



Chapter 4

Affected Environment and Environmental Consequences

4.0 Affected Environment and Environmental Consequences

4.1 Introduction

This chapter describes the baseline conditions and the potential social, economic, and environmental impacts associated with the Antelope Valley Major Investment Study (AV MIS) preferred alternative—the Amended Draft Single Package. The potential impacts of the Amended Draft Single Package in the year of completion of the City’s currently planned growth levels are also compared to those of the No-Action Alternative. For additional information about both alternatives, please see Chapters 2 and 3. For additional information on traffic and traffic safety impacts, please see Chapter 5. Plans of the Amended Draft Single Package are provided in Appendix I.¹

In the sections that follow, the Amended Draft Single Package and the No-Action Alternative are considered with respect to 29 categories of environmental impact. These sections are:

| | | | |
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| 4.17 | Water Body Modification and Wildlife | 4.29 | Secondary Impacts |
| | | 4.30 | Cumulative Impacts |

¹ Technical reports, which are identified in this EIS, are all incorporated by reference in this EIS. Appendix A provides a complete list of referenced reports. Copies of this EIS and the Antelope Valley Study Team reports are available for public viewing from the City of Lincoln-Lancaster County Planning Department, Suite 213, 555 South 10th Street, Lincoln, Nebraska, 68508. Copies of this EIS and Study Team reports are also available for viewing at city public libraries and available for purchase at Kinko’s Copies, 1201 Q Street, Lincoln, Nebraska, 68508.

Most sections contain subsections describing the existing conditions, the methodology used to evaluate the potential impacts, and the resultant impacts on stormwater management, transportation, and community revitalization.* Where appropriate, potential mitigation measures are also described. In the majority of the 29 sections, the subsections are titled:

- Baseline Environmental Conditions
- Impact Assessment Methodology
- Impacts of Stormwater Management
- Impacts of Transportation Improvements
- Impacts of Community Revitalization Actions
- Combined Impacts of the Actions
- Potential Impact Mitigation Measures

An analysis of potential impacts follows.

4.2 Affected Communities

In this section, the communities within the study area are considered with respect to demographics, neighborhood characteristics/cohesion, community resources, and safety and security.

4.2.1 Baseline Environmental Conditions

Demographics. US Census Bureau data from the 1990 Census of Population and Housing were used to estimate the demographic characteristics of the study area. The residential neighborhoods in the study area, described below, do not correspond directly to the US Census Bureau's block groups or basic data units. In order to aggregate the block group data into units that are useful for this study, informed judgments about population distribution within the study area were made based on digital map overlays and aerial photographs. As a result, population, economic, ethnic, and household/housing information was estimated for the area by study section (see Figure 4.1).

The 1990 study area population was estimated to be 16,880 (see Table 4.1). Just over one-half of the study area population (8,480) resided in the South study section within the University of Nebraska-Lincoln (UNL), Malone, Near South/Antelope Park, Downtown, and Near South neighborhoods. The Central section was the next most populous section with over one-third of the study area population (6,195). The third and fourth ranking positions were the North section with 1,281 people and the Northwest section with 924 people. Together, the study area represents 8.8 percent of the City of Lincoln's population.

*Exceptions include:

- Acquisition and Relocation
- Permits
- Construction Impacts
- Secondary Impacts
- Any Irreversible and Irretrievable Commitments of Resources Involved in the Proposed Action
- Relationship Between Local Short-term Uses of Man's Environment and the Maintenance and Enhancement of Long-term Productivity

Figure 4.1

**Table 4.1
STUDY AREA POPULATION**

| Study Section | Total 1990 Estimated Population | Percent of Study Area |
|----------------------|--|------------------------------|
| Northwest | 924 | 5.5 |
| North | 1,281 | 7.6 |
| Central | 6,195 | 36.7 |
| South | 8,480 | 50.2 |
| Study Area | 16,880 | 100 |
| Lincoln | 191,972 | |

Source: US Department of Commerce, Census Bureau, 1990 & AV Study Team

The study area has a higher percentage of non-white minorities than the City of Lincoln (see Table 4.2). The Northwest study section is the only section with a higher percentage of whites than the City overall, with 96.6 percent compared to 95.3 percent City-wide. The white population of the North section is similar to that of the City. The Central and South sections—the study area’s most populous sections—are home to a greater than average non-white population (9.4 and 12.7 percent, respectively).

Of the non-white population, blacks represent the greatest proportion of non-white minorities. Specifically, blacks represent 5.3 percent of the study area population, or just over 50 percent of the minority population. Asian and Pacific Islanders are the next largest minority group, representing 3.5 percent of the study area population, or about one-third of the minority population.

**Table 4.2
STUDY AREA ETHNICITY**

| Study Section | Ethnicity | | | | | % Hispanic Origin |
|----------------------|------------------|----------------|----------------------------------|--------------------------------------|----------------|--------------------------|
| | % White | % Black | % Asian, Pacific Islander | % Amer. Indian, Eskimo, Aleut | % Other | |
| Northwest | 96.6 | 0.6 | 2.2 | 0.4 | 0.0 | 1.5 |
| North | 94.1 | 4.0 | 0.5 | 1.3 | 0.0 | 1.2 |
| Central | 90.6 | 5.6 | 1.4 | 2.3 | 0.1 | 2.9 |
| South | 87.3 | 5.8 | 5.6 | 1.1 | 0.1 | 3.8 |
| Study Area | 89.6 | 5.3 | 3.5 | 1.5 | 0.1 | 3.1 |
| Lincoln | 95.3 | 2.4 | 1.5 | 0.6 | 0.1 | 1.7 |

Note: Totals do not add to 100% due to rounding.

Source: US Department of Commerce, Census Bureau, 1990 & AV Study Team

The percentage of the population claiming Hispanic origin was also examined (the Census Bureau calculates Hispanic origin separately from other ethnicity data). The Northwest (1.5 percent) and North (1.2 percent) study sections are home to a lower proportion of Hispanics than the City (1.7 percent). The more populous Central (2.9 percent) and South (3.8 percent) study sections, on the other hand, are home to a greater proportion of Hispanics. As a result, that population is relatively well represented in the study area, with a 3.1 percent

Hispanic origin population within the study area compared to 1.7 percent City-wide. Based on this information, the study area has larger than average non-white and Hispanic-origin populations.

Median household income is useful in defining the relative prosperity of the study sections (see Table 4.3). The 1989 median household income ranged from a low of \$10,815 in the study area's most populous South section to a high of \$28,162 in the Northwest section. In all but the Northwest study section, the median household income was well below the City-wide median of \$28,056. This suggests that the study area's low median household income of \$12,292 place these households at an economic disadvantage relative to the average City of Lincoln household.

**Table 4.3
HOUSEHOLD CHARACTERISTICS**

| Study Section | Average Household Size | 1989 Median Household Income | Total Housing Units | Percent Of Total Housing Units That Are Vacant | Percent Owner-Occupied Housing Units | Percent Renter-Occupied Housing Units | % HH In Same Residence 6 Or More Years |
|----------------------|-------------------------------|-------------------------------------|----------------------------|---|---|--|---|
| Northwest | 2.7 | \$28,162 | 360 | 2.7 | 65.8 | 34.2 | 50.9 |
| North | 2.2 | \$22,031 | 623 | 5.8 | 51.5 | 48.5 | 36.8 |
| Central | 4.8 | \$17,288 | 1,408 | 7.7 | 40.9 | 59.1 | 38.7 |
| South | 2.6 | \$10,815 | 3,544 | 9.0 | 8.9 | 91.1 | 16.2 |
| Study Area | 3.1 | \$12,292 | 5,935 | 8.0 | 24.7 | 75.3 | 26.0 |
| Lincoln | 2.5 | \$28,056 | 79,079 | 4.6 | 58.1 | 41.9 | 42.8 |

Source: US Department of Commerce, Census Bureau, 1990 & AV Study Team

With the exception of the Central study section, the average household size ranged from 2.2 persons in the North section to 2.7 in the Northwest in 1990 (see Table 4.3). This range is similar to the City of Lincoln's 2.5 persons per household. The exception to the rule—the Central section's 4.8 persons per household—is explained by the UNL student population residing there. This study section's relatively large household size is attributed to the large number of fraternity houses and compact student living arrangements, which tend to inflate the household size figure.

There were a total of 5,935 housing units in the study area in 1990 (see Table 4.3). This comprises approximately seven percent of the 79,079 housing units in the City of Lincoln. The majority of these units (60 percent) are in the South study section, with 24 percent in the Central section. These figures are consistent with the high percentage of apartment buildings, mobile homes, and other multi-family dwellings in these sections. The North and Northwest study sections contain 10 percent and six percent of the study area housing stock, respectively. This is also consistent with the higher proportion of single-family homes in these study sections.

Eight percent of the total housing stock (474 units) in the study area was vacant in 1990 (see Table 4.3). This is nearly double the 4.6 percent vacancy rate for the City of Lincoln. Fully two-thirds of the vacant units were located in the South study section, with another 22 percent in the Central section. The North and Northwest sections had eight percent and two percent of the study area vacant housing stock, respectively.

Household tenancy is useful in defining the relative prosperity of the study sections (see Table 4.3). The percentage of owner-occupied housing is highest in the Northwest section at 65.8 percent, followed by the North section at 51.5 percent, and the Central section at 40.9 percent. The South section trails behind with only 8.9 percent owner-occupied housing units. In the study area, therefore, a lower-than-average household income correlates with a higher-than-average percentage of renter-occupied housing units. For example, in the South study section there is both a low median household income (\$10,815) and a preponderance of renter-occupied housing units (91.1 percent). Conversely, in the Northwest study section where the median household income is the highest, the percentage of renter-occupied housing units is the lowest (34.2 percent). As a result, residential turn-over is relatively high throughout the study area, with the exception of the Northwest section where the home ownership rate of 65.8 percent has kept over 50 percent of its residents in the same dwelling for six or more years. Compared to the City of Lincoln, households living within the study area, with the exception of the Northwest section, are more likely to have low incomes, not own a home, and move more frequently.

The housing stock in the study area is generally older than the City of Lincoln as a whole (see Table 4.4). According to the 1990 Census, 36 percent of the homes in the study area are more than 50 years old, compared to 20 percent for the City. In the Central study section, more than one-half of the units (56 percent) were built in 1939 or earlier. The South study section also has a high proportion of older housing: 35 percent of houses were built in 1939 or earlier. Eighteen percent and 10 percent of the North and Northwest sections' housing stock are at least 50 years old, respectively.

**Table 4.4
AGE OF HOUSING**

| Study Section | Percent of Study Section Housing Stock Built in Given Time Periods | | | | | | | |
|---------------|--|-----------|-----------|-----------|-----------|-----------|-----------|--------------|
| | 1989-1990 | 1985-1988 | 1980-1984 | 1970-1979 | 1960-1969 | 1950-1959 | 1940-1949 | 1939-earlier |
| Northwest | 0.9 | 5.5 | 2.8 | 10.6 | 18.3 | 32.2 | 11.9 | 17.8 |
| North | 2.4 | 9.1 | 4.4 | 39.9 | 20.6 | 11.1 | 2.2 | 10.5 |
| Central | 3.5 | 3.9 | 1.7 | 9.9 | 8.1 | 8.2 | 9.3 | 55.4 |
| South | 0.9 | 4.8 | 12.2 | 23.0 | 14.0 | 5.7 | 4.1 | 35.3 |
| Study Area | 1.6 | 5.1 | 8.3 | 20.9 | 13.6 | 8.5 | 5.6 | 36.4 |
| Lincoln | 2.7 | 6.8 | 7.8 | 24.4 | 15.3 | 16.0 | 6.7 | 20.3 |

Source: US Department of Commerce, Census Bureau, 1990 & AV Study Team

In the Northwest section, almost one-third (32.2 percent) of homes were built between 1950 and 1959. The North section contains somewhat newer housing stock: 39.9 percent of the homes in this area were built between 1970 and 1979. However, newer home construction in the study area lags behind the City of Lincoln. Less than seven percent of homes in the study area were built between 1985 and 1990, compared to nearly 10 percent for the City.

Neighborhood Characteristics, South Study Section. This study section includes parts of the UNL City Campus and the Malone and Downtown neighborhoods (see Figure 4.2). The UNL City Campus in this section includes the Beadle Center, classroom and

research facilities, dormitory housing, fraternities and sororities, surface parking lots, tennis courts, and softball fields (a land use map is provided later in Figure 4.8).

The Downtown neighborhood is characterized by a densely populated area between the State Capitol building and Lincoln High School where two- and three-story, 1960s and 1970s-style brick apartment buildings dominate. Older single-family homes are found on 20th and E Streets and single-story bungalows with distinctive front porches line 21st Street west of Lincoln High School. Several large Victorian/Queen Anne style, three-story homes in the neighborhood have been converted into apartments. The neighborhood includes a senior center, churches, Lincoln High School, Elliott Elementary School, and some commercial development. Immediately north of K Street, the Downtown neighborhood includes a mix of residential and commercial uses. This area also includes Antelope Park/Lewis ball fields, and smaller recreational and community center facilities.

There is a business cluster with over 50 automobile-related businesses between 17th and 23rd Streets and N and P Streets. New and used automobile dealerships along with parts and repair services are the predominant businesses found in this area.

Neighborhood Characteristics, Central Study Section. This study section includes part of the North Bottoms and Clinton neighborhoods, the UNL City Campus, and State Fair Park.

The North Bottoms and Clinton neighborhoods in this section are typified by one- to two-story, single-family bungalows constructed in the late 19th and early 20th centuries. The homes and churches of North Bottoms display architectural characteristics of the German immigrants from Russia who settled in the area. Both neighborhoods are popular with UNL students, and “Fraternity Row” on 16th Street is officially designated the Greek Row Historic District in the National Register of Historic Places. In addition to well-established housing, there are a number of new and converted apartment buildings. On the southern fringe, the neighborhood includes industrial and railroad facilities, vacant parcels, a surface parking lot, and a small commercial area.

The UNL City Campus in this section includes classroom and research facilities, dormitory housing, and varsity sports facilities.

State Fair Park is located on an 89-hectare (220-acre) tract of land between the Burlington Northern Santa Fe (BNSF) Railroad right-of-way (ROW) and Salt Creek, between 14th and 27th Streets. State Fair Park features a number of larger permanent facilities including a grandstand, an industrial arts building, an arsenal which now serves as a museum, the Coliseum, which is the home of the Lincoln Stars hockey team, and several large sheds. State Fair Park also contains a campground north of Oak Creek, and UNL’s Bob Devaney Sports Center is located in the southwest corner of State Fair Park. Salt and Oak Creeks meet on the northwest part of State Fair Park.

The City of Lincoln’s wastewater treatment plant is located west of 27th Street and immediately north of the State Fair Park, along Salt Creek. This area is characterized by a

Figure 4.2

number of commercial and industrial uses, and a mobile home park is near 27th and Theresa Streets.

Neighborhood Characteristics, Northwest Study Section. This study section includes part of the Northwest Lincoln neighborhood north of Cornhusker Highway, the northern portion of the North Bottoms neighborhood, State Fair Park, and property west of State Fair Park and south of Cornhusker Highway.

The Northwest Lincoln neighborhood, which includes multifamily townhouses and a newer apartment complex, houses the majority of the Northwest study section's residents. Just south of the neighborhood, along Cornhusker Highway, are numerous commercial / light industrial developments, a grocery store, and fast food restaurants.

The North Bottoms neighborhood in this study section includes the Indian Center (cafe, gift shop, and apartments) and property owned and used by the Nebraska National Guard for training and recruitment. State Fair Park in this study section includes a recreational vehicle (RV) campground located north of Salt Creek.

The area west and north of State Fair Park contains a shooting range, open space owned by the Lower Platte South Natural Resources District (LPSNRD), half a dozen single-family homes, and an auto salvage yard located between Salt and Oak Creeks.

Neighborhood Characteristics, North Study Section. Commercial and industrial uses dominate in the North study section. There are two mobile home parks on Cornhusker Highway and 27th Street. Portions of UNL East Campus (land for agricultural research) and Clinton and University Place neighborhoods are included.

The area around 27th Street and Cornhusker Highway is an intensely developed commercial area, with busy four- to six- lane streets carrying both local and regional traffic. North of Cornhusker Highway are large retailers and to the south are a number of industrial developments. In addition, there are numerous restaurants—primarily fast food—in the area. There is an auto salvage yard farther east on Cornhusker Highway. The property farther north, between Salt Creek and Superior Street, is predominantly undeveloped farmland, hosting two private enterprises. Just north of Superior Street is a strip mall and Lincoln Electric System substation. This area is planned as intense commercial and residential development in the *Lincoln City -- Lancaster County Comprehensive Plan*.

The Clinton and University Place neighborhoods are typified by small one- to two-story single-family houses constructed in the late 19th and early 20th centuries. The architectural styles vary widely and include bungalows, ranches, and split-level homes. There are newer homes on the northern edges of both neighborhoods and three-story apartment buildings and duplexes on 28th Street, from Fair to Merrill Streets. North of Leighton Avenue, between 29th and Griffith Streets, are the combined 1.3-hectare (3.2-acre) Woodside and Fleming Fields Parks. There are also several business centers located west of 33rd Street, between Leighton and Baldwin Avenues, and north of Dead Mans Run.

Community Resources. Many of the community resources within the study area are mentioned in the neighborhood descriptions above. Below is a brief summary of the major resources in the study area (see Figure 4.3).

Figure 4.3

The City of Lincoln has one public school district, with schools located throughout its various neighborhoods. The study area contains three of these public schools, including Elliott Elementary School, McPhee Elementary School, and Lincoln High School. Figure 4.4 shows the attendance areas for these schools.

Other educational facilities in the study area include: the Lincoln School of Commerce (a private business and trade school located at 1821 K Street), the UNL City Campus located immediately north of Downtown, and UNL East Campus located northeast of 33rd and Holdrege Streets (see Figure 4.3). The following community centers are located in or near the study area:

- Indian Center
- Asian Community Center
- Hispanic Community Center
- Malone Community Center
- Salvation Army, and
- F Street Recreation Center.

These centers provide a number of community services to area residents, including daycare, meal service, English as a Second Language (ESL) instruction, job training, and youth recreational programs (see Figure 4.3, Community Resources).

Table 4.5 lists study area public parks. Abel, Fleming Fields, and McWilliams Parks are classified as “mini” parks. They are less than 0.8 hectare (2.0 acres) in size and contain specialized facilities that serve a concentrated or limited population. Lintel, Pentzer, Trago, and Woodside Parks are classified as “neighborhood” parks. These areas are between 0.4 and 3.4 hectares (1.0 and 8.5 acres) in size and can accommodate some active recreational activities. Centennial Mall is classified as a “special area,” or an area of single purpose recreational activities. Finally, Antelope Park serves as the sole study area “regional” park. The portion of this park within the study area is the 8.9-hectare (22-acre) Lewis ball fields area north of Lincoln High School. The five fields at Antelope Park are used intensely throughout the spring, summer, and fall for youth softball programs (Parks and Recreation Strategic Plan, 1995).

Existing off-street trails in the study area include portions of the John Dietrich bikeway, the Billy Wolff trail, and trails along Salt Creek and portions of 19th, 27th, and 33rd Streets. Trails are discussed in Section 4.7.

The City of Lincoln Fire Administration building is located at 1801 Q Street. The Lincoln Police Station is located at the west end of Downtown, at 233 South 10th Street (see Figure 4.3). A new police sub-station is planned at 27th and Holdrege Streets.

Other community resources in the study area include the State Capitol building at 15th and K Streets and the main Bennett Martin Public Library at 14th and N Streets. The study area is also home to 13 churches and synagogues, as listed in Table 4.6.

Figure 4.4

**Table 4.5
STUDY AREA PUBLIC PARKS**

| Park/Facility | Location | Size (Hectares) | Size (Acres) | Type |
|----------------------|--|----------------------------|-------------------------|---------------|
| Abel | 18 th and E | 0.2 | 0.5 | Mini |
| Antelope Park | 23 rd and N / 33 rd and Sheridan | 45.1 | 111 | Regional |
| Centennial Mall | 15 th , K to R | 1.4 | 3.5 | Special areas |
| Fleming Fields | 31 st and Leighton | 0.8 | 2.0 | Mini |
| Lintel | 22 nd and Holdrege | 0.8 | 2.0 | Neighborhood |
| McWilliams | 25 th and T | 0.1 | 0.2 | Mini |
| Pentzer | 27 th and Potter | 1.6 | 4.0 | Neighborhood |
| Trago | 22 nd and Y | 3.4 | 8.5 | Neighborhood |
| Woodside | 30 th and Leighton | 0.5 | 1.2 | Neighborhood |
| Total | | 53.7 | 133 | |

Source: City of Lincoln Parks and Recreation Department "Strategic Plan," 1995

**Table 4.6
STUDY AREA CHURCHES AND SYNAGOGUES**

| Church/Synagogue | Address |
|--|---------------------------------------|
| Allon Chapel of Seventh Day Adventists | 2301 Y Street |
| Faith United Church of Christ | 901 Charleston Street |
| First Baptist Church | 1340 K Street |
| First Christian Church of Lincoln | 430 S 16 th Street |
| First Presbyterian Church | 840 S 17 th Street |
| Immanuel Church | 10 th & Charleston Streets |
| Latvian Saint John's Evangelical Lutheran Church | 1324 New Hampshire Street |
| Lincoln Christian Fellowship | 1145 Furnas Avenue |
| Newman United Methodist Church | 2273 S Street |
| Saint John Baptist Church | 701 N 24 th Street |
| Saint Mary's Church | 1400 K Street |
| Saint Thomas Aquinas Church | 320 N 16 th Street |
| St. John of Kronstadt Eastern Orthodox Church | 2800 Holdrege Street |
| The All Nations Church | 2615 N 27 th Street |

Source: Aliant Communications Phone Book & AV Study Team

Safety and Security. In 1997, crimes reported in the study area comprised about 22.5 percent of crimes reported City-wide, and the study-area crime rate was more than twice as high as those of the City (see Table 4.7). Larceny, burglary, and theft together comprised 65 percent of the total reported crimes in the study area in 1997. Almost one-third were assaults, and another four percent involved rapes, attempted rapes, and other sex crimes.

**Table 4.7
STUDY AREA 1997 REPORTED CRIME RATES**

| Study Section | Total Reported Crimes | Crime Rate (Crimes/ 1,000 people) | Percent of City Crimes |
|----------------------|------------------------------|--|-------------------------------|
| Northwest | 411 | 445 | 2.6 |
| North | 467 | 365 | 3.0 |
| Central | 953 | 154 | 6.0 |
| South | 1,724 | 203 | 10.9 |
| Study Area | 3,555 | 211 | 22.5 |
| Lincoln | 15,772 | 82 | 100.0 |

Source: Lincoln Police Department & AV Study Team

In 1995, the *Daily Nebraskan* conducted an extensive study of crime in nine central Lincoln neighborhoods. In the study, the Near South neighborhood was ranked sixth, fifth, and sixth for assault, auto theft, and narcotics crimes committed in 1995, respectively. This study also revealed a relatively low crime rate in the Malone neighborhood, which contradicted the common perception that the area was awash in crime (for more information, see “Rethinking Malone” in the December 12, 1996 issue of *Daily Nebraskan*).

Table 4.8 provides a summary of the social impacts that would result from constructing the Amended Draft Single Package. As mentioned, it has been a priority of the AV MIS to minimize negative impacts to establish cohesive neighborhoods in the study area. The Amended Draft Single Package represents the best effort of the community to solve the eight Purposes and Needs while protecting and enhancing the neighborhoods that would be most directly impacted by those solutions.

4.2.2 Impacts of Stormwater Management

Demographics. The household relocations necessary to construct the Amended Draft Single Package’s stormwater management components would decrease the study area population by less than one percent. Relocating displaced housing onto vacant lots within the study area would reduce this housing loss further. The study area ethnic composition, median household income, household size, age of housing stock, household tenancy rates, and number of housing units would also change minimally as a result of displacements (see Section 4.5 for a discussion of relocation impacts and Section 4.3 for a discussion of environmental justice concerns).

The stormwater management component of the No-Action Alternative would not affect demographic characteristics of the study area.

Neighborhood Cohesion. The Amended Draft Single Package’s proposed Antelope Creek channel would run along the west edge of the Malone neighborhood with the exception of the mostly commercial four blocks, bounded by 19th, 21st, O, and Q Streets, which would be separated from the rest of the neighborhood to the east. Today these four blocks are mostly vacant or commercial properties with only a few residences. These four blocks are included in the Downtown development area for community revitalization and would include new land uses in the future. The remainder of the Malone neighborhood east of the channel contains primarily residential blocks. Pedestrian/trail crossings over the creek

**Table 4.8
COMBINED SOCIAL IMPACTS**

| | Amended Draft Single Package | | | No-Action Alternative |
|------------------------------|--|--|--|--|
| | Stormwater Management | Transportation | Community Revitalization | |
| Demographic | -Construction would cause less than 1% change in population -Minimal changes in ethnic composition | -Construction would cause less than 1% change in population -Minimal changes in ethnic composition | -Construction would cause less than 1% change in population -New development east of Downtown increased pop.; change ethnic & socio-economic composition | -No impact |
| Neighborhood Cohesion | -Would provide open space amenity -Would connect parks -Could be perceived to isolate 4 blocks of Malone neighborhood | -Would improve vehicular access to Downtown -Would improve vehicular access to businesses in 27 th – 33 rd and Cornhusker area | -Expanded community services would enhance quality of life in area neighborhoods -New development east of Downtown would change character & provide neighborhood services | -No impact |
| Community Resources | -Trail would improve pedestrian access to schools, community, and wrap-around centers -Would change some vehicular access routes -Would provide new open space in study area | -Would change pedestrian and/or vehicular access to Elliott Elementary, Malone Community Center -Would require replacement of three UNL softball fields | -New trails would expand and connect City-wide system -New and expanded parks would provide additional recreation in central Lincoln | -No impact, other than those elements already included in the City's Capital Improvement Program |
| Safety and Security | -Elimination of flood threat | -Change emergency vehicle response routes to Malone neighborhood -Improved emergency vehicle response time to N. Bottoms -Improved grade crossing safety | -No adverse impact | -No impact, other than the City's construction of a new police station |

Source: AV Study Team, 1998.

between the two sides of the neighborhood would be provided at the vehicular bridges as well as at the following locations:

- two in Antelope Park,
- one at S Street,
- one south of the BNSF Railroad, and
- one north of the BNSF Railroad.

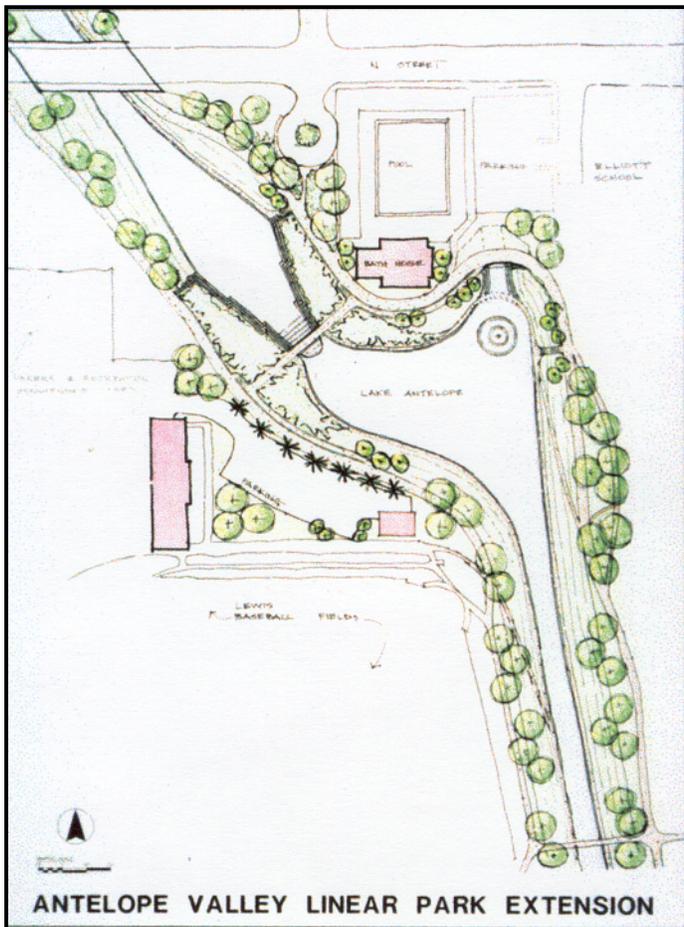
Through the consensus-building process, the community agreed that the best way to handle the Antelope Creek 100-year floodwater would be with an attractive, open waterway that would incorporate a variety of amenities and features along its length from N Street to Salt Creek. Its alignment along neighborhood boundaries is designed to minimize impacts to neighborhood cohesion. Some residents of the Malone neighborhood have expressed concern, however, about how an open waterway would impact their community. Concerns fall into three categories and are outlined below:

- **Space.** The perceived adequacy of space between the Beadle Center and Malone Community Center and its impacts on the adjacent Trago Park is a concern for some area residents and Beadle Center faculty. There are at least 79 meters (260 feet) between the east building face of the Beadle Center and the west building face of the Malone Center. The roadway ROW would be 37 meters (120 feet) wide, and the channel ROW would be 43 meters (140 feet) wide, thus allowing the roadway and conveyance channel to just fit between the two buildings. While the new roadway would not *reduce* the size of Trago Park, adding the stormwater channel would. Replacement land (1:1) would be added back to the park from the unused portions of property acquired for the project. The shape of the park would change and the waterway within the channel would become the new west edge. Trago Park's net size would remain the same.
- **Safety.** The channel would be designed so that water would always be flowing to discourage mosquitoes from breeding. In addition, open channels are generally considered safer in the event of an emergency than closed conduits. Open channels are easier to escape from during periods of high flow. Emergency personnel can possibly rescue someone they can see within an open channel. Whereas, anyone carried into an opening of a long closed conduit could drown before escaping, or being located or rescued. Many Lincoln neighborhoods have open channels, and safety concerns have not been overwhelming in the past.
- **Cost.** Some residents feel that a covered conduit would be less expensive than an open channel. Between S and Vine Streets, the open channel would follow the western edge of Trago Park. A closed conduit in this area would cost approximately \$7.5 million *more* than an open channel. A closed conduit located under the North-South Roadway would leave the existing park area unchanged after construction is completed. However, additional costs would be allocated for concrete and steel only to be used during a flood event. Conversely, the open channel would be used every day as an extension of the park's open space. With total channel construction costs at about \$24 million, the \$7.5 million would be over a 30 percent increase in the construction costs without compensating additional benefits for flood protection.

