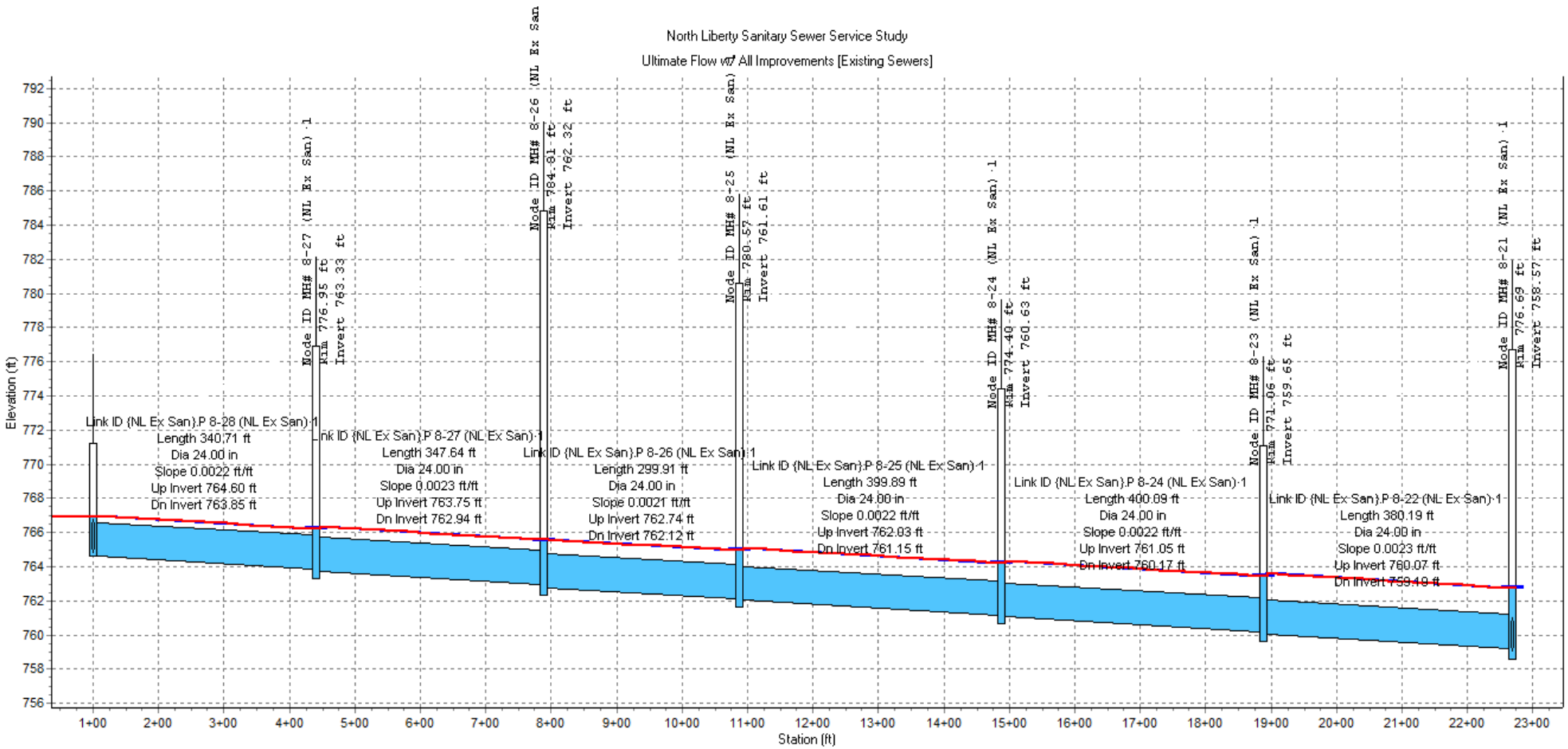
Node ID:		MH# 7 (7) (NL Ex San)-1	MH# 6 (NL Ex San)-1	MH# 5 (5) (NL Ex San)-1	MH# 4 (4) (NL Ex San)-1	MH# 3 (3) (NL Ex San)-1	MH# 2 (2) (NL Ex San)-1	MH# 1 (1) (NL Ex San)-1	Jur-01
Rim (ft):	723.22	724.00	727.93	727.00	732.00	721.50	720.50	720.00	710.10
Invert (ft):	711.71	711.00	710.04	709.14	708.40	707.10	705.88	704.70	704.10
Min Pipe Cover (ft):	8.76	10.90	15.73	15.70	21.50	12.30	12.50	13.20	1.00
Max HGL (ft):	713.65	713.11	712.31	711.57	710.77	709.49	708.21	706.94	706.63

Link ID:	(NL Ex San).P 8 (NL Ex San) 1	(NL Ex San).P 7 (NL Ex San) 1	(NL Ex San).P 6 (NL Ex San) 1	(NL Ex San).P 5 (NL Ex San) 1	(NL Ex San).P 4 (NL Ex San) 1	(NL Ex San).P 3 (NL Ex San) 1	(NL Ex San).P 2 (NL Ex San) 1	(NL Ex San).P 1 (NL Ex San) 1	Jur-01
Length (ft):	157.29	250.22	220.82	240.00	400.00	400.00	400.00	221.96	0.84
Dia (in):	24.00	24.00	24.00	24.00	24.00	24.00	24.00	24.00	60.00
Slope (ft/ft):	0.0039	0.0032	0.0036	0.0029	0.0030	0.0027	0.0027	0.0027	0.0036
Up Invert (ft):	711.71	711.00	710.10	709.20	708.40	707.10	705.88	704.70	704.10
Dn Invert (ft):	711.10	710.20	709.30	708.50	707.20	706.00	704.80	704.10	704.10
Max Q (mgd):	7.18	7.18	7.28	7.28	7.54	7.54	7.54	7.54	20.70
Max Vel (ft/s):	3.55	3.54	3.58	3.58	3.71	3.71	3.71	3.71	5.09
Max Depth (ft):	1.97	2.00	2.00	2.00	2.00	2.00	2.00	2.00	1.78



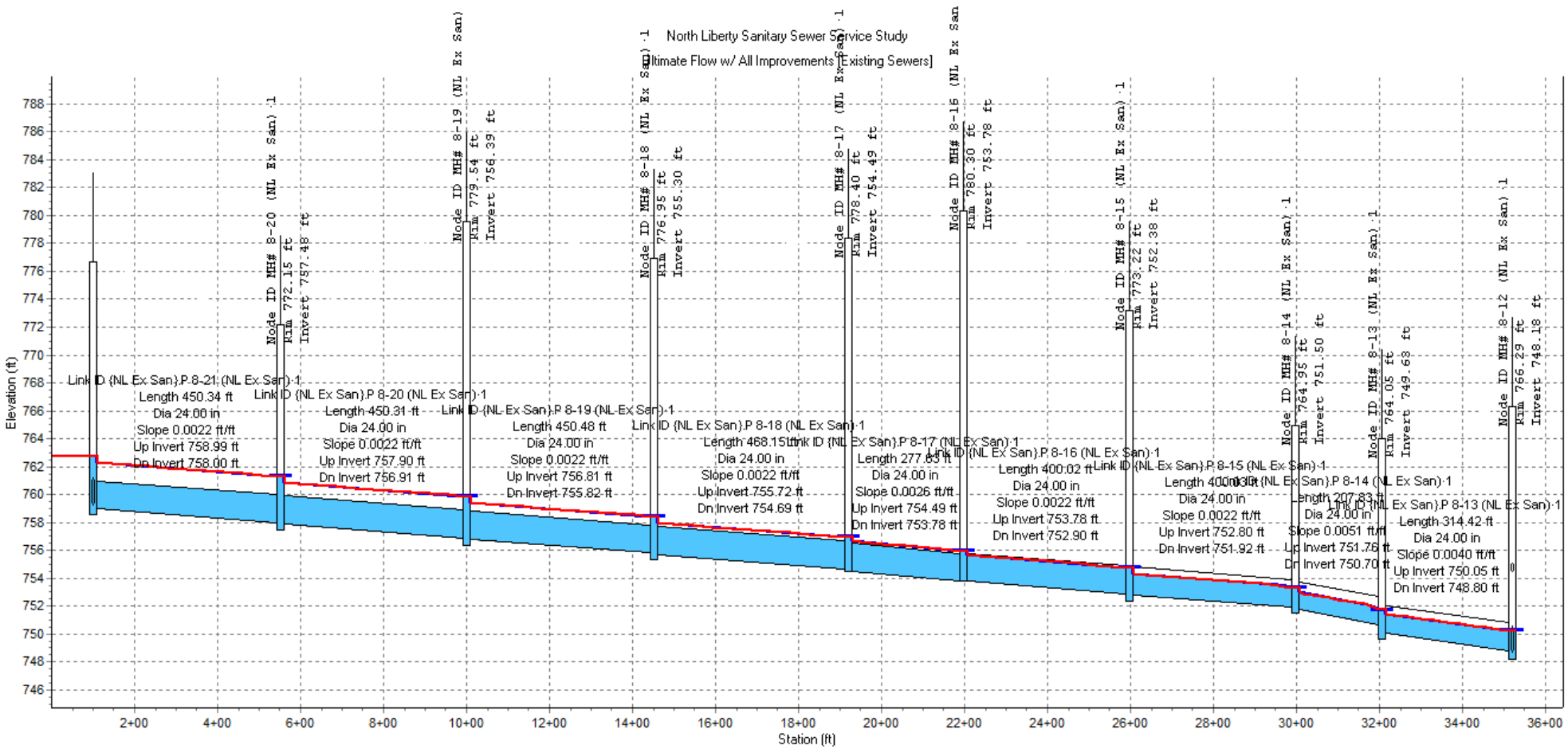
Node ID:		MH# 8-34 (NL Ex San)-1	MH# 8-33 (NL Ex San)-1	MH# 8-32 (NL Ex San)-1	MH# 8-31 (NL Ex San)-1	MH# 8-30 (NL Ex San)-1	MH# 8-29 (NL Ex San)-1	
Rim (ft):	779.07	779.91	783.30	786.46	788.28	787.03	778.81	771.25
Invert (ft):	771.60	771.13	770.85	770.24	769.52	768.77	768.12	764.60
Min Pipe Cover (ft):	5.05	6.26	10.03	14.06	16.24	15.74	8.27	4.45
Max HGL (ft):	773.15	772.70	772.20	771.91	771.47	770.70	769.34	766.90

Link ID:	{NL Ex San}.P 8-35 (NL Ex San)-1	{NL Ex San}.P 8-34 (NL Ex San)-1	{NL Ex San}.P 8-33 (NL Ex San)-1	{NL Ex San}.P 8-32 (NL Ex San)-1	{NL Ex San}.P 8-31 (NL Ex San)-1	{NL Ex San}.P 8-30 (NL Ex San)-1	{NL Ex San}.P 8-29 (NL Ex San)-1
Length (ft):	339.89	284.48	432.51	147.28	323.89	323.36	313.78
Dia (in):	24.00	24.00	24.00	24.00	24.00	24.00	24.00
Slope (ft/ft):	0.0011	0.0010	0.0018	0.0018	0.0020	0.0020	0.0119
Up Invert (ft):	772.02	771.55	771.17	770.30	769.94	769.19	768.54
Dn Invert (ft):	771.65	771.27	770.40	770.04	769.29	768.54	764.80
Max Q (mgd):	2.71	2.71	2.71	5.41	5.41	5.41	5.41
Max Vel (ft/s):	2.39	2.54	1.99	3.27	3.39	3.98	3.56
Max Depth (ft):	1.09	1.04	1.27	1.52	1.47	1.27	1.40



