2.0 DESIGN CRITERIA

2.1 GEOTECHNICAL INVESTIGATION

A preliminary geotechnical study was conducted by HWS for this project. This study consisted of Dutch friction-cone soundings, test borings, and soil sampling performed at the site on May 7, 2004. These tests were conducted in 3 general areas: the north end of the alignment on the west side of the BNSF tracks, the mid-point of the alignment near Rokeby Road (east and west of the railroad tracks), and the south end of the alignment on the east side of the railroad tracks.

In general, the types of soils encountered during the geotechnical study consisted of medium stiff to very stiff clays, which appear to be suitable for open-cut trench methods. Of special note, for the borings at Rokeby Road, on the east side of the railroad, the soil sampling equipment met refusal at approximately 7.5 feet below grade. This is assumed to be due to the underlying Dakota sandstone formation, which is apparent to the north of this location along a cut made for the railroad corridor. The elevations at which these events occurred are well above the proposed flow line elevation of the trunk sewer. More detailed investigations in this area are recommended to determine the extents and geological properties of the sandstone formation, in order to select the appropriate route and construction methods through this area.

From the geotechnical study, groundwater elevations were compared to the proposed flow line elevations of the trunk sewer along the alignment. At the north end, the groundwater elevation is approximately at the same elevation as the flow line of the pipe. A the mid-point of the alignment near Rokeby Road, the groundwater elevation was approximately 4 feet above the proposed flow line elevation. At the south end of the alignment, near the drainage channel, the groundwater elevation was approximately 6.5 feet above the proposed flow line elevation of the trunk sewer. These groundwater elevations may fluctuate based on antecedent moisture conditions and stream flow levels. From the data collected, it appears that de-watering of the trench may be required along the proposed alignment.

A complete copy of the Geotechnical Engineering Report is included in Appendix B.

2.2 HISTORICAL AND ENVIRONMENTAL ASSESSMENTS

An archeological site file search was conducted for the project area by the Nebraska State Historical Society (NSHS). According to the NSHS, there are no recorded archeological sites in their records within the limits of this project. Any potential archeological or historic sites discovered during final design or construction must be brought to the attention of the NSHS for further review, as part of the Section 106 Requirements of the National Historic Preservation Act.

A search of several environmental records was conducted to determine if there are any potential hazardous or contaminated sites, or existing wells that might conflict within the boundaries of this project. The environmental databases researched include the following:

1. Registered underground storage tanks (USTs), from the Office of the Nebraska Fire Marshall.
2. Leaking underground storage tanks (LUSTs), from the Nebraska Department of Environmental Quality.
3. EPA Envirofacts Warehouse, which contains information on the following EPA programs and environmental databases:
    a. Air Releases under the AIRS/AFS system.
    b. Toxic Release Inventory (TRI).
    c. Superfund (CERCLIS) sites.
    d. RCRAInfo for hazardous waste generators and TSDFs.
4. Registered groundwater wells, from the Nebraska Department of Natural Resources.

From a review of the reporting lists, it does not appear that there are any potential hazardous or contaminated sites within the boundaries of this project. There are several groundwater wells in the general area, but they appear to be irrigation wells that will not be adversely impacted by the trunk sewer.

2.3 SERVICE AREAS, DESIGN FLOWS, AND PIPE SIZES

Development projections for the Tier I (25-year), Tier II (50-Year), and Tier III (beyond 50-year) horizons were taken from the City of Lincoln-Lancaster County Comprehensive Plan. As decided at the 3 March 2004 meeting with personnel from the City of Lincoln's Wastewater Division, the trunk sewer associated with this project will receive flow from Urban Planning Zones S-2, S-3, and S-5, and will NOT serve the Upper Southwest Salt Creek basin.

The Tier I plan includes all of S-2 and S-3, and a part of S-5. The Tier II plan includes all of S-2, S-3 and S-5 (see Table 2 below). Since trunk sewer planning and service life lasts beyond the 25-year horizon, and with the intention of constructing through Wilderness Park only once, this report evaluates each of the Tier I, Tier II, and Tier III conditions. In addition, as shown in the Lincoln Wastewater Facility Plan, the boundary around S-5 circles around the Town of Roca's 1-mile zoning jurisdiction (see Figure 3). This does not represent the actual ridgeline for S-5 which would include an additional 868 acres to the south. When designing sewers, the ridgeline area is typically used because this would include all of the area that could drain to the sewer by gravity. Table 2.1 below summarizes the total acreages for the scenarios discussed above.