North of the BNSF Railroad, the channel would follow the eastern edge of the North Bottoms neighborhood. It would not bisect or isolate any portion of the neighborhood. The channel would be developed as a public, linear park and would contain a bike trail. The trail would

increase accessibility from North Bottoms to destinations south of the BNSF Railroad mainline tracks. No other changes to the characteristics of the North Bottoms neighborhood are anticipated as a result of stormwater management.

The stormwater management component of the No-Action Alternative would not adversely affect neighborhood cohesion in the study area.



Source: Antelope Valley Study Team

Figure 4.5: Antelope Valley Linear Park Extension

hike/bike trail and other amenities (see Figure 4.5). The waterway would not adversely affect study area churches, fire and police stations, libraries, or the State Capitol building.

There would be pooled areas of water or lakes along the new waterway. Designs for such amenities have been considered during preliminary engineering.

The stormwater management component of the No-Action Alternative would not affect community resources in the study area.

Safety and Security. The channel would not impact police and fire primary response routes to the Malone neighborhood. Lighting along the waterway trail would be incorporated to aid nighttime security.

Community Resources. Providing bike trails in the Amended Draft Single Package channel's ROW would improve access to and from Elliott Elementary School via bicycle or foot, especially for residents of the Malone neighborhood. Some vehicular access routes to Elliott School would change (see Section 4.2.4).

The trails constructed in the Amended Draft Single Package channel's ROW would improve foot and bicycle access to the community and recreation centers in the study area, which is particularly useful to those identified as future wrap-around centers. For example, the trail would pass by the Malone Community Center and within two blocks of the Indian Center/Armory. This trail would also connect to the John Dietrich bikeway, which leads to Pentzer Park and the Salvation Army Community Center.

The construction of the Amended Draft Single Package's channel would provide approximately 12 hectares (30 acres) of new parkland in the study area. The waterway and linear park would connect Antelope Park/Lewis Fields on the south with Trago Park and would contain a

The flat, grassy slopes of the channel would not pose any greater safety risk for children falling in than exists at other similar water features throughout Lincoln (see Section 4.2.3 for impacts due to street closings at the channel).

As previously discussed, the stormwater management component would contain the 100-year flood within the confines of a channel, thus reducing the risk to life and property.

The stormwater management component of the No-Action Alternative would not affect police and fire safety and security in the study area, nor would it reduce the risk of serious flooding.

4.2.3 Impacts of Transportation Improvements

Demographics. Similar to the discussion of stormwater management impacts (Section 4.2.2). The transportation component of the No-Action Alternative would not affect the demographic characteristics of the study area.

Neighborhood Cohesion. The North-South Roadway in the 19th Street corridor would limit east-to-west vehicular access in some locations and change some travel routes to and from Downtown, although in no cases would access be completely eliminated. Specifically, M Street would become a “right-in, right-out” intersection at the new roadway. P Street would ultimately be a limited-access intersection, although the interim plan is for it to be a full-access intersection. Access to individual properties would be maintained. Some area residents and business owners have expressed concern that limiting access at M and P Streets could create bottlenecks at O and Q Streets, that the area between 19th and 27th Streets is isolated from Downtown, and that Downtown is not an easy destination to reach. Refinements to the Amended Draft Single Package, particularly access to the North-South Roadway from east-west streets, have alleviated these concerns. Further, traffic models used in the study have shown sufficient East-West Roadway capacity to accommodate traffic in this area. The North-South Roadway would reduce “cut-through” traffic in the Malone neighborhood and remove through traffic from the UNL City Campus, allowing 16th and 17th Streets to become two-way streets for local, University-destined traffic.

The Amended Draft Single Package roadways were intentionally placed at the edges of neighborhoods to avoid disrupting the established, cohesive communities in the study area. They were also designed with the intention of removing non-neighborhood traffic from neighborhood streets.

The North-South Roadway would run between the UNL City Campus and the Malone neighborhood, between Q and Vine Streets. Farther north, it would follow the east edge of the North Bottoms neighborhood. With the closing of the BNSF Railroad grade crossings, 14th, 16th, & 17th Streets south of Court Street would become local streets, thus not dividing the UNL City Campus.

While the Malone neighborhood would not be split, isolated, or otherwise cut off by the North-South Roadway, pedestrian access from the Malone neighborhood to the University and Downtown areas would be more limited. The width of the roadway and heavy traffic volumes during peak periods could create a perception that the Malone neighborhood, UNL City Campus, and Downtown are cut off from one another. To mitigate these concerns and promote adequate pedestrian access at major intersections such as O, Q, and Vine Streets, pedestrian crosswalks with adequate light cycles for pedestrian movement through the intersections would be provided.

The East-West Roadway would be north of the BNSF Railroad mainline tracks, on State Fair Park land, to avoid disrupting the Clinton neighborhood on the south side of the tracks. This roadway would move some vehicular access points to State Fair Park, especially near the Devaney Center, but access to State Fair Park would not be reduced.

The roadway alignments near 33rd Street and Cornhusker Highway, particularly the Adams Street Connector and the Huntington Avenue Connection west of 33rd Street, were designed to minimize through traffic in residential neighborhoods further south by discouraging a “straight shot” on 33rd Street north to Superior Street.

Access to some businesses between 27th and 33rd Streets along Cornhusker Highway would change due to the closed grade crossings at 33rd and Adams Streets. Traffic to and from Adams Street on the east would no longer have direct access to Cornhusker Highway. Instead, drivers would be required to either use the 48th Street underpass or take the Adams Street Connector and/or Huntington Street Extension to the new East-West Roadway to connect back to Cornhusker Highway at about 30th Street. Some local business owners have expressed concern that they might lose customers due to this changed traffic pattern. Businesses along Baldwin Avenue and 33rd Street, between Huntington Avenue and Cornhusker Highway, are also concerned that Baldwin Avenue would become a cut-through for people traveling between Adams and 33rd Streets. Traffic concerns such as these resulted in a refinement to the Amended Draft Single Package to include a 33rd Street underpass, thus maintaining a direct connection to Cornhusker Highway from the south on 33rd Street.

The transportation component of the No-Action Alternative would not affect neighborhood cohesion in the study area.

Community Resources. The new North-South Roadway would impact pedestrian routes to Elliott Elementary School for students who walk to school from areas west of the roadway between K and Vine Streets. The Lefler Middle School and Lincoln High School attendance areas are also in this vicinity, although Lefler students living north of O Street are currently bused to school. Where appropriate, crosswalks would be provided, and pedestrian phases in traffic signals would be used so safe access to the school would be maintained.

The closing of R Street at the channel would change some automobile travel routes to the Malone Community Center. Located at 22nd and U Streets, the Malone Center would remain accessible on 22nd Street from Vine Street on the north or R Street east of 22nd Street on the south. Travel to the Malone Center to or from the west of Antelope Creek would be accommodated on Vine, O, P, or Q Streets.

Constructing the Amended Draft Single Package roadways would not change the amount of space in public parks and recreation areas in the study area due to a commitment to find replacement sites for the three softball fields and other smaller tennis, volleyball and horseshoe courts negatively impacted. The North-South Roadway would cross UNL’s three softball fields north of Vine Street, immediately west of the existing Antelope Creek. These fields would be replaced, possibly at the new Northeast Community Park (see the 4(f) discussion in Chapter 7). The other courts would be relocated on campus.

The Amended Draft Single Package roadways would not adversely impact fire or police stations, libraries, the State Capitol building, or its view-corridors.

The transportation component of the No-Action Alternative would not affect community resources in the study area.

Safety and Security. The new grade closings at 14th, 17th, and Adams Streets would have the ultimate effect of decreasing average emergency response times to destinations north of the BNSF Railroad mainline tracks. New grade-separated crossings at the North-South and East-West Roadways and at 33rd Street would provide direct access—even when trains are moving.

Limited east-west vehicular access along the North-South Roadway would change some emergency vehicle response routes south of the tracks. Elliott School and Muni Pool generate a relatively high volume of police calls, particularly during the summer months.

Despite some access changes, this area would still remain fully accessible for emergency vehicles along designated routes. Proper treatment at street closings would maintain adequate in- and out-access for police and fire response vehicles.

The transportation component of the No-Action Alternative would not affect safety and security in the study area. Hazards for pedestrians and motorists would remain at railroad/roadway at-grade crossings.

4.2.4 Impacts of Community Revitalization Actions

Demographics. The number of household relocations necessary to construct the Amended Draft Single Package's community revitalization components would, in the short term, decrease the study area population by less than one percent. Relocating displaced housing on vacant lots within the study area would reduce this. The study area ethnic composition, median household income, household size, age of housing stock, household tenancy rates, and number of housing units would see minimal changes as a result of these displacements. See Section 4.5 for a discussion of relocation impacts and Section 4.3 on environmental justice issues.

The development opportunity concept for the area immediately east of Downtown would include new owner-occupied housing and rental apartments. These new units would, in the long term, increase the study area population and housing. Depending on the socioeconomic background of the population that would be attracted to the new housing, the median household income and ethnic composition of the study area would also change. Because changes in this area are intended for private market development, it is difficult to speculate about the possible demographic changes to the study area.

The community revitalization component of the No-Action Alternative would affect demographic characteristics of the study area. The Northeast Radial Reuse Area and Focus Area Revitalization efforts would attract new residents to this part of Lincoln.

Neighborhood Cohesion. The community revitalization strategies contained in the Amended Draft Single Package are the result of many brainstorming sessions with neighborhood residents. As implemented, the wrap-around centers, expanded park lands, new hike/bike trails, Downtown development, and relocated housing would create better opportunities for social interaction and foster bridge-building among the many communities that coexist in this part of Lincoln. These strategies would enhance neighborhood cohesion and strengthen the identity of Lincoln's oldest and most established neighborhoods. In no

cases would the strategies split, cut off, or isolate the study area neighborhoods from one another or from community resources.

The Downtown development area, between 17th Street and the channel, would change some existing land uses in this predominantly commercial area over the next 15 to 20 years (see Chapter 3). This area is bordered on the south by the Near South neighborhood, on the east by the Woods Park and Malone neighborhoods and on the west by UNL City Campus and the “traditional” Downtown. These neighborhoods would benefit from the new mixed-use development, particularly new housing opportunities, a grocery store, and supporting services such as dry cleaners, drug stores, and banks. Expanded employment opportunities in this area would also provide new jobs for area residents (see Section 4.4 for land use impacts and Section 4.6 for economic impacts).

The expanded pedestrian trails would provide City-wide benefits for Lincoln residents by completing the award-winning trail system in the Downtown area. In essence, the “spokes” of existing trails would be connected by a trail loop around Downtown. New trails and trail connections would provide better access both to community resources in the study area (such as schools and wrap-around centers) and to resources in other parts of the City (see Section 4.7 for further discussion of trail impacts). Also, the Northeast Community Park would enhance the quality of life for residents of the nearby University Place, Clinton, East Campus, and Hartley neighborhoods by providing new recreation space accessible by trails. It would also include joint-use fields for use by UNL recreation program participants.

The Indian Center/Armory wrap-around center would increase the interaction and cooperation between the Nebraska National Guard and the Indian Center, particularly if shared facilities and programs are developed. It would also provide additional community resources in the form of educational and/or recreation programs for the North Bottoms neighborhood. The conversion of the former Whittier Junior High School to a wrap-around center and expansion of community services at the Malone Community Center would positively impact the quality of life for Clinton and Malone neighborhood residents. The North 27th Street/Salvation Army Community Center would provide similar benefits for Clinton, Hartley, and Malone neighborhood residents.

The health clinic is intended to provide greater access to health and medical services for study area residents. Having health providers nearby would enhance the quality of life for study area neighborhoods by reducing the time needed to travel longer distances to receive medical attention.

The community revitalization component of the No-Action Alternative includes separate actions that would positively impact neighborhood cohesion through housing programs, infrastructure improvements, redevelopment activities, and other actions. However, it doesn't include any of the improvements contained in the Amended Draft Single Package.

Community Resources. The implementation of a wrap-around center at Elliott Elementary School would enhance the community services already provided at the school. Other community revitalization strategies would not impact other public schools in the study area. The Downtown development area would include expansion space for the Lincoln School of Commerce and new housing options for UNL students, faculty, staff, and Downtown workers.

Some wrap-around center sites already serve as community centers. The Malone Community Center, the Indian Center, and North 27th Street/Salvation Army are such locations. Any new services provided at these wrap-around centers would augment those already provided (see Chapter 3).

Wrap-around services provided at these three community centers would attract additional pedestrian traffic. However, each of these centers is either already located on a hike/bike trail or would be accessible by the construction of the trails. There would be design implications (or limitations) for the wrap-around center at Elliott School if the concept includes construction or reconstruction since the building is eligible for inclusion on the National Register of Historic Places (see Section 4.18).

The construction of recreation fields north of Whittier Junior High School would provide approximately 0.8 hectare (2.0 acres) of active recreation space. The Northeast Community Park would provide an additional 13 hectares (33 acres) of park space for central Lincoln residents.

The community revitalization component of the No-Action Alternative would add a new police station to central Lincoln. Other strategies would not affect community resources in the study area.

Safety and Security. The community revitalization strategies would not impact emergency vehicle response times or routes in the study area. Strengthening these central Lincoln neighborhoods with the new strategies would help reduce crime rates in the study area, although it is not possible to predict any change in numbers.

The community revitalization component of the No-Action Alternative would improve safety and security in this area with the construction of a police sub-station at 27th and Holdrege Streets. Response times would decrease because the sub-station would be closer to some parts of the community, and community policing efforts from the new sub-station hopefully would reduce crime rates.

4.2.5 Combined Impacts of the Actions

No additional adverse impacts would result from the combined actions.

4.2.6 Potential Impact Mitigation Measures

The proximity of the North-South Roadway to Trago Park raises important questions about possible negative impacts to the park. As mentioned above, the channel, with its landscaping, path, and activity areas east of the roadway would help mitigate the impact. Additional impacts and mitigation measures are discussed in Chapter 7.

Malone neighborhood residents and the Malone Center have been working with the City's Departments of Urban Development and Parks and Recreation to develop restrooms, park benches, and other amenities in the existing Trago Park. These amenities are being planned with an eye toward the potential implementation of the Amended Draft Single Package. And, if the Amended Draft Single Package stormwater channel is constructed, there would be opportunities for the City to expand Trago Park and incorporate new sports fields or other uses.

Other potential mitigation activities discussed in each of the sections above include:

- Relocate acquired housing to vacant parcels in affected neighborhoods,

- Construct pedestrian bridges to enhance east-west access for all,
- Move water continuously through the channel to discourage the breeding of mosquitoes,
- Provide adequate lighting and vegetation in stormwater management channel to maximize safety,
- Locate linear Amended Draft Single Package features along the edges of neighborhoods,
- Maintain entrances to State Fair Park,
- Work with Business to mitigate access concerns,
- Replace lost park land, and
- Provide proper turning radii at intersections for emergency vehicle access.

4.3 Environmental Justice

4.3.1 Baseline Environmental Conditions

President Clinton signed the Executive Order on Environmental Justice (Executive Order 12898, “Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations,”) on February 11, 1994. The Executive Order requires that, to the extent practicable and permitted by law, neither minority nor low-income populations may receive disproportionately high or adverse impacts as a result of a planned project. It requires federal agencies to take the appropriate and necessary steps to identify and address “disproportionately high and adverse” effects of federal projects on the health or environment of minority and low-income populations to the greatest extent practicable and permitted by law. It also requires representatives of any low-income or minority populations that would be affected by a project in the community are given the opportunity to be included in the impact assessment and public involvement process. FHWA implements EO 12898 through policies it sets forth in FHWA Order 5540.23, “FHWA Actions to Address Environmental Justice in Minority Populations and Low-Income Populations” (December 2, 1998).

The analyses provided throughout this Environmental Impact Statement (EIS) provide discussions of social, economic, and relocation effects on various socioeconomic groups, including minorities and low-income populations, in accordance with Title VI of the Civil Rights Act of 1964 and related statutes. Title VI requires that no person, because of race, color, religion, national origin, sex, age, or handicap, be excluded from participation in, denied benefits of, or be subjected to discrimination by any federal-aid activity. Executive Order 12898 broadens this to require that disproportionately high and adverse health or environmental impacts to minority and low-income populations be avoided or minimized to the extent feasible. This study and the Amended Draft Single Package have been developed in accordance with the Civil Rights Act of 1964, as amended, Executive Order 12898, and FHWA Order 6640.23.

4.3.2 Impact Assessment Methodology

The methodology used to assess environmental justice impacts for the Amended Draft Single Package identifies geographic areas with the most low-income and minority households and investigates the relative benefits and impacts of the improvements to such areas. The analysis refers to the impact analyses contained throughout Chapter 4 as well as the public involvement activities.

Minority and Low-income Populations. The composition of the populations within the study area provides the context to identify whether the improvements would cause disproportionately high and adverse impacts on minority or low-income populations. The study sections vary in composition and income levels.

Population and income characteristics for the study area were derived from the 1990 US Census, are assumed similar for 1998, and are presented in Section 4.2.1. For the purpose of conforming to Executive Order 12898, minority populations include non-Hispanic black, non-Hispanic American Indian, non-Hispanic Asian, non-Hispanic other, and Hispanic populations.

To identify low-income populations, the US Department of Commerce, Economics and Statistics Administration, Bureau of the Census definition was used; the average poverty threshold in 1989 for a family of four was an annual income of \$12,674 (Appendix B of the 1990 Census of Populations and Housing Summary Social, Economic, and Housing Characteristics, California, June 1992).

An analysis of census data illustrates that the South study section has the highest percentage of low-income and minority residents compared to other study sections. Section 4.2 indicates that half of the residents in the study area reside in the South study section, and over one-third live in the Central study section. The remaining residents live in the North and Northwest study sections. Of the four study sections, the South has the lowest median household income (\$10,800) and the highest minority population (12.6 percent non-white and 3.8 percent of Hispanic origin).

Figures 4.6 and 4.7 provide the percent of low-income and minority populations within broad analysis area census tracts. According to the US Department of Transportation guidance, *low-income* means a person whose median household income is at or below the Department of Health and Human Service poverty guideline (the census data indicate a number of households or percent below the poverty line). *Minority* means black, Hispanic, Asian American, American Indian and Alaskan Native.

Minority composition within these census tracts ranged from two percent of all households in tract 14 (the southeast corner of the broad analysis area) to 28 percent in tract 7 (the Malone neighborhood). From 1992 to 1998, (subsequent to the 1990 census, which is the basis of this analysis) over 2,000 refugees from Southeast Asia, the Middle East, and Eastern Europe have settled in Lincoln, many in the Antelope Valley study area (UNL *North 27th Street Ethnic Enclave Study*, May 1999).

Tracts 7, 18, 19, and 20 have the highest percentage of low-income households with 43 percent, 30, 34, and 30 percent of the households with poverty status. These census tracts are primarily in the South study section. The Central study section includes census tract 4, which has 27 percent of its households at or below the poverty level.

Purpose and Need. The Antelope Valley Major Investment Study began with the identification of purposes and needs for evaluating possible improvements. These are summarized in Chapter 1. Citizen participation was sought to develop the purposes and

Figure 4.6

Figure 4.7

needs, several of which are consistent with the intent of the Executive Order, particularly regarding neighborhood cohesiveness. The Antelope Valley Study has embraced community revitalization as a key component of the study in response to community concerns and requests, including those voiced by neighborhood organization leaders, residents, elected officials, and business owners representing the South study section.

Community Involvement. The manner in which a study is conducted and the opportunities that are provided for all segments of society to contribute and have their issues voiced and needs identified is an important component in the identification of the best infrastructure solution. It also a key element of achieving environmental justice.

The Antelope Valley Study Team has conducted over 1,000 meetings, large and small, been advised by an Advisory Committee comprised of neighborhood representatives and agency staff, and has made substantive effort to meet with all segments of the community. The Antelope Valley approach has been very inclusive throughout the process—from need identification, alternative development and screening, to impacts assessment. The extensive meetings have included representatives from the South study section, including residents, leadership from neighborhood groups, and business representatives. Many of these individuals are on the Advisory Committee, which has been meeting monthly since the onset of the study in 1996.

Special attention to the needs of minority groups has been given, and the Antelope Valley Study Team has enlisted the active participation of the residents in the South study section. Over 15 organizations and 16 known leaders of the minority community have been involved throughout the study and participated in over 60 meetings. In mid-1999, it was noted that there is a concentration of newer immigrant residents settled in portions of the study area, especially in the southeast quadrant of the Malone neighborhood and in the Near South neighborhood below K Street. To reach these resettled refugees, special flyers in four languages were distributed and meetings with translators were held to explain the plan and seek participation. While turnout was poor, some ideas did emerge from those present. In addition, neighborhood representatives have been actively involved in committees, and work groups, including the Process Committee, Advisory Committee, Community Revitalization Team, and Town Hall Planning Committee.

Throughout the acquisition and relocation analyses in this section, the numbers given for the total relocations are regardless of ownership or tenancy, income levels, or ethnicity. Since most of the South study section acquisitions are in the Malone census tracts, it is possible to suggest that the population mix in the acquired residences is similar to that of the relevant census tracts (43 percent low income and 28 percent minority as shown in Figures 4.6 and 4.7). To suggest so, however, would probably understate the impacts, especially in the case of low-income status. Examination of the housing values of many residences proposed for acquisition suggests that these homes are of lower value, thus it is more likely that low-income families live in them, compared to higher valued homes. Another consideration is many of the younger tenants are UNL students. The South study section, especially the Malone census tracts, has logical, less costly housing choices for students, given the proximity to the UNL City Campus.

4.3.3 Impacts of Stormwater Management

Amended Draft Single Package. Stormwater management improvements are located along Antelope Creek in the South and Central study sections. The stormwater management improvements would result in reducing the Antelope Creek floodplain that now restricts and threatens many homes and businesses. There are 835 structures currently within the Federal Emergency Management Administration-defined floodplain of Antelope Creek from A Street to the BNSF Railroad (mostly the South study section). With the stormwater management improvements, the threat of flooding from a 100-year storm would be eliminated. This is a very large benefit of the Amended Draft Single Package for the South study section. The acquisition of property and displacement and relocation of residents and businesses can be one of the more important impacts of any infrastructure project, and an area where concerns with maintaining environmental justice can arise. Federal regulations set the process and compensation policies associated with ROW acquisition associated with the Amended Draft Single Package. Any acquisition of property and displacement of residents or businesses is subject to the requirements and protections of the Uniform Relocation and Real Property Acquisition Policies Act of 1970 (shortened to Uniform Act) and the Uniform Relocation Act Amendments of 1989. Regulations and implementing laws are contained in Title 49, Part 24, Section 201 of the *Code of Federal Regulations*. As a result, all property would be purchased at fair market value and residents, businesses and land users would be eligible for relocation benefits (see Section 4.5 for a discussion of acquisition and relocation).

While the South study section receives the most benefits of stormwater management improvements compared to other study sections, it also has the most potential acquisitions associated with stormwater management. Specifically, the stormwater management improvements require acquisition of 17 residential buildings and 13 non-residential buildings in the South study section, and two buildings in the Central study section. Combined, the Central and South study sections receive all the benefits of floodplain reduction, with relatively small impact to homes and businesses. Table 4.9 identifies potential relocations by study section, including the number of residential and non-residential buildings, and residential and business units. Note There are no potential relocations associated with stormwater management improvements in the North and Northwest study sections.

Though there is much benefit expected from the removal of the flooding and damage threat to properties, there is the potential for an increase in property values as the community recognizes these benefits. Over time, this may translate into an increase in the cost to live in older, near-in neighborhoods, and could ultimately change the composition of incomes, race and ethnicity in the decades after implementation of Antelope Valley.

No-Action Alternative. With the No-Action Alternative, the threat of flooding would continue along Antelope Creek. No homes or business would be acquired to construct stormwater management improvements. However, the threat of flooding would endure in low-income and minority neighborhoods concentrated in the South study section.

**Table 4.9
POTENTIAL RELOCATIONS BY STUDY SECTION***

| | Buildings by Study Section | | | | | |
|-----------------------------|-----------------------------------|---------------|----------------|---------------|--------------|---------------|
| | South | | Central | | North | |
| | Res'l | NonRes | Res'l | NonRes | Res'l | NonRes |
| Stormwater Management | 17 | 14 | 1 | 1 | 0 | 0 |
| Transportation | 9 | 16 | 0 | 0 | 0 | 22 |
| Community Revitalization | 19 | 3 | 0 | 0 | 0 | 8 |
| Sub Total | 45 | 33 | 1 | 1 | 0 | 30 |
| Total | 78 | | 2 | | 30 | |
| Population by Study Section | 8,480 | | 6,195 | | 1,281 | |
| Residential Buildings/1000 | 5.3 | | 0.2 | | 0.0 | |
| Buildings per 1000 people | 9.2 | | 2.7 | | 23.4 | |
| | Units by Study Section | | | | | |
| | South | | Central | | North | |
| | Res'l | Bus. | Res'l | Bus. | Res'l | Bus. |
| Stormwater Management | 18 | 12 | 1 | 1 | 0 | 0 |
| Transportation | 16 | 8 | 0 | 0 | 0 | 16 |
| Community Revitalization | 19 | 2 | 0 | 0 | 0 | 5 |
| Sub Total | 53 | 22 | 1 | 1 | 0 | 21 |
| Total | 75 | | 2 | | 21 | |
| Population by Study Section | 8,480 | | 6,195 | | 1,281 | |
| Residential Units/1000 | 6.3 | | 0.2 | | 0.0 | |
| Total Units per 1000 people | 8.8 | | 0.5 | | 16.4 | |

*Excludes UNL, State Fair Park, and City of Lincoln-owned buildings.

Source: AV Study Team

4.3.4 Impacts of Transportation Improvements

Amended Draft Single Package. The South study section benefits from the new North-South Roadway by receiving traffic relief on neighborhood streets. The purpose and need of traffic operational improvements includes the need to reduce the amount of “through” traffic that utilizes neighborhood streets. The investment in new roadways has the ability to attract through travelers from parallel streets in residential areas. Thus, the South study section would benefit from reduced traffic volumes in residential areas.

Similar to the stormwater management discussion in Section 4.3.3, some property relocations would be expected with the Amended Draft Single Package. Refer to Table 4.9. The Amended Draft Single Package is expected to acquire nine residential buildings in the South study section. In addition, it is expected to acquire 16 non-residential buildings in the South study section and 22 in the North study section.

No-Action Alternative. The No-Action Alternative proposes no new roadways, and thus there would be no relief from through traffic on neighborhood streets. No relocations of homes or businesses would be necessary because no new roadways would be constructed.

4.3.5 Impacts of Community Revitalization Actions

Amended Draft Single Package. Many of the community revitalization corollary actions would benefit residents in the South study section. In fact, residents of the South study section neighborhoods have requested that certain community revitalization actions occur. Community revitalization corollary actions are directly related to the purposes and needs discussed in Chapter 1.0; the community revitalization actions address neighborhood vitality, land-use patterns, Downtown vitality, trail continuity, recreation, and health and human services (see Chapter 3). Of the potential residential acquisitions related to community revitalization actions, all 19 are in the South study section.

The South study section would receive the most benefits from the community revitalization actions through neighborhood vitality improvements in the Malone and Clinton neighborhoods, including a new downtown supermarket, mixed-use development, new residential options, and “Closer-to-Home” strategies. Other strategies focused on the South study section include more coherent land-use patterns, a revitalized downtown area, and an expanded Trago Park. Improved trail connections and community “wrap-around centers” would provide improvements throughout the study area.

No-Action Alternative. The benefits of specific community revitalization concepts would not be realized and the associated relocations would not occur under the No-Action Alternative.

4.3.6 Combined Impacts of the Actions

Whether the intent of the Executive Order on Environmental Justice has been met for a specific project is a function of both the project’s potential impacts, and the process by which the study has been conducted.

Amended Draft Single Package. The Amended Draft Single Package has the potential to provide many benefits to the South study section. The reduction of the Antelope Creek floodplain would reduce the threat of widespread flood damage along Antelope Creek from a major storm and provide opportunities for new development in the South study section. The new roads would provide traffic relief on neighborhood streets while providing opportunities for increased development. In addition, the community revitalization actions would directly benefit residents in the South study section.

- **Relocation Impacts.** Overall, 45 of the 46 residential buildings that would be acquired are in the South study section. Of the non-residential buildings, there are 33 that would be acquired in the South study section, 30 in the North study section, and 1 in the Central study section.

Regarding impacts to businesses, there are two areas where most potential relocations occur: in the North study section around the 33rd Street hub and in the South study section along the new channel and roadway. The North study section has 21 businesses to relocate and the South study section has 22 businesses to relocate.

- **Process.** The extensive community involvement process and the functioning of the Advisory Committee demonstrate that more than reasonable effort has been expended to seek out the broadest possible input and to recognize the specific interests and needs of the diverse communities in the study area. The changes in the stormwater

management and transportation alignments that have been made based on public input also demonstrate honest efforts to develop consensus on an acceptable project. Further, the advancement of community revitalization concepts is directly related to the needs of various populations, including minority and low-income households in the study area. The conclusion of the various discussions and analyses of the Antelope Valley plan is that the neighborhood benefits outweigh the costs (including acquisitions and relocations). However, at the individual family level, it will not be so clear. While the Uniform Act provides many protections to all affected persons and businesses, the process is still considered by many as disruptive to quality of life beyond the monetary protections.

Continued efforts by the City to encourage and assist in formation of new housing, especially a the affordable range of price, is going to help reduce the individual adverse impacts. Opportunities for displaced jobs and businesses to relocate within the study area may be available as community revitalization concepts materialize. However, some businesses (and therefore, jobs) may choose to relocate elsewhere in the region.

No-Action Alternative. With the No-Action Alternative, the threat of flooding would continue along Antelope Creek and redevelopment efforts would be stymied. The No-Action Alternative includes projects that are listed in the City's Capital Improvement Program (CIP). Land use impacts associated with those projects would include some property acquisitions. While the improvements have the potential to spur some development, that potential is not nearly on the order of magnitude of the Amended Draft Single Package.

4.4 Land Use

4.4.1 Generalized Land Use

Residential, industrial, public/institutional, parks/open space, and commercial land uses are all represented within the study area. Generalized land uses are shown in Figure 4.8 and are described below.

Residential. Residential neighborhoods are located throughout the study area and represent a wide variety of architectural styles and ages of housing. For the most part, residences within the study area are older and are located in established, cohesive neighborhoods. There are four large areas of residential development in the study area representing parts of neighborhoods and groups of contiguous neighborhoods.