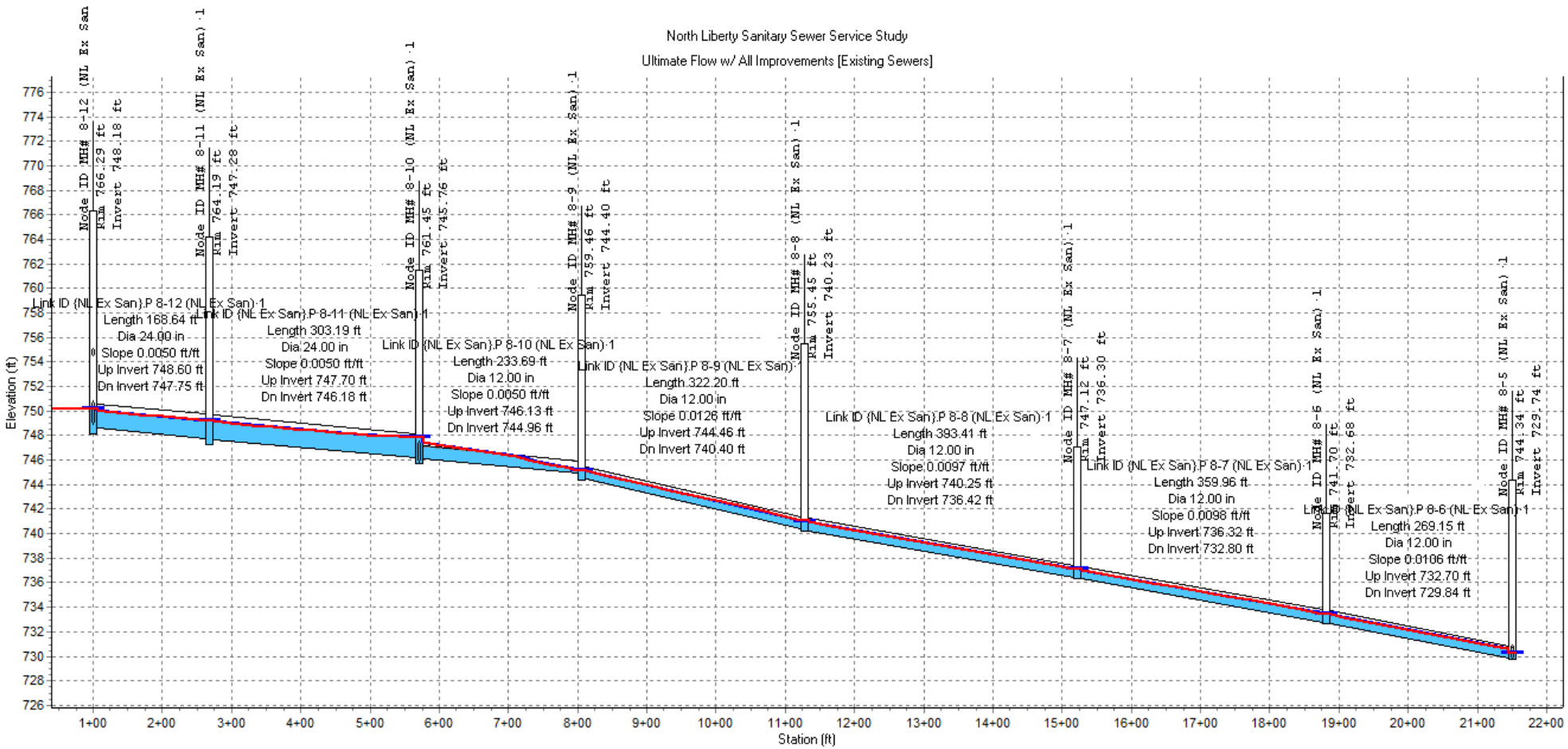
Node ID:		MH# 8-27 (NL Ex San)-1	MH# 8-26 (NL Ex San)-1	MH# 8-25 (NL Ex San)-1	MH# 8-24 (NL Ex San)-1	MH# 8-23 (NL Ex San)-1	
Rim (ft):	771.25	776.95	784.81	780.57	774.40	771.06	776.69
Invert (ft):	764.60	763.33	762.32	761.61	760.63	759.65	758.57
Min Pipe Cover (ft):	4.45	11.10	19.87	16.45	11.25	8.89	15.50
Max HGL (ft):	766.90	766.24	765.57	764.98	764.22	763.47	762.75

Link ID:	(NL Ex San).P 8-28 (NL Ex San)-1	(NL Ex San).P 8-27 (NL Ex San)-1	(NL Ex San).P 8-26 (NL Ex San)-1	(NL Ex San).P 8-25 (NL Ex San)-1	(NL Ex San).P 8-24 (NL Ex San)-1	(NL Ex San).P 8-22 (NL Ex San)-1
Length (ft):	340.71	347.64	299.91	399.89	400.09	380.19
Dia (in):	24.00	24.00	24.00	24.00	24.00	24.00
Slope (ft/ft):	0.0022	0.0023	0.0021	0.0022	0.0022	0.0023
Up Invert (ft):	764.60	763.75	762.74	762.03	761.05	760.07
Dn Invert (ft):	763.85	762.94	762.12	761.15	760.17	759.19
Max Q (mgd):	5.78	5.78	5.78	5.78	5.81	5.84
Max Vel (ft/s):	2.85	2.85	2.85	2.85	2.86	2.88
Max Depth (ft):	2.00	2.00	2.00	2.00	2.00	2.00



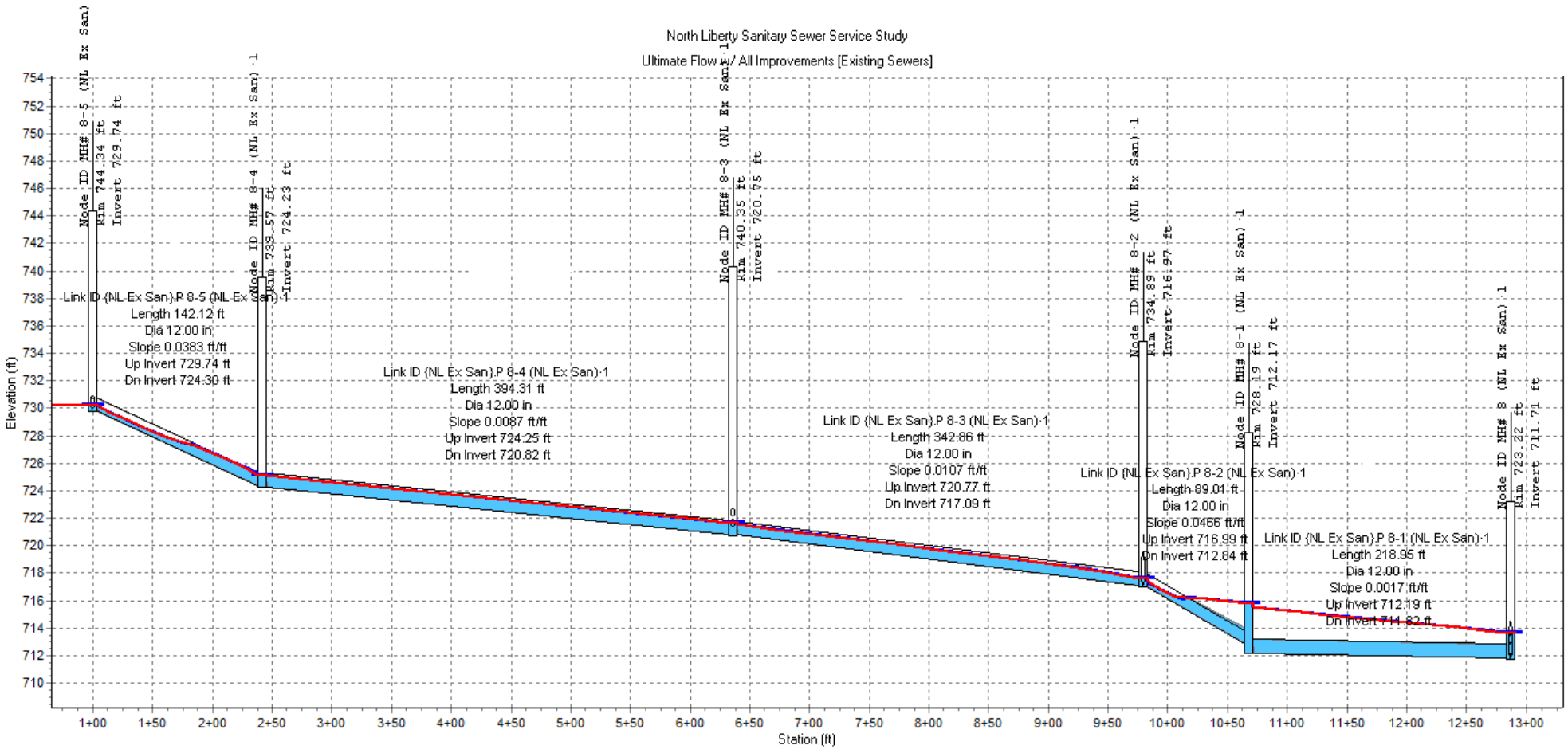
Node ID:		MH# 8-20 (NL Ex San)·1	MH# 8-19 (NL Ex San)·1	MH# 8-18 (NL Ex San)·1	MH# 8-17 (NL Ex San)	MH# 8-16 (NL Ex San)·1	MH# 8-15 (NL Ex San)·1	MH# 8-14 (NL Ex San)·1	MH# 8-13 (NL Ex San)·1	
Rim (ft):	776.69	772.15	779.54	776.95	778.40	780.30	773.22	764.95	764.05	766.29
Invert (ft):	758.57	757.48	756.39	755.30	754.49	753.78	752.38	751.50	749.63	748.18
Min Pipe Cover (ft):	15.50	12.15	20.63	19.13	21.71	24.52	18.32	11.03	11.35	11.18
Max HGL (ft):	762.75	761.31	759.87	758.43	756.94	755.97	754.78	753.31	751.73	750.21

Link ID:	{NL Ex San}.P 8-21 (NL Ex San)·1	{NL Ex San}.P 8-20 (NL Ex San)·1	{NL Ex San}.P 8-19 (NL Ex San)·1	{NL Ex San}.P 8-18 (NL Ex San)·1	{NL Ex San}.P 8-17 (NL Ex San)	{NL Ex San}.P 8-16 (NL Ex San)·1	{NL Ex San}.P 8-15 (NL Ex San)·1	{NL Ex San}.P 8-14 (NL Ex San)·1	{NL Ex San}.P 8-13 (NL Ex San)·1	
Length (ft):	450.34	450.31	450.48	468.15	277.63	400.02	400.03	207.83	314.42	
Dia (in):	24.00	24.00	24.00	24.00	24.00	24.00	24.00	24.00	24.00	
Slope (ft/ft):	0.0022	0.0022	0.0022	0.0022	0.0026	0.0022	0.0022	0.0051	0.0040	
Up Invert (ft):	758.99	757.90	756.81	755.72	754.49	753.78	752.80	751.76	750.05	
Dn Invert (ft):	758.00	756.91	755.82	754.69	753.78	752.90	751.92	750.70	748.80	
Max Q (mgd):	7.62	7.62	7.62	7.62	7.62	7.62	7.62	8.22	8.22	
Max Vel (ft/s):	3.75	3.75	3.75	3.75	3.75	3.79	4.18	5.35	4.87	
Max Depth (ft):	2.00	2.00	2.00	2.00	2.00	1.94	1.68	1.41	1.55	



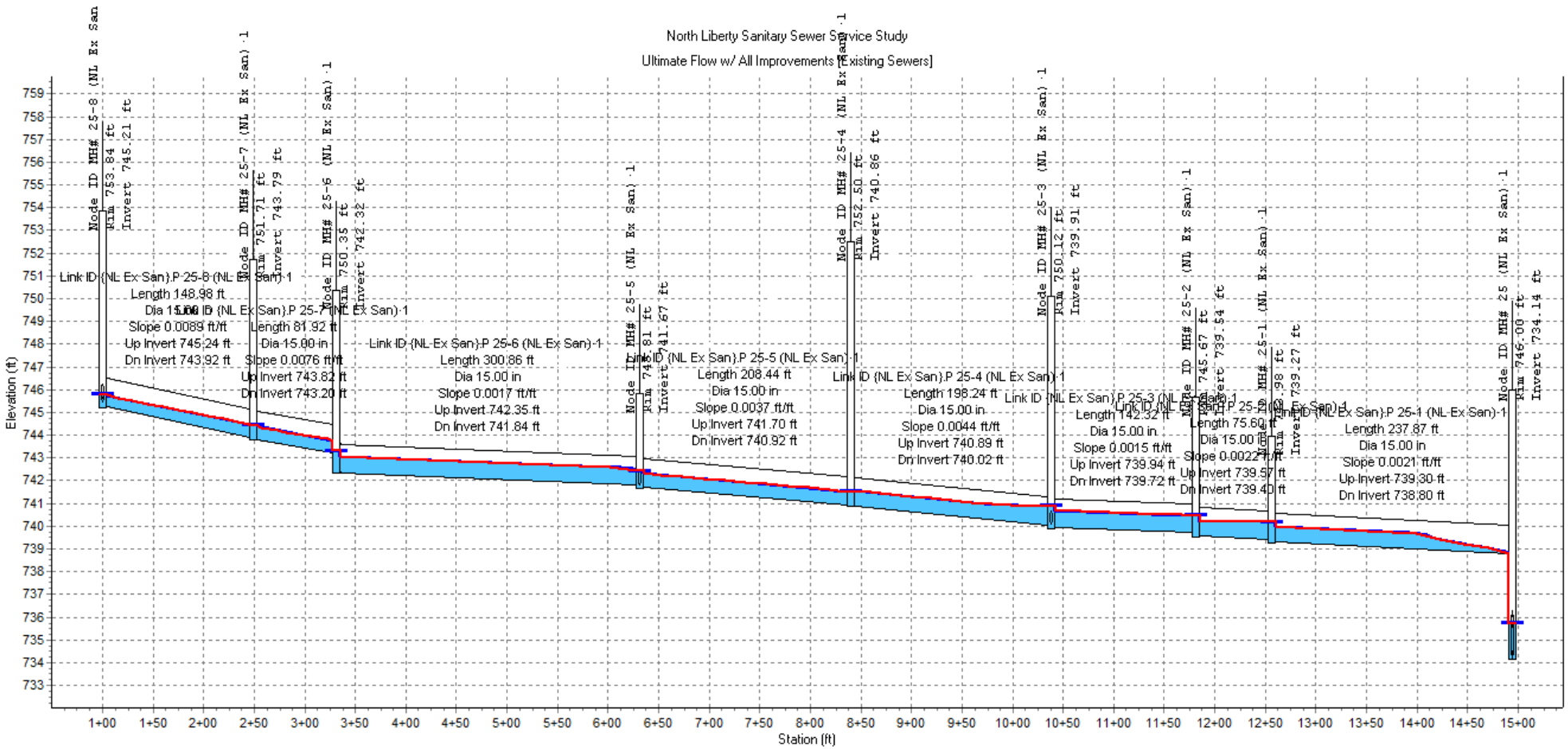
Node ID:		MH# 8-11 (NL Ex San)-1	MH# 8-10 (NL Ex San)-1	MH# 8-9 (NL Ex San)-1	MH# 8-8 (NL Ex San)-1	MH# 8-7 (NL Ex San)-1	MH# 8-6 (NL Ex San)-1	
Rim (ft):	766.29	764.19	761.45	759.46	755.45	747.12	741.70	744.34
Invert (ft):	748.18	747.28	745.76	744.40	740.23	736.30	732.68	729.74
Min Pipe Cover (ft):	11.18	14.44	13.27	13.50	14.05	9.70	7.90	13.42
Max HGL (ft):	750.21	749.20	747.86	745.17	741.03	737.10	733.46	730.22