Table 2.1 – Urban Planning Zone Service Area Summary

Urban Planning Zone	Tier I Acres	Tier II Acres	Total Ridgeline Acres
S-2	2,128	2,128	2,128
S-3	1,929	1,929	1,929
S-5	586	3,760	3,760
S-5 (ridge-line)			868
Total	4,643	7,817	8,685
Green Space	-275	-275	-275
Revised Total	4,368	7,542	8,410

According to the City of Lincoln Design Standards, the entire acreage of the natural watershed is used to compute the design flow, minus any public or private park lands, golf courses, cemeteries, and other dedicated open-space that decreases the developed density in the watershed, if it is greater than 50 acres. Green space areas were calculated from the Lincoln/Lancaster County Land Use Plan given in the City of Lincoln's Comprehensive Plan (updated October 21, 2003). For the project area, 275 acres were determined to be green space, including the flood plain area. The flood prone area was not subtracted out for a more conservative approach. All 275 acres of green space are within the Tier I area.

The acreages given in Table 2.1, minus the green space area, are the areas (A) used in calculating the peak flow using the City's design flow equation:

$$Q\ (cfs) = 0.01726*(A)^{0.8} + 0.003(A) \qquad [A = \text{area (acres)}]$$

Table 2.2 summarizes the calculated flow, pipe diameter, slope and resulting velocity for the three planning scenarios discussed above and shown in Table 2.1. Existing Trunk Service Areas include basin S-1 (748 acres). The slope was calculated using the existing 48-inch downstream invert elevation and matching the top of pipe to the bottom elevation of the south drainage ditch at the project termination point. Channel stabilization will be required at this drainage ditch. Pipe capacities are calculated using a Manning's roughness coefficient (n) of 0.013.

Table 2.2 – Future Service Area Requirements Vs. Capacity
Calculated Pipe Diameter, Flow and Velocity

Planning Horizon	Cumulative Flow Area, acres	Design Flow, cfs	Required Pipe Diameter, inches	Available Pipe Slope, ft/ft	Pipe Capacity, Cfs	Full Flow Velocity, fps
Tier I	4,368	27.2	42	0.00099	31.7	3.3
Tier II	7,542	44.5	48	0.00093	43.8	3.5
Total Ridgeline Area	8,410	49.1	54	0.00086	57.7	3.6
Existing Trunk Capacity	8,550	49.8	48	0.00120	49.8	4.0
Existing Trunk Service Area **(Tier I)**	5,116	31.4				
Existing Trunk Service Area **(Tier II)**	8,290	48.4				
Existing Trunk Service Area **(Total Ridgeline)**	9,158	53.0				

----In each case listed to the left, the Existing Trunk Service Area includes Urban Planning Zone S-1 (748 acres)

As can be seen in the above table, depending on the area used, Tier I, Tier II or the Total Ridgeline area, the required pipe diameter changes. This project will connect to the existing 48-inch trunk sewer. This 48-inch line can serve 8,550 acres of developed land based on pipe slope in the City record drawings. It is currently serving Urban Planning Zone S-1 (748 acres). Subtracting out the area from basin S-1, this leaves 7,802 acres for future development. By comparing this to the areas given for each planning scenario, the Tier I and Tier II areas could be served by the existing trunk sewer, but the existing trunk sewer could not serve all of the Total Ridgeline area. Out of the additional 868 acres added by including all of the basin S-5 ridgeline area, 608 acres could theoretically not be served.

Hydraulic Grade Line (HGL) Analysis

An analysis of the various service areas, design flows, pipe sizes, and pipe slope options was performed to determine the HGL in the proposed trunk sewer extension, as well as the existing 48-inch trunk sewer immediately downstream. The 48-inch and 54-inch pipe

sizes were analyzed at various slopes and flows to determine the HGL and potential full-pipe surcharge under these conditions. The results are summarized below in Table 2.3.