In the North study section, residential development includes portions of the Clinton and University Place neighborhoods. The Northwest study section has residential development as part of the Northwest Lincoln neighborhood, north of Cornhusker Highway. The Central study section includes the residential areas of the North Bottoms, UNL City Campus, and Clinton neighborhoods. The South study section includes the Malone and Downtown neighborhoods. Neighborhoods are discussed in Section 4.2.1.

Industrial. Industrial land uses are likewise located throughout the study area, with the largest tracts in the northeast corner of the study area, north of Cornhusker Highway. In the

Figure 4.8

industrial area north of Salt Creek, several businesses line 27th and Superior Streets. Parcels east and south of these businesses are undeveloped.

The linear, northeast-southwest BNSF Railroad mainline bisects the study area and is flanked by grain elevators and other industrial businesses between 27th and 33rd Streets.

A small industrial area east of the UNL City Campus, near Y Street, contains the Abel concrete plant and Cushman Industries plant. An industrial area north of State Fair Park contains large warehouse-style businesses fronting on Cornhusker Highway.

Institutional/Public. UNL is split between two campuses in Lincoln, including the City Campus in the Central study section north of Downtown, and the East Campus, part of which is in the North study section, north and east of the corner of 33rd and Holdrege Streets.

Other public/institutional land uses in the study area include the State Capitol, Lincoln High School, Elliott Elementary School, and numerous churches and synagogues.

Parks/Open Space. Open spaces in the study area include Trago Park and Antelope Park/Lewis Fields and several neighborhood and mini-parks (see Figure 1.6 and Table 4.5). Based on national planning standards used to create the Purpose and Need Statement (see Chapter 1), central Lincoln lacks adequate larger parks and open space. Other open space, some of which is not available to the general public and not included in this substandard finding, includes playing fields associated with UNL recreation and varsity sports programs.

Open space in the study area also includes portions of the John Dietrich, Billy Wolff, MoPac, and Rock Island trails (see Figure 1.6).

Commercial. Commercial land uses are clustered in two locations within the study area. Near 27th Street and Cornhusker Highway is an intensely developed commercial area including fast food restaurants, grocery stores, large retailers and other highway commercial businesses. Commercial uses extend east-west along Cornhusker Highway and north-south along 27th Street.

The second cluster of commercial land uses can be found east of Downtown. In the area between 17th, 23rd, N, and P Streets are over 50 automobile-related businesses. Dubbed "Autoland," this area also contains more traditional Downtown commercial development along O Street.

4.4.2 Land Use Plans and Policies

This section describes land use plans and policies relevant to the Amended Draft Single Package and No-Action Alternative, including local comprehensive plans.

1994 Lincoln City – Lancaster County Comprehensive Plan. Since the establishment of a joint City-County Planning Commission in 1959, Lincoln and Lancaster County have worked closely together to plan comprehensively. The land use plan contained in the *Lincoln City -- Lancaster County Comprehensive Plan* provides the foundation for guiding community growth and supporting public investments. The plan is guided by six basic principles articulated as the Community Vision:

1. A Continuing Commitment to Neighborhoods;
2. Managed Contiguous Growth;
3. Downtown as a Community Focus;

4. A Variety of Activity Centers;
5. Environmental Preservation and Sustainable Growth; and,
6. Planning as a Process.

The land use plan contained in the *Lincoln City -- Lancaster County Comprehensive Plan* articulates a number of goals related to land use, commercial areas, Downtown, business development, residential neighborhoods, parks/open space, wetlands/water bodies, and sub area plans. These goals are intended to “maximize opportunities for planned urban development which are sensitive to the natural qualities of the area, including land uses efficiently served by a balanced and energy-efficient transportation system and community services and facilities.” In addition, new growth is intended to be concentrated “in the Lincoln urban area and in the villages throughout Lancaster County.” The following paragraphs summarize some of the key goals contained in the land use plan.

One of the land use goals is to enhance and protect Lincoln’s neighborhoods by providing “an environment for each neighborhood that promotes the safety and wellbeing of the residents and provides a sense of community.” In addition, the land use plan strongly encourages the development of “geographically convenient and accessible retail areas throughout the City and County so as to provide the widest possible variety of goods and services.”

Several goals related to Downtown are articulated in the *Lincoln City -- Lancaster County Comprehensive Plan’s* land use plan. Among them are the following:

- Develop Downtown Lincoln as the primary multi-use center;
- Maintain and enhance Downtown’s multi-use role as the office, business, financial, entertainment, education, cultural, hotel, convention, retail and government center of the community, serving as the heart of the entire community;
- Encourage retail and commercial services which support and enhance Downtown as a convenient and full-service, multi-use center;
- Enhance Downtown as a well-planned, well-designed and maintainable, high quality environment involving public and private developments;
- Strengthen linkages between Downtown and adjacent areas, including the UNL City Campus, historic Haymarket District and adjacent residential and commercial neighborhoods; and,
- Encourage office and retail development, entertainment and cultural opportunities, government and University employment and housing in Downtown Lincoln.

The land use plan seeks to encourage the development of retail establishments that “are convenient to, and serve, neighborhood residents, yet are compatible with, but not intrusive upon residential neighborhoods.” Among the goals for parks and open space are providing “green space, including common green space for active and passive use,” and developing and maintaining “a linear parkway system along waterways and roadsides.”

For wetlands and water bodies, the land use plan outlines several goals. They include; “protect natural stream corridors and enhance man-made open channels for the purpose of improving water quality and reducing flood damage and erosion while retaining open space,” and protect the “quantity and quality of ground and surface water.”

Downtown 2001: The Heart of the City. This 1996 document by the Downtown Strategic Plan Steering Committee outlines a number of short-term goals and strategies for maintaining a healthy Downtown. The goals for Downtown include the following:

- Maintain and strengthen Downtown’s position as the community’s “destination entertainment district”;
- Maintain Downtown as a safe, clean, attractive place to live, work and play, giving special attention to the needs of pedestrians;
- See that Downtown’s traffic patterns and parking availability make Downtown convenient, accessible and “user-friendly”;
- Build upon the Haymarket and entertainment districts’ successes as unique retail and commercial districts by creating connecting “niche” retail, entertainment and other commercial uses along P Street (“Market Place”) and strengthen other pedestrian corridors; and
- Emphasize Downtown housing as a key factor in Downtown’s continued progress as a vital, 24-hour mixed-use center.

UNL Master Plan. The UNL campus master plan update process is currently underway. The Amended Draft Single Package improvements are being considered as part of that planning process. In fact, UNL’s draft Master Plan map includes the Amended Draft Single Package stormwater management channel, roads, and campus edges as described in this document. UNL is one of the Partners in the Antelope Valley Study, and thus is able to successfully integrate the planning of the Amended Draft Single Package with its own planning.

The draft UNL Master Plan proposes new development on land between 17th and 19th Streets after the Amended Draft Single Package stormwater channel is built. Future land uses in this part of campus include new academic buildings west of the Beadle Center and new parking structures. A new parking structure is also shown north of the Beadle Center.

4.4.3 Impact Assessment Methodology

The assessment of land use impacts associated with the Amended Draft Single Package and the No-Action Alternative is provided in the sections that follow. These impacts have been categorized as follows:

- Removal or partial acquisition of existing land uses;
- Introduction of incompatible facilities in proximity to existing land uses;
- Consistency with plans and policies; and
- Potential incentives for increased development.

The criteria used in assessing the effect of these types of impacts are described as follows:

Removal or partial acquisition of land uses. This type of land use impact refers to the creation of unusable remainder parcels. Where unusable or uneconomic remainder parcels would be created, the entire parcel would be acquired, thus avoiding this impact. Therefore, partial acquisitions would only be considered where the property to remain is economically viable.

Introduction of incompatible facilities. An adverse land use impact would result if the study alternative creates physical or environmental impacts that could not be mitigated and would be fundamentally incompatible with the continued or planned use of adjacent

land. For example, if the Amended Draft Single Package results in noise levels that are not appropriate for residences and cannot be mitigated, an adverse land use impact would result. Potential land use impacts in this category would arise from impeded or hindered access, unmitigatable noise, or visual impacts.

Consistency with plans and policies. An adverse land use impact would result if the study alternative would be inconsistent with applicable land use plans or policies. A beneficial effect would result if the selected alternative supports or furthers the goals and policies of the City of Lincoln.

Potential for increased development. The potential for increased development around new facilities would result in an adverse land use impact if such development would be inconsistent with the pattern and density of land use. Zoning safeguards are one means for the City to guide future development in ways compatible with surrounding uses.

4.4.4 Impacts of Stormwater Management

Removal or partial acquisition of land uses. Property acquisitions are discussed in Section 4.5.

Introduction of incompatible facilities. The construction of the channel would not introduce incompatible project facilities. The channel is considered an amenity for residential neighborhoods and commercial areas alike. Vehicular access across the channel would be provided at N, O, Q, Vine, and Y Streets, at the new East-West Roadway and at the west entrance to State Fair Park. Pedestrian access would also be provided at various locations along the channel (to be determined during preliminary engineering). All adjacent properties not acquired for the channel would maintain access to public rights-of-way.

Consistency with plans and policies. The channel would be consistent with the land use plan contained in the *Lincoln City -- Lancaster County Comprehensive Plan*, and would further the goals set forth for parks/open space and wetlands/water bodies as described in Section 4.4.2.

The channel would also be consistent with UNL's goal of developing land on their campus that is currently in the Antelope Creek 100-year floodplain.

Potential for increased development. Constructing the channel would reduce the 100-year floodplain to within the limits of the channel corridor (about 12 hectares or 30 acres), thus easing development restrictions on approximately 240 hectares (600 acres) of land currently in the floodplain.

The channel would be designed as an aesthetic creek with wide, grassy slopes. As an amenity, it would encourage new development along its edges, especially between N and Q Streets. Over time, new development in this area would include commercial, retail, entertainment, and residential uses that do not currently exist in the area east of Downtown. See Chapter 3 for a discussion of possible land use changes in this area.

No-Action Alternative. The No-Action Alternative includes projects that are listed on the City's CIP. Land use impacts associated with those projects would include some property acquisitions. However, they are designed to provide compatible facilities in accordance with formally adopted plans. While the improvements have the potential to spur some new

development, that potential is not nearly on the order of magnitude of the Amended Draft Single Package.

With the No-Action Alternative, flooding would continue along Antelope Creek and redevelopment efforts would be stymied. There would be no removal of existing land uses or introduction of incompatible facilities. Maintaining the floodplain and associated flood hazard are inconsistent with the City of Lincoln's plans and policies.

4.4.5 Impacts of Transportation Improvements

Removal or partial acquisition of land uses. Full property acquisitions are discussed in Section 4.5. Until preliminary engineering of the roadways is completed, a comprehensive list of partial property acquisitions cannot be prepared. Where properties would lose an important asset, either on- or off-site mitigation would be considered or full acquisition of the property would be pursued.

Introduction of incompatible facilities. Roadways of the scale shown in the Amended Draft Single Package are generally compatible with commercial and industrial development, and are sometimes incompatible with residential and recreational uses. Most of the transportation improvements in the Amended Draft Single Package occur in commercial and industrial areas and do not pose adverse land use impacts. Since roadways follow neighborhood boundaries and their intended effect is to remove traffic from neighborhood streets, adverse land use impacts are not anticipated.

The Clinton, Malone, and North Bottoms neighborhoods would experience changes in noise levels, vibration, air quality, and/or visual impacts near the North-South Roadway. These impacts can be mitigated (see Sections 4.8, 4.9, 4.10, and 4.20 and Chapter 7 for a discussion of these impacts).

Consistency with plans and policies. The roadways are consistent with the goals and objectives documented in the *Lincoln City -- Lancaster County Comprehensive Plan*. They are also consistent with the *Downtown 2001* goal of providing traffic patterns that make Downtown convenient and accessible. The UNL draft Master Plan also includes the North-South Roadway in its plan.

Potential for increased development. The North-South Roadway would encourage increased development between K and Q Streets. Since this is already a developed area and the types of new development that would be encouraged to locate along the new roadway would be consistent with current uses or with future land use plans, it is likely that no adverse land use impact would result.

Between Q Street and the BNSF Railroad mainline tracks, the North-South Roadway would be flanked on the east by the channel and west by the UNL City Campus. New development in this area would occur on the UNL City Campus as outlined in the draft UNL Master Plan.

North of the BNSF Railroad mainline tracks, the roadway would pass by the North Bottoms neighborhood, State Fair Park, and the National Guard area. Increased development at State Fair Park and/or the military area could result from better east-west access between Military Road and the west entrance to State Fair Park. Others not associated with the Antelope Valley Study would initiate any new development in these public/institutional areas. Increased development in the North Bottoms neighborhood due to proximity to the North-South Roadway is unlikely.

The East-West Roadway would present limited opportunities for increased development. At its west end, it would be flanked by the BNSF Railroad tracks on the north and the UNL City Campus on the south. Between 16th and 27th Streets it would parallel the railroad tracks at State Fair Park. East of 27th Street it would proceed in a northeasterly direction through already developed industrial and commercial areas south of Cornhusker Highway. Some conversion or reuse of land is possible south of Cornhusker Highway.

North of Cornhusker Highway the East-West Roadway would proceed through land that is currently used for agriculture. The portion of this area not in the Salt Creek floodplain would be attractive for development and would include industrial, commercial, or office uses. Since this land is zoned for industrial development, such new uses would not be inconsistent.

No-Action Alternative. The No-Action Alternative proposes no new roadways, and thus there would be no removal of existing land uses and no introduction of incompatible facilities. The No-Action Alternative is not consistent with existing plans and policies, however, the *Lincoln City -- Lancaster County Comprehensive Plan* and the draft UNL Master Plan recommend transportation improvements. Without the access provided by new roads, there would be no opportunity for redevelopment.

4.4.6 Impacts of Community Revitalization Actions

Removal or partial acquisition of land uses. The community revitalization actions in the Amended Draft Single Package would not require any partial acquisitions of privately owned properties in the study area. Properties acquired to construct play fields north of Whittier Junior High School or the Northeast Community Park would be full acquisitions, and thus would not create unusable remainder parcels or incompatible vacant land.

The other community revitalization actions described in Chapter 3 would not require any acquisition of private property.

Introduction of incompatible facilities. The community revitalization actions in the Amended Draft Single Package would not create physical or environmental impacts that would not be mitigated.

The Northeast Community Park, for example, would include lighted ball fields near residential areas. However, lights would be directed down and, if necessary, shields would be placed on lights to minimize light scatter to residential areas south of the park. In addition, ball fields need not be lighted after 10 or 11 P.M. Because this tract of land is adjacent to the BNSF Railroad mainline, it is unlikely that new recreation activities in the park would noticeably increase existing noise levels.

Consistency with plans and policies. The community revitalization strategies contained in the Amended Draft Single Package are consistent with the *Lincoln City -- Lancaster County Comprehensive Plan*, and would further many of the goals described in Section 4.4.2. The development in the “Downtown development area” is also consistent with the *Downtown 2001* goals.

Potential for increased development. Development in the “Downtown development area” is specifically one of the featured components of community revitalization. Chapter 3 describes a conceptual land use plan for this area that includes uses that are compatible with the North-South Roadway and stormwater channel. No adverse land use impacts from

increased development are anticipated. Other community revitalization strategies are not likely to spur development in adjacent areas.

No-Action Alternative. Community revitalization strategies in the No-Action Alternative would not pose adverse land use impacts.

4.4.7 Combined Impacts

The land use impacts of the Amended Draft Single Package and the No-Action Alternative are summarized in Table 4.10.

**Table 4.10
LAND USE IMPACTS SUMMARY**

| Potential Land Use Impacts | Amended Draft Single Package | | | No-Action Alternative |
|--|---|--|--|--|
| | Stormwater Management | Transportation | Community Revitalization | |
| Full acquisition or partial acquisition of land uses | Acquisitions designed to provide compatible facilities | Acquisitions designed to provide compatible facilities | Acquisitions designed to provide compatible facilities | Acquisitions for CIP projects designed to provide compatible facilities |
| Introduction of incompatible facilities | Channel, with numerous access points across, is considered an amenity | Neighborhood boundaries are followed | Additional public parks and neighborhood improvements | No channel Amenity and no access improvements |
| Consistency with plans and policies | Consistent with plans | Consistent with plans | Consistent with plans | CIP elements are consistent with plans, but not on the order of the Draft Single Package |
| Potential for increased development | Yes | Yes | Not likely | Limited |

Source: AV Study Team

4.4.8 Potential Impact Mitigation Measures

No adverse land use impacts are anticipated as a result of the Amended Draft Single Package, so no mitigation was considered or is necessary.

4.5 Acquisition and Relocation

The Antelope Valley Study has been ongoing since 1992 and has included over 1,000 meetings in an effort to build consensus among concerned citizens, area business leaders, neighborhood residents, and technical experts. A special study Advisory Subcommittee also met to discuss this acquisition and relocation process and concerns. An important consideration during this process was the need to balance good stormwater management, roadway design, and community revitalization measures while minimizing the numbers of acquisitions and relocations. During concept screening in Phase III of the MIS, a number of

roadway options were eliminated from further consideration because of the complexity of acquisition and large number of relocations that would be involved.

Based on the plans and engineering to date, in total, the Amended Draft Single Package would require the acquisition of 121 buildings (See Table 4.11). The majority are between 19th and 21st Streets, K and Vine Streets (in the Antelope Creek floodplain), or 33rd and 35th Streets, south of Cornhusker Highway (See Section 4.3).

**Table 4.11
AMENDED DRAFT SINGLE PACKAGE
ACQUISITION AND RELOCATION SUMMARY**

| | Number of Acquired Buildings | Number of Households | Number of Businesses |
|--------------------------|-------------------------------------|-----------------------------|-----------------------------|
| Stormwater Management | 36 | 17 | 13 |
| Transportation | 54 | 12 | 24 |
| Community Revitalization | 31 | 19 | 7 |
| Total | 121 | 48 | 44 |

Source: Antelope Valley Study Team, Lancaster County Assessor

4.5.1 Residential Acquisitions

The Amended Draft Single Package would require the acquisition of 46 residential buildings, 34 of them are currently located within the Antelope Creek floodplain (see Table 4.12). These acquisitions would result in the relocation of 48 households from their current living quarters, mostly mid- to lower-income of a full range of minority, ethnic and age categories, including college students. During functional design it is possible that some of these residences would be preserved in their current or new, nearby locations. Until more engineering of the roadways and stormwater channel is completed, however, the number of homes that would be retained, if any, is not known.

At this time, none are known to have special relocation considerations. However, if any are later identified, their special considerations will be resolved prior to acquisition.

All of the homes are located at the edge of established neighborhoods or more importantly, typically “isolated” in commercial or public use areas. According to Lancaster County Assessor’s data, the median value of acquired residencies is \$34,000.

Impacts of Stormwater Management. The stormwater management improvements shown in the Amended Draft Single Package would require the acquisition of 17 single-family homes and one house that has been converted into two apartment units, for a total of 18 buildings and 19 dwelling units. Six units are currently owner-occupied and eleven are renter-occupied. The two apartment units are currently vacant. This acquisition results in the displacement of 17 households from their living quarters. Twelve housing units have two bedrooms, four units have three bedrooms, and one has four bedrooms. The converted house contains a total of five bedrooms between the two units.

Ten of these homes are located in the blocks immediately west of the Malone neighborhood boundary (as established by a 1988 Interlocal Agreement between the City of Lincoln and the University of Nebraska-Lincoln), and eight buildings are located in Malone neighborhood between O and Q Streets. All 18 structures are in the Antelope Creek 100-year floodplain.

The stormwater management component of the No-Action Alternative would not require any residential acquisitions.

**Table 4.12
AMENDED DRAFT SINGLE PACKAGE RESIDENTIAL ACQUISITIONS**

| | Number of Buildings | Number of Buildings in a Floodplain | Number of Households |
|--------------------------|----------------------------|--|-----------------------------|
| Stormwater Management | 18 | 18 | 17 |
| Transportation | 9 | 3 | 12 |
| Community Revitalization | 19 | 13 | 19 |
| Total | 46 | 34 | 48 |

Source: Antelope Valley Study Team, Lancaster County Assessor

Impacts of Transportation. The transportation improvements shown in the Amended Draft Single Package would require the acquisition of eight single-family homes and one eight-unit college student apartment building, for a total of nine buildings and 16 dwelling units. Two units are currently owner-occupied and ten units are renter-occupied. Four apartment units are currently vacant. This acquisition results in the displacement of 12 households from their living quarters. Eight dwelling units have one bedroom, four units have two bedrooms, and three units have three bedrooms. The remaining single-family house has eight bedrooms.

Six of these buildings are in the Downtown neighborhood; two are in the Malone neighborhood and one in the North Bottoms neighborhood. Three buildings are located in the Antelope Creek 100-year floodplain.

The transportation component of the No-Action Alternative would not require any residential acquisitions.

Impacts of Community Revitalization Actions. Most of the community revitalization improvements in the Amended Draft Single Package would not require the acquisition of private property. The Downtown development area, for example, is envisioned as a long-term, private-sector endeavor that would not generally require public acquisition of private property. New trails in the study area would be constructed in existing rights-of-way. Expanded programs at four of the five wrap-around centers would likely not involve capital expenditures for additional land.

One community revitalization strategy that would require the acquisition of private residences is the construction of play fields north of Whittier Junior High School, which would require the acquisition of six single-family homes in the Malone neighborhood. As a

result, six households would be relocated. Three homes are currently owner-occupied and three are leased to renters. None of these buildings is located in a floodplain. One building has one bedroom, one has two bedrooms, three have three bedrooms, and one has four bedrooms.

Expansion of Trago Park along the open channel would require the acquisition of 13 buildings, all of which are currently in the Antelope Creek 100-year floodplain. One acquisition is owner occupied; twelve are leased to renters. One building has one bedroom, five have two bedrooms, three have three bedrooms, and four have four bedrooms.

The community revitalization component of the No-Action Alternative would require the acquisition of two homes for commercial redevelopment.

4.5.2 Non-Residential Acquisitions

The Amended Draft Single Package would require the acquisition of 75 non-residential buildings, 53 of which are in a floodplain (see Table 4.13). Eleven buildings are owned by the City of Lincoln, UNL, or the State of Nebraska. A total of 44 businesses (approximately 500 jobs) would be relocated.

Almost all businesses are located in standard-type commercial buildings or sites and are not known to require special considerations. Two businesses, however, occupy large sites with multiple buildings. They are discussed under Impact Mitigation Measures (see 4.5.4).

**Table 4.13
AMENDED DRAFT SINGLE PACKAGE NON-RESIDENTIAL ACQUISITIONS**

| | Publicly Owned Buildings* | Privately Owned Buildings | | |
|--------------------------|----------------------------------|----------------------------------|-----------------------------|--------------------------------------|
| | | Number of Bldgs | Number of Businesses | Number in 100-year Floodplain |
| Stormwater Management | 3 | 18 | 13 | 17 |
| Transportation | 7 | 45 | 24 | 26 |
| Community Revitalization | 1 | 12 | 7 | 10 |
| Total | 11 | 75 | 44 | 53 |

Source: Antelope Valley Study Team, Lancaster County Assessor

*Included in totals to the right.

Impacts of Stormwater Management. The Amended Draft Single Package's stormwater management channel would require the acquisition of 18 non-residential buildings, including two maintenance buildings on the UNL City Campus. All the structures are in the Antelope Creek unofficial floodway, 100-year floodplain, or the 500-year floodplain; seventeen of these are in the 100-year floodplain. In all, 13 private businesses would be relocated.

The stormwater management component of the No-Action Alternative would not require any non-residential acquisitions.

Impacts of Transportation Improvements. The transportation improvements of the Amended Draft Single Package would require the acquisition of 45 non-residential buildings. This includes two UNL service buildings, one maintenance storage building owned by the City of Lincoln Public Works and Utilities Department, three buildings at State Fair Park, and a small service building that supports a cluster of UNL Recreation Department softball fields (three) and tennis, volleyball and horseshoe courts. Twelve non-residential structures are in the Antelope Creek 100-year or 500-year floodplain, 12 are in the Dead Mans Run 100-year floodplain, and two are in the Salt Creek 100-year floodplain. Twenty-four businesses would be relocated.

The transportation component of the No-Action Alternative would not require any non-residential acquisitions.

Impacts of Community Revitalization Actions. Creation of the Northeast Community Park would require the acquisition of six private businesses, all of which are in the Dead Mans Run 100-year floodplain. In addition, the Northeast Community Park would require the functional replacement of one storage building owned by the City of Lincoln Public Works and Utilities Department. This structure is in the Dead Mans Run 100-year floodplain. A second community revitalization strategy in the Amended Draft Single Package that would require the acquisition of a private business is for the new play fields north of Whittier Junior High School. This business is not located in a floodplain.

4.5.3 Combined Impacts of the Actions

There is no additional impact resulting from the combined actions.

4.5.4 Impact Mitigation Measures

A Draft Relocation Plan has been prepared to guide the acquisition and relocation process for the partners. The relocation plan identifies potential property acquisitions required by the Antelope Valley improvements, resultant residential, business, and employee displacement and proposed mitigation measures designed to minimize or alleviate the effects of these acquisitions and displacements. The City's Real Estate Officer has been closely involved in the planning for future acquisitions. As part of the Antelope Valley Study, a special sub-committee of the Advisory Committee was formed to discuss relocation issues. The Antelope Valley improvements have been designed to avoid property acquisition to the extent possible while remaining consistent with the purposes and needs. When not possible to avoid property acquisition, the study has aligned improvements so as to minimize the number of potential acquisitions. The Draft Relocation Plan assessment is that there will be adequate resources to carry out the legal acquisition and relocation requirements of the multi-year Amended Draft Single Package implementation period. The plan also summarizes major mitigation benefits available. This section summarizes information provided in the Draft Relocation Plan.

As noted earlier, two of the business acquisitions occupy larger sites with multiple buildings. Extra efforts to help find appropriate relocation sites will be started soon after project approval. These current sites would not be needed in the earliest several years of construction, thereby leaving more time to relocate the businesses.

The Partners understand the sensitive and personal nature to owners and tenants whenever there is a potential acquisition. The Partners will work conscientiously with parties affected by each acquisition, and will carry out all obligations as required by law and which are

discussed in this section. Depending on construction phasing, certain homes and businesses would be acquired earlier than others. Given the likely phasing of the stormwater management improvements in the initial construction phase, homes and businesses needed for the Antelope Creek stormwater management channel would be some of the initial purchases. These acquisitions would occur as early as 12 to 18 months following approval to proceed with final design and construction of the Amended Draft Single Package. It is also likely that the above-grade roadway intersection near the Devaney Center would be constructed earlier than the roadways near 33rd Street and Cornhusker Highway, and would thus require earlier acquisition of property to assemble the needed ROW. Other acquisitions, however, would occur over a longer time period, between five and 15 years.

Given the rapid growth rate and development trends in the City of Lincoln as well as the wide diversity of residential and non-residential building types and locations throughout the City, there are not likely to be problems finding replacement housing or new business locations in the city, many of them in Lincoln's older, core neighborhoods. If there is insufficient comparable replacement housing available, the Last Resort Housing Program would be used (see below). An update of the Antelope Valley Relocation Plan would be developed during final design of the Amended Draft Single Package to more carefully analyze available properties for relocation. In addition, relocation assistance for all eligible residential and business relocatees would be provided, without discrimination, through the Nebraska Relocation Assistance Act as required by federal and state laws (see Neb. Rev. Stat. § 76-1214 *et. seq.*). The acquisition and relocation process and payment provisions are discussed below.

Following an appraisal, property owners would be offered, and paid no less than fair market value for their residential or commercial property. This payment would be through fee simple acquisition. In addition, the Relocation Assistance Act would provide displaced persons and businesses with various types of payments related to moving. The length of occupancy would determine eligibility for certain replacement-housing benefits, but moving costs would be available to all persons regardless of length of occupancy, provided they are in occupancy as of the date of acquisition. The following sections outline the types of federal assistance available for residential and non-residential relocations.

Regardless of which partnering agency (the City of Lincoln, LPSNRD, or UNL) or federal agency (US Federal Highway Administration [FHWA] or the US Army Corps of Engineers [Corps]) acquires needed properties, the relocation assistance program and process would be administered in a fair and consistent manner without discrimination.

Last Resort Housing Program. In the event that insufficient comparable replacement housing is available to the relocatees or that comparable replacement housing is available but exceeds the spending limits prescribed by the Nebraska Relocation Assistance Act, the Last Resort Housing Program would be used. This program allows use of project funds to construct or provide housing. It is not intended to deprive relocated persons or households the right to receive relocation assistance payments or to deprive them freedom of choice in selecting replacement housing. No eligible person would be required to move from the ROW required until comparable decent, safe, and sanitary housing is available for immediate occupancy.

The Partners may not require eligible persons or households, without written consent, to accept a dwelling under Last Resort Housing provisions in lieu of an acquisition payment for

their real property or any replacement housing payments for which they are eligible. The Partners' obligation to provide comparable replacement housing is discharged when such housing is made available in compliance with the Uniform Relocation Act. If the relocatee does not accept the comparable replacement housing provided by the Partners, but obtains and occupies other decent, safe, and sanitary housing, the replacement housing payment shall be the lesser of the amount necessary to provide comparable replacement housing or the amount actually incurred by the relocatee for decent, safe, and sanitary housing.

Residential Relocation Assistance. To help individuals and families move from their residential property, two moving cost options would be provided. One is the actual moving cost option, in which the actual reasonable moving expenses supported by receipts or other evidence would be reimbursed. This cost would include expenses associated with moving, such as storage of goods, transportation of personal property, insurance on the goods while in transit, and a number of other related costs.

The other option would reimburse the individual or family according to a fixed moving cost schedule based on the number of rooms in the vacated dwelling. This payment would be considered as covering any and all costs associated with the move.

Homeowner occupants who have owned the dwelling for at least 180 days prior to acquisition would receive a replacement housing payment, not to exceed \$22,500, for a decent, safe replacement dwelling if purchased within one year of relocation. Homeowner occupants who have owned the dwelling for less than 180 days but at least 90 days would be eligible for a \$5,250 payment.

Displaced residential tenants would receive a rental assistance payment not to exceed \$5,250 for a decent, safe replacement dwelling unit if rented within one year of acquisition. This payment could also be used as a down payment.

Functional Replacement of Public Use Structures. This is a provision of State and Federal acquisition and relocation regulations that makes publicly owned and publicly used buildings eligible to be replaced (at project expense) prior to their being demolished. This provision recognizes the need to keep existing public buildings and services functioning without disruption while new public infrastructure is developed. All of the eleven publicly owned buildings acquired for Antelope Valley are deemed eligible for functional replacement. During development of the Amended Draft Single Package, study officials and owning agency officials have discussed the effect of possible acquisition and potential application of functional replacement procedures. After project approval, and when the owning agency requests functional replacement, FHWA regulations at 23 CFR 712 would be followed and FHWA would need to determine that each property acquisition is in the public interest. Any acquisition of new property needed for functional replacement will be in accordance with the Uniform Assistance and Real Property Acquisition Policies Act of 1970.