Link ID:	(NL Ex San).P 8-12 (NL Ex San)-1	(NL Ex San).P 8-11 (NL Ex San)-1	(NL Ex San).P 8-10 (NL Ex San)-1	(NL Ex San).P 8-9 (NL Ex San)-1	(NL Ex San).P 8-8 (NL Ex San)-1	(NL Ex San).P 8-7 (NL Ex San)-1	(NL Ex San).P 8-6 (NL Ex San)-1	
Length (ft):	168.64	303.19	233.69	322.20	393.41	359.96	269.15	
Dia (in):	24.00	24.00	12.00	12.00	12.00	12.00	12.00	
Slope (ft/ft):	0.0050	0.0050	0.0050	0.0126	0.0097	0.0098	0.0106	
Up Invert (ft):	748.60	747.70	746.13	744.46	740.25	736.32	732.70	
Dn Invert (ft):	747.75	746.18	744.96	740.40	736.42	732.80	729.84	
Max Q (mgd):	8.22	8.22	2.05	2.05	2.05	2.05	2.05	
Max Vel (ft/s):	4.92	4.74	4.33	5.49	4.93	4.93	5.07	
Max Depth (ft):	1.53	1.59	0.88	0.69	0.76	0.76	0.74	



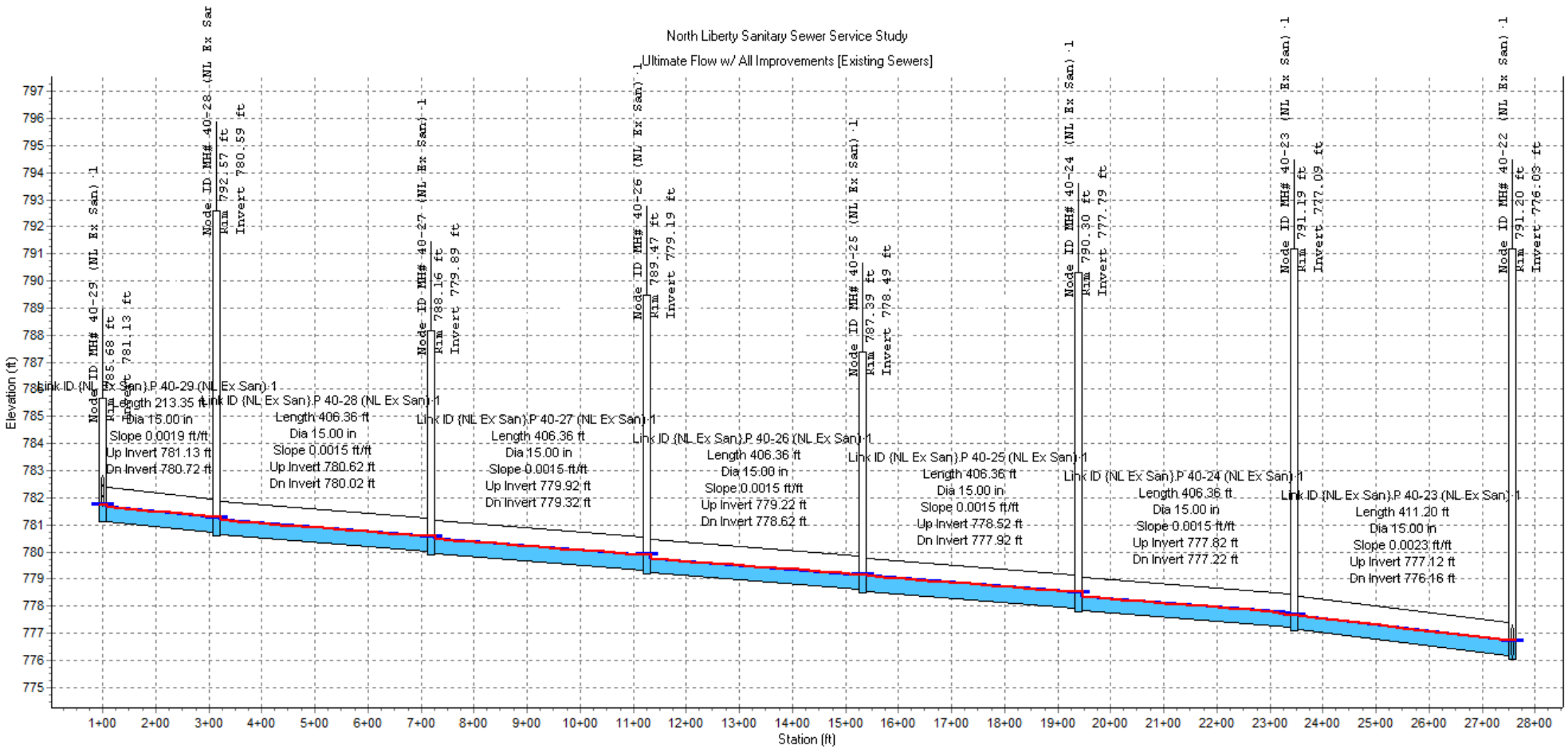
Node ID:		MH# 8-4 (NL Ex San)-1	MH# 8-3 (NL Ex San)-1	MH# 8-2 (NL Ex San)	MH# 8-1 (NL Ex San)-1	
Rim (ft):	744.34	739.57	740.35	734.89	728.19	723.22
Invert (ft):	729.74	724.23	720.75	716.97	712.17	711.71
Min Pipe Cover (ft):	13.42	14.27	17.63	15.42	14.35	8.76
Max HGL (ft):	730.22	725.12	721.64	717.57	715.79	713.65

Link ID:	(NL Ex San).P 8-5 (NL Ex San)-1	(NL Ex San).P 8-4 (NL Ex San)-1	(NL Ex San).P 8-3 (NL Ex San)-1	(NL Ex San).P 8-2 (NL Ex San)-1	(NL Ex San).P 8-1 (NL Ex San)-1	
Length (ft):	142.12	394.31	342.86	89.01	218.95	
Dia (in):	12.00	12.00	12.00	12.00	12.00	
Slope (ft/ft):	0.0383	0.0087	0.0107	0.0466	0.0017	
Up Invert (ft):	729.74	724.25	720.77	716.99	712.19	
Dn Invert (ft):	724.30	720.82	717.09	712.84	711.82	
Max Q (mgd):	2.13	2.13	2.33	2.13	2.13	
Max Vel (ft/s):	6.04	4.64	5.15	4.93	4.19	
Max Depth (ft):	0.66	0.85	0.84	0.79	1.00	



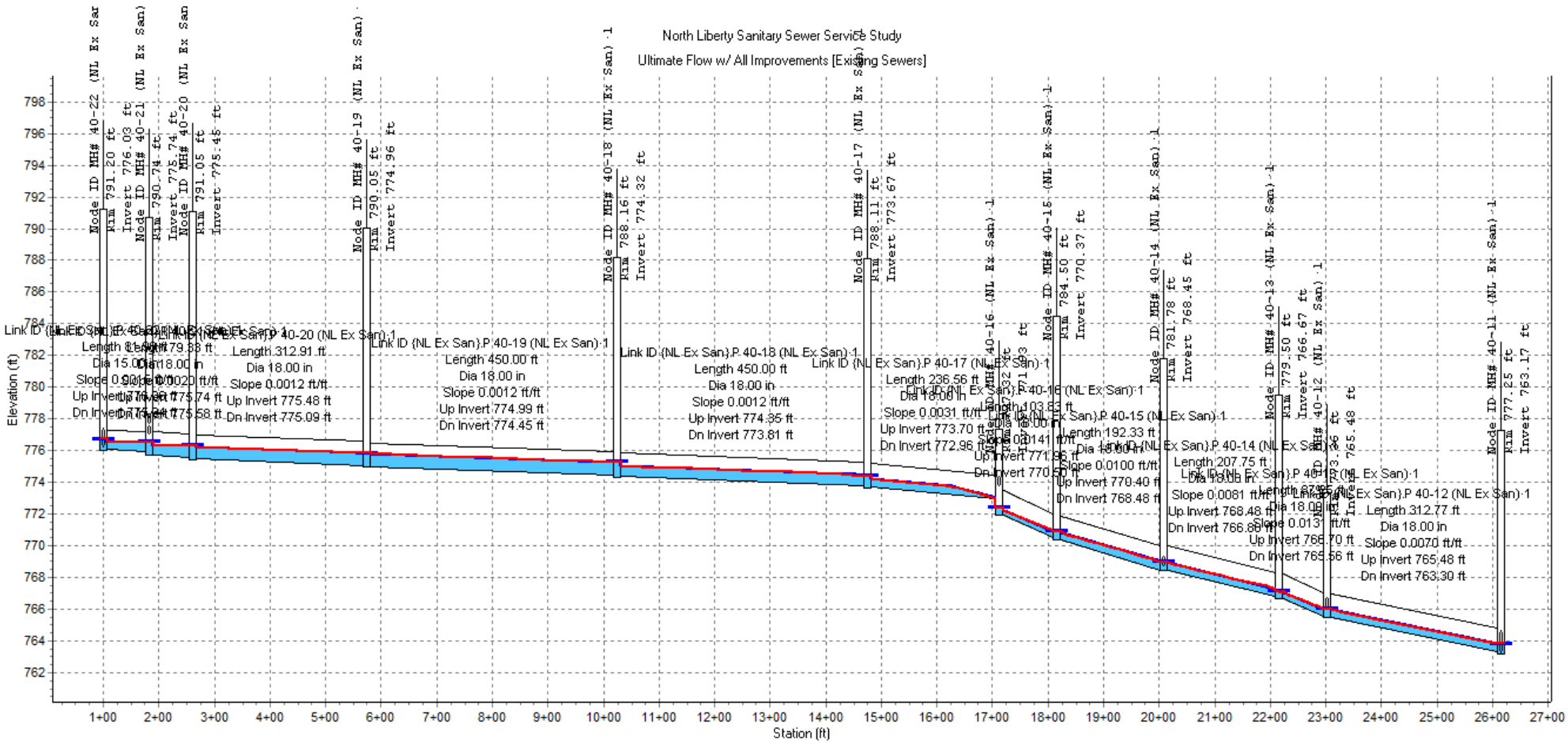
Node ID:		MH# 25-7 (NL Ex San)-1	MH# 25-6 (NL Ex San)-1	MH# 25-5 (NL Ex San)-1	MH# 25-4 (NL Ex San)-1	MH# 25-3 (NL Ex San)-1	MH# 25-2 (NL Ex San)-1	MH# 25-1 (NL Ex San)-1	
Rim (ft):	753.84	751.71	750.35	745.81	752.50	750.12	745.67	743.98	746.00
Invert (ft):	745.21	743.79	742.32	741.67	740.86	739.91	739.54	739.27	734.14
Min Pipe Cover (ft):	7.35	6.54	5.90	2.72	10.33	8.85	4.70	3.33	5.95
Max HGL (ft):	745.79	744.42	743.30	742.42	741.52	740.87	740.45	740.18	735.72

Link ID:	(NL Ex San).P 25-8 (NL Ex San)-1	(NL Ex San).P 25-7 (NL Ex San)-1	(NL Ex San).P 25-6 (NL Ex San)-1	(NL Ex San).P 25-5 (NL Ex San)-1	(NL Ex San).P 25-4 (NL Ex San)-1	(NL Ex San).P 25-3 (NL Ex San)-1	(NL Ex San).P 25-2 (NL Ex San)-1	(NL Ex San).P 25-1 (NL Ex San)-1
Length (ft):	148.98	81.92	300.86	208.44	198.24	142.32	75.60	237.87
Dia (in):	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00
Slope (ft/ft):	0.0089	0.0076	0.0017	0.0037	0.0044	0.0015	0.0022	0.0021
Up Invert (ft):	745.24	743.82	742.35	741.70	740.89	739.94	739.57	739.30
Dn Invert (ft):	743.92	743.20	741.84	740.92	740.02	739.72	739.40	738.80
Max Q (mgd):	1.41	1.41	1.41	1.41	1.41	1.41	1.41	1.41
Max Vel (ft/s):	4.35	3.98	2.75	3.31	2.89	2.53	2.53	2.91
Max Depth (ft):	0.54	0.57	0.77	0.66	0.74	0.83	0.83	0.73