Table 2.3 – Hydraulic Grade Line Calculations For Pipe Diameter, Slope, and Flow

Pipe Diameter (in)	Pipe Slope (ft/ft)	Service Area	Total Flow @ Existing MH #37	FL Elev @ Existing MH #37	HGL Elevation @ MH #37	Amount of Surcharge @ Existing Manhole #37 (*)
48	0.00093	Tier II	50.1	1171.34	1174.70	None
48	0.00093	Total Ridgeline	54.7	1171.34	1175.61	0.27 ft (increases to 3.0 ft upstream)
54	0.00086	Total Ridgeline	54.7	1171.34	1175.61	0.27 ft (decreases upstream)

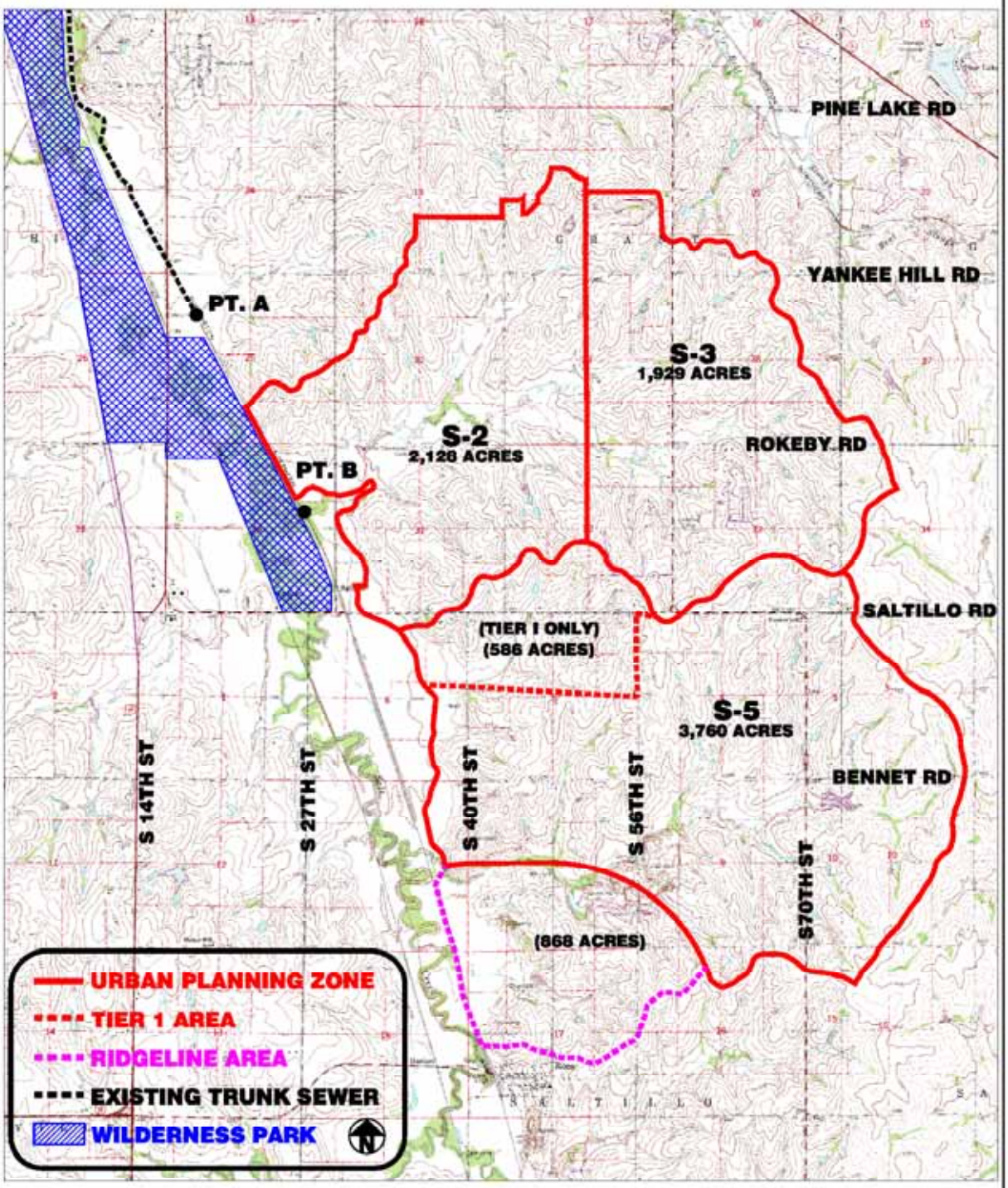
**** Manhole 37 is the is the last manhole on the existing trunk sewer.***