Non-Residential Relocation Assistance. Displaced businesses, nonprofit organizations, and farms would have two moving cost options. The actual moving cost option, if supported by receipts or other evidence, would cover the actual reasonable expenses associated with moving, such as storage of goods, actual transportation of personal property, insurance of the goods while in transit, license or permit fees needed at the replacement property, new lettering of signs and stationary, and other related costs.

The second option would reimburse the displaced businesses, nonprofit organizations, and farms with a fixed payment for moving expenses equal to its average net earnings. This payment would be no less than \$1,000 and no more than \$20,000.

In addition to moving payments, businesses, nonprofit organizations, and farms would be eligible for re-establishment payments, not to exceed \$10,000. This payment would cover such expenses as modifications to replacement property, construction and installation of signage, licenses and fees when not paid as a moving expense, repairs and improvements required by law, redecoration fees, feasibility studies, advertisements, and other related costs at the replacement site.

4.5.5 Relocated Housing

Some residences to be acquired for the Antelope Valley project have potential local value. These homes could be saved by relocating them through a separate City community revitalization program to vacant residential parcels in nearby neighborhoods such as Malone or Clinton. If moveable, these homes would provide architecturally similar infill housing in central Lincoln neighborhoods, as well as enable some households to remain in or near their current neighborhoods. Determinations of which homes would be moved as well as possible relocation sites are a community revitalization strategy that is under study and assessment by the City. These homes would need to be moved before the under-lying land is acquired for Antelope Valley improvements.

4.6 Economic Impacts

4.6.1 Baseline Environmental Conditions

The economic climate of the study area is characterized below by three components, including tax revenue, building permits, and employment. These components are described below.

Tax Revenue. Tax revenue received by Lancaster County and the City of Lincoln includes monies received from property and sales taxes.

- **Property tax:** Property tax is assessed on the value of privately held property. The City of Lincoln property tax rate is 2.4885 percent of assessed value. In the 1997-1998 fiscal year, the City had a total assessed property valuation of \$7.5 billion (equal to over \$186 million in property tax revenue).
- **Sales tax:** In the City of Lincoln, the current overall sales tax rate is six and a half percent, including a one and a half percent city sales tax and five percent Nebraska state sales and use tax. Between 1990 and 1998, City sales tax revenue increased from \$23.2 million to \$37.5 million, with an average annual increase of six percent. Recent Lincoln sales and use tax collections are listed below.

| | |
|------|----------------|
| 1998 | \$37.5 million |
| 1997 | \$36.5 million |
| 1996 | \$33.5 million |
| 1995 | \$31.4 million |
| 1994 | \$29.7 million |
| 1993 | \$25.9 million |

Building Permits. Since 1980, building permits have been issued for 14,751 dwelling units in the City of Lincoln. Of these permits, 6,417 were for multi-family units and 8,334 were for single family or duplex units. The annual total value of new dwelling units permitted has increased from approximately \$38 million in 1980 to \$126 million in 1993. The low number for the period occurred in 1982 when the value fell to \$11 million. The average value per new single family/duplex permit increased from about \$41,000 in 1980 to \$115,000 in 1993.

The total number of permits issued for new non-residential buildings increased from 435 in 1980 to 729 in 1993. The total value of permits issued for new construction increased from \$62,883,780 in 1980 to \$171,424,135 in 1993.

Employment. The County's civilian labor force grew from 108,339 in 1980 to 133,518 in 1992, an increase of 23 percent. This was a faster level of growth than the state, which grew by only 12 percent, and is equal to the nation's level of growth.

Unemployment rates in 1996 averaged 2.4 percent in Nebraska, and were the *lowest* of all states in the US, which together averaged 2.9 percent. The comparable US average rate in 1996 was 5.4 percent, placing Lincoln and the state at an advantage in terms of an employed labor force.

Total non-farm wage and salary employment in Lancaster County grew by 75 percent between 1975 and 1992. Government employment has traditionally been the largest sector in Lancaster County. In 1992 state employees accounted for 14.7 percent of total non-farm wage and salary employment, local government employees accounted for 9.9 percent, and federal employees accounted for 2.1 percent (for a total of nearly 27 percent). The total number of government employees grew by 12,800 between 1970 and 1992, but government employment as a proportion of total employment declined from 29 percent to 27 percent.

The largest growth in employment occurred in the service sector. Service employment grew by 159 percent between 1970 and 1992. The total number of service employees grew from 11,450 in 1970 to 29,599 in 1992- from 16 percent to 23.7 percent of the total employment in the respective years.

Wholesale and retail trade employment has increased in number, but has steadily decreased as a proportion of total employment. In 1970, manufacturing employment accounted for 14.6 percent of the total, declining to 13.4 percent by 1980 and 11.8 percent by 1992.

The construction sector, finance-insurance-real estate (FIRE) sector, and the transportation-communication-utilities sector have all experienced a downward share trend similar to manufacturing. In 1970, these sectors had respective employment shares of 4.8 percent, 7.6 percent, and 7.0 percent of the work force. By 1992, they accounted for 3.6 percent, 6.9 percent, and 5.9 percent, respectively.

4.6.2 Impact Assessment Methodology

Economic and fiscal effects of the Amended Draft Single Package include sales and property tax impacts due to acquisitions, building permit issues for new construction, and effects on employment.

Tax Revenue. Acquisitions of privately owned properties that would be required by the Amended Draft Single Package were considered to estimate the consequences for local tax revenues.

- **Property Tax:** When privately owned property is acquired by a government entity for construction of a public works project, annual property tax revenue is initially lost to local, county, and state governments as well as special taxing districts. To compute the potential local property tax loss, the 1998 local property tax revenue from the businesses and residences to be acquired was calculated using data provided by the Lancaster County Assessor's Office.
- **Sales Tax:** When commercial property is acquired, annual sales tax revenues can be lost to local, county, and state governments as well as to special districts. However, it is assumed that most of the acquired commercial businesses rely on the urban population of Lincoln for their customer base. Therefore, they would likely re-establish elsewhere within the City, and no local sales tax revenues are anticipated to be lost following re-establishment of the businesses.

Building Permits. With the Amended Draft Single Package, the number of building permits issued would likely increase following containment of the Antelope Creek floodplain, particularly as the Downtown redevelopment area is revitalized. However, the number of permits is less important than the dollar value attached to those permits and the corresponding tax revenue (see above). Thus, building permit impacts are not quantified below.

Employment. It is assumed that the majority of commercial businesses acquired for the Amended Draft Single Package would relocate within the City of Lincoln. As a result, employment losses due to property acquisitions are not anticipated. In fact, employment in the Downtown redevelopment area would increase as mixed-use buildings attract neighborhood businesses and create jobs. It is also assumed that the on-going operation and maintenance of Amended Draft Single Package facilities would require some new employees.

Construction of the Amended Draft Single Package would also provide an employment benefit while its elements are under construction.

4.6.3 Impacts of Stormwater Management

Amended Draft Single Package.

Tax Revenue: The acquisition of privately owned properties to construct the channel would remove approximately \$3.5 million from the property tax base and reduce annual property tax revenues by approximately \$86,000. This amount is far less than one percent of annual property tax revenues in the City. It would be offset by revenues from new development—particularly in the Downtown redevelopment area where it would become far easier to redevelop approximately 240 hectares (600 acres) of land in Lincoln's core once the floodplain is contained.

Employment: Construction of the channel would provide a short-term (18-24 months) employment benefit in study area construction jobs (the channel would be constructed in a single phase). Periodic maintenance of the channel and its associated features would be performed by the City of Lincoln Parks and Recreation Department and/or the LPSNRD, and would require some new hires.

No-Action Alternative. The No-Action Alternative would not remove the properties identified in this DEIS from the tax rolls, but neither would it provide an area for Downtown

redevelopment nor remove development constraints on over 600 acres of land in Lincoln's core. No changed long-term or short-term employment effects would be felt.

4.6.4 Impacts of Transportation improvements

Amended Draft Single Package.

Tax Revenue: The acquisition of privately owned properties to construct the roadways would remove approximately \$6.1 million from the property tax base and reduce annual property tax revenues by approximately \$151,000.

Employment: Construction of the Amended Draft Single Package transportation improvements would provide an employment benefit in the study area for up to 15 years due to phasing of the improvements on an as-needed and as-funded basis. Overall growth in the transportation system over the next 20 years may require that new people be hired by the City for on-going maintenance. The Amended Draft Single Package, if implemented, would be part of that growth.

No-Action Alternative. The No-Action Alternative would not remove the properties identified in this DEIS from the tax rolls, but neither would it provide improved access through Lincoln's core. No long-term or short-term employment effects would be felt, other than short-term transportation construction associated with projects listed in the City of Lincoln's CIP.

4.6.5 Impacts of Community Revitalization Actions

Amended Draft Single Package.

Tax Revenue: The acquisition of privately owned properties to construct new playing fields north of Whittier Junior High School, park expansion along the open channel, and the Northeast Community Park would remove approximately \$900,000 from the property tax base and reduce annual property tax revenues by approximately \$21,000.

Redevelopment in the Downtown area would increase the property tax base by several million dollars. Future land uses in this area alone (as shown in Figure 3.3) would increase the local property tax base by more than four million dollars, assuming that property values for these new uses would reflect the average property values for existing land uses in the broad analysis area. Four million dollars is likely a conservative estimate of future property values given the Downtown development area's proximity to goods, services, and employment centers, the aesthetics of the new channel, and the convenience of the North-South Roadway.

Employment: The community revitalization strategies included in the Amended Draft Single Package would provide a long-term employment benefit in the study area. Expanded services at wrap-around centers could require additional staffing.

No-Action Alternative. The No-Action Alternative would not impact property tax revenues or employment in the study area.

4.6.6 Combined Impacts of the Actions

Amended Draft Single Package. No additional adverse impacts would result from the combined actions.

No-Action Alternative. The No-Action Alternative would not allow or encourage an extensive redevelopment of Lincoln’s core. So, while properties wouldn’t be removed from the tax rolls, redevelopment opportunities and their attendant tax revenues wouldn’t be realized. In addition, short-term job creation would be related only to those projects listed in Lincoln’s CIP.

4.6.7 Potential Impact Mitigation Measures

No mitigation is required because:

- The adverse impact on tax rolls of removing buildings would likely be offset by new development in the Downtown redevelopment area and at infill sites. In addition, some homes may be relocated onto vacant lots rather than simply removed from the tax rolls.
- Construction-related employment is seen as a positive benefit to the community, and no mitigation is necessary. Long-term job creation is also considered a benefit.

4.7 Bicycle and Pedestrian Accommodations

4.7.1 Baseline Environmental Conditions

The City of Lincoln has developed an extensive system of bicycle and pedestrian trails and paths. The system includes sidewalks, on-street routes for bicycles, and “off-road” trails for multiple use. The 1994 *Lincoln City -- Lancaster County Comprehensive Plan* includes a multi-use trail component that guides development of these trails. While many trails have been developed to date (see Figure 4.9), there is general agreement that connections both at the edge of and through Downtown are still lacking as trail users must navigate City streets through much of the study area.

Three existing major trail corridors all provide excellent access opportunities into the study area, but all fall short of entering the Downtown or the UNL City Campus. There are also other trail corridors heading towards the central portion of Lincoln from the north, south, and southwest. While the *Lincoln City -- Lancaster County Comprehensive Plan* provides specific goals about making the obvious connections, there are no specific plans designating alignments. The baseline system is described as it relates to the Antelope Valley Study Area.

Bicycle and Multi-use Accommodations. The City of Lincoln has been recognized for the quantity and quality of its award-winning urban trails system. Numerous trails support groups are very active in the development of additional trails and maintenance of current trails.

The City of Lincoln has over the years been able to acquire a variety of inactive railroad corridors to create these multi-use trail corridors. In addition, there are a number of linear parks, generally following the major drainage corridors, which also have extensive trails to accommodate both bicycles and pedestrians. These railroad and drainage corridors provide the majority of the “off-road” trail system within the City of Lincoln. Some wider sidewalks also serve as “off-road” trail connectors as do UNL City Campus walkways and roadways.

- **On-street trails:** Many bicycle routes into and within the study area consist of designated on-street routes. These routes have been identified based upon relatively low volumes of traffic, wide lanes, and speed limits generally less than 55 kilometers

- **Figure 4.9**

(35 miles) per hour. These routes are not identified on the streets with any pavement markings or designated special lanes, although street signs are provided to define these routes for motorists and bicyclists.

There are some bicycle support facilities within Downtown, including bike-parking racks at the major parking structures, and scattered bike racks/parking on the Downtown streets. Within the UNL City and East Campuses, there are bike racks/parking facilities at most classroom buildings and dorms.

- **Off-road trails:** Lincoln's "off-road" trails are multi-use trails for pedestrians, bicyclists, and rollerbladers/skateboarders. The trails often use abandoned railroad corridors or drainage corridors, have been built to specific design standards, and accommodate multiple uses. Others use new rights-of-way created for the specific trail. The design standards include specifications for drainage, cross-sections, materials, sight distance, grade, signage/graphics, clearance, and width. Trails are 2.4 meters (8.0 feet) or 3.0 meters (10.0 feet) wide, so bikes can meet and pass safely. All standards meet or exceed the Americans with Disabilities Act (ADA) standards.

There are two "off-road" trails that enter the study area. From the northeast, the John Dietrich Trail generally follows the BNSF Railroad mainline into the study area. The off-road portion of the trail ends at Huntington Avenue and 33rd Street, and utilizes local streets eastward from there. The second trail within the study area is the combined Billy Wolff (from the southeast)/Rock Island (from the south) Trail, which enters the study area from the south along an old railroad corridor, Capitol Parkway, and Antelope Creek. This corridor is a major open space corridor, providing a variety of recreational and trail uses within south Lincoln. At Antelope Park/Lewis Fields, it becomes a sidewalk trail and ends at O Street. From there to Downtown and the UNL City Campus, local streets and sidewalks are utilized. The trail ends at 19th and Vine Streets.

Just to the east of the study area there is another popular "off-road" trail. The MoPac Trail enters Lincoln from the southeast, providing a major trail experience from rural Lancaster County. Currently, at the western end, the trail stops at about 30th and X Streets. Westward from there into the study area, the current landowner (the Union Pacific Railroad) is in the process of service abandonment and transferring much of the ROW to the City of Lincoln for conversion to trail use.

Portions of other "off-road" trails are built along the levees of Salt Creek, south and northeast of the study area, and along Oak Creek, northwest of the study area. None of the trail segments near the study area, however, have yet been built.

Annual counts of trail use show increasing numbers every year. Trails are maintained by a combination of City Parks and Recreation, LPSNRD and volunteer organizations. All trails are signed at roadway intersections and other important junctions. Several major streets are grade-separated from the trails (e.g., 48th Street and the MoPac Trail, and 27th Street and the Billy Wolff/Rock Island Trail).

Pedestrian Accommodations. Most of Lincoln's residential areas within the study area include sidewalks, and sidewalks are required by code in all new areas of residential development. Both residential and non-residential developers must install sidewalks in new neighborhoods and developments. These requirements have been in place for many years, so within the study area there is an extensive sidewalk system.

Within the study area, both the UNL City Campus and the Downtown area provide wide sidewalks. Within the Downtown area, between R and K Streets west of 16th Street, no bicycles, skates, skateboards, coasters or toy vehicles are allowed on the sidewalks. Both the Downtown and UNL City Campus have an extensive pedestrian system enhanced with benches, trash receptacles, landscaping, and bike racks.

4.7.2 Impact Assessment Methodology

Impacts of the stormwater management, transportation improvements, and community revitalization actions upon bicycle and pedestrian accommodations were evaluated for the Amended Draft Single Package and the No-Action Alternative based upon:

- General accessibility considerations,
- Conflicts with major pedestrian and bicycle movements or concentrations, and
- Changes in bicycle or pedestrian activity.

4.7.3 Impacts of Stormwater Management

Amended Draft Single Package. The stormwater management element of the Amended Draft Single Package would have long-term positive impacts upon bicycle and pedestrian accommodations. The major component of stormwater management would be the creation of a new channel. The channel would incorporate soft engineering approaches such as landscaped, meandering edges that would provide an enhanced visual and recreational corridor into and adjacent to the Downtown area of Lincoln, and the UNL City Campus. Within this corridor would be a major bicycle and pedestrian trail system extending the Billy Wolff/Rock Island Trail into the central City, through the UNL City Campus, and past State Fair Park north to Salt Creek.

This open space corridor and associated off-road trail system would provide direct access into and out of the central city and UNL City Campus. It would intersect the various east-west residential neighborhood sidewalks, and provide a major open space and trail corridor linking various community elements. The trail extension, besides connecting at street level to major cross streets, would be grade-separated at most, if not all, major streets crossing the new channel, thus improving safety and enhancing ride quality. The stormwater channel would disrupt some of the east-west pedestrian and bicycle movements on some streets, but the new corridor and trail system would lead bicyclists and pedestrians to selected crossings at the channel.

The trail crossing next to Antelope Creek under the BNSF Railroad mainline at UNL's Bob Devaney Center is an especially important delay-free safety improvement for students and those attending the Nebraska State Fair as well as events at the Devaney Center. This wide, well-lighted under crossing would allow the railroad to be fenced on both sides of the ROW to minimize illegal crossing of the tracks.

No-Action Alternative. The No-Action Alternative would have no adverse impact upon bicycle and pedestrian accommodations as described in the baseline conditions. The present sidewalks, trails, and street system would continue to serve the bicyclists and pedestrians, but opportunity for major linkages through the central city and UNL City Campus would not be provided.

4.7.4 Impacts of Transportation Improvements

Amended Draft Single Package. The transportation improvements of the Amended Draft Single Package would have a variety of impacts upon bicycle and pedestrian accommodations. The overall transportation improvements consist of eliminating some at-grade railroad crossings and providing higher capacity roadways with fewer intersections. Eliminating four at-grade railroad crossings (14th, 17th, 33rd and Adams Streets) with the BNSF Railroad mainline and providing new grade-separated crossings would eliminate potential locations for pedestrian/bicyclist and train accidents. This is also an important improvement for the railroad in terms of reducing delays in service and the costs associated with accidents and delays.

While these new roadways limit access to a few local streets and some people would perceive them as physical barriers, they would improve safety for pedestrians and bicyclists. In the Downtown area, a wide median is shown for the North-South Roadway to provide a better refuge for pedestrians crossing this street. While limiting locations for some cross-street movement and railroad crossing, pedestrians and bicyclists would use major signalized crossings, thereby improving overall safety. Likewise, the neighborhood streets that no longer would have direct, through access to the major new roadways would in turn have reduced traffic, and would, therefore, be safer for pedestrians and bicyclists.

As noted, the student crossings at 16th and 17th Streets on the UNL City Campus are one of the greatest concentrations of pedestrian/motor vehicle conflict. The North-South Roadway would reduce motor vehicle traffic by half on these streets by providing a by-pass route for through traffic that does not need access to campus. UNL City Campus pedestrian safety would be a major beneficiary of this transportation improvement.

No-Action Alternative. The No-Action Alternative would have no adverse impact upon bicycle and pedestrian accommodations. Railroad crossings would remain a potential threat to pedestrians and bicyclists and increasingly large numbers of vehicles would continue to use neighborhood streets.

4.7.5 Impacts of Community Revitalization Actions

Amended Draft Single Package. The community revitalization actions of the Amended Draft Single Package would have positive and long-term impacts upon bicycle and pedestrian accommodations. For pedestrians and bicyclists, the most important aspect of the entire community revitalization element is the creation of new “off-road” trails that would provide all the missing Downtown elements of the existing trail network. The new multi-purpose trail around the north, west, and south sides of Downtown would complete the link-up of all the existing trails. Just as the new Antelope Valley trail would pick up and extend missing sections of the John Dietrich, MoPac, and Billy Wolff/Rock Island Trails, the Downtown loop would provide new links for the Salt Creek Levee Trail to the southeast, and the Oak Creek/Superior Street Trails to the northwest. By providing an off-street route on the other three sides of the Downtown and UNL City Campus, this trail loop would allow interconnections from all quadrants of the City to all other quadrants. This would be accomplished by an integrated “trail loop,” completing a comprehensive core Downtown trail program for the City of Lincoln. The loop trail would provide two-way bicycle and pedestrian accommodations, bringing users close to their final destination in Downtown or on the UNL City Campus with minimal on-street connection.

The other primary activities of the community revitalization actions, such as the closer-to-home strategies, special land-use districts, the new Northeast Community Park, the new medical clinic, and wrap-around centers all contribute to an enhanced pedestrian and bicycle environment.

The land-use needs of the residential neighborhoods would be provided for through the use of special districts, appropriate land-use transitions, and physical improvements. Urban design features such as landscaping, street lighting, pedestrian lighting, traffic calming, and other “street furniture” would be utilized to strengthen the residential neighborhoods and enhance the visual experience of pedestrians or bicyclists. The use of special districts, redevelopment strategies, strong neighborhood plans, new health and human service facilities, and physical improvements all provide for stronger and safer neighborhoods. These revitalization efforts promote more pedestrian and bike movement since more of everything the neighborhood requires is close at hand. Thus, automobiles are less important and pedestrian-friendly neighborhoods and environments are promoted.

No-Action Alternative. The No-Action Alternative would have no adverse impact upon bicycle and pedestrian accommodations. The CIP project to provide connections at X Street would improve pedestrian safety and trail connectivity. Elsewhere, however, trail connections through Downtown would remain absent, and the visual environment would remain as is.

4.7.6 Combined Impacts of the Actions

The stormwater management, transportation improvements, and community revitalization actions of the Amended Draft Single Package would positively affect the bicycle and pedestrian environment by providing for an enhanced physical and visual environment for walking and biking. The Amended Draft Single Package would provide facilities that accommodate and promote working, living, playing and shopping within the study area, in turn encouraging and enhancing bicycle and pedestrian movement. In addition, completing the core portions of the trails plan would promote safety by separating bicyclists and pedestrians from motor vehicle traffic.

Short-term impacts of the Amended Draft Single Package would briefly disrupt the bicycle and pedestrian movements. Construction would disrupt existing sidewalk and roadway patterns and would force additional construction-related traffic into neighborhoods

4.7.7 Potential Impact Mitigation Measures

The long-term impacts of the Amended Draft Single Package on bicyclist and pedestrian accommodations are beneficial, and no mitigation would be necessary. To mitigate impacts during construction, temporary walkways, signage, and detours would alleviate safety concerns.

4.8 Air Quality

4.8.1 Baseline Environmental Conditions

National Ambient Air Quality Standards (NAAQS). The Clean Air Act of 1970, as amended in 1977, 1990 and 1997, establishes NAAQS for seven criteria pollutants (see Table 4.14). Primary standards are established to protect public health, including sensitive populations, children and the elderly. Secondary standards are established to protect public

welfare, including protection against decreased visibility & damage to animals, crops, vegetation, and buildings (EPA, Sept. 1995).

Study Area Ambient Air Quality. According to the Lincoln-Lancaster County Health Department, in 1978, a portion of the study area near 22nd and O Streets was designated as a non-attainment area for carbon monoxide (CO). This area was officially re-designated to attainment in February 1989. The major factor involved in achieving attainment was the advent of catalytic converters and the cleaner air subsequently emitted by motor vehicles. However, street widening and coordinated traffic signals within the Antelope Creek basin were also important.

The Nebraska Department of Environmental Quality (NDEQ) reports that all of Nebraska has been in attainment of the NAAQS for the past several years, with the exception of a small area near the Missouri River in Omaha (Nebraska Air Quality, 1996). With respect to the new standards for ozone and PM_{2.5} listed in Table 4.14, further study and data collection (by others) beyond the scope of this study is necessary before conformity determinations can be made. EPA does not require these conformity determinations in this case, and there is no reason to believe Lincoln violates any new air quality standards.

4.8.2 Impact Assessment Methodology

Stormwater Management Impact Assessment Methodology. There are no long-term air quality impacts associated with stormwater management. Potential air quality impacts could arise during construction activities. A discussion of construction-related air quality impacts is provided in Section 4.8.6.

Transportation Impact Assessment Methodology. To determine the significance of the transportation impact to air quality, pollutant levels are predicted. Those levels, together with the existing background air quality levels, are compared to the NAAQS on a

**Table 4.14
NATIONAL AMBIENT AIR QUALITY STANDARDS**

| Pollutant | Averaging Time | Primary Standard | Secondary Standard |
|------------------------|-------------------------|-------------------------|---------------------------|
| Sulfur Oxides | 3- Hour 24- Hour | 0.03 ppm* 0.14 ppm* | 0.5 ppm* 0.5 ppm* |
| Carbon Monoxide | 8- Hour 1- Hour | 9 ppm* 35 ppm* | Same as Primary |
| Ozone | 1- Hour** 8- Hour*** | 0.12 ppm* 0.08 ppm* | Same as Primary |
| Nitrogen Oxides | Annual mean | 0.05 ppm* | Same as Primary |
| Lead | Calendar Quarter | 1.5 µg/m ³ | Same as Primary |

| Pollutant | Averaging Time | Primary Standard | Secondary Standard |
|-----------------------------|-------------------------|---|---------------------------|
| PM₁₀ | Annual mean 24- Hour | 50 µg/m ³ 150 µg/m ³ | Same as Primary |
| PM_{2.5} *** | 24- Hour | 65 µg/m ³ | Same as Primary |

Source: US EPA, "National Primary and Secondary Ambient Air Quality Standards" (40 CFR 50).

*ppm = parts per million; µg/m³ = micrograms per cubic meter

** Applicable to current Non-Attainment Areas only

*** New Standard effective September 16, 1997

regional and/or project-level basis. Regional and project-level methodologies used for this study are discussed below.

The objective of a *regional* analysis is to determine the impact a project would have on regional air quality and whether the project is in conformance with the State Implementation Plan (SIP). Based upon the most currently published data (Nebraska Air Quality, 1996), the study area is in full compliance with the NAAQS for measured pollutants. The earliest years that EPA will designate non-attainment areas in the state for the new PM_{2.5} and ozone standards is 2002 and 2000, respectively (EPA, 1997). Any area designated as non-attainment for these new standards will be allowed three years to revise the state SIP.

Until EPA approves the affected state's SIP revisions, a conformity determination for the new PM_{2.5} and ozone standards is not required for transportation projects. Since the State is in compliance with established NAAQS, therefore, a regional air quality analysis was neither necessary nor performed.

The objective of *project-level* analyses is to predict criteria pollutant concentrations at sensitive sites (e.g., schools, parks, greenhouses, and residences), near so-called "worst-case" (high traffic volume) portions of transportation improvements, and compare the predicted concentrations to the NAAQS. Although there are several criteria pollutants associated with mobile source emissions, FHWA considers carbon monoxide (CO) to be the major criteria pollutant for a project-level analysis (FHWA Discussion Paper, undated). Assuming the NAAQS are not violated at "worst-case" sites, then entire project areas are assumed to not cause violations.

The project-level analysis for the Antelope Valley Study used the EPA's CAL3QHC (Version 2) and the MOBILE 5a models. CAL3QHC is an air dispersion model that predicts CO and other inert pollutant concentrations generated by moving and idling motor vehicles (EPA, November 1992). MOBILE 5a is used to generate traffic source emission factors for input into the CAL3QHC model. Model inputs and assumptions are described in the Technical Memorandum contained in Appendix F.

Three free-flow roadways and five intersections were selected for analysis. The number of locations analyzed is based on level of service ratings and is in accordance with EPA guidance. A segment of only one of the roadways and one of the intersections exist today. The remainder have not yet been built. Modeled results at two selected "worst-case" intersections (North-South Roadway at O Street and North-South Roadway at Vine Street) are described in Section 4.8.4.

At the request of the Lincoln-Lancaster County Health Department, the need for a project-level analysis of PM_{2.5} emissions was researched. According to EPA officials, existing models would require modification to provide accurate mobile source PM_{2.5} emission prediction for comparison to the new federal standard. These modifications would not be completed for several years. Therefore, PM_{2.5} emissions were not predicted in this analysis.

Community Revitalization Impacts Assessment Methodology. Potential air quality impacts would arise from increased traffic volumes associated with some of the community revitalization measures. These traffic volumes are already incorporated into the City's long range traffic projections used throughout this DEIS. Thus, the analysis of transportation impacts already includes community revitalization elements. No separate air quality analysis of community revitalization is necessary.

4.8.3 Impacts of Stormwater Management

Amended Draft Single Package. No-long term adverse air quality impacts are associated with stormwater management.

Construction equipment emissions generated from internal combustion engines and airborne dust generated during excavation, grading, and site preparation may cause a short-term worsening of ambient air quality. Of these emissions, airborne dust would be the most predominant. Dust generated from construction activities is predominantly large particles that are redeposited close to the source. However, a fraction of the dust is composed of small particles referred to as PM₁₀ that remains airborne for an indefinite period of time.

No-Action Alternative. The No-Action Alternative does not include activities affecting the existing stormwater system, and no air quality impacts are anticipated.

4.8.4 Impacts of Transportation Improvements

Amended Draft Single Package Impacts. The predicted CO levels for receptors at two "worst-case" intersections are summarized in Appendix F. Based on Tables F.8 and F.9 (and corresponding Figures F.8 and F.9) in the appendix, none of the predicted one- and eight-hour CO values at the selected "worst-case" intersections exceed the NAAQS of 35 ppm and 9 ppm for one and eight hours, respectively. Therefore, no long-term impacts to air quality are anticipated relative to EPA standards. Since these are "worst-case" intersections, it is reasonable to assume that all intersections and roadway segments would be in compliance with the NAAQS.

Beadle Center Concerns. Concern has been raised by UNL faculty regarding the impact to indoor air quality at the Beadle Center and greenhouse complex located west of the North-South Roadway. Information provided by UNL indicates the air intakes for the Beadle Center are located adjacent to the west and north exterior walls of the building and the greenhouse air intakes are located near the middle of each unit along the roofline. The maximum predicted one-hour and eight-hour CO concentrations in these locations, 6 ppm and 4 ppm respectively, occur near the Beadle Center air intakes located at the north corner of the building. These concentrations reflect an increase of 1 to 2 ppm above the background CO level for these respective averaging periods, but are still well below EPA's thresholds of acceptability for people and plants.