Node ID:	MH# 40-28 (NL Ex San)·1	MH# 40-27 (NL Ex San)·1	MH# 40-26 (NL Ex San)·1	MH# 40-25 (NL Ex San)·1	MH# 40-24 (NL Ex San)·1	MH# 40-23 (NL Ex San)·1	
Rim (ft):	792.57	788.16	789.47	787.39	790.30	791.19	791.20
Invert (ft):	780.59	779.89	779.19	778.49	777.79	777.09	776.03
Min Pipe Cover (ft):	10.60	6.89	8.90	7.52	11.13	12.72	13.79
Max HGL (ft):	781.28	780.58	779.89	779.17	778.52	777.67	776.72

Link ID:	(NL Ex San).P 40-29 (NL Ex San)·1	(NL Ex San).P 40-28 (NL Ex San)·1	(NL Ex San).P 40-27 (NL Ex San)·1	(NL Ex San).P 40-26 (NL Ex San)·1	(NL Ex San).P 40-25 (NL Ex San)·1	(NL Ex San).P 40-24 (NL Ex San)·1	(NL Ex San).P 40-23 (NL Ex San)·1
Length (ft):	213.35	406.36	406.36	406.36	406.36	406.36	411.20
Dia (in):	15.00	15.00	15.00	15.00	15.00	15.00	15.00
Slope (ft/ft):	0.0019	0.0015	0.0015	0.0015	0.0015	0.0015	0.0023
Up Invert (ft):	781.13	780.62	779.92	779.22	778.52	777.82	777.12
Dn Invert (ft):	780.72	780.02	779.32	778.62	777.92	777.22	776.16
Max Q (mgd):	0.78	0.78	0.78	0.78	0.78	0.78	0.78
Max Vel (ft/s):	2.14	2.03	2.02	2.05	1.98	2.19	2.29
Max Depth (ft):	0.59	0.61	0.61	0.61	0.62	0.57	0.56

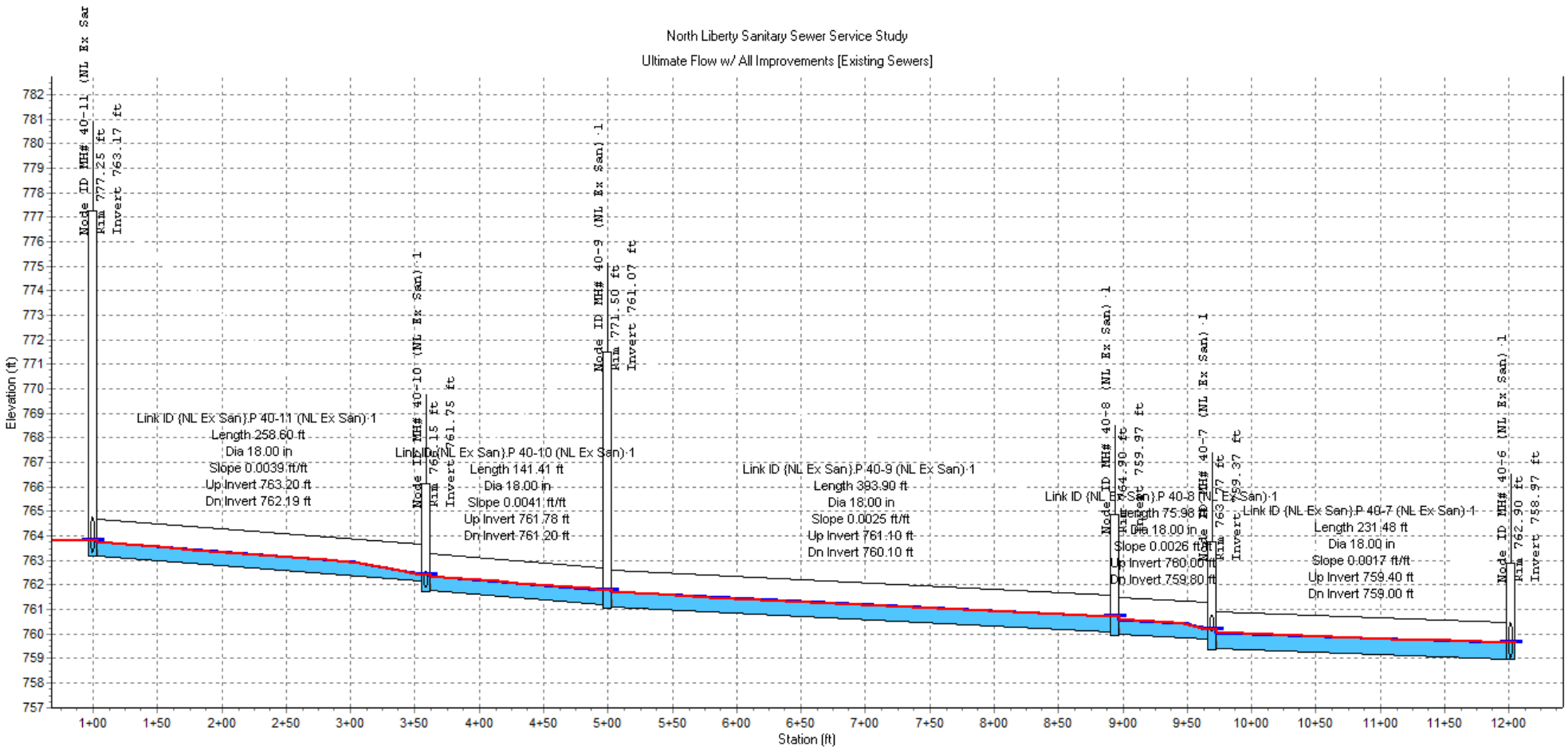


Node ID:	MH# 40-22 (NL Ex San) 1	MH# 40-21 (NL Ex San) 1	MH# 40-20 (NL Ex San) 1	MH# 40-19 (NL Ex San) 1	MH# 40-18 (NL Ex San) 1	MH# 40-17 (NL Ex San) 1	MH# 40-16 (NL Ex San) 1	MH# 40-15 (NL Ex San) 1	MH# 40-14 (NL Ex San) 1	MH# 40-13 (NL Ex San) 1	MH# 40-12 (NL Ex San) 1	MH# 40-11 (NL Ex San) 1
Rim (ft):	791.20	790.74	791.05	790.05	788.16	788.11	777.32	784.50	781.78	779.50	773.36	777.25
Invert (ft):	776.03	775.74	775.45	774.96	774.32	773.67	771.93	770.37	768.45	766.67	765.48	763.17
Min Pipe Cover (ft):	13.79	12.41	13.97	13.46	12.21	12.80	2.87	12.50	11.80	11.20	6.30	12.45
Max HGL (ft):	776.72	776.53	776.33	775.84	775.27	774.36	772.41	770.87	768.98	767.16	765.99	763.81

Link ID:	(NL Ex San).P 40-21 (NL Ex San) 1	(NL Ex San).P 40-20 (NL Ex San) 1	(NL Ex San).P 40-19 (NL Ex San) 1	(NL Ex San).P 40-18 (NL Ex San) 1	(NL Ex San).P 40-17 (NL Ex San) 1	(NL Ex San).P 40-16 (NL Ex San) 1	(NL Ex San).P 40-15 (NL Ex San) 1	(NL Ex San).P 40-14 (NL Ex San) 1	(NL Ex San).P 40-13 (NL Ex San) 1	(NL Ex San).P 40-12 (NL Ex San) 1
Length (ft):	81.90	79.33	312.91	450.00	450.00	236.56	103.83	192.33	207.75	87.25	312.77
Dia (in):	15.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00
Slope (ft/ft):	0.0015	0.0020	0.0012	0.0012	0.0012	0.0031	0.0141	0.0100	0.0081	0.0131	0.0070
Up Invert (ft):	776.06	775.74	775.48	774.99	774.35	773.70	771.96	770.40	768.48	766.70	765.48
Dn Invert (ft):	775.94	775.58	775.09	774.45	773.81	772.96	770.50	768.48	766.80	765.56	763.30
Max Q (mgd):	0.78	1.35	1.35	1.35	1.35	1.35	1.35	1.35	1.35	1.35	1.35
Max Vel (ft/s):	1.95	2.27	2.17	2.07	2.41	3.12	4.94	4.20	4.15	4.71	3.89
Max Depth (ft):	0.63	0.77	0.80	0.83	0.74	0.60	0.43	0.49	0.49	0.45	0.51

North Liberty Sanitary Sewer Service Study

Ultimate Flow w/ All Improvements [Existing Sewers]

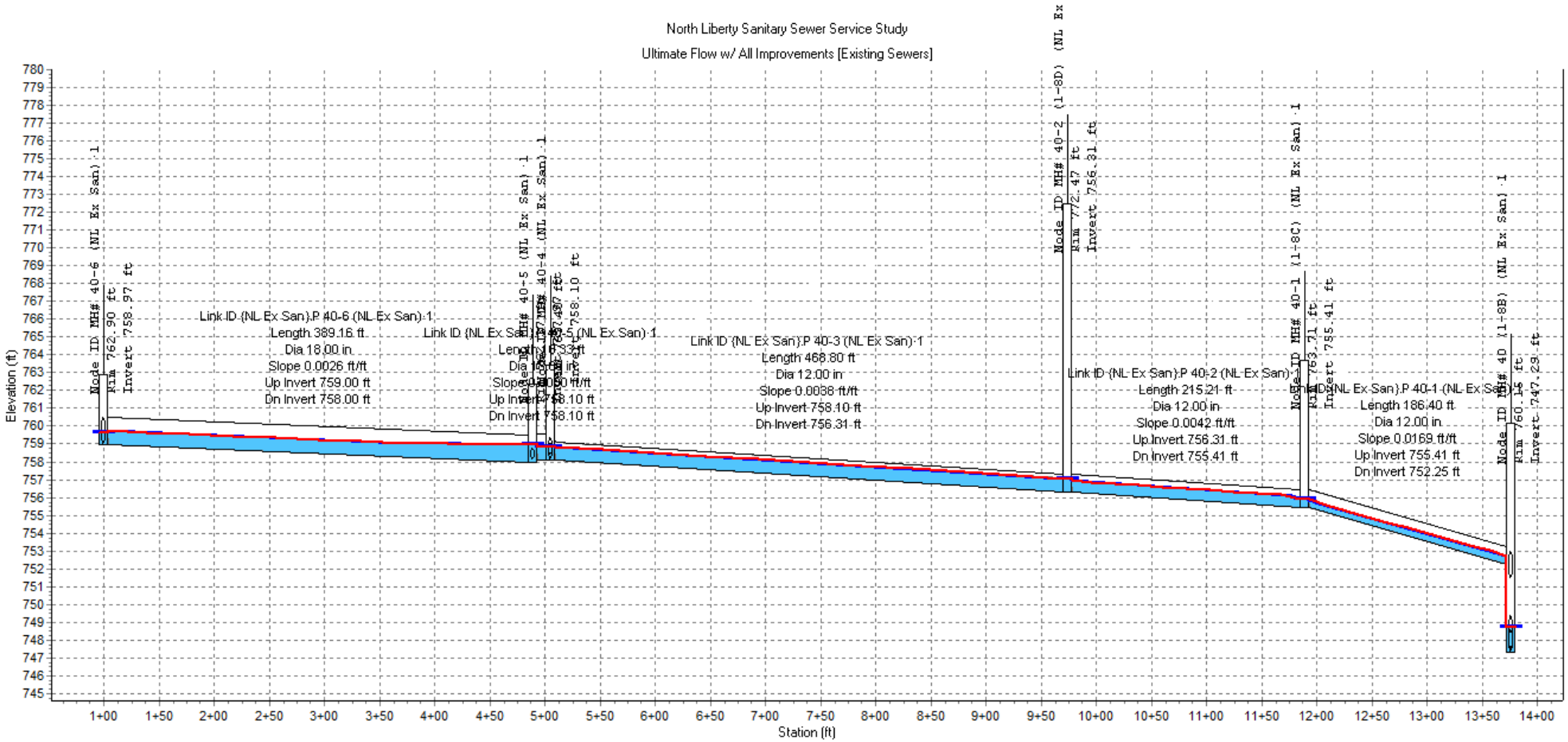


Node ID:		MH# 40-10 (NL Ex San)-1	MH# 40-9 (NL Ex San)-1	MH# 40-8 (NL Ex San)-1	MH# 40-7 (NL Ex San)-1	
Rim (ft):	777.25	766.15	771.50	764.90	763.77	762.90
Invert (ft):	763.17	761.75	761.07	759.97	759.37	758.97
Min Pipe Cover (ft):	12.45	2.46	8.80	3.30	2.47	2.40
Max HGL (ft):	763.81	762.40	761.80	760.71	760.19	759.65