- In the Tier II service condition, the existing and proposed 48-inch trunk sewer do not experience a surcharge at design flow conditions.
- In the Total Ridgeline service condition, the maximum surcharge in the existing 48-inch trunk sewer is 0.27 feet, but the HGL continues to rise as the proposed 48-inch trunk sewer progresses upstream, to a level of 3.0 feet above the pipe at the last manhole. This level is approximately 3 feet below the proposed rim elevation of the manhole.
- In the Total Ridgeline service condition, the maximum surcharge in the existing 48-inch trunk sewer remains at 0.27 feet, but the HGL stays within the pipe profile in the proposed 54-inch trunk sewer.

The modeling was performed on the last 3 sections of the existing trunk sewer and the entire reach of the proposed trunk sewer. Flow input for Urban Planning Zone S-1 was included at Manhole 38 on the existing trunk sewer, and flow input for the proposed service areas were input at the upper end of the proposed trunk sewer. In the Total Ridgeline scenarios, there was minimal surcharge in the existing trunk sewer, because the greater slope of the existing trunk sewer (s=0.00120) provides capacity that is only slightly less than the model flow (49.8 cfs versus 54.7 cfs).

Results of the HGL analysis for each of these scenarios are included in Appendix C.

FIGURE 3 - SERVICE AREAS
UPPER SOUTHEAST SALT CREEK TRUNK SEWER
PRELIMINARY ROUTING STUDY
-LINCOLN WASTEWATER SYSTEM-



EA ENGINEERING, SCIENCE, AND TECHNOLOGY	UPPER SE SALT CREEK TRUNK SEWER PRELIMINARY ROUTING STUDY LINCOLN, NEBRASKA	SERVICE AREAS

PROJECT MGR.	DESIGNED BY	DRAWN BY	CHECKED BY	DATE	SCALE	PROJECT NO.	FILE NAME	DRAWING NO.	FIGURE
DS	MAB	EG	LNG	8-24-04	NONE	13540.06	–	–	3

2.4 PHYSICAL CONSTRAINTS AND DESIGN ISSUES

Several site-specific constraints and constructibility issues have been identified as a part of the Preliminary Routing/Corridor Study. Their effects on the preliminary design and pipe alignment are discussed in the following sections.

1. Pipe slope and available grade.
   The maximum slopes identified for each pipe size in Table 2.2 are based upon the flow line of the existing 48-inch trunk sewer at the terminal manhole. The pipe slope was set at a continuous grade such that the top of the pipe will match the flow line elevation of the drainage channel at the south end of the project. In each case, the full flow velocity of the pipe is adequate for scouring requirements to prevent solids deposition in the pipe. However, it is anticipated that there will be relatively small flows in the pipe when it is first placed in service, and may require periodic cleaning to prevent solids buildup.

   In the Tier I and Total Ridgeline scenarios in Table 2.2, the flow capacity for the 42-inch and 54-inch pipes are greater than the design flow for the service area, which would allow for a slightly flatter pipe slope and additional cover at the south drainage channel, while maintaining adequate pipe capacity. In the Tier II scenario, the flow capacity of the 48-inch pipe is nearly equal to the design flow for the service area, which requires that the pipe slope be maintained at the maximum allowable, which provides the minimum clearance at the upstream drainage channel. For final design the elevation of the channel must be confirmed with the Watershed Management Division, for compliance with the Southeast Upper Salt Creek Basin Stormwater Master Plan. If the proposed trunk sewer can project into the stream cross-section at a higher elevation, the slope could be increased, resulting in increased capacity and reduced depth and de-watering costs. Stream crossing protection and a grade check structure in the channel will be required, similar to the details in LSP-220.

2. Groundwater and de-watering alternatives.
   As noted in the Geotechnical Engineering Report, the profile of the proposed Upper Southeast Salt Creek Trunk Sewer intersects the groundwater profile at the beginning of the project. As the trunk sewer extends upstream, it's profile projects deeper into the groundwater table, proceeding to about 6.5 ft into groundwater at the upstream end of the project. Since the presence of groundwater and de-watering costs have the potential to significantly impact the project construction cost, extensive geotechnical exploratory investigations are required for final design. These investigations should include required data collection and preliminary design of the de-watering methods necessary for the work.