Another faculty concern is about existing vehicles that idle alongside Beadle Center air intakes. While this problem is not caused by the Amended Draft Single Package roadways, faculty are concerned that the new North-South Roadway would exacerbate an existing condition. The Amended Draft Single Package, in this context, would be looked on as an opportunity. Since new local access routes to the Beadle Center would be required, the existing routes alongside air intakes would be re-routed farther away from intakes as part of this study. Access opportunities are described further in Chapter 5.

The US Department of Labor, Occupational Safety and Health Administration (OSHA), has established permissible exposure levels (PELs) for certain toxic and hazardous substances. In accordance with Title 40, Code of Federal Regulations, Part 1900 (July 1, 1997), subpart Z, an employee's exposure should not exceed 50 ppm CO for any eight-hour work shift of a 40-hour workweek. As previously noted, the maximum predicted eight-hour CO concentration at the air intakes (6 ppm) is below the NAAQS levels for protection of human health. This concentration is also well within the OSHA PEL. Therefore, no health-related impacts to indoor air quality are indicated.

Air quality impacts are a concern to UNL professors who conduct research on plants in the greenhouse complex just south of the Beadle Center. Air intakes are currently not equipped with activated carbon filters, so researchers are concerned about the North-South Roadway's impacts on their plant experiments. Therefore, they have requested that the analysis of air quality impacts on people be expanded to consider impacts on plants as well.

The NAAQS shown previously in Table 4.14 include secondary standards designed to protect the public welfare, including damage to crops and vegetation. In the case of CO modeled for this study, the secondary standards are the same as the primary standards. Based on study-area modeling, the primary and, therefore, the secondary standards (which describe impacts to crops and vegetation) for CO would not be exceeded as a result of vehicles traveling on the North-South Roadway.

There was also some concern about non-CO pollutant impacts at the greenhouse complex. Most other pollutants emitted from automobiles react on a *regional* level rather than a *local* level. Therefore, their study is more appropriately based on vehicle miles of travel within the *region*. To compare the effects of alternatives on the regional pollutant burden, the vehicle miles of travel are typically multiplied by emission factors for various pollutants. The total vehicle miles of travel within the region for the Amended Draft Single package are forecast to be only 0.15 percent greater than those of the No-Action Alternative. Therefore, the difference in regional pollutant levels associated with the Amended Draft Single Package and No-Action Alternative is not great, and adverse impacts of these regionally modeled pollutants are not anticipated at the greenhouse complex.

The University of California-Riverside (UCR) was contacted for information about their urban air quality problems at research greenhouses. Air quality concerns have been minimal at the UCR greenhouses, which have been fitted with activated carbon filters to mitigate regional air quality concerns. Researchers at UCR recommend planting foliage between the roadway and the greenhouse to mitigate some of the contaminant concerns associated with the North-South Roadway. Foliage such as trees and shrubs would provide benefits through plant uptake and the collection of particulate matter on leaves (Bill Imig of the Antelope Valley Study Team and Roger Atkinson of UCR, Air Pollution Research Center, 1998).

A firm specializing in the design of research greenhouses (Agritechnove Consulting) was contacted to ascertain their experience with air quality concerns. The representative contacted had not encountered concerns specific to vehicle emissions. Activated carbon filters have been used where regional air quality concerns are present and where the effects of acid rain on plants were being studied (Bill Imig of the Antelope Valley Study Team and David Brault of Agritechnove Consulting, August 1998).

A number of major research universities with biochemistry departments and research greenhouses are located in urban environments. Data was collected showing the location and level/type of air quality mitigation provided at 10 peer biochemistry departments in the US. Based on that research, there are a number of research greenhouses functioning in urban environments. Preliminary Beadle Center research findings relative to air quality and other issues are contained in Appendix G.

No-Action Alternative Impacts. The No-Action Alternative would not provide the desired transportation improvements. Therefore, the existing transportation corridors would carry increasingly more traffic. Under this alternative, the air quality impacts would be greater in some areas as a result of slower travel speeds and increased delays at intersections because of vehicles idling at over-capacity intersections.

4.8.5 Impacts of Community Revitalization Actions

Amended Draft Single Package Impacts. The Amended Draft Single Package community revitalization components include neighborhood vitality, land-use patterns, Downtown vitality, trail continuity, recreation, and health and human services. Several of the concepts are needed to achieve these objectives (Downtown supermarket, mixed-use development, redevelopment of public properties, and an employment center) would increase traffic volumes and impact air quality. Future population and employment growth would, in general, generate additional traffic. Based on the *Lincoln-Lancaster County Comprehensive Plan*, the additional traffic related to community revitalization actions has been included in the Amended Draft Single Package's traffic projections and assessed under the transportation impact chapter (Chapter 5). Other concepts (new bike paths, which can improve air quality; new parks; and a medical clinic) would not generate the volume of traffic necessary to cause a measurable air quality impact.

No-Action Alternative Impacts. The No-Action Alternative would not include the community revitalization components. Therefore, there would be no additional impact to air quality.

4.8.6 Combined Impacts of the Actions

Amended Draft Single Package. Adverse impacts at UNL's Beadle Center research greenhouse complex may require mitigation, particularly if researchers remain concerned that their experiments may be compromised by air quality. This potential impact is not quantifiable since the severity of the impacts is dependent on the types of plants being grown, which vary from project to project. To provide an adequate growth environment for most plant types, UNL may decide that air quality within the greenhouse complex should be improved.

Short-term impacts to air quality caused by construction equipment emissions and airborne dust may occur during the construction phase of the stormwater management and transportation components. This is particularly the case near UNL's Beadle Center research

greenhouse complex. The long-term stormwater management, transportation, and community revitalization components would not adversely impact CO levels since predicted levels do not exceed the NAAQS.

No Action Alternative. See transportation impacts discussion, above.

4.8.7 Potential Impact Mitigation Measures

No adverse impacts to human health were identified and, therefore, no mitigation is considered necessary. To improve an existing problem, vehicle local access routes near UNL's Beadle Center air intakes would be relocated. UNL is also considering providing a landscaped garden at the southwest corner of Vine Street and the North-South Roadway.

To mitigate concerns about impacts on research conducted at the greenhouse complex, new foliage would be planted between the roadway and the greenhouses. UNL may wish to further investigate the installation of filters at the Beadle Center's research greenhouse complex if faculty concerns persist.

During construction, application of water to construction areas to reduce airborne dust and abatement devices on construction equipment are mitigation measures that would be included in contract specifications.

4.9 Noise

4.9.1 Baseline Environmental Conditions

Sources of Ambient Noise Levels. Ambient noise levels within the study area are primarily dominated by vehicles moving on the existing road network and, in some areas along rail corridors, railroad operations. Vehicle noise is caused by pavement and tire friction, tailpipe emissions, and engine noise, and varies by vehicle speed and traffic volumes. Vehicle speeds on study area roadways in Lincoln are well below highway speeds, which tends to minimize roadway traffic noise.

Traffic-generated noise levels were estimated for existing conditions and predicted for long range conditions using computer-modeling techniques. Noise levels associated with rail travel through the study area were not estimated or predicted since the Amended Draft Single Package would not change rail operations. Instead, it would remove at-grade crossings and, thus, reduce the need for intermittent train whistles at crossings. It would also change the roadway noise environment because vehicle travel speeds would remain more constant. When vehicles must stop for trains now, noise levels change as vehicles slow, idle, and accelerate when trains are present.

Ambient noise levels were monitored at five study area sites during peak traffic periods of 7 A.M. to 9 A.M. and 4 P.M. to 6 P.M. Monitored levels ranged from 56 dBA L_{eq} at receptor 3 to 71 dBA L_{eq} at receptor 5 (see Table 4.15). The noise levels are expressed in dBA L_{eq} , which are decibel levels equal to an average of measured levels over a specified length of time using the A-weighted network to approximate the range of human hearing. In this case, the length of time for averaging sound levels was 20 minutes.

Table 4.15
MONITORED NOISE LEVELS

| Monitor Receptor | Land Use | Measured Noise Level (dBA L_{eq}) | | Modeled Noise Level (dBA L_{eq}) | | Difference Between Measured & Modeled (dBA L_{eq}) | |
|-------------------------|-----------------|--|-------------|---|-------------|---|-------------|
| | | A.M. | P.M. | A.M. | P.M. | A.M. | P.M. |
| 1 | Residential | 67 | 66 | 67 | 66 | 0 | 0 |
| 2 | Institutional | 57 | 60 | 58 | 59 | 1 | 1 |
| 3 | Park | 58 | 56 | 56 | 56 | 2 | 0 |
| 4 | Residential | 60 | 63 | 61 | 63 | 1 | 0 |
| 5 | Undeveloped | 69 | 71 | 68 | 68 | 1 | 3 |

Source: AV Study Team

4.9.2 Impact Assessment Methodology

Noise Abatement Criteria. To analyze future noise impacts, study area receptors and their associated land uses were identified based on existing and platted land uses. At 23 CFR 772, the FHWA establishes minimum noise levels or Noise Abatement Criteria (NAC), which define when noise abatement or mitigation must be considered in roadway projects. Noise abatement thresholds are specific to land use. Abatement must be considered in Nebraska when noise levels in residential and other sensitive land uses is 66 dBA L_{eq} and commercial and industrial land uses is 71 dBA L_{eq} or higher. These levels are 1 dBA L_{eq} below the corresponding NAC. In addition, NDOR has established that predicted noise levels of 15 dBA L_{eq} or more above existing levels “substantially exceed” existing levels for purposes of interpreting federal noise standards.

Where abatement is considered under the above rules, FHWA and NDOR recommend it only when considered feasible and reasonable. Abatement is considered feasible when a recommended measure would cause at least a five decibel sound level reduction measured at a point 3.0 meters (10.0 feet) from a residence. Abatement is considered reasonable when it is considered cost-effective, when the change in computed noise levels between existing and future conditions equals or exceeds three decibels, when the majority of residences or plats were developed before FHWA environmental approval, and when control of roadway access is possible. In addition, noise abatement would only be provided if at least 75 percent of the benefited property owners vote in favor of it. When recommended, the City and affected residents must agree on what form of abatement to pursue.

Computer Model. STAM2VU1/OPTIMVU1, a revised version of the FHWA’s computer model STAMINA 2.0/OPTIMA (1982), was used to predict future noise levels within the study area for the Amended Draft Single Package and the No-Action Alternative. The revised model allows the incorporation of speeds below 48 km/h (30 mph) under urban, stop-and-go traffic conditions. Predicted noise levels for the Amended Draft Single Package and the No-Action Alternative are compared, and are also compared to existing conditions.

4.9.3 Impacts of Stormwater Management

Amended Draft Single Package. The stormwater management component of the Amended Draft Single Package would not affect typical ambient noise levels. Construction noise is discussed in Section 4.9.6.

No-Action Alternative. The stormwater management component of the No-Action Alternative would not affect typical ambient noise levels.

4.9.4 Impacts of Transportation Improvements

Amended Draft Single Package. Results of the noise analysis, including modeled noise levels for every property within the study area, are provided in a separate Technical Memorandum contained in Appendix B. Results are summarized below. Exterior noise levels for each property are represented by individual receptor points, and levels are reported for existing conditions, the No-Action Alternative, and the Amended Draft Single Package. Figures showing the 66 and 71 dBA L_{eq} contours (or lines of equal loudness) along all new or improved study area roadways are contained in Appendix I. These contours define when mitigation must be considered.

The majority of exterior noise impacts are predicted to occur in the South study section, within established residential / commercial areas. In all, 15 developed properties were identified with potential noise impacts (see Figure 4.10 and Table 4.16). Although there are no noise impacts at the UNL Beadle Center, noise levels at the facility were given particular attention due to the sensitive nature of the research conducted there.

No-Action Alternative. At the majority of receptors modeled, noise levels are lower with the No-Action Alternative than with the Amended Draft Single Package (see Table 4.17). This is primarily because of the placement of new roadways and widening of existing roadways near receptors. In some cases, however, noise levels are predicted to exceed the 66 and 71 dBA L_{eq} thresholds where noise abatement is typically considered for projects. These impacts are predicted to occur under conditions of naturally increasing traffic volumes, and no mitigation is warranted or recommended.

**Table 4.16
RECEPTORS IMPACTED BY NOISE**

| Receptor | Existing | | Future N-A | | AD SP | | Land Use | Exceed NAC? | Increase ≥ 15 dBA? |
|----------|----------|------|------------|------|-------|------|-------------|-------------|-------------------------|
| | A.M. | P.M. | A.M. | P.M. | A.M. | P.M. | | | |
| 120 | 48 | 49 | 50 | 49 | 65 | 63 | Residential | No | Yes |
| 121 | 49 | 49 | 50 | 50 | 68 | 65 | Residential | Yes | Yes |
| 238 | 61 | 61 | 61 | 61 | 66 | 66 | Residential | Yes | No |
| 239 | 62 | 61 | 62 | 62 | 67 | 66 | Residential | Yes | No |
| 243 | 72 | 69 | 72 | 69 | 69 | 68 | Residential | Yes | No |
| 244 | 74 | 71 | 74 | 71 | 71 | 71 | Commercial | Yes | No |
| 249 | 66 | 64 | 67 | 64 | 64 | 66 | Residential | Yes | No |
| 250 | 66 | 63 | 66 | 64 | 64 | 66 | Residential | Yes | No |
| 251 | 66 | 63 | 66 | 64 | 64 | 66 | Residential | Yes | No |
| 252 | 66 | 63 | 66 | 64 | 65 | 66 | Residential | Yes | No |
| 253 | 61 | 62 | 62 | 63 | 65 | 66 | Residential | Yes | No |
| 254 | 61 | 64 | 61 | 64 | 65 | 66 | Residential | Yes | No |

| Receptor | Existing | | Future N-A | | AD SP | | Land Use | Exceed NAC? | Increase ≥ 15 dBA? |
|----------|----------|------|------------|------|-------|------|-------------|-------------|-------------------------|
| | A.M. | P.M. | A.M. | P.M. | A.M. | P.M. | | | |
| 370 | 68 | 68 | 69 | 68 | 71 | 71 | Commercial | Yes | No |
| 528 | 52 | 55 | 52 | 54 | 69 | 69 | Residential | Yes | Yes |
| 564 | 59 | 60 | 60 | 60 | 67 | 66 | Recreation | Yes | No |

Source: AV Study Team

4.9.5 Impacts of Community Revitalization Actions

Amended Draft Single Package. The community revitalization components would affect noise levels as follows:

- Neighborhood vitality: The supermarket and mixed-use development would generate additional traffic volumes, thus contributing to higher noise levels in predominantly non-residential areas. These additional traffic volumes were included in the build-out traffic projections and, therefore, any associated noise has been accounted for. Traffic calming closer-to-home strategies to reduce traffic volumes and/or speeds on neighborhood streets would reduce noise levels in residential areas. Other closer-to-home strategies would have no effect on noise levels.
- Land-use patterns: Mixed-use development and redevelopment of public properties would generate additional traffic volumes, thus contributing to higher noise levels in predominantly non-residential areas. These additional traffic volumes were included in the build-out traffic projects and, therefore, any associated noise has been accounted for. Special districts and stormwater conveyance-related parks would not likely affect noise levels.
- Downtown vitality: New Downtown housing, mixed-use development, and a new employment center would generate additional traffic volumes, thus contributing to higher noise levels in predominantly non-residential areas. These additional traffic volumes were included in the build-out traffic projections and, therefore, any associated noise has been accounted for.
- Trail continuity: New bike paths would have no effect on noise levels unless many former drivers choose to bike instead. Under this scenario, noise levels would be reduced.
- Recreation: The 13-hectare (33-acre) Northeast Community Park and the expansion of Trago Park would attract some additional traffic volumes, thus contributing to higher noise levels in generally non-residential areas. These additional traffic volumes were included in the build-out traffic projections and, therefore, any associated noise has been accounted for.
- Health and human services: A new medical clinic and wrap-around centers would attract additional traffic volumes, thus contributing to higher noise levels in predominantly non-residential areas. These additional traffic volumes were included in the build-out traffic projections and, therefore, any associated noise has been accounted for.

Figure 4.10

**Table 4.17
NOISE ABATEMENT CONSIDERATIONS**

| Receptor | Study Barrier Considered? | Barrier Feasibility | | |
|----------|---|---------------------|-------|----------------------|
| | | Compatible w/ Topo? | < 16' | Other Noise Sources? |
| 120 | Yes | Yes | | No |
| 121 | Yes | Yes | | No |
| 238 | No, visual and physical access adversely affected to north. | n.a. | n.a. | n.a. |
| 239 | No, visual and physical access adversely affected to north. | n.a. | n.a. | n.a. |
| 243 | No, physical access adversely affected at the site. | n.a. | n.a. | n.a. |
| 244 | No, visual and physical access adversely affected to site. | n.a. | n.a. | n.a. |
| 249 | No, physical access adversely affected at the site. | n.a. | n.a. | n.a. |
| 250 | No, physical access adversely affected at the site. | n.a. | n.a. | n.a. |
| 251 | No, physical access adversely affected at the site. | n.a. | n.a. | n.a. |
| 252 | No, physical access adversely affected at the site. | n.a. | n.a. | n.a. |
| 253 | No, physical access to east-west alley adversely affected. | n.a. | n.a. | n.a. |
| 254 | No, physical access adversely affected at the site. | n.a. | n.a. | n.a. |
| 370 | No, visual and physical access adversely affected to site. | n.a. | n.a. | n.a. |
| 528 | No, physical access to this corner site adversely affected. | n.a. | n.a. | n.a. |
| 564 | Yes | Yes | | Yes |

Source: AV Study Team

No-Action Alternative. The No-Action Alternative would provide none of the opportunities for community revitalization improvements that would generate traffic. Traffic volumes associated with economic development activities would not be generated in predominantly non-residential areas. Also, traffic calming techniques would not be employed to reduce traffic and the resultant noise levels in residential areas.

4.9.6 Combined Impacts of the Alternatives

Amended Draft Single Package. The combined impacts associated with the Amended Draft Single Package are contained in Section 4.9.4 and Appendix B. In addition, eliminating the at-grade crossings would also eliminate the need for trains to sound their horns in these locations, thus reducing noise levels at adjacent residential areas.

In addition to these long-term impacts, short-term impacts may occur during construction. Because of the sensitive nature of residential land use, these impacts would be more pronounced at residences along the North-South and East-West Roadways, roadway connectors, and stormwater channel. Impacts at the Beadle Center are also important because of the sensitive nature of the research conducted there.

No-Action Alternative. The No-Action Alternative would not cause any noise impacts other than those occurring under conditions of natural traffic increase. In addition, trains would continue to sound their horns at existing at-grade crossings.

4.9.7 Amended Draft Single Package Potential Impact Mitigation Measures

Analysis has determined potential noise impacts at 15 receptors, as described below, along with impact mitigation considerations.

- **336 S. 19th Street (receptor 238), 338 S. 19th Street (receptor 239), 1944 L Street (receptor 243), 302 S. 19th Street (receptor 244), 1907 L Street (receptor 252), and 426 S. 19th Street (receptor 253).** These five one- and two-family residential properties and one commercial property are located in the Southern study section. Noise barriers were considered to mitigate impacts at these locations. In all cases, barriers would adversely affect physical access to either the site or adjacent properties.
- **1973 S Street (receptor 120) and 1971 S Street (receptor 121).** These two single-family residential properties are located on the south side of S Street, east of 19th Street and Carter Lumber. A noise barrier on the east side of the North-South Roadway is possibly one of the practical means of mitigating the increase in noise levels at this location
- **1915, 1921, 1925 L Street (receptors 251, 250, 249).** These three residential properties are located in the South study section. Noise barriers were considered to mitigate impacts to these properties. In all cases, barriers would adversely affect physical access to the properties.
- **1900 K Street (receptor 254).** This residential property is located in the South study section. A noise barrier was considered to mitigate impacts to the property. However, a barrier would adversely affect physical access to the property.
- **2902 Cornhusker Highway (receptor 370).** This commercial property is located in the North study section. A noise barrier was considered to mitigate impacts to the property. However, a barrier would adversely affect physical and visual access to the property, thereby threatening its commercial viability.
- **3300 Huntington Avenue (receptor 528).** This three-story apartment building is located on the north side of Huntington Avenue, just east of 33rd Street. Huntington Avenue would be widened in this location, with traffic relocated closer to the apartment building. A noise barrier is not considered feasible in this corner location due to the need to maintain driveway access to Huntington Avenue or 33rd Street.
- **UNL Recreation field north of Beadle Center (receptor 564).** This active-use recreation area contains University softball fields. The draft UNL Master Plan shows this

area as a parking garage in the future. For this analysis, it was conservatively assumed that a softball field would remain as the dominant use following construction of the North-South Roadway. A noise barrier on the southwestern side of the North-South Roadway and a barrier along the north side of Vine Street in this location are one possible means of mitigating noise impacts.

University standards would be used to determine if a softball field would be constructed within the remaining property. More likely the University will construct a parking garage which would be a noise-compatible use. This garage is in the new Campus Plan. The University is actively developing a garage construction and fundraising program to implement this plan.

The UNL Beadle Center on the south side of Vine Street, just west of the North-South Roadway, houses research laboratories and offices. Concerns related to the sensitive nature of this equipment were raised during Scoping. Consequently, the predicted noise environment at this location is discussed here. Preliminary findings of environmental analyses are presented in Appendix G. As the roadway and channel alignments were refined, the proposed investments were shifted eastward to avoid potential impacts at the Beadle Center, without adversely affecting the park on the east side of the Antelope Valley improvements. With the proposed roadway configuration, the predicted 66 dBA L_{eq} noise contour does not intersect the eastern-most wing of the facility. Therefore, there is considered to be no impact in this area and the study of mitigation is not necessary.

Every effort would be made to minimize construction noise impacts, and there are a variety of effective measures that can be adopted to reduce construction noise impacts. The effectiveness of the measures would depend, however, on the scale of construction, the phase of construction, and various aspects of the individual pieces of machinery used. Measures that may be employed include designing haul routes away from sensitive areas, controlling noise at the source, and limiting particularly noisy aspects of construction to certain hours of the day.

These mitigation measures are more fully described in the Technical Memorandum contained in Appendix B.

4.10 Vibration

A summary of the potential vibration impacts associated with this study is provided below. A Technical Memorandum is provided in Appendix C.

4.10.1 Baseline Environmental Conditions

Traffic-induced vibration travels through the ground to adjacent receivers in a source-path-receiver scenario. In this scenario, each vehicle or source operating on a roadway is modeled as a single moving source. The strength of the source varies by vehicle (including operating speed and weight), nature of pavement surface (which is the primary vibration source), structure of the pavement/sub-grade, and the alignment of the roadway relative to the receiver. Traffic-induced vibration decreases with increasing distance from the source. Therefore, traffic-induced vibration is generally not an environmental consideration beyond approximately 60 meters (200 feet) from the source.

Vibration waves are characterized by unique wave phases and wave frequencies. It is extremely unlikely that both the phase and frequencies of waves from two different sources

(i.e., building mechanical systems and vehicles on the new North-South Roadway) would ever be in phase. In fact, it is so unlikely that the thousands of conditions that affect vibration waves would make waves from different sources equal, that it is assumed the condition would never exist. Therefore, the vibration wave with the greatest magnitude at a sensitive receptor is important when defining impacts.

Land uses within the study area were evaluated to identify areas that are potentially sensitive to vibrations. Based on the evaluation, it was determined that UNL's Beadle Center is sensitive to vibrations because special equipment—including electron microscopes and a planned confocal microscopy facility—is in use. In addition, residences adjacent to projects of the Amended Draft Single Package may be considered vibration-sensitive during construction—particularly those near any pile driving activities. However, residences are typically not considered sensitive during the post-construction phase. No other vibration-sensitive land uses were identified within the study area.

Existing vibration levels in the Beadle Center were measured with a calibrated set of Bruel and Kjaer (B&K) vibration measuring equipment, including a B&K Type 2231 sound level meter fitted with a B&K Type 4379 accelerometer and a B&K Type ZR 0020 integrator. Two locations were selected for monitoring, including an existing electron microscope lab at N319 and a proposed lab at E119 (see Figure 4.11). Monitoring equipment at both sites was placed on the floor. Based on measurements taken on April 7, 1998, existing vibration velocities are 0.018 millimeter per second at N319 and 0.015 millimeter per second at E119. Velocity is a measure of the energy carried by vibration and is the preferred unit for assessing any potential risk of damage to buildings.

4.10.2 Impact Assessment Methodology

For the successful operation of the sensitive equipment located in the Beadle Center, vibrations of the facility floor where the equipment is mounted should not exceed identified acceptable levels. Therefore, a literature review was conducted to identify appropriate vibration criteria related to sensitive laboratory equipment. As a result of that review, no criteria from national or international agencies were identified. In the absence of published national or international vibration criteria for sensitive microscopes, reliable and broadly applicable vibration criteria for sensitive equipment* are used in the analysis below. In the case of electron microscopes, the criteria are based on the need to limit vibrations of the image relative to the eye of the observer. Based on this consideration, 0.012 millimeter/second (500 microinch/second) is considered the criterion for electron microscopes at up to 30 000 X magnification and 6 micrometers/second (250 microinch/second) is the criteria for electron microscopes greater than 30,000 X magnification. Microscopes at the Beadle Center fit both descriptions. At 0.018 and 0.015 millimeters per second, the existing vibration levels measured in this building in 1998 already exceed these criteria of 0.012 and 0.006 millimeter per second. Although existing vibration levels measured exceed the criteria, there have been no known interruptions to research.

Vibration effects are assessed based on the maximum amplitude of vibration caused by a single event—from traffic or from other vibration-generating activities. When caused by

* As summarized by Eric E. Ungar in "Vibration Criteria for Sensitive Equipment" Proceedings of Inter-Noise, 1992, p. 737.

Figure 4.11

sources within or outside buildings, single event vibration effects on equipment operation are not additive and in that respect they are different from noise effects on human beings. Even if two or more vibration events occur at the same time, it is very unlikely that the vibration patterns will be exactly cohesive and perfectly in phase, which is a necessary condition for them to be additive. Therefore, ground-vibration effects are always assessed on a single event basis and the maximum vibration level produced by a single event is used in assessing vibration effects. This is exactly what the standard and criteria specify.

The number of vibration events in an hour is important from the point of view of annoyance to people. To minimize annoyance, vibration standards usually limit the total number of single event maximum vibration levels in a given period of time, say in one hour, to a certain number. This is especially the case with vibration levels from trains. Such standards do not exist for vibration levels from road vehicles. However, such standards set the limits they place on total number of vibration events are only applicable to psychological effects (or annoyance) on people and not physical effects on sensitive equipment. For sensitive equipment operation, the criteria are solely based on single event, maximum vibration level.

4.10.3 Impacts of Stormwater Management

Amended Draft Single Package. The stormwater management component of the Amended Draft Single Package would not affect vibration levels other than during construction. These impacts are discussed below under transportation improvements as well as in Section 4.26, Construction Impacts.

No-Action Alternative. The stormwater management component of the No-Action Alternative would not affect vibration levels.

4.10.4 Impacts of Transportation Improvements

Amended Draft Single Package. Potential long-term vibration impacts to the Beadle Center were analyzed with respect to three areas of potential impact, including:

- Damage to the Beadle Center building.
- Annoyance to Beadle Center occupants.
- Effects on sensitive Beadle Center equipment.

Vibration levels able to cause minor architectural damage are approximately five millimeters per second for non-historic structures. Typically, at a distance of 15 meters (50 feet), a heavy truck passing by creates a velocity level of 0.08 to 0.1 millimeter per second. As a result, traffic vibrations caused by vehicles on the North-South Roadway would not likely cause any damage to structures—even to structures that are closer than 15 meters (50 feet) such as the Beadle Center.

Traffic-induced vibration and its annoyance to people inside the Beadle Center were considered by comparing the maximum amplitude of vibration caused by a single vehicle. Typically, at distances greater than 15 meters (50 feet), vehicles generate vibration velocities less than the threshold of perception. This is predicted to be the case for the North-South Roadway.

Possibility of damage to the Beadle Center building and annoyance to its occupants would be given further study during final design. Factors that would *reduce* predicted ground-borne vibrations, such as discontinuities in the source-receptor path, floor-to-floor attenuation, and foundation details, would be considered in future analyses. These items

would be provided by more geotechnical investigations conducted during final design and would lead to a better understanding of future vibrations.

The potential vibration impact studied at the Beadle Center includes interference with the operation of sensitive electron microscopes. Since many of the prediction parameters are usually not determined until final design, predicted vibration velocities from the Antelope Valley roadways were conservatively estimated from a generally accepted rate of decrease with increasing distance from the roadway. It is conservatively predicted that maximum vibration levels would be on the order of 0.014 millimeters per second at the two microscope sites. This level is lower than the existing levels (0.018 and 0.015), and therefore is not likely to affect the operation of sensitive electron microscopes.

Short-term construction vibration impacts to the Beadle Center may occur during the operation of heavy construction equipment. Blasting, which is typically the most damaging aspect of construction, is not required to construct the Amended Draft Single Package. However, some pile driving is anticipated. Pile driving is a source of ground-borne vibration, and its velocity is dependent on the type of pile driving equipment used. Occupants of buildings within 60 meters (200 feet) from an impact pile driver may perceive ground vibration effects during operation of the equipment. All other construction equipment would generate much lower vibration levels than pile drivers, and vibration levels would not exceed impact thresholds, with the exception of the threshold established for the electron microscopes in the Beadle Center. Common vibration levels caused by the operation of construction equipment are presented in Appendix C.

No-Action Alternative. The transportation component of the No-Action Alternative would not affect existing vibration levels, which would remain on the order of 0.018 and 0.015 at the two sites measured.

4.10.5 Impacts of Community Revitalization Actions

Amended Draft Single Package. The community revitalization components of the Amended Draft Single Package would not affect vibration levels.

No-Action Alternative. The community revitalization components of the No-Action Alternative would not affect vibration levels.

4.10.6 Combined Impacts of the Actions

Long-term impacts of the Amended Draft Single Package and the No-Action Alternative would be similar. Existing vibration levels caused by building mechanical systems would continue to characterize the peak vibration levels, regardless of whether or not the Amended Draft Single Package roadways are constructed as shown in Table 4.18. There is no cumulative interaction among vibration signals.

Short-term impacts associated with the Amended Draft Single Package would occur as outlined in Section 4.10.4, above (e.g., sensitive electron microscope operations could be affected).