Link ID:	{NL Ex San}.P 40-11 (NL Ex San)-1	{NL Ex San}.P 40-10 (NL Ex San)-1	{NL Ex San}.P 40-9 (NL Ex San)-1	{NL Ex San}.P 40-8 (NL Ex San)-1	{NL Ex San}.P 40-7 (NL Ex San)-1
Length (ft):	258.60	141.41	393.90	75.98	231.48
Dia (in):	18.00	18.00	18.00	18.00	18.00
Slope (ft/ft):	0.0039	0.0041	0.0025	0.0026	0.0017
Up Invert (ft):	763.20	761.78	761.10	760.00	759.40
Dn Invert (ft):	762.19	761.20	760.10	759.80	759.00
Max Q (mgd):	1.35	1.35	1.35	1.35	1.35
Max Vel (ft/s):	3.30	3.09	2.82	2.98	2.48
Max Depth (ft):	0.58	0.61	0.65	0.63	0.72

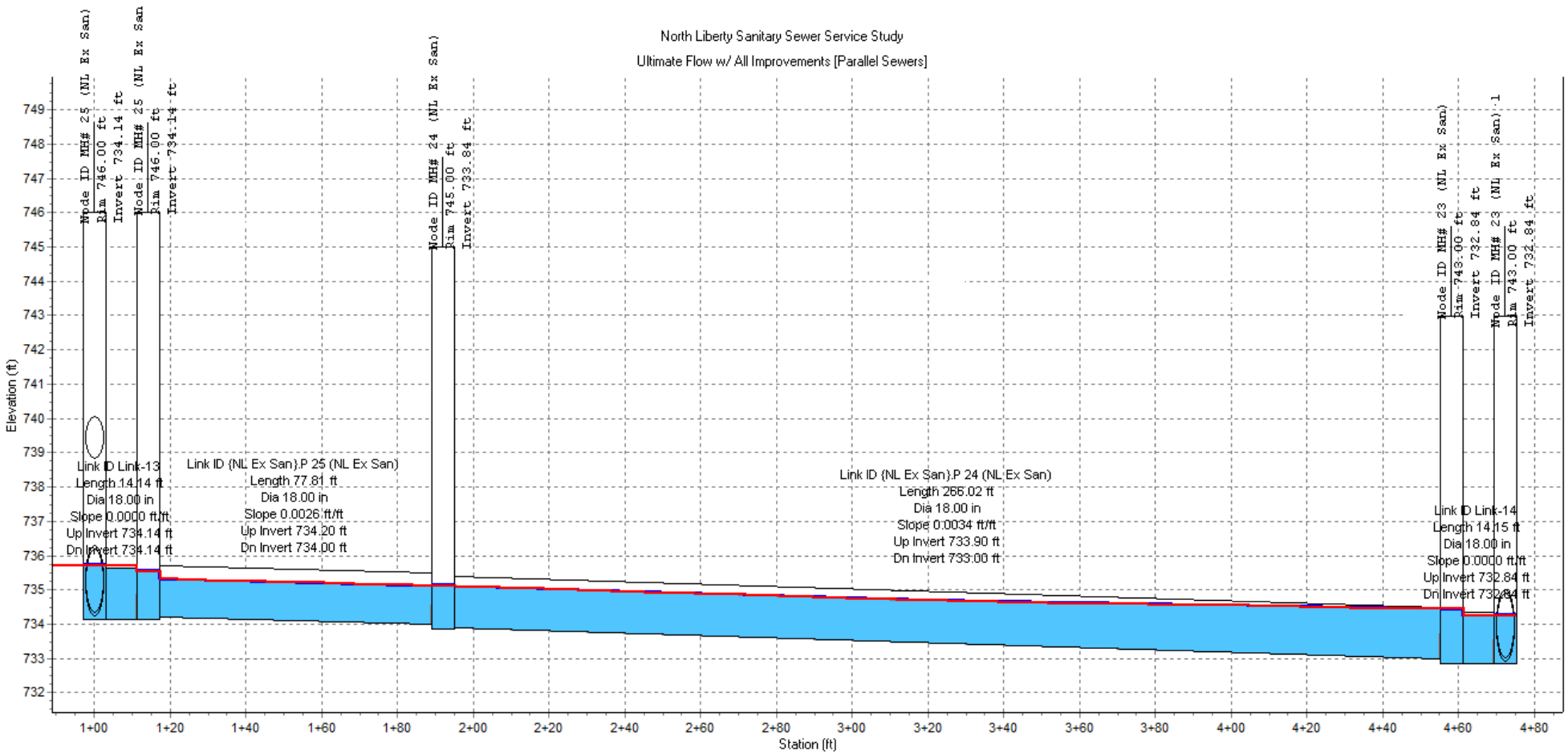
North Liberty Sanitary Sewer Service Study

Ultimate Flow w/ All Improvements [Existing Sewers]



Node ID:		MH# 40-5 (NL Ex San) 1		MH# 40-2 (1-8D) (NL Ex San) 1	MH# 40-1 (1-8C) (NL Ex San) 1	
Rim (ft):	762.90	763.40	762.97	772.47	763.71	760.15
Invert (ft):	758.97	758.10	758.10	756.31	755.41	747.29
Min Pipe Cover (ft):	2.40	2.80	2.73	15.16	7.30	6.90
Max HGL (ft):	759.65	758.84	758.84	757.07	755.88	748.71

Link ID:	(NL Ex San) P 40-6 (NL Ex San) 1	(NL Ex San) P 40-5 (NL Ex San) 1	(NL Ex San) P 40-3 (NL Ex San) 1	(NL Ex San) P 40-2 (NL Ex San) 1	(NL Ex San) P 40-1 (NL Ex San) 1
Length (ft):	389.16	16.33	468.80	215.21	186.40
Dia (in):	18.00	18.00	12.00	12.00	12.00
Slope (ft/ft):	0.0026	0.0000	0.0038	0.0042	0.0169
Up Invert (ft):	759.00	758.10	758.10	756.31	755.41
Dn Invert (ft):	758.00	758.10	756.31	755.41	752.25
Max Q (mgd):	1.35	1.35	1.23	1.23	1.23
Max Vel (ft/s):	2.15	2.17	3.03	3.78	5.43
Max Depth (ft):	0.81	0.80	0.75	0.61	0.46

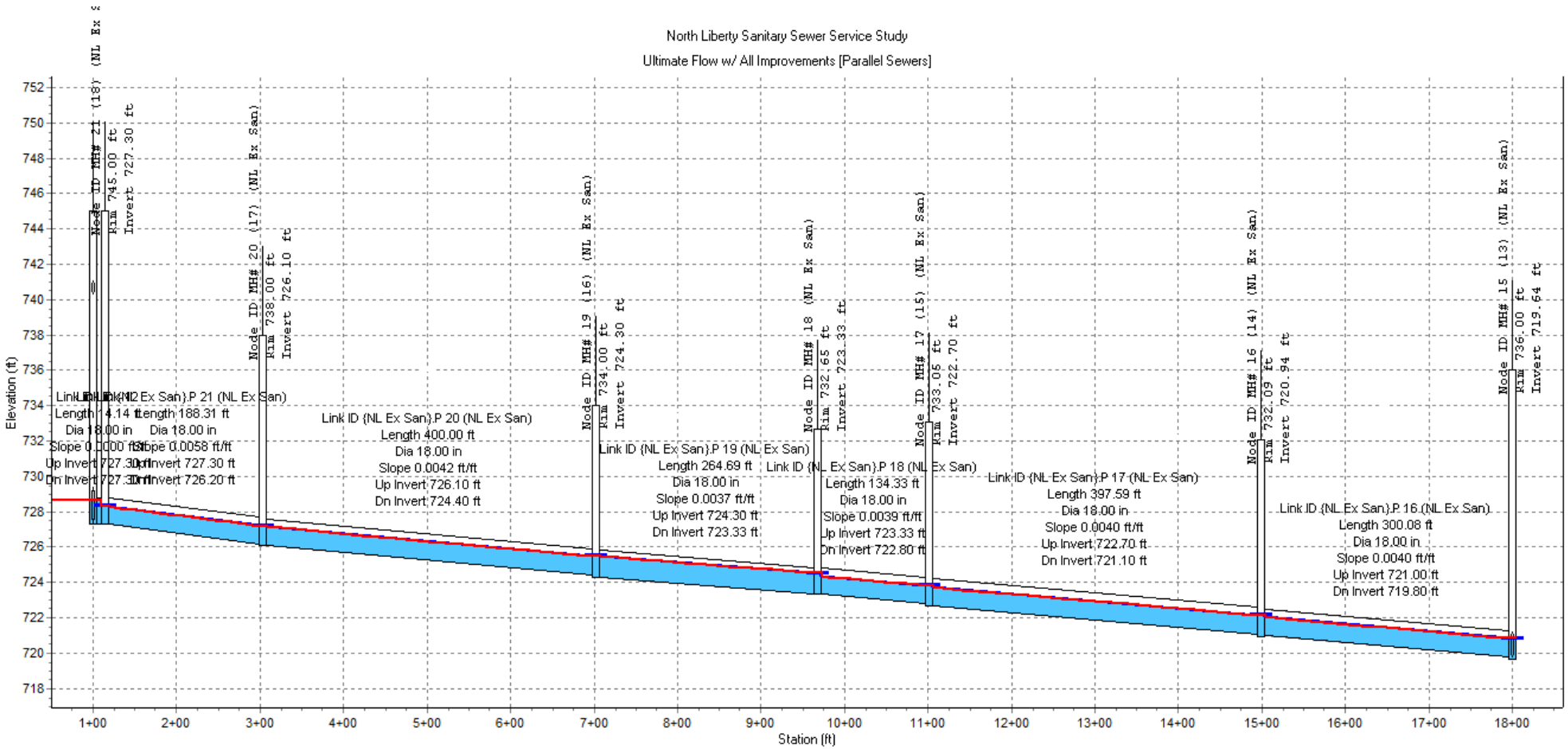


Node ID:	MH# 25 (NL Ex San)		MH# 24 (NL Ex San)	MH# 23 (NL Ex San)	
Rim (ft):	746.00	746.00	745.00	743.00	743.00
Invert (ft):	734.14	734.14	733.84	732.84	732.84
Min Pipe Cover (ft):	5.95	10.30	9.50	8.50	8.00
Max HGL (ft):	735.72	735.53	735.12	734.44	734.26

Link ID:	Link-13	(NL Ex San).P 25 (NL Ex San)	(NL Ex San).P 24 (NL Ex San)	Link-14
Length (ft):	14.14	77.81	266.02	14.15
Dia (in):	18.00	18.00	18.00	18.00
Slope (ft/ft):	0.0000	0.0026	0.0034	0.0000
Up Invert (ft):	734.14	734.20	733.90	732.84
Dn Invert (ft):	734.14	734.00	733.00	732.84
Max Q (mgd):	3.32	3.32	3.32	3.32
Max Vel (ft/s):	2.94	3.32	3.10	2.93
Max Depth (ft):	1.45	1.23	1.33	1.46

North Liberty Sanitary Sewer Service Study

Ultimate Flow w/ All Improvements [Parallel Sewers]

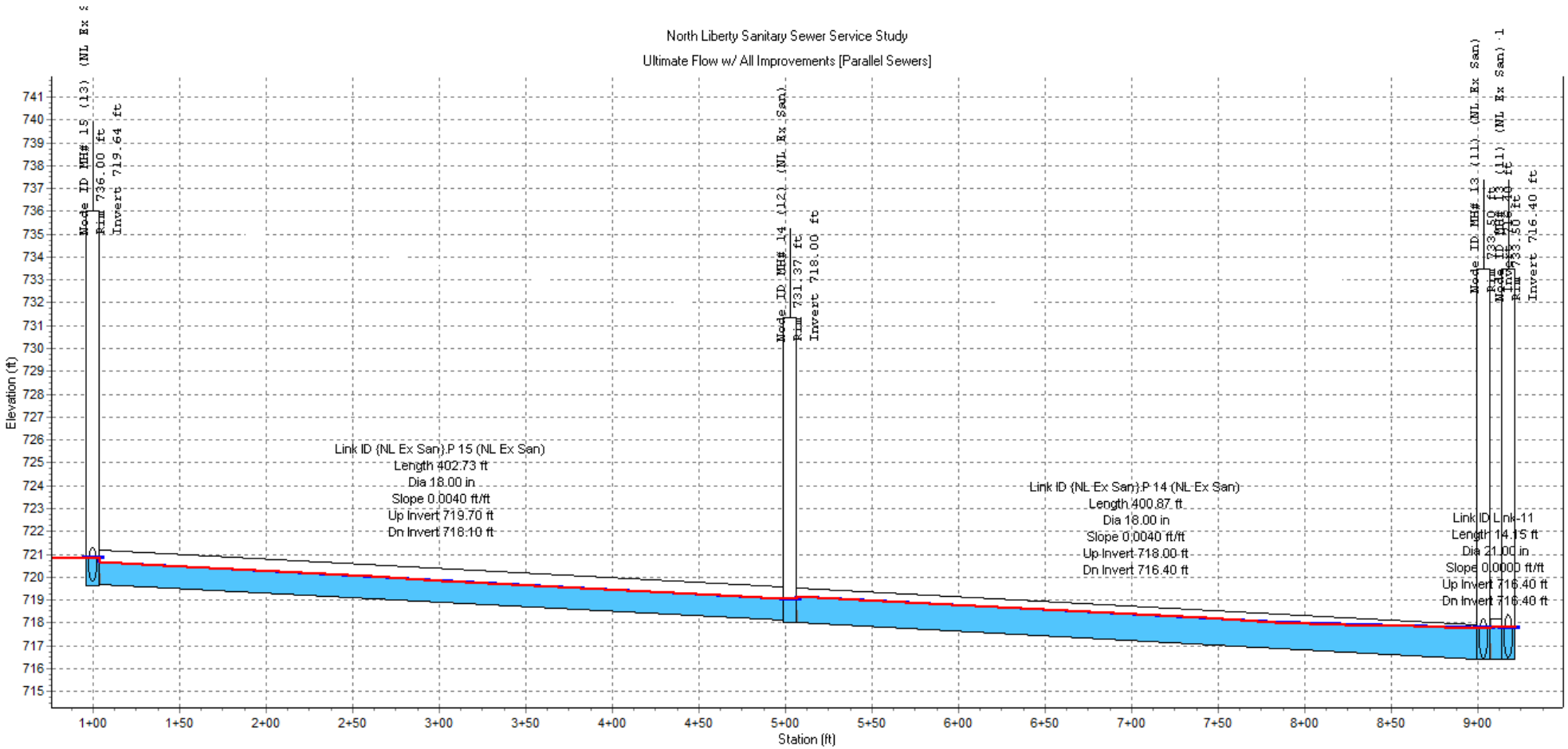


Node ID:			MH# 20 (17) (NL Ex San)	MH# 19 (16) (NL Ex San)	MH# 18 (NL Ex San)	MH# 17 (15) (NL Ex San)	MH# 16 (14) (NL Ex San)	
Rim (ft):	745.00		738.00	734.00	732.65	733.05	732.09	736.00
Invert (ft):	727.30		726.10	724.30	723.33	722.70	720.94	719.64
Min Pipe Cover (ft):	3.11		10.30	8.10	7.82	8.75	9.49	14.70
Max HGL (ft):	729.31		727.17	725.48	724.53	723.81	722.13	720.84