3. Pipe materials and bedding design.
   It is anticipated that the allowed pipe materials for this project will include reinforced concrete pipe (RCP), pre-stressed concrete cylinder pipe (PCCP), centrifugally cast

fiberglass reinforced polymer mortar pipe (CCFRPMP or Hobas Pipe), and polyvinyl chloride pipe (PVC). Concrete pipe will be required to have a corrosion resistant liner on the inside of the pipe (such as T-Lok). Advantages of the concrete pipe materials include the inherent strength of rigid pipe and reduced bedding requirements. Advantages of Hobas and PVC pipe include longer laying lengths, and inherent corrosion resistance.

Due to the elevation of groundwater along the alignment and the properties of the potentially dispersive clay soils present at the site, it is anticipated that the bedding design will require the use of geotextile fabric to encase the granular bedding material. Bedding requirements for rigid pipe are anticipated to be to the springline of the pipe, and bedding requirements for flexible pipe are expected to be a minimum of 12 inches above the top of the pipe. These requirements and the need for additional foundation material in the trench may be revised depending upon actual field conditions, and recommendations of the geotechnical engineer.

4. Manhole design, spacing, and rim elevations.
   Depending upon the pipe material chosen for the trunk sewer, the manholes may be constructed according to LSP-201, or as prefabricated tee manholes from the pipe manufacturer. It has been the Wastewater Division's policy in the past to not construct manhole steps in large diameter trunk sewers, because personnel entry is very infrequent and confined space regulations require the use of a personnel retrieval system, which can cause interference with permanent manhole steps. Based on comments received at the Design Memo review meeting on 31 March 2004, the maximum manhole spacing for this trunk sewer should be between 800 and 1,000 feet. Also discussed at the review meeting was the preferred method of flood-proofing the manholes that are within the 100-year flood plain. In the past, manhole rim elevations have been set at 1 foot above the 100-year flood elevation. This results in manhole risers that can be several feet above grade. This option may be intrusive to the natural habitat of the park. Other options include placing the manhole rims at grade with watertight lids, which may be bolted down or tack welded in place.

5. Connection to existing 48-inch trunk sewer.
   The last manhole on the existing 48-inch trunk sewer was stubbed out to the south with a 48-inch pipe, directly opposite to the downstream sewer, and parallel to the BNSF right-of-way. Due to the proximity (less than 10 feet) of a double box culvert under the railroad tracks, it appears that the best alignment would be to continue south for approximately 30 feet, and then cross to the west side of the railroad tracks at a perpendicular angle. This will allow additional separation between the boring/ receiving pits and the box culvert wing walls. This alignment will also allow the existing manhole to be used in-place, rather than be reconstructed to accommodate a revised stub location. In addition, the existing manhole receives flow from the 18-inch sewer to the east, and reconstruction under live flow would require plugging and by-pass pumping.

6. Future connection to upstream trunk sewers.
   The upper end of this project will terminate at the drainage channel south of Rokeby Road. The trunk sewer will cross under the channel, and terminate on the south side. This location is where flow from the S-2/S-3 basins and the S-5 basin will connect to the trunk sewer, and a manhole and sewer stubs to the east and south will be required at this location. Drainage area of the S-2 and S-3 basins is 4,057 acres, which yields a design flow of 25.5 cfs, based on the City's design equation. Extension of the trunk sewer upstream to the S-5 basin will serve an area of 3,760 acres (Tier II area) to 4,628 acres (Total Ridgeline area). Due to the flat topography at this location the sewer stubs to each of these upstream basins will require flat slopes and large diameter pipes. The minimum slopes and required pipe sizes are summarized in Table 2.4 below.