**Table 4.18
VIBRATION IMPACTS SUMMARY (Millimeters Per Second)**

| | Existing Monitored Levels | Criterion Levels | Predicted Maximum Single Event Vibration Levels from New Roadways | Existing Range of Maximum Single Event Vibration Levels |
|------------------------------|----------------------------------|-------------------------|--|--|
| Amended Draft Single Package | 0.015-0.018 | 0.012/0.006* | 0.014 | 0.015-0.018 |
| No-Action Alternative | 0.015-0.018 | 0.012/0.006* | N.A. | 0.015-0.018 |

*Depending on Magnification < > 30,000 times
Source: AV Study Team

4.10.7 Potential Impact Mitigation Measures

Amended Draft Single Package. Mitigation for long-term vibration impacts of vehicles operating on roadways often includes decreasing posted speed limits and restricting vehicle weight. In cases where future vibrations would exceed current levels, then the goal in mitigation is to return long-term conditions to existing conditions as closely as possible. No mitigation for long-term vibration impacts on sensitive equipment at the Beadle Center is necessary since levels caused by vehicles operating on the roadways would be *less* than existing levels. Monitoring during construction by the construction contractor would be carried out to avoid damage to the Beadle Center or annoyance to its occupants. If the microscope manufacturer determines that existing conditions in the building warrant mitigation, then it is incumbent upon the manufacturer to identify appropriate mounting structures and procedures for sensitive equipment and test them. Additional information is contained in the Technical Memorandum contained in Appendix C and in preliminary research summaries for the Beadle Center contained in Appendix G.

Mitigation for short-term impacts of construction equipment includes careful consideration of the benefits of sonic and impact pile drivers, the inclusion of vibration specifications in construction contracts, and vibration monitoring during the construction period to see that levels remain within acceptable ranges. In addition, early coordination with Beadle Center researchers would be necessary to allow adequate warning prior to construction interruptions to the operation of electron microscopes. This would involve a set of specifications agreed upon by the Beadle Center, the Partners, and contractor outlining procedures/policies for when pile driving may/may not occur.

No-Action Alternative. No vibration impact mitigation is required for the No-Action Alternative.

4.11 Lighting

4.11.1 Baseline Environmental Conditions

Potential lighting impacts were assessed within the study area. Since street lights are already provided throughout much of the area, lighting included as part of the roadways is

generally not incompatible with existing conditions. More study of potential impacts was concentrated at the Beadle Center, where plant research is conducted at a greenhouse complex just south of the main building.

Lighting sources around the Beadle Center greenhouse complex consist of the Beadle Center parking lot to the south, exterior lighting on the Beadle Center to the north, exterior lighting on the Malone Center to the east, and a UNL parking lot to the south and west. The nearest existing light source is the Beadle Center parking lot.

Based on lighting location, type, and height, the Beadle Center parking lot currently has the greatest light impact on the greenhouse complex. A point-by-point lighting analysis (see Impact Assessment Methodology below) indicates the current maximum light intensity from the parking lot occurs at the south edge of the greenhouse complex at 1.1 lux (0.11 footcandle). This light level currently is considered acceptable to those conducting plant research at the Beadle Center.

4.11.2 Impact Assessment Methodology

Modeling existing lighting from the Beadle Center parking lot and the roadway east of the greenhouse complex has assessed roadway lighting impacts. The computer model used for the assessment is Genesis.

Roadway lighting design has not been completed, so the assessment simulates the brightest potential lighting conditions by using the maximum typical roadway light intensity and “worst-case” light fixture locations. Under the modeled scenario, the roadway would be illuminated to 12 lux (1.2 footcandles) (average maintained), which is the recommended luminance for a major roadway in a commercial area. It is also the highest recommended luminance value for *any* roadway. A roadway lighting fixture was placed directly east of the greenhouse complex in the model to maximize the light effect on the structure. No fixture side-light shields (for minimizing spill light behind the fixture) were modeled. These “worst-case” conditions are meant to give a conservative estimate of potential light levels incident on the greenhouse complex. Vehicles can also be a light source. Therefore, vehicle light characteristics and roadway geometry were also assessed.

4.11.3 Impacts of Stormwater Management

Amended Draft Single Package. Stormwater management would have no lighting impact on the greenhouse complex.

No-Action Alternative. The No-Action Alternative would have no lighting impact on the greenhouse complex.

4.11.4 Impacts of Transportation Improvements

Amended Draft Single Package Impacts. The modeled impact on the greenhouse complex from both the roadway lighting and the parking lot is illustrated in Figure 4.12. The highest combined light level is 3 lux (0.30 footcandle) at the southeast corner of the greenhouse building. For comparison, 10 lux (1 footcandle) average is the minimum illumination level required along the path of emergency egress (such as an emergency fire exit) by the National Fire Protection Association. The levels incident on the greenhouse complex, therefore, are far below this.

Vehicle lights are designed such that lights illuminate the area in front of the vehicle while minimizing side spill light. The north-south orientation of the roadway dictates that vehicles would either point parallel to or away from the greenhouse complex. In addition, the period in which vehicles would require headlights is at night, during lowest traffic levels. Consequently, no light impacts are anticipated as a result of vehicles traveling on the North-South Roadway.

No-Action Alternative. The No-Action Alternative would have no lighting impact on the greenhouse complex. Ambient nighttime light levels would continue to be influenced by the adjacent parking lot.

4.11.5 Impacts of Community Revitalization Actions

Amended Draft Single Package. Community revitalization would have no lighting impact on the greenhouse complex.

No-Action Alternative. The No-Action Alternative would have no lighting impact on the greenhouse complex.

4.11.6 Combined Impacts of the Actions

Combined impacts are similar to those discussed under Section 4.11.4.

4.11.7 Potential Impact Mitigation Measures

Street lighting mitigation measures, if necessary, would consist of house side-shields placed on the light fixtures. These features block most spill light behind the fixture. Fixtures on the opposite side of the roadway (i.e., northbound lanes) facing the greenhouse complex have no measurable contribution at the edge of the greenhouse complex. Therefore, side-shields would be placed on lights for the southbound lanes only. Using this mitigation measure would maintain light levels close to ambient conditions.

Fixture placement also impacts lighting levels at the edge of the greenhouse complex. Fixture spacing would be in the range of 49 to 55 meters (160 to 180 feet). Locating fixtures such that they span the greenhouse complex versus being placed directly in front of the greenhouse complex as modeled, would minimize the lighting level at the edge of the complex.

Installing roadway shielding, such as hedges, between the roadway and the greenhouse complex would further reduce vehicle light impacts. To effectively shield fixture light, the hedges would need to be tall enough to at least break the line of sight between the greenhouse complex and the light fixtures. However, vegetation is recommended to shield any side spill light. Such vegetation is also recommended to alleviate air quality concerns.

Based on the minimal increase in light levels due to stationary lighting, the available light shielding measures, and the manufacturer's specifications for shield efficiency, no net increase in lighting levels would occur from the stationary roadway lighting. Roadway landscaping would create an appropriate barrier for stray vehicle lighting.

Figure 4.12

4.12 Wetlands

4.12.1 Affected Environment

Because the study is in an urban setting, there are few wetlands remaining. The US Fish and Wildlife Service's (FWS) National Wetland Inventory (NWI) (1992), Interagency Resource Categorization of Nebraska's Saline Wetlands (Gilbert and Stutheit, 1994), and Farm Services Agency Land Classification Maps show that the main wetland areas in the study area are:

1. riverine wetlands along Salt Creek, a channeled stream,
2. wooded linear wetlands along small tributary drainages,
3. man-made ditch wetlands along various roads and railroads,
4. farmed wetlands and drainage ditches in farm ground north of Cornhusker Highway and south of Salt Creek, and
5. isolated freshwater and saline wetlands in the vicinity of the old Chicago & North Western Railway (C&NW RR) between Leighton Avenue and Superior Street.

Antelope Creek and Dead Mans Run have been channeled, and are generally either concrete or gabion-lined, or piped underground through the study area. They have no associated wetlands.

4.12.2 Impact Assessment Methodology

Wetlands in the study area were delineated in May and September 1998 (see *Wetland Delineation Report*). The field survey included all potential wetland areas and stream crossings that have the potential to be affected by the Amended Draft Single Package. The delineated wetlands and sampling locations are shown in Appendix I, Sheets 7 through 11. Routine On-Site Wetland Determination data forms were used to document the presence of wetland hydrology, hydric soils, and hydrophytic vegetation according to guidelines established by the Corps and described in the 1987 Wetland Delineation Manual. Wetland classification on the data forms is according to Cowardin, *et al.* (1979).

4.12.3 Impacts of Stormwater Management

Amended Draft Single Package. There would be no wetland impacts from the Amended Draft Single Package stormwater management components.

No-Action Alternative. There are no wetland impacts associated with the No-Action Alternative.

4.12.4 Impacts of the Transportation Improvements

Amended Draft Single Package. Based on the conceptual design (which does not include any additional ROW for cut or fill sections), an estimated 0.34 hectare (0.84 acre) of wetlands would be impacted by the transportation component of the Amended Draft Single Package. However, only 0.23 hectare (0.58 acre) of wetlands is likely to be jurisdictional under Section 404. Most of the impacted wetlands are road, railroad, or agricultural ditches. All of the impacted wetlands are Category IV freshwater wetlands on non-saline soils. Additional information is provided in the *Wetland Delineation Report* and Table 4.19.

At the time of preliminary design, wetland impacts would need to be reassessed based on limits of construction of the final roadway alignments.

The Amended Draft Single Package would require a Section 404 permit from the Corps for wetland fill activities. The permit application package would include a conceptual mitigation plan.

No-Action Alternative. The No-Action Alternative would avoid impacting any wetlands, and would avoid the expense of mitigating wetland impacts.

4.12.5 Impacts of Community Revitalization

Amended Draft Single Package. There would be no wetland impacts from the Amended Draft Single Package community revitalization components.

No-Action Alternative. There are no wetland impacts associated with the No-Action Alternative.

4.12.6 Combined Impacts of the Alternatives

Amended Draft Single Package. The combined wetlands impacts and permit requirements of the Amended Draft Single Package would be the same as the impacts of the transportation improvements (See Section 4.12.4).

4.12.7 Impact Mitigation Measures

The Partners propose to mitigate wetland impacts following requirements and guidelines of the Corps and NDEQ*. Impacts would be handled as follows:

Road and bridge crossings with no more than 60 linear meters (200 linear feet) of fill in waters of the United States or with 0.13 hectare (1/3 acre) of wetland impacts would be handled under Nationwide Permit (NWP) 14, which does not require mitigation. It is expected that there would be few (if any) crossings that would not fall under NWP 14—even the Salt Creek bridge appears to fall under the 60-meter (200-feet) limit.

Based on current information, there is only one jurisdictional wetland/ditch crossing that exceeds the (0.13-hectare) 1/3-acre maximum. Since that crossing impact is 0.15 hectare (0.36 acre) and is not on saline soils, it may fall under NWP 14 if the proposed changes are approved to increase the maximum area to 0.4 or 0.8 hectare (1 or 2 acres) for public projects. All jurisdictional impacts that do not fall under NWP 14 would be handled under one Individual Permit due to the overriding requirement for the channel improvements associated with the stormwater component. Under the current Corps program, mitigation is required for all impacts above 0.04 hectare (0.10 acre).

- To the extent possible, riverine and ditch wetland crossings requiring greater than 0.13 hectare (1/3 acre) of wetland impacts would be mitigated in-place and in-kind in the vicinity of each crossing. Currently, there is only one ditch wetland requiring any type of mitigation (see above).
- Any other impacts (none are present) would be mitigated at a wetland mitigation site.
- Freshwater wetlands would be mitigated at a 1.5:1 replacement-to-loss ratio, assuming in-kind replacement. If freshwater impacts are mitigated with higher value saline wetlands, this ratio would vary depending on the plant community association.

* Corps and NDEQ regulations are in English units. Metric conversions are provided for document consistency.

**Table 4.19
WETLAND IMPACTS**

| Location | Site No. | Waters of the US | Existing Channel Type | Wetland Impacts & Wetland Category | Jurisdictional Under 404 | Amended Draft Single Package | | | No-Action Alternative Impacts |
|--|----------|------------------|---|------------------------------------|--------------------------|------------------------------|------------------------|----------------------------------|-------------------------------|
| | | | | | | Storm-water Impacts | Transportation Impacts | Community Revitalization Impacts | |
| East-West Roadway: BNSF Railroad Ditches | 12, 13 | No | Earth bottom with naturalized vegetation | 0.01 ha (0.03 ac) Category IV | No | No | Yes | No | No |
| East-West Roadway: State Fair Park Drive Ditch | 11, 14 | No | Earth bottom with naturalized vegetation | 0.004 ha (0.01 ac) Category IV | No | No | Yes | No | No |
| East-West Roadway: Former C&NW RR Ditch East of State Fair Park Drive (now stormwater) | 15, 22 | No | Earth bottom with naturalized vegetation | 0.09 ha (0.22 ac) Category IV | No | No | Yes | No | No |
| East-West Roadway: Agricultural Ditches at Northgate Park, Inc. | 7, 8 | Yes | Earth bottom with naturalized and native vegetation | 0.19 ha (0.46 ac) Category IV | 0.19 ha (0.46 ac) | No | Yes | No | No |
| East-West Roadway: Agricultural Ditch on Miller Seed Company | 23 | No | Earth bottom with weedy annual vegetation | 0.05 ha (0.12 ac) Category IV | 0.05 ha (0.12 ac) | No | Yes | No | No |
| Total Wetland Impacts | - | - | - | 0.34 ha (0.84 ac) | 0.24 ha (0.58 ac) | - | - | - | - |

Source: AV Study Team.

Based on current information, the only mitigation that would be required for the Amended Draft Single Package would be 0.22 hectare (0.54 acre) of freshwater ditch wetlands created in-place in the vicinity of North 33rd Street, south of the Salt Creek channel. This represents a 1.5:1 replacement ratio.

If additional mitigation would be required, five locations adjacent to the Amended Draft Single Package East-West Roadway alignment would be investigated for mitigation sites; all appear to be feasible. The five candidate sites are located in Section 7, Township 10 North, Range 7 East generally in the vicinity of the former C&NW RR embankment (see Appendix I, Sheet 11). All but one of the sites has both saline and non-saline hydric soil types. Most of the sites have existing wetlands that could be expanded once hydrologic and land use practices have been corrected; the others are farmed wetlands that can be restored.

Mitigation construction would follow practices that have been successful at other nearby sites. These would likely include modification of surface drain systems, construction of low embankments, and installation of water level control structures. Following construction, the mitigation site would be monitored for a period of three years, or until successful

establishment has been demonstrated. Long-term management of the site would be handled by LPSNRD. The LPSNRD employs experienced resource managers, and currently manages several other wetland sites as public natural areas.

4.12.8 Compliance with Executive Order 11990, Protection of Wetlands

The Amended Draft Single Package stormwater management component, by definition, must be located in the Antelope Valley floodplain to reduce the area of the floodplain. The roadway component, by definition, must provide arterial connectors in both north-south and east-west directions, thereby requiring new bridges across Dead Mans Run and Salt Creek. Although few wetlands remain in the study area and wetlands have been avoided to the extent possible, the Amended Draft Single Package would unavoidably impact some existing wetlands because of these floodplain locations. Alternatives to the Amended Draft Single Package were evaluated (see Chapter 2), but were determined to be unacceptable during the screening process and to have greater social, economic and/or environmental impacts. With the wetland mitigation, the Amended Draft Single Package would conform to existing State (NDEQ) requirements for mitigation of wetland impacts. Since most of the impacted wetlands are located in drainage ditches and agricultural fields and since these wetlands would be mitigated in-kind (or better) at accepted replacement-to-loss ratios, there would be minimal impact on the functions and values of wetlands in the area.

4.13 Floodplains

4.13.1 Baseline Environmental Conditions

There are three waterways located within the study area, including Antelope Creek, Dead Mans Run, and Salt Creek. The affected floodplains* of each of these waterways are described below.

Antelope Creek. Antelope Creek is a straightened drainage channel traversing through an urbanized area of Lincoln, between Holmes Lake Dam and its confluence with Salt Creek. It has a drainage area of 19.2 square kilometers (7.4 square miles) below Holmes Lake Dam, with no flood control measures. As a result, a large portion of the area along the creek downstream from Holmes Lake is within the 100-year floodplain as shown on Figure 1.2.

Typically, precipitation events in Lincoln are intense, short duration thunderstorms. As a result, Antelope Creek is subject to rapid flooding following major rainfall events. During the past 30 years, several channel improvement projects were undertaken to primarily stabilize streambanks, with little improvement in channel capacity. These improvements had little effect in reducing flood damage.

A major feature of Antelope Creek is a twin, 2.4-meter by 2.7-meter (8.0-foot by 9.0-foot) concrete conduit extending from N to Vine Streets, for a total length of 1 250 meters (4,100 feet). This conduit is more than 80 years old, and was rehabilitated in 1994. It has a hydraulic capacity of approximately the four-year storm event and causes severe flooding during occurrences of greater storm events. The area has not been subjected to major flooding since completion of Holmes Lake Dam, although a relatively minor flood did occur

* All references to the 100-year floodplain means as designated by Federal Emergency Management Agency in its most recent flood study of the subject waterways.

in September 1989. During this flood, the water level reached the top of the conduit and flooded Antelope Park/Lewis Field's softball diamonds and surrounding areas, including N Street between 21st and 23rd Streets. The 1989 flood of Antelope Creek caused only minor damages, and is estimated to have a return period of five to seven years.

The 38th Street and South Street bridges, which are hydraulically undersized, impede stormwater conveyance during major storm events. The estimated capacity of the 38th Street Bridge is equivalent to approximately the 10-year event.

Presently, Antelope Creek's 100-year floodplain below Holmes Lake Dam has an approximate average width of 460 meters (1,500 feet), and covers a total area of 238 hectares (588 acres). A total of 1,297 structures, and a population of 1,852 would potentially be affected by the 100-year flood event. This discussion covers the entire Antelope Creek reach from the Holmes Dam to Salt Creek, whereas other sections of this EIS refer to 835 structures in the study area. Of the 1,297 structures, 961 are residential, 200 are commercial, 81 are industrial, 34 are public, and 21 are located in parks/open spaces. The majority of these structures are within the study area. Additionally, public facilities such as roads, bridges, and utilities would be subjected to potential damage by the 100-year flood event. The estimated damage from the 100-year flood exceeds \$20 million, with the very real potential for loss of life. Antelope Creek flooding is, indeed, a serious concern. Figure 1.2 shows Antelope Creek's floodway and floodway fringe based on the City of Lincoln's Flood Insurance Study (Federal Emergency Management Agency [FEMA] 1997).

In the 100-year storm event, the most severe flooding damage along Antelope Creek would occur between N and Vine Streets because of the limited hydraulic capacity of the existing conduit. The predominant land uses in this area are commercial and residential. These properties are subjected to high flood insurance premiums, and the potential for development and redevelopment is greatly limited by the flood hazard and floodplain regulations. Downstream from the conduit outlet, Antelope Creek has an open channel and traverses through the UNL City Campus and along the State Fair Park. The 100-year flood event covers approximately 20 hectares (50 acres) of the UNL City Campus. Future UNL development in this area is, therefore, limited.

Salt Creek & Dead Mans Run. The 100-year floodplains of Salt Creek, from 10th to Superior Streets, and Dead Mans Run, from Huntington Avenue to near its confluence with Salt Creek, are also located within the study area. Figure 4.13 shows the Salt Creek and Dead Mans Run floodways and floodplains, as delineated by FEMA. Generally, Salt Creek's 100-year floodplain is approximately 1,070 meters (3,500 feet) wide. The floodplain south of Salt Creek extends to near the BNSF Railroad tracks, approximately 760 meters (2,500 feet). Currently, there are a number of residential, commercial, and industrial buildings, as well as roadways and utilities, within the floodway fringes of Salt Creek and Dead Mans Run.

Floodway/Floodway Fringe. For the most part, all three streams have established floodways and floodway fringes within the study area. The exception to this is Antelope Creek between N and Vine Streets. The concept of floodway or floodway fringe is used to regulate encroachment (development) within the floodplain. A floodway consists of a channel and a portion of the adjacent floodplain areas required to convey the post-development (within the floodplain) 100-year flood discharge with no more than 0.3 meter (1 foot) increase in the pre-development 100-year flood elevation. Floodway fringe is defined as the area between the limits of the floodway and the 100-year floodplain. In essence, once

a floodway is established for a stream, theoretically the entire floodway fringe may be developed in most cases.

The implication of the above regulatory guideline between N and Vine Streets, where there is no defined floodway, is that the cumulative rise in the base flood elevation as a result of any new development (or redevelopment) must be less than 0.3 meter (1 foot). This can present limitations for future development depending upon the level of rise in the base flood elevation and restrictions imposed by previous developments in the area since the time of the adoption of the floodplain ordinance.

Salt Creek's floodway, as shown on Figure 4.13, is confined to the channel and levee system within the study area. However, establishment of the floodway was based on the continued availability of storage volume within the floodway fringe for the storage of floodwater (FEMA 1997). As a result, not all the floodway fringe may be developed and certain portions of the floodway fringe should be preserved for storage of the 100-year flood based on the City's proposed floodplain regulations.

National Flood Insurance Program. The City of Lincoln participates in the National Flood Insurance Program (NFIP). Generally, the City's floodplain management ordinance places higher restrictions on development than the minimum federal regulatory standards for areas having established floodways. New buildings (roadways, utilities, etc. are excluded) within floodway fringes must include a 0.3-meter (1-foot) freeboard. New developments in Special Flood Hazard Areas (SFHA, unnumbered A Zones) with no regulatory floodway, may not cause more than 0.3-meter (1-foot) of rise in the base flood elevation. The ordinance is designed to protect the public health and welfare and to meet the requirements of the NFIP. Currently, the City of Lincoln and the LPSNRD are evaluating a more stringent floodplain ordinance for the entire City (and Lancaster County) to protect infrastructure and properties within the floodway fringe. Some of the concepts being discussed include provisions for no net loss of floodplain storage, and no net rise of base flood elevation within the floodway fringe/floodplain. These provisions are contemplated, in part, for the purpose of uniform county-wide floodplain management.

Corps Feasibility Study. The Corps conducted a concurrent Feasibility Study of Antelope Creek. Along with this EIS, it is a parallel, cooperative study identifying an economically feasible flood management solution according to the Corps' economic analysis and funding program requirements. The outcomes of the two studies result in a merged flood management approach for Antelope Creek. The focus of the Corps' investigation is also on the portion of the creek from approximately 38th Street to its confluence with Salt Creek. The Corps' study assesses the existing flood risk, and evaluates potential alternatives to reduce flooding damages by comparing capital, operational, and maintenance costs with benefits accrued over a 50-year period of analysis. This study is similarly sponsored by the LPSNRD, the City of Lincoln, and the University of Nebraska, with the goal of identifying economically beneficial National Economic Development (NED) improvements consistent with Corps' standards to qualify any project for Federal Water Resource Development Act funding. A Draft Feasibility Report and Draft Environmental Assessment is complete (which is incorporated by reference in this EIS).

Figure 4.13

4.13.2 Impact Assessment Methodology

Impacts of the Amended Draft Single Package. Impacts of the Amended Draft Single Package on the floodplains of affected streams were evaluated by overlaying the Flood Boundary and Floodway Map of the study area (FEMA 1997; Community-Panel Number 315273 0025) on the study area base map. The respective impacts of the alternatives on the floodplain and floodway of Antelope Creek, Salt Creek, and Dead Mans Run were then identified and assessed. The stormwater management component would reduce and narrow the Antelope Creek floodplain from approximately A Street to the BNSF Railroad tracks, resulting in less population, properties, and infrastructure in the floodplain. The affected population, properties, and infrastructure were quantified in a separate study document based on data obtained from the Lancaster County Assessor, City of Lincoln Planning Department, the Corps, and the 1990 US Census of Population and Housing (AV MIS 1997). Impacts of the transportation improvements to the floodplain were assessed based on the plans for the roadways and their corresponding rights-of-way.

4.13.3 Impacts of Stormwater Management

Amended Draft Single Package. Stormwater management would have positive long-term impacts on the community. Narrowing and containing the 100-year floodplain and delineating the new floodway along Antelope Creek would reduce the risk of flooding and flood hazards. The area that would be removed from the 100-year floodplain of Antelope Creek extends from near A Street in the south, to the BNSF Railroad tracks in the north as shown on Figure 4.14. Direct impacts on structures and areas, by land use, along the channel corridor are tabulated below (Table 4.20). The stormwater management improvements would result in an estimated 1,200 fewer persons living in the 100-year floodplain of Antelope Creek.

Positive impacts of stormwater management would also include the potential for multi-use, diverse development and redevelopment opportunities within the areas currently located in the 100-year floodplain, an area of approximately 166 hectares (409 acres). Similarly, it allows a portion of the transportation improvements (beginning west of Trago Park and continuing north to the State Fair Park) to be constructed within a common corridor and outside the 100-year floodplain. The Amended Draft Single Package would thus complement the transportation and community revitalization components.

**Table 4.20
STRUCTURES AND AREAS NO LONGER WITHIN
THE 100-YEAR FLOODPLAIN BY LAND USE***

| Impact Category | LAND USE | | | | | Total |
|------------------------|-------------------|-------------------|-------------------------|---------------|--------------------|--------------|
| | Commercial | Industrial | Parks/Open Space | Public | Residential | |
| Structures, No. | 150 | 81 | 16 | 30 | 558 | 835 |
| Area, ha (acre) | 32 (80) | 31 (77) | 28 (69) | 30 (73) | 45 (110) | 166 (409) |

Source: AV MIS, *100-Year Flood Area Analysis*, 1997.

*From A Street to BNSF Railroad Tracks

Figure 4.14

The design of the channel would be based on soft engineering approaches, which incorporate non-traditional engineering approaches and natural materials. The channel would be vegetated and landscaped, and integrated into the City's trail system to maximize visual, aesthetic, cultural, recreational, and business opportunities in the Downtown and neighboring areas. Removal of the 100-year floodplain from the UNL City Campus would also promote development opportunities there.

Without stormwater management, the economic impacts would be major. Damage reduction associated with just the 100-year flood event is estimated to be more than \$20 million. In addition to the \$20 million in estimated damages from the 100-year storm, costs associated with lesser storms would also accrue through time. For instance, over the course of 100 years, two 50-year storms and four 25-year storms would occur on average. These storms would have major damages as well, bringing the total cost of flooding to well over the \$20 million figure.

There are a number of other benefits as well. The channel would reduce risk to human life during a major storm. The green space provided would reduce the impact of visually intrusive concrete and steel infrastructure common to an urban setting, and would provide an aesthetically pleasing buffer to area neighborhoods. In fact, the channel would restore some of the natural and beneficial values that have been lost due to the construction of the conduit and concrete lining of the channel. The low flow channel or water feature at the bottom of the channel would environmentally and aesthetically function as a perennial stream. The hiking and biking trail system integrated with the channel would provide recreational opportunities. The new channel would offer opportunities for people to congregate.

Removing the 38th Street bridge and replacing the South Street bridge would reduce flood hazards and provide more protection to residential, commercial, and public properties and facilities. Design of the bridges and conduits downstream from J Street would be based on total conveyance of the 100-year flood event with freeboard (i.e., the vertical distance between the maximum water surface elevation and top of the damming impediment). This would result in containing the floodway within the channel. Therefore, bridges and conduits would not cause the 100-year flood to be spread to overbank areas. Construction of the channel and bridges would require floodplain and environmental (Section 404 of the Clean Water Act) permits from the City of Lincoln and the Corps, respectively. Additionally, construction of the channel would require a National Pollutant Discharge Elimination System (NPDES) permit from NDEQ. Overall, design and construction of the stormwater management components must be in compliance with applicable local, state, and federal regulatory requirements.

Other issues related to stormwater management include:

- **Mosquitoes.** As discussed in Section 4.16.3, the low flow channel would be designed primarily to enhance aesthetic qualities, with ample base flow to maintain continuous flows within the channel (which is the normal condition, today). As it does upstream in Antelope Creek, moving water will minimize mosquitoes.
- **Existing Conduit.** The existing conduit is an integral component of the stormwater management of Antelope Creek, and would be utilized in concert with the channel. A base flow along the constructed channel would be maintained, and the conduit would be used to convey minor storm events up to the two year frequency before storm run-off

from up stream would divert into the channel. This scheme would offer an aesthetically pleasing channel with minimal maintenance expenses associated with the clean up of frequent storm events, and continued frequent use of the conduit. Maintenance costs for the channel are included in the economic evaluation within the Corps' study as discussed in Economic Impacts. It would continue to use the recent investments made by the City and LPSNRD for rehabilitation of the conduit. Functional performance of the conduit and the channel would be addressed during final design.

With its recent structural rehabilitation, the conduit is expected to function adequately for another 50 years or more. In the event of its failure, several options would be evaluated to restore sufficient capacity for conveyance of the 100-year flood event. These options include reconfiguration of the channel's cross-section to increase flow area (re-configuring and re-landscaping), rehabilitation of the conduit, or construction of another conduit.

- **Downstream Effects.** Channeling Antelope Creek would result in an increase in peak runoff and a decrease in travel time for storm events larger than the four-year event (i.e., current conduit flows). The peak runoff increases, primarily from Vine Street to Salt Creek, since peak runoff reaching the conduit would be conveyed through the channel rather than spread over the floodplain. However, the impact of this change on Salt Creek would be insignificant since Antelope Creek's 19.2 square kilometer (7.4 square mile) drainage area is less than three percent of Salt Creek's 750 square kilometer (290 square mile) drainage area. During a runoff event, peak flow from Antelope Creek reaches Salt Creek, which is still rising. Because the magnitude of Antelope Creek's peak flow is much smaller than Salt Creek's, the net impact is insignificant. To better illustrate this impact, consider the contribution of Antelope Creek on peak flows of Salt Creek. The FEMA-computed (FEMA 1997) 100-year peak discharges of Salt Creek just downstream and just upstream of Antelope Creek are 1 020 cubic meters per second (36,000 cubic feet per second) and 1 017 cubic meters per second (35,900 cubic feet per second), respectively. The peak flows of Salt Creek occur during the recession of Antelope Creek's flows. Antelope Creek's contribution to Salt Creek's 100-year flood event is 0.3 percent.
- **Salt Creek Impacts.** According to the City's Flood Insurance Study (FEMA 1997), Salt Creek's 100-year flood elevation at the Antelope Creek confluence is 349.8 meters (1,147.8 feet) above mean sea level. When Salt Creek is experiencing A 100-year flood event and when there is no runoff in Antelope Creek, the resulting water surface elevation would extend along Antelope Creek (and the conduit) to approximately N Street. Under this scenario, overbank flooding from Salt Creek backwater would occur along Antelope Creek from the mouth to areas in the vicinity of BNSF Railroad tracks. In the very unlikely event of both Salt Creek and Antelope Creek experiencing the coincidental 100-year event, the channel would be overtopped from the mouth to areas in the vicinity of Vine Street. The approximate width and depth of overbank flooding would remain the same as pre-construction conditions. The general conclusion drawn is that Salt Creek's 100-year flood event has a large influence on the hydraulic performance of Antelope Creek (and its other tributaries), irrespective of Antelope Creek's flow. Salt Creek's drainage area is considerably larger than Antelope Creek's; thus, the large magnitude flood events experienced by Salt Creek would be translated along the

tributaries resulting in bank flooding in the vicinity of their mouths irrespective of tributary improvement projects

- **Economic impacts.** Economic evaluation of the stormwater management is in progress as part of the Corps' Feasibility Study of Antelope Creek. Preliminary evaluations by the Corps have estimated that with existing conditions, damage resulting from one 100-year event would exceed \$20 million, and that annualized damages from all frequencies of storm events are approximately \$4 million. Preliminary results from the evaluation also indicate a probability that benefits of the stormwater management improvements will exceed the costs.