Link ID:	Link ID (NL Ex San).P 21 (NL Ex San)		(NL Ex San).P 20 (NL Ex San)	(NL Ex San).P 19 (NL Ex San)	(NL Ex San).P 18 (NL Ex San)	(NL Ex San).P 17 (NL Ex San)	(NL Ex San).P 16 (NL Ex San)	
Length (ft):	14.14	188.31	400.00	264.69	134.33	397.59	300.08	
Dia (in):	18.00	18.00	18.00	18.00	18.00	18.00	18.00	
Slope (ft/ft):	0.0000	0.0058	0.0042	0.0037	0.0039	0.0040	0.0040	
Up Invert (ft):	727.30	727.30	726.10	724.30	723.33	722.70	721.00	
Dn Invert (ft):	727.30	726.20	724.40	723.33	722.80	721.10	719.80	
Max Q (mgd):	3.52	3.52	3.52	3.52	3.52	3.52	3.52	
Max Vel (ft/s):	3.62	4.40	4.01	3.61	3.89	4.02	3.97	
Max Depth (ft):	1.19	0.99	1.08	1.19	1.11	1.07	1.09	

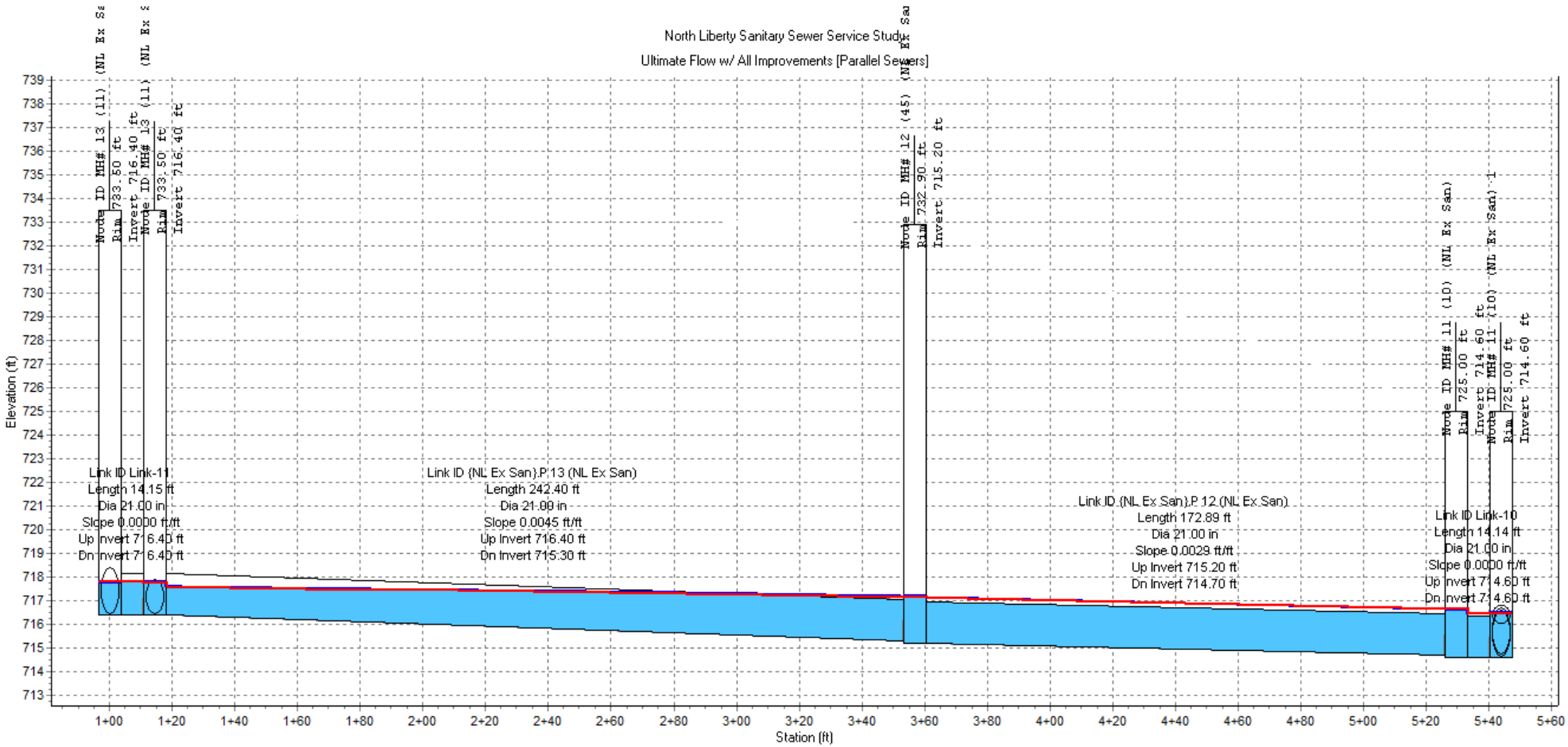
North Liberty Sanitary Sewer Service Study

Ultimate Flow w/ All Improvements [Parallel Sewers]



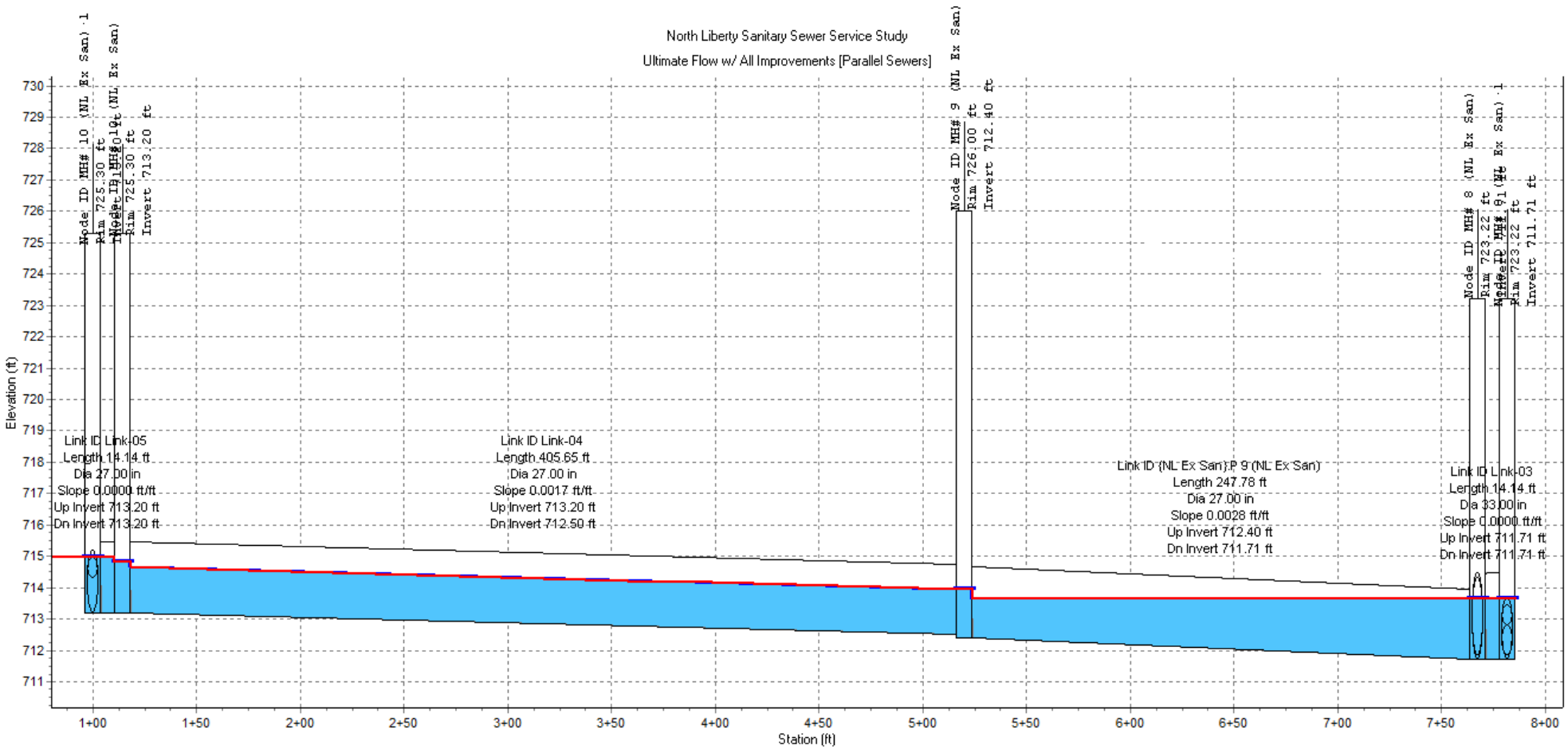
Node ID:		MH# 14 (12) (NL Ex San)	MH# 13 (11) (NL Ex San)
Rim (ft):	736.00	731.37	733.50
Invert (ft):	719.64	718.00	716.40
Min Pipe Cover (ft):	14.70	11.77	15.35
Max HGL (ft):	720.84	719.03	717.79

Link ID:	(NL Ex San).P 15 (NL Ex San)	(NL Ex San).P 14 (NL Ex San)	Link-11
Length (ft):	402.73	400.87	14.15
Dia (in):	18.00	18.00	21.00
Slope (ft/ft):	0.0040	0.0040	0.0000
Up Invert (ft):	719.70	718.00	716.40
Dn Invert (ft):	718.10	716.40	716.40
Max Q (mgd):	3.52	3.52	1.32
Max Vel (ft/s):	4.18	3.58	1.00
Max Depth (ft):	1.04	1.20	1.38



Node ID:	MH# 13	(11) (NL Ex San)	MH# 12 (45) (NL Ex San)	MH# 11 (10) (NL	Ex San)
Rim (ft):	733.50	733.50	732.90	725.00	725.00
Invert (ft):	716.40	716.40	715.20	714.60	714.60
Min Pipe Cover (ft):	15.10	15.35	15.85	8.55	8.17
Max HGL (ft):	717.79	717.77	717.18	716.64	716.45

Link ID:	Link-11	{NL Ex San}.P 13 (NL Ex San)	{NL Ex San}.P 12 (NL Ex San)	Link-10
Length (ft):	14.15	242.40	172.89	14.14
Dia (in):	21.00	21.00	21.00	21.00
Slope (ft/ft):	0.0000	0.0045	0.0029	0.0000
Up Invert (ft):	716.40	716.40	715.20	714.60
Dn Invert (ft):	716.40	715.30	714.70	714.60
Max Q (mgd):	1.32	4.84	4.84	4.84
Max Vel (ft/s):	1.00	3.30	3.11	3.11
Max Depth (ft):	1.38	1.56	1.75	1.75