Table 2.4 – Upstream Basin Service Requirements
Calculated Pipe Diameter, Flow and Velocity

Urban Planning Zone	Flow Area, acres	Design Flow, cfs	Pipe Diameter, inches	Minimum Pipe Slope, ft/ft	Pipe Capacity, Cfs	Full Flow Velocity, fps
S-2	2,128					
S-3	1,929					
Combined S-2/S-3	4,057	25.5	36	0.00150	25.8	3.7
			42	0.00080	28.5	3.0
S-5 (Tier II)	3,760	23.8	36	0.00130	24.1	3.4
			42	0.00080	28.5	3.0
S-5 (Total Ridgeline)	4,628	28.7	36	0.00190	29.1	4.1
			42	0.00085	29.3	3.1

   In each case shown above, the minimum slope for the 42-inch pipe is limited by the requirement of maintaining the full-flow velocity in the pipe above 3.0 feet per second, in order to achieve scouring velocities and prevent solids deposition. The flat topography at this location may prevent the use of 36-inch pipes to serve these upstream basins.

7. Railroad crossings.
   The trunk sewer alignment will require crossings of the BNSF railroad tracks at the point of connection to the existing 48-inch trunk sewer, and again at approximately Rokeby Road. BNSF standards require steel casing pipe for all utility crossings under the railroad. The steel casing pipe must be a minimum of 5.5 feet beneath the base of the rail, and must have a minimum of 3 feet of cover below the ground surface throughout the railroad right-of-way. The use of plastic carrier pipe requires the use of steel casing pipe for the full width of the railroad right-of-way. The proposed alignment will locate the turn manholes at either end of the railroad crossing outside of the railroad right-of-way. The north crossing at the beginning of the project will be a perpendicular crossing. The south crossing at Rokeby Road may be a diagonal crossing, in order to accommodate conflicts with Dakota sandstone outcropping on

the east side of the railroad and the mature Bur Oak trees on the west side of the railroad, as well as the meander of Salt Creek.

The two railroad crossings will require Pipeline Crossing Permits from BNSF. Due to delays in the permitting process, the permit applications and 2 sets of drawings should be submitted to the railway's real estate agent as soon as possible, to avoid potential construction delays.

8. Trenchless methods and locations.
   The soil borings from the geotechnical investigation at the crossing locations indicated primarily medium stiff to very stiff lean to fat clays. These material are suitable for traditional directional boring applications. The soil borings at the drainage channel at Rokeby Road, on the east side of the BNSF railroad tracks, indicate that underlying Dakota sandstone is present at 7 to 7.5 feet below grade (elevations 1186 to 1190), which is also evident in the railroad cut bank north of this location, and at other locations along the stream bed. These elevations are above the flow line elevation of the trunk sewer, and therefore the alignment and boring/tunneling method through this area will require further delineation of the extents and elevations of the rock formation. Consideration of an alternate route that stays on the west side of the BNSF railroad for an additional distance south of Rokeby Road (200 to 300 feet) should be reviewed.

9. Other utilities.
   The proposed alignment is relatively clear of other existing utilities, due to the location within Wilderness Park and on undeveloped agricultural land. However, site inspection of the alignment has revealed several locations of interest where coordination with other public and private installations will be necessary. Other utilities identified along the alignment include:
   a. At the north end of the alignment, there is evidence of a waterline trench along the west boundary of the Wilderness Ridge golf course, presumably a section of the irrigation system. Further investigation of the golf course record drawings and maintenance records will be necessary to determine size and exact location of this system.
   b. Along the BNSF railway, inside the east right-of-way line, are markers for Qwest fiber optic cable. BNSF utility guidelines require that buried fiber optic lines paralleling the railroad be within 5 feet of the right-of-way line, and have a minimum of 4 feet of cover. It is anticipated that the boring operations for the railroad crossings will be significantly below these fiber optic lines, but on-site location by Qwest will be necessary to avoid any potential conflicts.
   c. At the southwest corner of the Wilderness Ridge golf course property, near Rokeby Road, there is a stormwater detention cell, with a drop inlet structure and a RCP outlet to the drainage ditch south of the golf course property. The outlet structure to the channel is approximately 25 feet east of the west property line of the golf course. There is also a line of overhead power poles at the southwest corner of the golf course property.

d. At the south end of the proposed alignment, near the main drainage channel for the S-2 and S-3 basins, there is a line of overhead power poles and an agricultural irrigation well, along the east right-of-way line of the BNSF railway.