No-Action Alternative.

- A total of 238 hectares (588 acres) would remain in the 100-year floodplain, which severely limits the potential for development and redevelopment. This area includes approximately 20 hectares (50 acres) of the UNL City Campus.
- The restricted capacity of the Antelope Creek conduit would continue to pose a threat of flooding that would damage residential and commercial buildings, public facilities, and other infrastructure within the floodplain. The Corps' estimated damage from the 100-year flood event would exceed \$20 million, with potential loss of human lives.
- Insufficient flow capacity at the 38th Street and South Street bridges over Antelope Creek would continue to be an impediment to safe conveyance of flood flows, resulting in flooding of residential and commercial areas in the vicinity.
- There would be no green space, trail systems, aesthetically pleasing landscaped features, or cultural/recreational opportunities along Antelope Creek.
- Structural stability of the Antelope Creek channel downstream from the conduit outlet (north of Vine Street) to Court Street would remain marginal, with the potential for continued repair and major maintenance projects similar to those incurred in 1989.

4.13.4 Impacts of Transportation Improvements

Amended Draft Single Package. The evaluation of transportation improvement impacts on floodplains is based on the assumption that the Antelope Creek stormwater management component would be in place or constructed concurrently. Overall, the transportation improvements would have varying impacts on commercial, residential, and public structures within the floodplain of Antelope Creek, Dead Mans Run, and Salt Creek. For example:

- Impacts would be negligible along Antelope Creek where the 100-year floodplain would be contained within the channel, and bridge crossings would be designed such that there are no, or minimal, backwater effects on the 100-year flood profile.
- Impacts of the roadway in the vicinity of, and parallel to, the BNSF Railroad tracks on Salt Creek's floodplain would be minimal because it is located on the fringe of the 100-year floodplain and the roadway is parallel to direction of flow
- The roadway segments crossing the floodplain and floodway of Salt Creek and Dead Mans Run would have more impacts because the roadways are nearly perpendicular to direction flow (roadway embankments would act like dams).

- The transportation improvements must comply with the City's floodplain ordinance. In areas where impacts would be major, mitigative measures would be provided.

The North-South Roadway would be outside Antelope Creek's 100-year floodplain because the new channel, along with the existing conduit, would convey the 100-year flood event. This roadway would have several bridges crossing the new channel of Antelope Creek at N, O, Q, Vine, and Y Streets; and at the west entrance to the State Fair Park. These bridges would not create an encroachment upon the floodplain (which is confined to the floodway in this case) of Antelope Creek, would not pose large risk to human life, and would not cause probable future property damage with large repair costs. However, the approach sections of the bridge crossing Antelope Creek at the west entrance to State Fair Park would be partially located in Salt Creek's 100-year floodplain.

Another section of the transportation improvements involves modifying Military Road and the west entrance to the State Fair Park. This would impact approximately 880 meters (2,900 feet) of Salt Creek's 100-year floodplain, with a 36.6 meter (120-foot) ROW (which is *currently* ROW).

In the East-West Roadway section from Avery Avenue to 21st Street, the new roadway would be outside the 100-year floodplain, resulting in no floodplain impacts. From 21st Street to near Theresa Street, the new roadway is on the fringe of Salt Creek's 100-year floodplain. The total length of the roadway in the 100-year floodplain is approximately 1 280 meters (4,200 feet), having a 36.6-meter (120-foot) ROW. However, considering that the roadway runs parallel to the Salt Creek floodplain in this area with an average width of 1 070 meters (3,500 feet), the floodplain impacts would be minor.

From near Theresa Street, the new roadway would continue in a northeasterly direction with a 36.6-meter (120-foot) ROW, crossing the 100-year floodplain and floodway of Dead Mans Run, and Salt Creek. From near Theresa Street to Cornhusker Highway, the length of the new roadway within Dead Mans Run 100-year left floodplain would be approximately 280 meters (920 feet). From Cornhusker Highway to Superior Street, the approximate length of the roadway crossing Salt Creek's floodplains (left and right) and floodway would be approximately 1 800 meters (5,900 feet).

Bridges crossing Dead Mans Run and Salt Creek would be designed such that there would be no net rise in the floodway's base flood elevation compared to existing conditions. The level of floodplain impacts associated with this segment of the roadway would depend on the City's governing floodplain ordinance at the time of design and construction. Both Dead Mans Run and Salt Creek have delineated floodways, and fill may be placed in the 100-year floodplain/floodway fringe of these waterways without the need for compensatory storage or conveyance measures under the City's current floodplain management requirements.

However, as discussed earlier, if the City adopts a more stringent policy of no net loss of storage and no rise of the base flood elevation within the 100-year floodplain, then the corresponding impacts would be greater. The new roadway would cross the entire floodplain, functioning as a low-head dam (with a nearly 1.0-meter [3.3-foot] high roadway embankment). Under either scenario, appropriate mitigation measures would be provided as discussed in Section 4.13.7.

The LPSNRD is responsible for maintaining levees along Salt Creek. The roadway bridge crossing Salt Creek would be designed to accommodate maintenance vehicles passing underneath the bridge along the levee.

The roadways connecting to 33rd Street proceed from the East-West Roadway in a southeasterly direction, under the BNSF Railroad mainline track. This segment is not within a floodplain. From the BNSF Railroad track, it runs south of, and parallel to, the track for approximately 490 meters (1,600 feet) within the 100-year floodplain of Dead Mans Run, with a 30-meter (100-foot) ROW. After crossing the Dead Mans Run floodway, it proceeds to Adams Street outside of the 100-year floodplain. Another roadway in this segment connects Baldwin to Huntington Avenues within the Dead Mans Run 100-year floodplain. The impacted length would be approximately 300 meters (1,000 feet).

No-Action Alternative. The No-Action Alternative's transportation impacts would not affect the floodplain, and conditions would be similar to the baseline conditions.

4.13.5 Impacts of Community Revitalization Actions

Amended Draft Single Package. The stormwater management component of the Amended Draft Single Package would reduce the 100-year floodplain of Antelope Creek into the channel from near A Street to BNSF Railroad tracks. Stormwater management would be constructed in the first phase once the Amended Draft Single Package becomes a project. As a result of this timing, the various elements of the community revitalization actions of the Amended Draft Single Package in the Downtown area would take place outside Antelope Creek's designated 100-year floodplain, resulting in no floodplain impacts.

The 100-year floodplain of Salt Creek would affect two of the five community revitalization components, including trail continuity and health and human services. In addition, trails would cross the floodway. The Salt Creek and Dead Mans Run floodplains would include 3 475 meters (11,400 feet) of bike trail, and 7.0 hectares (17.4 acres) of parkland. In addition, there would be 2 560 meters (8,400 feet) of new trail along the Antelope Creek stormwater management channel. Of the wrap-around centers, only the National Guard Armory/Indian Center is located within the Salt Creek floodplain. These impacts are shown in Figure 4.15.

Both the existing and new trails and the park are considered compatible and prudent uses of land within floodplains. All construction within the floodplain would meet requirements of the City's Floodplain Ordinance. Similarly, these concepts must not involve features with irreversible or incompatible development in the 100-year floodplain. Therefore, the community revitalization elements would be allowed to impact floodplains no more than the extent allowed by regulations. If necessary, appropriate mitigative measures would be incorporated to satisfy regulatory compliance.

No-Action Alternative. The impact of the No-Action Alternative would be similar to the baseline conditions, and the majority of the CIP projects listed in Chapter 2 would be located within a floodplain.

4.13.6 Combined Impacts of the Actions

The 100-year floodplain impacts are summarized in Table 4.21. There is no additional impact resulting from the combined actions.

4.13.7 Potential Impact Mitigation Measures

Floodplain and floodway impacts associated with the three components of the Amended Draft Single Package would be avoided or minimized through several mitigation options. Bridges crossing existing floodways would be designed such that there is no rise in the base flood elevation. This would be accomplished through setting the bridge low chord above the base flood elevation, employing long bridge spans (to minimize the number of piers involved), increasing the channel cross-sectional area through reshaping the streambank(s), relocating levees and/or increasing levee height, and bridging the roadway approach sections.

Bridges along the Antelope Creek channel would be designed such that the 100-year flood is totally contained within the channel, and backwater effects are minimized. Specific floodplain impact mitigation measures have not been fully identified yet (the City's requirements may change in the near future). However, several mitigation options are available for consideration. These options include: compensatory excavation along the fill area, placing roadway alignments at grade (no fill), compensatory channel conveyance improvements (to offset floodplain conveyance loss), and levee modifications.

The area between BNSF Railroad tracks and Antelope Creek's mouth would be flooded during Salt Creek's 100-year flood event. This results from lower overbank elevations along Antelope Creek compared to Salt Creek's base flood elevation. Possible mitigation measures include using the North-South Roadway's embankment as a new levee and constructing a new levee along the channel in this vicinity with an approximate height of 1 meter (3 feet).

4.14 Threatened and Endangered Species

4.14.1 Baseline Environmental Conditions

The Endangered Species Act of 1973 identifies those species of wildlife and plants determined to be endangered or threatened with extinction. The Nebraska Game and Parks Commission (NGPC) and FWS were contacted for information regarding endangered/threatened species and critical habitats within the study area. Their informed responses are provided in Appendix D. Based upon the information provided, there are no known resident threatened or endangered species within the study area. There are, however, two threatened/endangered species (bald eagle and peregrine falcon) of a transitory nature that may be present in the study area. According to the FWS, most observations of these species in Nebraska are in January, late April to early May, and September. Migrant and wintering eagles have been observed at the Salt Valley lakes, such as Capital Beach, and peregrine falcons have been observed at the State Capitol building (see communication from FWS and NGPC, 1998 presented in Appendix D). The FWS also expressed a concern about flow depletion in the lower Platte River (downstream from the study area) which would pose a problem for several endangered/threatened species. This concern is addressed in the Water Body Modification discussion (see Section 4.17).

The NGPC response also mentions the Salt Creek tiger beetle, which could exist within the study area. The Salt Creek tiger beetle has been listed previously as a federal candidate species, but is no longer listed. However, the beetle has no legal protection under the Endangered Species Act or State of Nebraska law, and is included in this document for informational purposes only.

Figure 4.15

Table 4.21
100-YEAR FLOODPLAIN SUMMARY

| | Amended Draft Single Package | No-Action Alternative |
|--|---|--|
| Stormwater Management | | |
| Diminished Land Uses within Floodplain | 835 Fewer structures 166 ha. (409 ac.) Less Area | Includes 835 structures Includes 166 ha. (409 ac.) |
| Development Opportunities | Increased | Prospects remain poor |
| Improved Visual Recreational Environment | Yes | No |
| Flooding Threat to Private Property | Virtually eliminated | 100-year flood damage > \$20 million |
| Flooding Hazard at Bridges | Virtually eliminated | Remains a threat |
| Transportation | | |
| Antelope Creek | No roadways in floodplain | Existing roadways in floodplains |
| Salt Creek | N-S Roadway bridge within floodplain E-W Roadway (partly) within floodplain | Existing roadways in floodplains |
| Dead Mans Run | E-W Roadway (eastern Part) within floodplain | Existing roadways in floodplains |
| Community Revitalization | | |
| Neighborhood Vitality | Disincentive to revitalization removed | Neighborhoods remain in floodplains |
| Land-Use Patterns | Disincentive to positive land use changes removed | Floodplain remains, effectively discouraging redevelopment |
| Downtown Vitality | Disincentive to Downtown revitalization removed | Floodplain remains, effectively discouraging redevelopment |
| Trail Continuity | Trail development is a compatible floodplain use | Trail development not encouraged |
| Recreation | Recreation opportunities promoted, albeit some in a floodplain (i.e., Northeast Community Park) | Recreational opportunities remain in a floodplain (i.e., Trago Park) |
| Health and Human Services | Indian Center/Armory within a floodplain | Majority of CIP elements within a floodplain |

Source: AV Study Team.

The tiger beetle has one of the most restricted ranges of any insect in the United States; it is found only in the eastern Nebraska saline wetlands of Lancaster County (Spomer and Higley, 1994). Within these saline wetlands, it is restricted to the wetter unvegetated, mudflat (saltflat) sites and internal drainage. Although once found predominantly on mudflats on the terraces of Salt Creek and its tributaries, the tiger beetle is now commonly found near the

base of the Little Salt Creek embankment where salt crusts form from interception of the local groundwater.

According to Steve Spomer (Research Associate, UNL), the Salt Creek tiger beetle may be found at one location in one year, but may not be present at the same location in another year. This is particularly true for mudflats, saltflats, and ephemeral lake areas where populations of the tiger beetle are considered transient. In comparison, stable populations are known at locations along Little Salt Creek. Between 1990 and 1995, the number of Salt Creek tiger beetles counted in the annual surveys of the species steadily increased as new populations were found (Steve Spomer, 23 August 1995 and 2 June 1998). Since 1995, population estimates based on visual counts of adults have averaged around 600 individuals per year (Spomer and Hoback, 1998). Because of its highly localized distribution, the beetle is considered vulnerable to environmental threats.

4.14.2 Impact Assessment Methodology

Information provided by NGPC and FWS was reviewed concerning threatened and endangered species and critical habitat. Based on NGPC comments, additional research was completed for the tiger beetle. This work included a review of literature concerning the tiger beetle and its critical habitat. Following the literature review, the one area identified in literature as a potential habitat for the tiger beetle was examined (see Section 4.14.3). No additional research was performed for transitory species mentioned in Section 4.14.1 since none have been observed within the study area.

4.14.3 Impacts of Stormwater Management

Field investigations for tiger beetles centered on areas with saline soils. Two areas of saline soils (i.e., potential tiger beetle habitat) are mapped within the study area. The first area, in the vicinity of North 27th Street and Cornhusker Highway; the majority of the saline soils have been paved over for construction of commercial and industrial developments. The few remnant wetlands do not support mudflat or creek bank habitats, or for that matter saline wetland vegetation. No investigations were required at this location.

A second area of saline soils is mapped in the vicinity of the Salt Creek Trail (former C&NWRR) between Salt Creek and Superior Street. To the east of the trail (where the alignment has been routed), the soils are in agricultural production and no areas of saline vegetation were present during the May and September 1998 wetland delineation. To the west of the trail, there is a large wetland complex dominated by weakly saline wetland species such as narrow-leafed cattail and spikerush, and saline meadow species. No mudflats or ephemeral pools are present. Therefore, tiger beetles are unlikely to be found in these areas of saline soils.

The only potential habitat for the tiger beetle in the study area is at the new Salt Creek Bridge where a steep embankment is present on the north side of the creek and on the sand bar on the south side. However, no salt crusts were observed during the May and September 1998 wetland delineations. Additionally, no Salt Creek tiger beetles have ever been collected within the channel of Salt Creek (Steve Spomer, 2 June 1998). Therefore, it is unlikely this species would be encountered.

Based on information provided by NGPC and FWS, a review of available literature and field work (for tiger beetles), no threatened and endangered species or critical habitat occurs in

the study area. Consequently, no impacts are anticipated with either the Amended Draft Single Package or No-Action Alternative.

4.14.4 Impacts of Transportation Improvements

Based on information provided by NGPC and FWS, a review of available literature and field work (for tiger beetles), no threatened and endangered species or critical habitat occurs in the study area. Consequently, no impacts would be anticipated with either the Amended Draft Single Package or No-Action Alternative.

4.14.5 Impacts of Community Revitalization Actions

Based on information provided by NGPC and FWS, a review of available literature and field work (for tiger beetles), no threatened and endangered species or critical habitat occurs in the study area. Consequently, no impacts would be anticipated with the Amended Draft Single Package or No-Action Alternative.

4.14.6 Combined Impacts of the Actions

Neither the Amended Draft Single Package nor the No-Action Alternative would adversely affect known populations of threatened or endangered species.

4.14.7 Potential Impact Mitigation Measures

No impacts were identified and, therefore, no mitigation was considered.

4.15 Farmland

4.15.1 Baseline Environmental Conditions

The majority of land within the study area is devoted to commercial, residential and industrial uses. While there is no agriculturally zoned property within the study area, there is one industrially zoned parcel in use today as farm/pasture land between Superior Street and Cornhusker Highway, east of 27th Street. The *Soil Survey of Lancaster County, Nebraska* (USDA, et al., 1980) indicates soils in this area consist of Wabash, Kennebec, Colo, Salmo, Crete, and Urban land-Crete-Sharpsburg complex. The former Soil Conservation Service (SCS) (1992) lists Colo, Crete and Kennebec as prime farmland soils (see Figure 4.16). Prime farmland soils are defined as those with the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oil-seed crops. Farmed land and prime farmland soils do not exist elsewhere in the study area.

4.15.2 Impact Assessment Methodology

The farmland impact has been assessed by providing study information to the Natural Resources Conservation Service (NRCS) using the U.S. Department of Agriculture's Form AD-1006 (see Appendix E) for a Farmland Conversion Impacting Rating. The rating is based on soil and market characteristics, with higher ratings for more severe farmland impacts. The impact rating points and total score for the Amended Draft Single Package were provided to NRCS for comment. NRCS responded and concurred with the scoring (Jeff Johnson of the Antelope Valley Study Team and Roger Kanable of NRCS, 28 April 1998).

4.15.3 Impacts of Stormwater Management

Amended Draft Single Package. The stormwater management component of the Amended Draft Single Package would not affect prime farmland soils.

No-Action Alternative. The stormwater management component of the No-Action alternative would not affect prime farmland soils.

4.15.4 Impacts of Transportation Improvements

Amended Draft Single Package. The NRCS Form AD-1006 indicates the total assigned to the Amended Draft Single Package is 89 out of 260 total points. FHWA (1987) indicates that scores of 160 or greater should provide measures to avoid farmland soils. Since the score for this study is less than the FHWA's threshold of 160, it is not necessary to consider mitigating farmland impacts.

The new East-West Roadway traverses farmed land south of Superior Street. As a result, this would make development of this land more attractive.

No-Action Alternative. The transportation component of the No-Action Alternative would not affect prime farmland soils.

4.15.5 Impacts of Community Revitalization Actions

Amended Draft Single Package. The Community Revitalization Actions of the Amended Draft Single Package would not affect prime farmland soils.

No-Action Alternative. The Community Revitalization Actions of the No-Action Alternative would not affect farmland soils.

4.15.6 Combined Impacts of the Actions

Amended Draft Single Package. The Amended Draft Single Package would not adversely affect farmlands. However, it would increase the potential for development pressures on land south of Superior Street.

No-Action Alternative. The No-Action Alternative would not adversely affect farmlands.

4.15.7 Potential Impact Mitigation Measures

No farmland impact mitigation measures are necessary. If the City wishes to discourage development of the farmed land south of Superior Street, the Amended Draft Single Package shows land could be preserved as floodplain. Proposed regulations by the City of Lincoln in cooperation with LPSNRD (currently being reviewed for adoption) would strengthen floodplain and waterway development controls.

4.16 Surface Water Quality

4.16.1 Baseline Environment Conditions

There are three streams in the study area: Antelope Creek, Dead Mans Run, and Salt Creek. All three have intermittent flow and have been channeled partly or in their entirety through the study area. All three streams are considered "Waters of the United States" under the Corps Section 404 permit program and State Section 401 Water Quality Certification program. With the exception of Salt Creek, there has been very little surface water quality monitoring conducted for the stream segments within the study area.

Designated Beneficial Uses. The three streams in the study area have been assigned beneficial uses by NDEQ (Table 4.22). All of the streams are designated as providing recreation, warmwater aquatic life, agricultural water supply, and aesthetic uses. None of

Figure 4.16

the streams provide public drinking water uses. Instead, the City of Lincoln obtains all of its drinking water from a wellfield and treatment plant near Ashland on the Platte River. Water is conveyed underground approximately 48 kilometers (30 miles) to the City.

The beneficial use designations correlate with specific numerical criteria of the Nebraska Surface Water Quality Standards. These criteria relate to:

- fecal coliform levels for primary contact recreation use,
- pH, temperature, toxic substances, petroleum oil, total dissolved gases, hydrogen sulfide, and key biological species for aquatic life uses,
- conductivity, nitrate and nitrite as nitrogen, selenium for agricultural water supply uses, and noxious odors; objectionable films, colors, turbidity or deposits; undesirable aquatic life (e.g., algal blooms); and other junk, refuse or dead animals for aesthetics. Because of the proximity to a large population, all urban stream segments are considered to have recreation uses—regardless of water quality, accessibility, or safety issues. Similarly, because Nebraska is an agricultural state, all streams are considered to have agricultural water supply uses—regardless of actual or potential agricultural uses. Lastly, all stream segments in the state are considered to have aesthetic uses—regardless of actual physical appearance (communication from John Bender, NDEQ, 12 March 1998). Certainly, the three streams in the study area are very limited in the extent that they actually provide the assigned beneficial uses.

**Table 4.22
STREAM CLASSIFICATION BY BASIN AND DESIGNATED BENEFICIAL USES**

| STREAM SEGMENT | SEG. NO. | USE CLASSIFICATION | | | | | | | Key Species | |
|--------------------------------------|----------|--------------------|------------|---------------------------|----------------|---------------------------|--------------|------------|-------------|--------------------------|
| | | State Res. Water | Recreation | Aquatic Life ¹ | | Water Supply ³ | | | | Aesthetics |
| | | | | Cold Water | Warm Water | Public Drinking Water | Agricultural | Industrial | | |
| Salt Creek-Beal Slough to Rock Creek | 20000 | | Yes | | A ² | | B | | Yes | Channel Catfish, Walleye |
| Dead Mans Run | 20400 | | Yes | | B | | A | | Yes | |
| Antelope Creek | 20900 | | Yes | | B | | A | | Yes | |

¹Warmwater Class A waters provide, or could provide, a habitat suitable for maintaining one or more key species on a year-round basis. These waters are capable of maintaining year-round populations of a variety of other warmwater fish and invertebrate organisms and plants. Warmwater Class B are waters where the variety of warmwater biota is presently limited by water volume or flow, water quality (natural or irretrievable human-induced conditions), substrate composition, or other habitat conditions. These waters are only capable of maintaining year-round populations of tolerant warmwater fish and associated vertebrate and invertebrate organisms and plants. Key species may be supported on a seasonal or intermittent basis (e.g., during high flows) but year-round populations cannot be maintained.

²Site specific water quality criteria for un-ionized ammonia are assigned.

³Agricultural Class A are waters used for general agricultural purposes (i.e., irrigation and livestock watering) without treatment; water quality criteria have been assigned for conductivity, nitrate and nitrite as nitrogen, and selenium. Agricultural Class B waters are where the natural background water quality limits its use for agricultural purposes; no water quality criteria are assigned to protect this use.

Source: Nebraska Department of Environmental Quality, Title 117 - Nebraska Surface Water Quality Standards

Recreational uses of the streams are generally limited to the various parks and bike paths that run alongside the portions of the streambanks. Actual access to the water is limited by the generally long, steep banks which lead to the streams.

Agricultural water supply uses of Antelope Creek and Dead Mans Run are virtually non-existent due to the development within the City. Salt Creek agricultural water supply use is generally located well upstream and downstream of the study area.

Aesthetic uses of all three streams are rather limited. As development has occurred, increased runoff has resulted in streambank degradation. Over the majority of Antelope Creek and Dead Mans Run, streambank stabilization consisting largely of concrete and gabion liners has transformed the streams into conveyance channels to maximize flood-carrying potential. A large portion of Antelope Creek within the study area is conveyed underground. The streambanks along Salt Creek have become nearly vertical in many locations and levees have been constructed. For the most part, the natural aesthetic features of these three streams are no longer present.

In regard to aquatic life uses, which relate directly to fish and wildlife impacts, Salt Creek has been designated as a Class A Warmwater stream; Dead Mans Run and Antelope Creek are designated as Class B Warmwater streams (see Section 4.16). Class A “waters provide, or could provide other, habitat suitable for maintaining one or more key species on a year-round basis. These waters are capable of maintaining year-round populations of a variety of warmwater fish and invertebrate organisms and plants” (NDEQ, 1996). In contrast, Class B “are waters where the variety of warmwater biota is presently limited by water volume or flow, water quality (natural or irretrievable human-induced conditions), substrate composition, or other habitat conditions. These waters are only capable of maintaining year-round populations of tolerant warmwater fish and associated vertebrate and invertebrate organisms and plants. Key species may be supported on a seasonal or intermittent basis (e.g., during high flows) but year-round populations cannot be maintained” (NDEQ, 1996).

Water Quality Studies for Antelope Creek. Chemical and biological water quality data for Antelope Creek upstream of the study area is contained in the *Holmes Lake Stormwater Study* (NDEQ, 1996). The report also contains a bacterial assessment of Holmes Lake and its watershed. According to the report, Holmes Lake does support its designated beneficial use for primary contact recreation. However, Antelope Creek and the south tributary to the lake do not meet fecal coliform bacteria water quality standards for primary contact recreation. No data was available for Antelope Creek downstream of Holmes Lake—other than NDEQ’s ambient pesticide and bacteria monitoring.

Water Quality Studies for Dead Mans Run. No water quality studies have been conducted on Dead Mans Run—other than NDEQ’s ambient pesticide and bacteria monitoring.

Water Quality Studies for Salt Creek. Comprehensive chemical and biological water quality data for Salt Creek is contained in the *Salt Creek Water Quality Studies Report* (Brown and Caldwell et al., 1996). The study was developed to evaluate the effects on water quality from ammonia and chlorine contributions from the City’s wastewater treatment plants. Data was collected through various monitoring programs. The study found that Salt Creek below Wilderness Park is a unique, saline environment resulting from very high instream chloride concentrations attributable to the Dakota Sandstone Formation. Salt Creek water is very hard and high dissolved solids in the creek shift chemical equilibrium away from the un-ionized ammonia form, and ammonia decays rapidly. As a result chloride is more likely than ammonia to exceed criteria in Salt Creek. Dissolved oxygen is not limiting. Although pesticides and herbicides could be a concern in Salt Creek, metals and other organic

priority pollutants are not found to any major degree in Salt Creek. The study concluded that the Warmwater A aquatic life beneficial use of this portion of Salt Creek cannot be attained because the biological communities are controlled by naturally occurring high chlorides, past channelization which limits habitat availability, and wash-out of stocked fish from upstream reservoirs. A summary analysis of the constituent loading in comparison to applicable exceedance criteria is shown in Table 4.23.

The Brown and Caldwell study included evaluation of Salt Creek water quality in the vicinities of Antelope Creek and Dead Mans Run. No appreciable differences in the Salt Creek samples upstream and downstream of these confluences could be directly attributed to these tributaries.

Pesticide and Bacteria Water Quality Studies. In 1994, the NDEQ collected bacteria and pesticide samples as a part of their ambient pesticide and ambient bacteria monitoring networks. The collection sites include Salt Creek near Highway 77, Antelope Creek near 27th Street, and Dead Mans Run at Cornhusker Highway. According to the data collected, fecal coliform levels exceeded NDEQ limits applicable for primary contact recreation on all three streams. Of the three pesticides sampled (atrazine, cyanazine and alachlor), only atrazine appeared to indicate the potential for exceedance of NDEQ limitations in each of the three streams.

Table 4.23
CONSTITUENT LOADINGS DETECTED IN SALT CREEK
1994-1995

| Constituents | Exceedance Criteria | Frequency of Exceedance |
|-------------------------|----------------------------|---|
| Chloride | U.S. EPA 1988, 1994 | exceeded acute level 65%-80% of samples exceeded chronic level 80%-100% of samples |
| Ammonia | NDEQ, Title 117 | exceeded chronic level 10%-35% of samples |
| pH, Temperature | NDEQ, Title 117 | within acceptable range |
| Dissolved Oxygen | NDEQ, Title 117 | below chronic level in isolated instances |
| Metals | NDEQ, Title 117 | several exceedances, but high hardness levels help to mitigate toxicity of metals |
| Pesticides & Herbicides | NDEQ, Title 117 | several exceedances, mostly after runoff events |

Source: *Salt Creek Water Quality Studies Report*
Brown and Caldwell, February 1996

Biological Water Quality Studies. Qualitative statements of ambient conditions for Salt Creek and Antelope Creek are contained in the *Nebraska Water Quality Report* (Nebraska Department of Environmental Control, 1990). The report indicates that both Salt Creek and Antelope Creek do not support their designated aquatic life beneficial uses. Antelope Creek is stated as exhibiting unbalanced aquatic plant and animal communities, and low abundance of fish. Salt Creek is said to have similar problems with its aquatic community. Increases in fecal coliform/fecal streptococcus ratios and in fecal coliform bacteria were also noted for Salt Creek. According to the report,

“The City of Lincoln and surrounding developments have impacted heavily on Salt Creek and Antelope Creek through domestic point source discharges, urban nonpoint sources and habitat modifications due to channelization. Salt Creek is also impacted by municipal industrial point sources and agricultural nonpoint sources while Antelope Creek is also affected by hydrologic modification.” (Nebraska Water Quality Report, NDEC, 1990, page 82)

The statements contained in the report suggest that the water quality problems demonstrated in Salt Creek by the Brown and Caldwell Report are likely to be similarly present in Antelope Creek and Dead Mans Run.

4.16.2 Impact Assessment Methodology

The methodology for assessing impacts on surface water quality was entirely subjective, and based on an evaluation of existing data for the water bodies in the study area.

4.16.3 Impacts of Stormwater Management

Amended Draft Single Package. The stormwater management component would require construction of a wider channel valley with a permanently flowing waterway. The side slopes would be gently sloped and incorporated into a surrounding landscaped greenbelt. The overall size of the contributing drainage areas would remain the same under existing and build conditions.