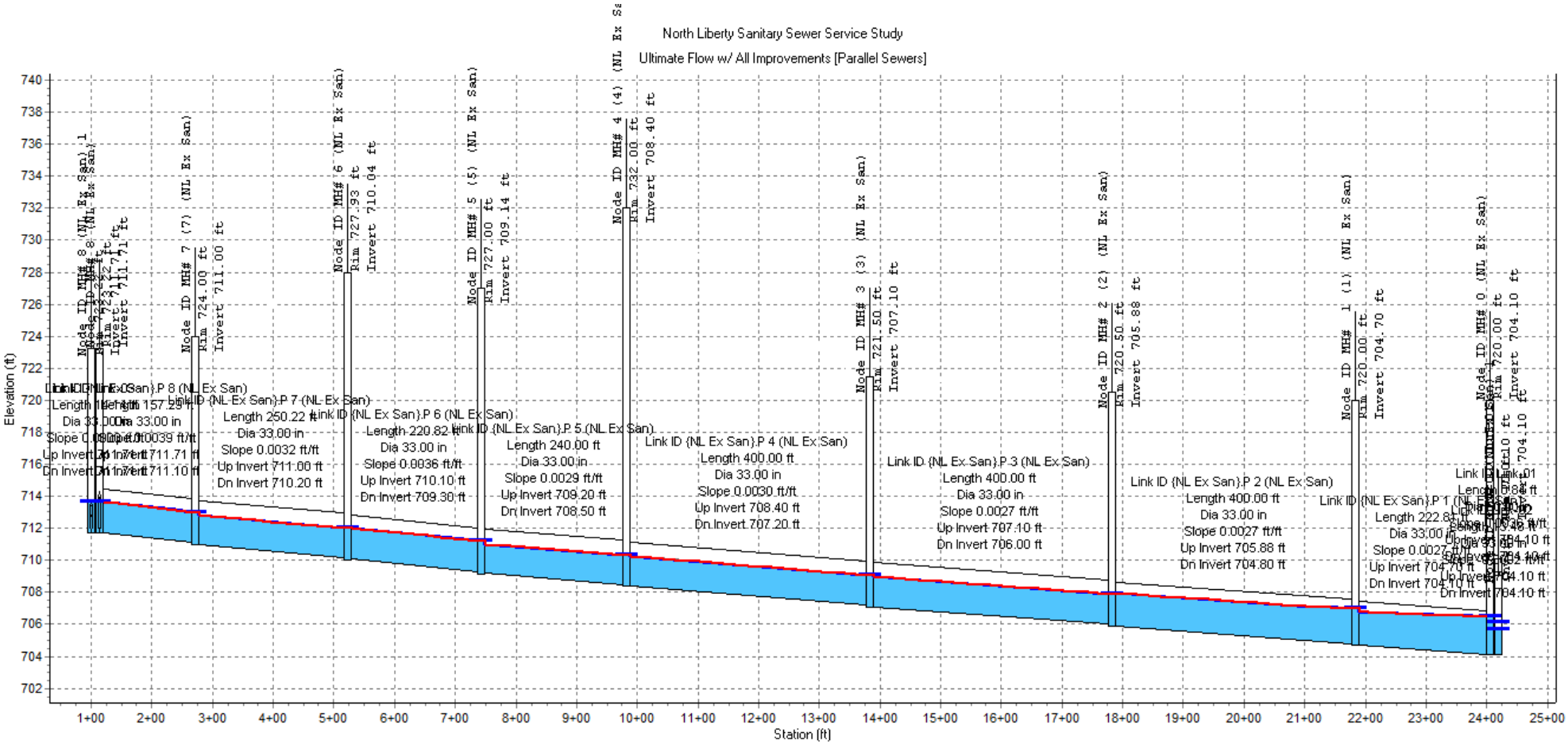


Node ID:	MH# 10 (NL Ex San)		MH# 9 (NL Ex San)	MH# 8 (NL Ex San)	
Rim (ft):	725.30	725.30	726.00	723.22	723.22
Invert (ft):	713.20	713.20	712.40	711.71	711.71
Min Pipe Cover (ft):	9.85	9.85	11.25	8.76	8.76
Max HGL (ft):	714.98	714.82	713.95	713.65	713.65

Link ID:	Link-05	Link-04	(NL Ex San).P 9 (NL Ex San)	Link-03
Length (ft):	14.14	405.65	247.78	14.14
Dia (in):	27.00	27.00	27.00	33.00
Slope (ft/ft):	0.0000	0.0017	0.0028	0.0000
Up Invert (ft):	713.20	713.20	712.40	711.71
Dn Invert (ft):	713.20	712.50	711.71	711.71
Max Q (mgd):	5.78	5.78	5.78	1.00
Max Vel (ft/s):	2.77	3.09	2.70	0.34
Max Depth (ft):	1.70	1.54	1.75	1.94

North Liberty Sanitary Sewer Service Study

Ultimate Flow w/ All Improvements [Parallel Sewers]

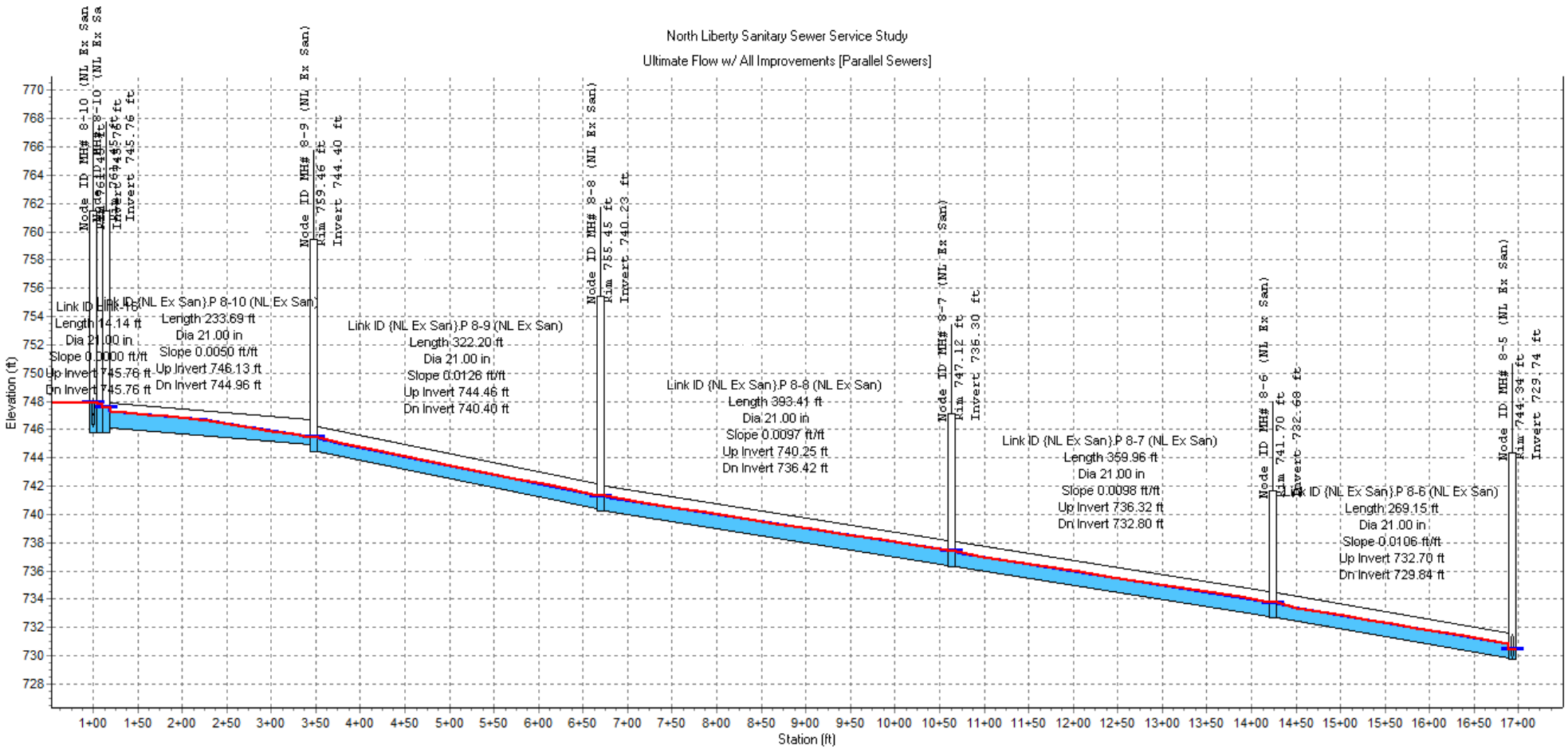


Node ID:		MH# 7 (7) (NL Ex San)	MH# 6 (NL Ex San)	MH# 5 (5) (NL Ex San)	MH# 4 (4) (NL Ex San)	MH# 3 (3) (NL Ex San)	MH# 2 (2) (NL Ex San)	MH# 1 (1) (NL Ex San)	MH# 0 (NL Ex San)
Rim (ft):	723.22	724.00	727.93	727.00	732.00	721.50	720.50	720.00	720.00
Invert (ft):	711.71	711.00	710.04	709.14	708.40	707.10	705.88	704.70	704.10
Min Pipe Cover (ft):	8.66	10.15	14.98	14.95	20.75	11.55	11.75	12.45	13.50
Max HGL (ft):	713.55	712.95	712.01	711.20	710.31	709.07	707.90	707.00	706.83

Link ID:	(NL Ex San).P 8 (NL Ex San)	(NL Ex San).P 7 (NL Ex San)	(NL Ex San).P 6 (NL Ex San)	(NL Ex San).P 5 (NL Ex San)	(NL Ex San).P 4 (NL Ex San)	(NL Ex San).P 3 (NL Ex San)	(NL Ex San).P 2 (NL Ex San)	(NL Ex San).P 1 (NL Ex San)	[illegible]
Length (ft):	157.29	250.22	220.82	240.00	400.00	400.00	400.00	222.81	[illegible]
Dia (in):	33.00	33.00	33.00	33.00	33.00	33.00	33.00	33.00	[illegible]
Slope (ft/ft):	0.0039	0.0032	0.0036	0.0029	0.0030	0.0027	0.0027	0.0027	[illegible]
Up Invert (ft):	711.71	711.00	710.10	709.20	708.40	707.10	705.88	704.70	[illegible]
Dn Invert (ft):	711.10	710.20	709.30	708.50	707.20	706.00	704.80	704.10	[illegible]
Max Q (mgd):	13.15	13.15	13.15	13.15	13.15	13.15	13.15	13.15	[illegible]
Max Vel (ft/s):	4.66	4.70	4.62	4.63	4.68	4.55	4.16	3.78	[illegible]
Max Depth (ft):	1.90	1.88	1.91	1.91	1.89	1.94	2.11	2.34	[illegible]

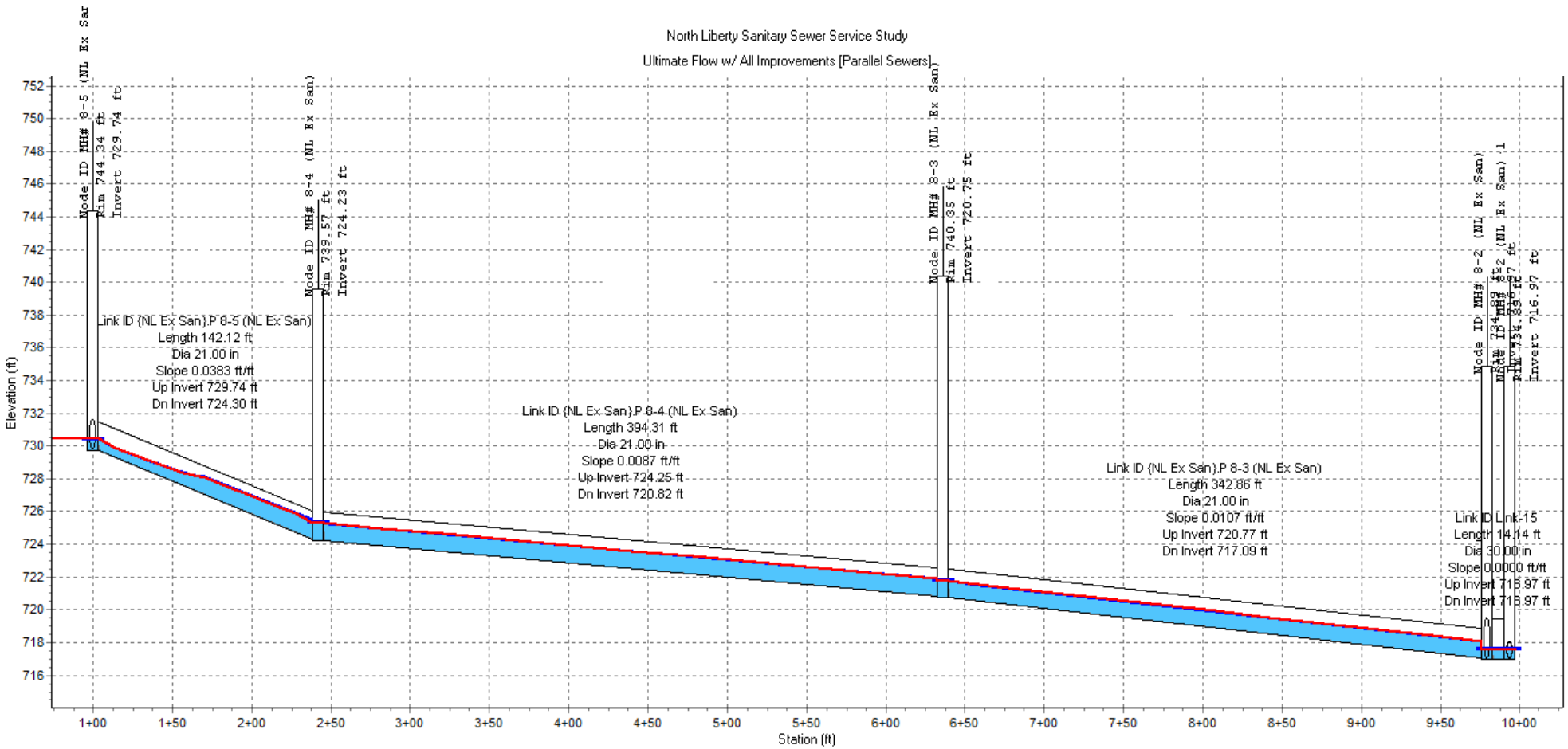
North Liberty Sanitary Sewer Service Study