10. Land ownership, required easements, and construction access.

Parcel ownership along the proposed route, from the north to the south are as follows:

e. Wilderness Ridge LLC (golf course)
f. Burlington Northern Santa Fe Railway
g. Ridge Development Company
h. Lancaster County (Wilderness Park)
i. Lola Sievers, et al

It is anticipated that there will be a 40-foot wide permanent easement for the Upper Southeast Salt Creek trunk sewer, centered over the pipe. Construction easements will generally be 150 feet wide, with some adjustments for staging areas and locations of the bores under the railroad.

Construction access on the west side of the railroad will likely be provided from 14th Street, on the access road at the north end of the Wilderness Park property. Construction access on the east side of the railroad will be from 27th Street, likely along the south drainage channel at the south end of the project, across the Sievers property. These access points will need to be confirmed and included in the agreements with the easement documents.

2.5 WILDERNESS PARK ISSUES

1. Existing park habitat characteristics and previous studies.
   Previous studies and park management recommendations that are referenced in this report include:
   a. "Ecosystem Report of Wilderness Park", January 1999, EA Engineering, Science and Technology
   b. "S1-S2 Subarea Plan", February 1999, Lincoln/Lancaster County Planning Department
   c. "Wilderness Park Subarea Plan", 1999, J. Kip Hulvershorn
   d. "Salt Creek at Wilderness Park Hydrologic Study", 1999, US Army Corps of Engineers (USACE)

   The area of the park that is within the alignment of the proposed trunk sewer is comprised mainly of the plant community characterized as "Old Fields", which are previously farmed agricultural fields that have been idle for 20-30 years. The "Old Fields" areas are dominated by non-native grasses and plant species, such as Smooth Brome and Goldenrod, and by Eastern Red Cedar, Green Ash, Dogwood, and Smooth Sumac. These species are indicative of rapid-spreading species that have established themselves due to the lack of habitat management practices in the old agricultural areas. The "Old Fields" area is generally north of Rokeby Road. On the property line between this area and the BNSF railroad, there is a stand of mature oak, hickory, and walnut trees, which act as a buffer between the park and the railroad. This area extends generally about 25 to 50 feet from the fence line onto the park property.

   The area south of Rokeby Road is a mature woodland area, consisting of Bur Oak, Hackberry, and Bitternut Hickory trees. Other tree species present include Black Walnut and Kentucky Coffeetree. Understory shrubs beneath the tree canopy include: Wolfberry, Gooseberry, and Wahoo. Other ground cover plants include: Wood Nettles, Wingstem, Black Sanicle, Honewort, Aniseroot, Meadow Rue, and Moonseed. This is a well-established woodland area of considerable age. However, it is undergoing a transition to more shade tolerant tree species, due to the closed canopy and the lack of habitat management practices.

   From the USACE Hydrologic Study, general recommendations regarding the habitat characteristics of Salt Creek and Wilderness Park included:
   a. Do not employ channel straightening or confinement projects within the park, as this will have an adverse effect on peak flood flows and flood storage within the park.
   b. Maintain the woodland and grassland vegetation areas of the park, in order to maintain flow "roughness values" across the park. Large scale removal or reduction of woodland and grassland habitat will have a negative effect on flood attenuation capacity in the park.

c. Any future development or fill within the floodplain will increase peak flows, and should be compensated for by on-site mitigation and compensatory storage techniques.

2. Sensitive areas and alignment considerations.
The "Old Fields" area north of Rokeby Road has been identified as in need of management and restoration activities, in order to control the existing invasive plant species and re-introduce native species. The mature trees along the fence line bordering the BNSF railroad have been identified as a valuable asset that should be maintained as a buffer between the park and the railroad. There is a seasonal wetland along the south side of the existing access road at the north end of the site, just to the west of the proposed trunk sewer alignment. Construction access to the site via this road will minimize impacts to the park in areas outside of the proposed construction easement.

The woodland area south of Rokeby Road is sensitive due to the nature and age of the tree and plant community, as well as its importance to the numerous bird species that are present in the area. Some habitat management recommendations have suggested that thinning and prescribed burns in this area will maintain the health of the dominant oak tress in the area. However, disturbance of this area for trunk sewer construction will be more difficult to restore to pre-construction conditions than the "Old Fields" area north of Rokeby Road. Removal and replacement of mature trees will require careful planning and monitoring during construction activities.