Ultimate Flow w/ All Improvements [Parallel Sewers]



Node ID:			MH# 8-9 (NL Ex San)	MH# 8-8 (NL Ex San)	MH# 8-7 (NL Ex San)	MH# 8-6 (NL Ex San)	
Rim (ft):	765.45		759.46	755.45	747.12	741.70	744.34
Invert (ft):	745.76		744.40	740.23	736.30	732.68	729.74
Min Pipe Cover (ft):	13.57		12.75	13.30	8.95	7.15	12.75
Max HGL (ft):	747.55		745.44	741.30	737.38	733.75	730.42

Link ID:	Link-16	(NL Ex San).P 8-10 (NL Ex San)	(NL Ex San).P 8-9 (NL Ex San)	(NL Ex San).P 8-8 (NL Ex San)	(NL Ex San).P 8-7 (NL Ex San)	(NL Ex San).P 8-6 (NL Ex San)	
Length (ft):	14.14	233.69	322.20	393.41	359.96	269.15	
Dia (in):	21.00	21.00	21.00	21.00	21.00	21.00	
Slope (ft/ft):	0.0000	0.0050	0.0126	0.0097	0.0098	0.0106	
Up Invert (ft):	745.76	746.13	744.46	740.25	736.32	732.70	
Dn Invert (ft):	745.76	744.96	740.40	736.42	732.80	729.84	
Max Q (mgd):	6.17	6.17	6.17	6.17	6.17	6.17	
Max Vel (ft/s):	3.97	5.04	7.19	6.55	6.54	6.68	
Max Depth (ft):	1.75	1.28	0.95	1.02	1.02	1.01	

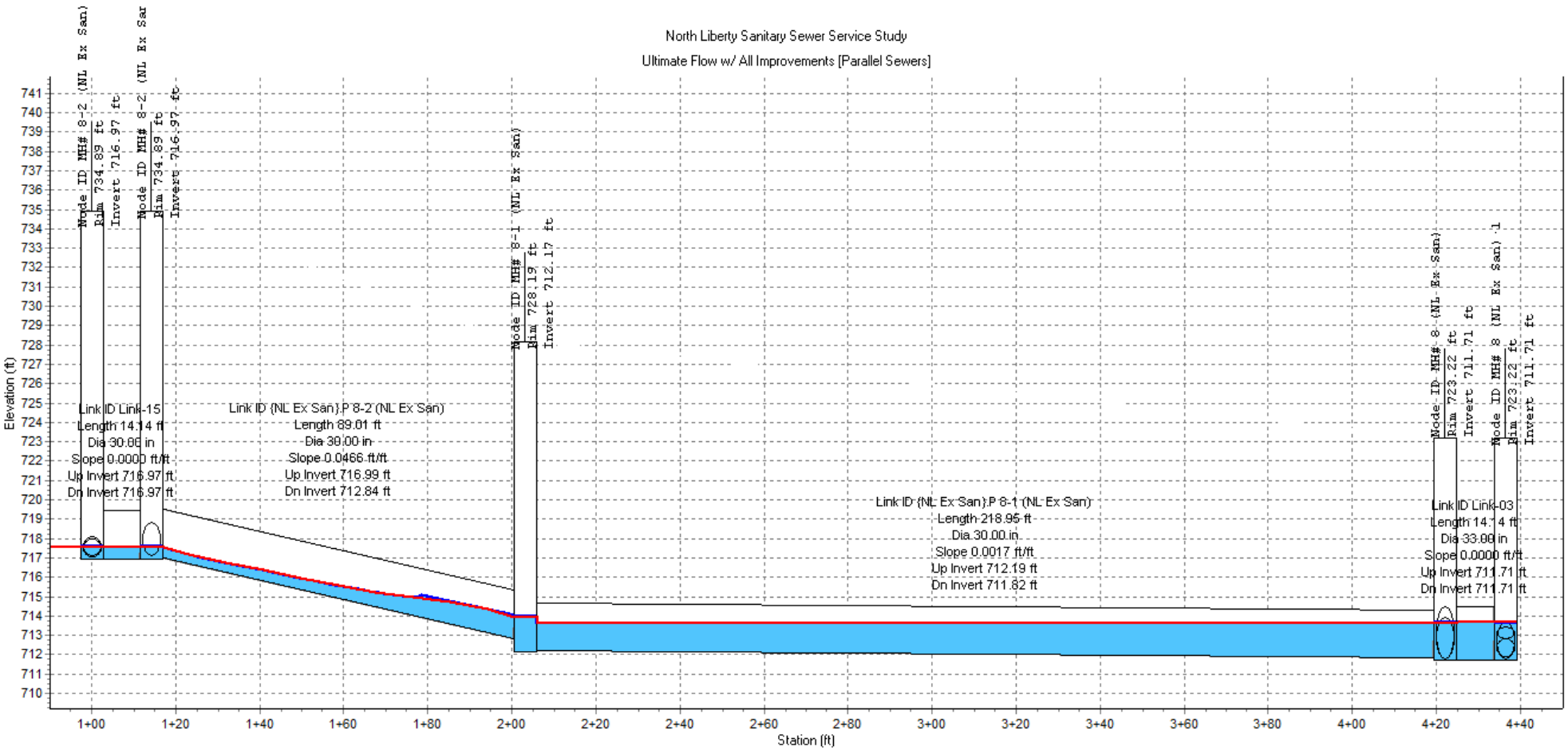


Node ID:		MH# 8-4 (NL Ex San)	MH# 8-3 (NL Ex San)	MH# 8-2 (NL Ex San)
Rim (ft):	744.34	739.57	740.35	734.89
Invert (ft):	729.74	724.23	720.75	716.97
Min Pipe Cover (ft):	12.75	13.52	17.78	15.42
Max HGL (ft):	730.42	725.34	721.80	717.57

Link ID:	{NL Ex San}.P 8-5 (NL Ex San)	{NL Ex San}.P 8-4 (NL Ex San)	{NL Ex San}.P 8-3 (NL Ex San)	Link-15
Length (ft):	142.12	394.31	342.86	14.14
Dia (in):	21.00	21.00	21.00	30.00
Slope (ft/ft):	0.0383	0.0087	0.0107	0.0000
Up Invert (ft):	729.74	724.25	720.77	716.97
Dn Invert (ft):	724.30	720.82	717.09	716.97
Max Q (mgd):	6.17	6.17	6.17	0.21
Max Vel (ft/s):	8.05	6.27	6.77	0.35
Max Depth (ft):	0.86	1.06	0.99	0.61

North Liberty Sanitary Sewer Service Study

Ultimate Flow w/ All Improvements [Parallel Sewers]

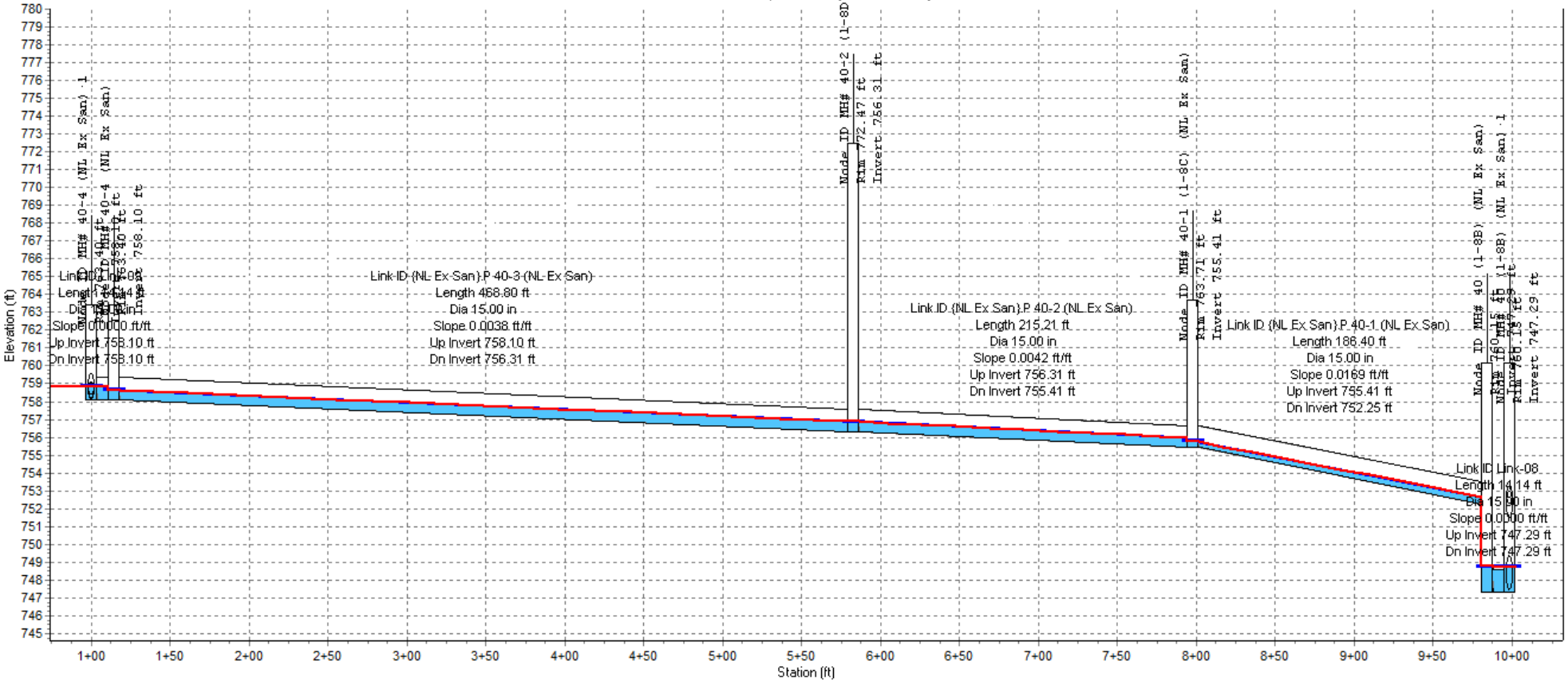


Node ID:	MH# 8-2 (NL Ex San)		MH# 8-1 (NL Ex San)	MH# 8 (NL Ex San)	
Rim (ft):	734.89	734.89	728.19	723.22	723.22
Invert (ft):	716.97	716.97	712.17	711.71	711.71
Min Pipe Cover (ft):	15.42	15.40	12.85	8.76	8.76
Max HGL (ft):	717.57	717.57	713.92	713.65	713.65

Link ID:	Link-15	{NL Ex San}.P 8-2 (NL Ex San)	{NL Ex San}.P 8-1 (NL Ex San)	Link-03
Length (ft):	14.14	89.01	218.95	14.14
Dia (in):	30.00	30.00	30.00	33.00
Slope (ft/ft):	0.0000	0.0466	0.0017	0.0000
Up Invert (ft):	716.97	716.99	712.19	711.71
Dn Invert (ft):	716.97	712.84	711.82	711.71
Max Q (mgd):	0.21	6.38	6.38	1.00
Max Vel (ft/s):	0.35	6.90	2.63	0.34
Max Depth (ft):	0.61	0.83	1.78	1.94

North Liberty Sanitary Sewer Service Study

Ultimate Flow w/ All Improvements [Parallel Sewers]



Node ID:	MH# 40-4 (NL Ex San)		MH# 40-2 (1-8D) (NL Ex San)	MH# 40-1 (1-8C) (NL Ex San)		
Rim (ft):	763.71	768.40	772.47	763.71	760.15	760.15
Invert (ft):	758.10	758.10	756.31	755.41	747.29	747.29
Min Pipe Cover (ft):	3.80	4.05	14.91	7.05	6.65	5.90
Max HGL (ft):	758.75	758.65	756.87	755.79	748.71	748.71

Link ID:	Link-09	{NL Ex San}.P 40-3 (NL Ex San)	{NL Ex San}.P 40-2 (NL Ex San)	{NL Ex San}.P 40-1 (NL Ex San)	Link-08
Length (ft):	14.14	468.80	215.21	186.40	14.14
Dia (in):	15.00	15.00	15.00	15.00	15.00
Slope (ft/ft):	0.0000	0.0038	0.0042	0.0169	0.0000
Up Invert (ft):	758.10	758.10	756.31	755.41	747.29
Dn Invert (ft):	758.10	756.31	755.41	752.25	747.29
Max Q (mgd):	1.00	1.00	1.00	1.00	1.00
Max Vel (ft/s):	2.43	2.94	3.68	5.08	1.27
Max Depth (ft):	0.65	0.56	0.47	0.37	1.25