The presence of a Salt Creek meander south of Rokeby Road will have an impact on the chosen alignment through this area. At its closest point this oxbow in Salt Creek is approximately 120 to 130 feet from the property line of the BNSF railroad. If the alignment alternative selected proceeds to the south through this area, a satisfactory buffer distance from the bank and channel of the stream will need to be determined, and a shift in the construction easement may be required to minimize impacts on the creek and the woodland area. A study of aerial photos dating back to 1937 indicates that the channel and banks of the creek have not shifted appreciably over time, and the oxbow appears to be fairly stable. Lack of significant upstream development or increased flows at this reach of the stream have contributed to the stability of the channel.

3. Restoration
Post-construction rehabilitation of this area will require careful backfill and grading to ensure that natural drainage through the park area is maintained as close to existing conditions as possible. Segregation of topsoil from the remainder of the trench spoil material is recommended; in order to replace the top soil strata to match the existing areas outside of the trench limits. In-situ soil density testing of the park site should be conducted so that backfill compaction and areas disturbed by construction equipment can be restored as close as possible to native conditions.

General recommendations of previous park studies and public meetings for restoration of the "Old Fields" area of the park include the removal of non-native invasive species of grass, shrubs and trees, and re-introduction of native prairie grasses and wildflowers, and selected tree plantings of native species. Restoration should occur in a non-linear, "cluster" manner to soften the transition to park boundaries and areas disturbed by construction. Construction and restoration activities should be sensitive to breeding seasons of the bird species present, and in general disturbance of the area in the fall and winter periods is preferred.

In addition to park restoration within the limits of the sanitary sewer construction as a part of the project cost, there are other potential funding sources available. If there is a decision to pursue additional park land restoration within and beyond the limits of the sewer construction project, there are federal programs available for assistance with these restoration costs. The "Fish and Wildlife Management and Habitat Restoration Program", sponsored by the U.S. Fish and Wildlife Service of the Department of the Interior, provides funding for habitat restoration projects on the basis of a 50/50 match with the local entity or landowner. The types of projects eligible for these funds include:

- Planting native trees and shrubs in formerly forested wetlands and other habitats.
- Planting native grasslands and other vegetation.
- Prescribed burning as a method of removing exotic species and to restore natural disturbance regimes necessary for some species survival.
- Removal of exotic plants and animals that compete with native fish and wildlife and alter their natural habitats.

2.6 PROJECT PARTNERING AND PUBLIC MEETINGS

1. Project partnering approach.
   EA has enlisted the Heartland Center for Leadership Development (HCLD) to facilitate, summarize, and direct the project kickoff meeting and the subsequent open house/public meetings. Two public meetings have been held thus far, to discuss such issues as the alternative routes for the trunk sewer, habitat characteristics of Wilderness Park, construction phase activities, and park land restoration. The first two public meetings were held on March 4th and March 25th of 2004. Notices of the public input process have been sent to such local groups as the Friends of Wilderness Park, the Wilderness Park Committee, the Wilderness Ridge Homeowner's Association and other adjacent landowners, the Lower Platte South NRD, the Audubon Society, the Lancaster County Ecological Advisory Committee, and the Parks and Recreation Advisory Committee.

2. Public meetings/ issues raised.
   The primary topics of discussion at the March 4th and March 25th public meetings centered around the proposed alignment for the trunk sewer, especially at the area near Rokeby Road, where potential conflicts with the woodland area, the oxbow of Salt Creek, and the elevation difference and sandstone outcropping on the east side of the BNSF railroad will affect the final route selected. Also of major interest during the public meetings was the proposed plan for restoration and long-term management of the park, and the potential for public input and monitoring of the final design, construction and restoration processes.

3. Summary of meeting discussions.
   The materials presented for review at the March 4th and March 25th public meetings are included in Appendix D, along with the report and meeting synopsis from the Heartland Center for Leadership Development, which documented the comments and discussion topics that were raised by the public audience in attendance.

4. Continued Public Participation.
   Additional stakeholder meetings are planned for September, to present the findings of this report in draft form. The results of the corridor study and the alternatives analysis will be presented to the Mayor's Environmental Committee, the County Ecological Committee, and the Wilderness Park Committee, in order to provide additional opportunities for input and to allow these groups to pass on project information and concerns to their constituents and the project team. Continued public involvement in this project, as it moves forward from the Preliminary Study to final design and construction, will be an integral part of the success of the project.