Based on 30 years of outflow records for Holmes Lake dam, which stores and regulates run-off from the uppermost 14 square kilometers (5.4 square miles) of the watershed, it has been concluded that adequate base flow will be available. An evaluation has been conducted to determine if sufficient base flow in Antelope Creek is available. For backup purposes, in the event Holmes Lake were de-watered for repairs or by extreme drought conditions, aesthetics of the waterway could be temporarily maintained with groundwater from the City’s Antelope Creek wellfield located near 27th and A Streets. The City can use water from the wells for all beneficial municipal purposes.

The Antelope wellfield draws from the Dakota and Lakota formations, which contain both fresh and salt water horizons. The Antelope Creek wellfield was not able to sustain long-term pumping without causing a regional drawdown of the water table, and draw-in of saline water from the west; therefore, the City had to look elsewhere for a dependable drinking water supply.

Since construction of the City’s first Ashland wells in 1932, the older Antelope Creek wellfield has only been used for peaking purposes. In 1990, it supplied about 2.5 percent of the water pumped by Lincoln Water System on an annual basis (however, this represented about 19.5 percent of the water pumped on the peak day of 3 July 1990) (Lincoln-Lancaster County Ecological Advisory Committee, 1997). Use of the Antelope wellfield for back up purposes will be coordinated to avoid conflicts with peak use periods. In no way would use of this source result in depletion or impairment of the City’s drinking water supplies.

In general, the stormwater management component would have no long-term adverse impacts on the chemical or biological constituents of the water in any of the three creeks. The contributing drainage areas would remain unchanged and because water quality is primarily dependent on domestic point source discharges, urban nonpoint sources,

municipal industrial point sources and agricultural nonpoint sources as well as naturally occurring chlorides. During unanticipated low flow conditions, supplementation of Antelope Creek could temporarily improve water quality to a limited extent by dilution of point and non-point source discharges, and by maintaining water levels to support year-round aquatic biological communities. In addition, construction of the new Antelope Valley channel and greenbelt would greatly improve recreation, aquatic life, and aesthetic beneficial uses along the stream course.

The Nebraska Department of Environmental Quality has stated that an excellent opportunity exists to improve aquatic life use of Antelope Creek by “daylighting” the creek. Further work during final design will derive the best benefits to improve aquatic life.

The stormwater management component would require construction of at least five new bridges over the new Antelope Creek channel at N, O, P, Q, and Vine Streets. Without the transportation components in place, four additional replacement bridges are needed at Y, 16th, 17th, and Court Streets. In addition, the stormwater component would require reconstructing the South Street Bridge over Antelope Creek and removing the 38th Street Bridge over Antelope Creek.

The primary adverse impact on surface water quality would be limited to temporary construction effects during construction of the new Antelope Valley channel. Although Best Management Practices would be employed during construction to control erosion and sedimentation, temporary and localized increases in turbidity and total suspended solids may occur in the stormwater management and creeks during channel construction. Construction impacts to surface waters are considered minor and temporary, and can be mitigated.

Construction for the new channel and eight bridge sites would require a Section 404 permit from the Corps for dredge and fill activities in waters of the United States and their adjacent wetlands. As part of this permit, the project would be reviewed for Section 401 Water Quality Certification from the NDEQ.

No-Action Alternative. The No-Action Alternative would avoid all temporary adverse impacts to surface water quality from construction of the Antelope Valley channel and associated bridges.

4.16.4 Impacts of Transportation Improvements

Amended Draft Single Package. The transportation component would require construction of two new roadways and three new bridges over surface waters. Two bridges over Dead Mans Run are located at Adams Street and the new East-West Roadway; one bridge over Salt Creek is located at the new East-West Roadway just south of Superior Street. In addition, three replacement bridges would be required at the west entrance to State Fair Park, just south of the BNSF Railroad tracks, and near Y Street. A seventh bridge at Cornhusker Highway and Dead Mans Run would require rehabilitation. An underpass for 33rd Street would also be constructed under the BNSF Railroad mainline. The Amended Draft Single Package would also require construction of an appropriate stormwater system for the new roadway and bridges. The new stormwater system for the roadway would be a continuous inlet and pipe system, and would be based on a 10-year design storm. This would exceed the capacity of the existing stormwater system for the City streets, thereby improving conditions during storm events. The new stormwater system would tie into

existing outlet locations which drain into Antelope Creek, Dead Mans Run and Salt Creek. The overall size of the contributing drainage areas would remain the same under existing and build conditions.

In general, the transportation components would have no long-term adverse impacts on the chemical or biological constituents of the water in any of the three creeks because the contributing drainage areas would remain unchanged. Also, water quality is dependent on a number of factors such as domestic point source discharges, urban nonpoint sources, municipal and industrial point sources, agricultural nonpoint sources and naturally occurring chlorides. Although the new roadways would increase lane-miles, it is a minor percentage of the total lane miles in the study area. In addition, the new roadways are not expected to cause major traffic increases through the area.

The primary adverse impact on surface water quality would be limited to temporary construction effects. Although Best Management Practices would be employed during construction to control erosion and sedimentation, temporary and localized increases in turbidity and total suspended solids would occur in the stormwater management and creeks in the vicinity of the bridge construction. Impacts to Dead Mans Run would be limited to the vicinity of the bridges at Adams Street, the new East-West Roadway, and Cornhusker Highway. Impacts to Salt Creek would be limited to the vicinity of the bridge at the new East-West Roadway just south of Superior Street. Construction impacts to surface waters are considered minor and temporary, and can be mitigated.

In addition, surface water impacts can be expected from wash off of accumulated pollutants from the road surface after construction; however, these are considered minimal and do not require mitigation. Common pollutants associated with roadways include zinc from motor oil and tires; oil and grease from spills and leaking vehicles; phosphorus and nitrogen from decaying organic debris, dust fallout, and motor oil; and pathogenic bacteria from human and animal wastes (Novatny and Chester, 1981; Gupta *et al.*, 1981). Although no specific data is available for the Lincoln area, the influence of the new roadway is probably minor in comparison to the effects of urban runoff from all the other Downtown streets, parking lots, and industrial, commercial and residential areas, or the effects of nonpoint source pollution in runoff from upstream of the study area. In addition, local winter roadway maintenance practices include sand and salt applications, as needed, on any road over one-year old.

A more critical surface water quality impact of roadways is the risk of a spill of toxic or hazardous materials on the road. Such a spill is more likely to occur with sub-standard traffic safety and flow. Currently, Lincoln has a Hazardous Materials Response Plan as part of the State required Local Emergency Operating Plan. The plan is implemented through the Emergency Services Division of the City of Lincoln (Fire, Police, and Public Works and Utilities Departments) which is trained and equipped for hazardous emergency response. Although the plan assumes all routes carry hazardous materials, the majority of carriers use recommended routes following 9th Street, 84th Street, Highway 2 and I-80, as opposed to other routes through Downtown (Amy Zlotzky of the Antelope Valley Study Team and Terry Biggerstaff of the Lincoln Fire Department, 21 April 1997). Since the transportation component would improve traffic safety and flow and would eliminate four railroad grade crossings of the BNSF Railroad, it would be expected to reduce the likelihood of accidental spills.

Construction for the bridges would require a Section 404 permit from the Corps for dredge and fill activities in waters of the United States and their adjacent wetlands. As part of this permit, the project would be reviewed for Section 401 Water Quality Certification from the NDEQ.

No-Action Alternative. The No-Action Alternative would avoid all temporary adverse impacts to surface water quality from construction of the Antelope Valley roadways, and its associated bridges and stormwater system. It would also avoid the minor impact of wash-off of accumulated pollutants on the new roads.

4.16.5 Impacts of Community Revitalization Actions

Amended Draft Single Package. Although unlikely, there could be minor adverse impacts to surface water quality from demolition and construction activities of the community revitalization component of Amended Draft Single Package. These impacts are considered temporary, minor, and mitigatable.

No-Action Alternative. There would be no impacts to surface water quality from not implementing the community revitalization component of Amended Draft Single Package.

4.16.6 Combined Impacts of the Actions

No additional impacts result from the combined actions.

4.16.7 Potential Impact Mitigation Measures

Mitigation measures for construction-related erosion and sedimentation control would include dikes, dams, sediment basins, fiber mats, temporary and permanent seeding, straw mulch, plastic liners, slope drains, and other devices which would intercept and trap transported sediments during construction. All heavy equipment should be refueled and serviced away from watercourses to prevent accidental contamination of surface waters with petroleum products. Only clean fill materials would be used in construction in the vicinity of waters and wetlands.

The City may wish to consider the development of a hazardous material route plan/system for the City to limit carriers of hazardous materials to specific corridors.

4.17 Water Body Modification and Wildlife

4.17.1 Baseline Environmental Conditions

As described previously, all three of the streams in the study area have intermittent flow and have been channeled partly or in their entirety through the study area.

Channel Morphology. Antelope Creek has been channeled, and is concrete-lined or conveyed underground through most of the study area (Figure 4.17). As such, the stream offers minimal habitat value for fish and wildlife. In the vicinity of the South Street and 38th Street bridges, the channel has a concrete floor and gabion armored side slopes with a 1:1:5 (1.5:1) slope². From 27th Street to J Street, the channel is concrete-lined with steep side slopes; vegetation of the upper banks consists of naturalized grasses, and the channel over banks are turf-grassed. Antelope Creek from J Street to N Street is characterized by an excavated channel with steep side slopes, naturalized vegetation within the channel, and turf grasses on the overbanks. This segment is the only portion of

² Slopes are presented in metric (rise:run) with English (run:rise) in parentheses.

Antelope Creek within the study area that has not been concrete-lined. From N Street to Vine Street, the flows in Antelope Creek are conveyed by an 80-year old concrete-lined conduit consisting of twin 2.4-meter (8.0-foot) by 2.7 meter (9.0-foot) conduits with a combined four-year storm capacity.

Downstream of the box culvert to Court Street, the channel is concrete-lined with steep side slopes, and commercial, industrial, and institutional development dominates the overbank areas. Downstream of Court Street to the confluence with Salt Creek, the creek is partially concrete-lined and has unstable side slopes. Channel bottom widths vary within the study area from 4.6 meters (15.0 feet) to 6.1 meters (20.0 feet) and top widths are in the 21.3 meters (70.0 feet) to 33.5 meters (110.0 feet) range. The City of Lincoln maintains the Antelope Creek channel; maintenance practices include mowing the grassed slopes and overbank, and keeping the channel relatively free of woody vegetation and urban debris.

Dead Mans Run has been channeled, and is either concrete or gabion-lined from the UNL East Campus through Cornhusker Highway, with naturalized grasses and weedy vegetation on the side slopes. Downstream of Cornhusker Highway to the confluence with Salt Creek, Dead Mans Run is a channeled stream with long, steep banks, which are nearly vertical in many areas. As such, the stream offers minimal habitat value for fish and wildlife. Channel bottom widths vary from 4.6 meters (15.0 feet) to 7.6 meters (25.0 feet) and the top width ranges from 24.4 meters (80.0 feet) to 36.6 meters (120 feet). Dead Mans Run is maintained by LPSNRD; maintenance practices include mowing the slopes and overbank, and keeping the channel relatively free of woody vegetation and urban debris.

Salt Creek is a channeled stream contained within a flood control levee. Long, steep banks subject to active erosion characterize the channel. The banks are nearly vertical in some locations. Naturalized vegetation covers the channel and overbanks. Channel bottom widths vary from 39.6 meters (130 feet) to 48.8 meters (160 feet) and the top width ranges from 73.2 meters (240 feet) to 107 meters (350 feet). Salt Creek is maintained by LPSNRD; maintenance practices include mowing the slopes and overbank, and keeping the channel free of woody vegetation and urban debris.

Aquatic Habitat. As discussed previously, the streams have been designated as having beneficial uses by NDEQ (see Table 4.20 and the discussion contained in Section 4.16.1).

According to NDEQ's *Nebraska Water Quality Report*, Salt Creek and Antelope Creek exhibit nonsupport of their aquatic life beneficial uses. Antelope Creek exhibits unbalanced aquatic trophic structures and low abundance of fish. Salt Creek is said to have similar problems with its aquatic community. Given the similarities between the channels and upstream characteristics of Dead Mans Run and Antelope Creek, it is likely that Dead Mans Run also does not support its aquatic life beneficial use.

Very limited aquatic biological sampling has been conducted other than that performed for the *Salt Creek Water Quality Study* (Brown and Caldwell, 1996). Review of the EPA STORET BIOS database indicate that there are no "taxtable" reports (species lists) for Dead Mans Run; one fish and one macroinvertebrate report for Antelope Creek (37th and South); and one fish and one macroinvertebrate report for Salt Creek at Lincoln (27th and Cornhusker). Based on this limited data, it would be misleading to draw any conclusions from the STORET data. The *Salt Creek Water Quality Study* (Brown and Caldwell, 1996) included a comprehensive multi-year study of biological characteristics. Its findings are summarized in the previous section.

Given the similarities in channel morphology, intermittent flows, and high temperatures, it is likely that comparable or lesser quality aquatic habitat conditions are present in Antelope Creek and Dead Mans Run. Chlorides probably have less of an influence on the biological communities of Antelope Creek and Dead Mans Run which are not generally considered to traverse areas of saline seeps except near their confluence with Salt Creek. However, some influence is probable considering that the Dakota sandstone layer is exposed at the Folsom Children's Zoo. There are high salinity levels in the nearby Antelope wellfield located in Dakota sandstone and there has been accelerated gabion corrosion (now repaired) at the level of the stream surface on Antelope Creek and Dead Mans Run.

Terrestrial Biological Habitat. There is generally only minimal habitat for terrestrial wildlife species along the three creeks due to the highly urban setting. Artificial nature of the channeled creeks, and maintenance practices of mowing and removing woody vegetation removes habitat cover. Wildlife species that utilize the creeks include raccoon, skunk, cottontail rabbit, ground squirrel, turtles, snakes, and other urban wildlife. Deer, mink, herons, geese, ducks, and pheasants are known to use the lower reaches of Antelope Creek, Dead Mans Run, and Salt Creek.

4.17.2 Impact Assessment Methodology

The methodology for assessing impacts from water body and habitat modification was subjective and is based on an evaluation of existing data for the water bodies in the study area. Table 4.24 summarizes impacts to water bodies and associated wildlife habitats.

4.17.3 Impacts of Stormwater Management

Amended Draft Single Package. In general, stormwater management would cause only minor adverse modification of water bodies or existing habitat, and would have no adverse impacts on wildlife that utilizes the water bodies. The only permanent adverse impact would be the minor effect of the addition of a varying concrete low flow liner to two short segments of Antelope Creek. Aquatic habitat in these segments is already of minimal beneficial use (see Section 4.16.1). Except for the two project stream segments from J Street to the existing conduit entrance and from the State Fair Park entrance to Salt Creek, the entire length of the portion of Antelope Creek within the study area currently has a concrete lined bottom. The primary negative impacts would be temporary disturbance of wildlife and aquatic habitat, and temporary increases in turbidity and total suspended solids during Antelope Creek channel reconstruction. Good construction practices would keep suspended sediments at acceptable levels. Temporary construction impacts to surface waters are considered minor, and can be mitigated. Once construction is complete, biological communities would reestablish themselves in the area.

The resulting positive impact of stormwater management on Antelope Creek would be improved open channel length and cross section, construction of a continuous park, open stream characteristics related to "naturalized shapes", and possible construction of a lake between O and Q Streets. This would result in a net increase of 1.2 kilometers (3,900 feet) or a 65 percent increase in the length of open stream channel, and associated aquatic habitat, through the study area. If implemented, temporary supplementation of Antelope Creek during low flow conditions is likely to improve aquatic habitat by maintaining water levels to support year-round aquatic biological communities. Additionally, the lake would

Figure 4.17

**Table 4.24
COMPARISON OF IMPACTS TO WATER BODIES AND ASSOCIATED
WILDLIFE HABITAT**

| POTENTIAL IMPACTS | AMENDED DRAFT SINGLE PACKAGE | | | | NO-ACTION ALTERNATIVE |
|---------------------|--|--|--------------------------|---|--|
| | STORMWATER MANAGEMENT | TRANSPORTATION | COMMUNITY REVITALIZATION | COMBINED | |
| Positive | Long-term beneficial impacts to wildlife & aquatic habitat from improved open channel length and cross section, continuous landscaped greenbelt, and backup supplementation of stream flow and new lake. | Long-term beneficial impact from new wildlife habitat at wetland mitigation/nature area. | None | Long-term beneficial impacts to wildlife & aquatic habitat from improved channel morphology, continuous landscaped greenbelt, new wildlife habitat at wetland mitigation/nature area, and possible supplementation of stream flow and new lake. | None |
| Adverse | Short-term habitat disturbance and increases in turbidity and total suspended solids. Minor loss of stream bottom habitat due to concrete low flow liner. | Short-term habitat Disturbance and Increases in turbidity and total suspended solids. | None | Short-term habitat disturbance and increases in turbidity and total suspended solids. Minor loss of stream bottom habitat due to concrete low flow liner. | No long-term improved open channel length or cross section, continuous landscaped greenbelt, new wildlife habitat at wetland mitigation/nature area, and back up supplementation of streamflow and new lake. Short-term impacts of Lincoln Capital Improvement Program are habitat disturbance and increase in turbidity and total suspended solids. |
| PLATTE RIVER | None | None | None | None | None |

Source: AV Study Team.

create a segment of wider and deeper aquatic habitat. No modifications are planned for the Dead Mans Run or Salt Creek channels as part of the stormwater management component. The greenbelt would include maintained turf-grasses, shrubs, and trees that would provide some habitat for urban wildlife species. With an existing vegetated stream cross-section ranging from 0 to 22.9 meters (0 to 75.0 feet), the 56.4-meter (185-foot) wide grassy valley would represent an improvement in channel cross section and an increase in green space over current conditions.

- **New Antelope Creek Waterway.** In general, the Amended Draft Single Package proposes modifications to the Antelope Creek channel from downstream of J Street to the confluence with Salt Creek (Figure 4.18). An additional bridge lengthening is included outside of this area—at South Street—to increase the hydraulic capacity of the channel. The plan proposes re-establishing an Antelope Creek channel through the area. The channel would occupy a corridor approximately one-half block in width, generally following the lowest portion of the 100-year floodplain. A gently sloped landscaped channel with concrete low flow liner and bridges are envisioned to provide flood capacity within a park-like setting from O to Vine Streets. Elsewhere, slopes of 2:1 or 3:1 will be

landscaped with natural materials. The resulting multi-purpose corridor would include a small, aesthetically designed stream at the bottom of the flood channel and a trail to facilitate public use and recreational access. The channel improvements would employ vegetative stabilization methods to minimize the visible amount of concrete or other “hard” stabilization materials included in the finished channel landscape.

- **Waterway: J to N Streets.** Between J Street and the existing box culvert entrance at N Street, the vegetated and channeled section of Antelope Creek would be widened on the east bank and modified to result in the multi-purpose flood channel described above. The existing channel has an extremely flat slope resulting in standing water and stagnation. The new channel would be constructed with an improved flow line and concrete low flow liner to provide better base flow conditions. The capacity of the existing box culvert would also be utilized during flood events.
- **Waterway: N to Vine Streets.** From the existing box culvert entrance at N Street to Vine Street, the Antelope Creek channel would be re-established. In this segment, Antelope Creek is currently conveyed underground for a distance of 1.2 kilometers (4,100 feet). Although the existing culvert would remain in service, the addition of the new 1.3-kilometer (4,200-foot) open channel would provide 100-year flood conveyance capacity while meeting the aesthetic and multi-purpose uses referred to above. The capacity of the existing box culvert would also be used during flood events.
- **Waterway: Vine Street to Salt Creek.** From Vine Street to the confluence with Salt Creek, the existing Antelope Creek channel is largely concrete-lined with steep slopes of marginal stability. Under the Amended Draft Single Package, this portion of Antelope Creek would be reconstructed to provide a multi-purpose flood channel as described above. The nearly 40 year-old concrete liner and failing side slopes would be replaced with the vegetated, park-like corridor described above. Instead of almost completely concrete-lined, only a varying width concrete low flow liner would be constructed in the bottom of the channel. The existing bends would be straightened with a loss of 91.4 meters (300.0 feet) of channel length (this would be more than compensated for by the addition of 1.3 kilometers (4,200 feet) of new open channel between N and Vine Streets). New roadway bridges would be constructed to span the channel and the opening under the existing BNSF Railroad bridge would be improved to provide the necessary hydraulic capacities.
- **New Lake.** The plans show constructing a 0.75 hectare (1.85 acres) lake along the waterway between O and Q Streets. The lake would create a wider and deeper area of aquatic habitat, and could incorporate a fountain or other water feature.
- **New Bridges.** The stormwater management component would require construction of four new bridges over the new Antelope Creek channel at N, O, Q, and Vine Streets. Without the transportation components in place, four replacement bridges would be needed at Y, 16th, 17th, and Court Streets. In addition, the stormwater management component would require reconstruction of the South Street Bridge over Antelope Creek and the removal of the 38th Street Bridge over Antelope Creek.

Figure 4.18

Impacts on the Platte River. Concern has been raised regarding the impact of the stormwater management channel on threatened and endangered species habitat on the Platte River downstream of the Salt Creek confluence. The project would have no impact on Platte River flows or habitat because the overall size of the contributing drainage area would remain the same under existing and build conditions. Therefore, there would be no depletion or accretion of flows on the Platte River. Also, any change in timing, magnitude, and frequency of flows is totally diminished by the time it reaches the Platte River approximately 50 kilometers (30 miles) downstream. The change would have no adverse effect on piping plover and interior least tern spring nesting habitat (sandbars, which could suffer wash-out if under higher flows) nor would it affect habitat for the pallid sturgeon or sturgeon chub.

No-Action Alternative. The No-Action Alternative would avoid all temporary adverse impacts to water bodies and associated wildlife from construction of the channel and its associated bridges.

4.17.4 Impacts of Transportation Improvements

Amended Draft Single Package. The transportation components would cause no adverse long-term modification of water bodies, and would have no adverse impacts on wildlife that use the water bodies. The primary negative impacts would be temporary disturbance of wildlife and aquatic habitat, and temporary increases in turbidity and total suspended solids during the bridge construction and straightening of the channel in the vicinity of Y Street. Good construction management practices known as “Best Management Practices” or “BMPs” should keep suspended sediments at acceptable levels. Impacts to Dead Mans Run are limited to the new bridges at Adams Street and the East-West Roadway, and bridge rehabilitation at Cornhusker Highway. Impacts to Salt Creek are limited to the vicinity of the East-West Roadway bridge south of Superior Street. Loss of aquatic habitat on Salt Creek due to pier and embankment construction would be largely offset by new pool and riprap habitat. The type of armory to be used on the Dead Mans Run bridges is unknown at this time and would be determined by the bridge designer. Temporary construction impacts to surface waters are considered minor and can be mitigated. Once construction is complete, biological communities would reestablish in the area.

Any riprap used for embankment and pier protection for the new and replacement bridges would provide a new stable substrate for periphyton and macroinvertebrate colonization, thereby increasing the availability of food for fish in the area.

- **Antelope Creek.** Without the stormwater management component in place, the Amended Draft Single Package would require the channel to be straightened in the vicinity of Y Street where the existing channel has an “S” curve. In addition, three replacement bridges would be required at the west entrance to State Fair Park, just south of the BNSF Railroad tracks, and near Y Street.
- **Dead Mans Run.** The Amended Draft Single Package includes new roadway bridges over Dead Mans Run at the new East-West Roadway and on Adams Street just south of the BNSF Railroad tracks (Figure 4.18) and rehabilitation of the Cornhusker Highway bridge. This portion of Dead Mans Run is currently concrete lined. The bridges would span Dead Mans Run without modification to the existing channel.

- **Salt Creek.** A new bridge for the East-West Roadway over Salt Creek is located south of 33rd and Superior Streets. In this area, Salt Creek is a vegetated, channeled creek with long, steep banks. The bridge would span the Salt Creek channel without wholesale modifications to the existing channel.

Wetland/Public Nature Area. In the vicinity of Salt Creek from the Dead Mans Run confluence downstream to Superior Street, and Dead Mans Run from Cornhusker Highway downstream to Salt Creek, the Amended Draft Single Package proposes wetland/floodplain public nature areas. Any mitigation requirement for the transportation component would be incorporated into the nature area. Trails would be included to provide public access and recreational opportunities.

No-Action Alternative. The No-Action Alternative would avoid all temporary adverse impacts to water bodies and associated wildlife from construction of the Antelope Valley roadways and associated bridges.

4.17.5 Impacts of Community Revitalization Actions

Amended Draft Single Package. There would be no water body modifications from the community revitalization component of Amended Draft Single Package.

No-Action Alternative. There would be no water body modifications from not implementing the community revitalization component of Amended Draft Single Package.

4.17.6 Combined Impacts of the Alternatives

No additional impacts result from the combined actions.

4.17.7 Potential Impact Mitigation Measures

The water body modification and wildlife impacts associated with the Amended Draft Single Package are positive. Where there are potential negative impacts, they are associated with temporary construction activities. Using BMPs to minimize erosion and sedimentation from construction areas would, however, minimize these impacts to the extent practicable. The only permanent adverse impact is related to use of a concrete low flow liner with segments that currently have earth bottoms. Considering the minimal beneficial uses of these segments, this impact is considered minor. Once construction is completed, even the concrete low flow liner will become an established biological community similar to those existing in the stream.

4.18 Cultural Resources

4.18.1 Baseline Environmental Conditions

As part of the Antelope Valley Study, the Study Team conducted extensive cultural resources investigations. The purpose of the investigations was to comply with Section 106 of the National Historic Preservation Act (NHPA) of 1966, as amended, and regulations of the Advisory Council on Historic Preservation found at 36 CFR 800. The law requires that effects to historic resources (*both standing structures and archeological resources*) be considered during the planning and execution of any federally funded project. Under this legislation, historic resources are defined as those listed in or considered eligible for listing in the National Register of Historic Places (NRHP). Eligibility is based on two primary considerations (1) the degree of historic integrity, and (2) the overall significance of the resource. Integrity requires the site to retain enough of its materials, appearance, and

feeling to illustrate its history clearly. Significance requires the resource relate to a historical context and must be based on at least one of the following four criteria: (a) association with events that have made a major contribution to the broad patterns of our history, (b) association with the lives of persons significant in our past, (c) embodiment of the distinctive characteristics of a type, period or method of construction, or high artistic values, and (d) likelihood to yield information important to historical understanding. Study Team investigations conducted by UNL involved surveys of historic standing structures and archeological resources on more than 1 200 hectares (3,000 acres), or 600 city blocks in the total study area. The surveys covered some of the oldest portions of the City of Lincoln, including 14 of the City's oldest neighborhoods, parts of the Downtown core area, and much of the UNL City Campus. As part of the surveys, the Study Team evaluated some 80 standing structures and conducted Phase I testing on 18 archeological sites. This information was used in developing the components of the Amended Draft Single Package to avoid effects to historic resources to the extent possible.

Findings of the survey inventories and evaluation of eligibility for the NRHP were presented in the following documents:

- *Cultural Resources and Geoarcheology of the Antelope Valley Major Investment Study Area: A Preliminary Survey* (Antelope Valley Study Team, UNL Department of Anthropology, March 1997)
- Memorandum "Cultural Resources within AV MIS: Preliminary Assessments" (Antelope Valley Study Team, UNL Department of Anthropology, October 1997)
- *1997 Archeological Inventory and Testing of the Antelope Valley Major Investment Study Area, Lincoln, Nebraska*, (Antelope Valley Study Team, UNL Department of Anthropology, May 1998)
- *Building Site Forms and Architectural Assessment-National Register of Historic Places Eligibility: Antelope Valley Major Investment Study Area, Lincoln, Nebraska* (Antelope Valley Study Team, UNL Department of Anthropology, July 1998)
- *Assessment of Effects to NRHP and NRHP-Eligible Sites and Properties; Antelope Valley Study Area, Lincoln, Nebraska* (Antelope Valley Study Team, UNL Department of Anthropology, June 2000)

Based on the findings of the historic and archeological surveys within the "area of potential undertakings" (also known as the "area of potential effect," see Figure 4.19), there are nine sites already listed in the NRHP, 31 sites eligible for listing, one National Register District and two locally designated districts (one of which is NRHP-eligible). In addition, three archeological sites are currently undetermined as to eligibility because of denial of access within the area of potential undertaking (also known as area of potential effect). Because the three sites have not been tested, the Study Team has been unable to determine the size of the sites or to study impacts or mitigation strategies. Efforts continue to gain access and to resolve this situation. Pending resolution, these sites would be considered eligible for the NRHP for planning purposes.

A map showing sites in the NRHP, and local and National Register Historic Districts is provided in Figure 4.20. The historic resources considered as part of the Section 106 consultation with the Nebraska State Historic Preservation Office (SHPO) are listed in Table 4.25.

In addition to historic sites in the study area, one study area resident, a traditional Teton Lakota, has reported that his property is a Native American cultural resource. Several meetings and discussions with that resident have been conducted. It has been determined all public actions avoid this property and will have no direct adverse effects on it. The resident expressly wishes that the nature and location of this property remain private.

4.18.2 Impact Assessment Methodology

Methodologies for the historic standing structures and archeological surveys are described in the documents listed above. They have been reviewed with the SHPO for appropriateness and have their concurrence.

4.18.3 Impacts of Stormwater Management

Amended Draft Single Package. One NRHP-eligible site, a private residence at 2110 P Street, occurs within the ROW required for the stormwater management channel (see Table 4.26). The site is a large Queen Anne-style cottage dating from the early 1880s. The residence has been converted to apartments, is in fair to poor condition, and has been altered by the addition of an early 20th century porch and asbestos siding. However, it is considered eligible under NRHP Criterion C because of the architecturally unique features of the roof and chimney (though the chimney has subsequently collapsed and been removed). To avoid affecting the structure by relocating the channel along another alignment (especially eastward) would be at the loss of other historic homes, including at least four NRHP-eligible homes, and other occupied residences within the Malone neighborhood; therefore avoidance is not desirable. Relocating to the west would also affect other businesses and residences, as well as the Rock Island Depot in the NRHP. This avoidance alignment is also undesirable and unreasonable.

Based on the effects analysis conducted in consultation with the SHPO and the City of Lincoln Historic Planner, there would be no other adverse effects to historic properties from the stormwater management channel. However, acquisition of three NRHP-Eligible residences on North 22nd Street is considered a secondary impact of the channel construction. They are discussed under Community Revitalization impacts Section 4.18.5. The project acquired Queen Anne-style cottage would be evaluated for relocation under the separate City community revitalization program described previously in Section 4.5.

The Amended Draft Single Package would have an indirect beneficial effect on other historic structures in the central core of the city. Once properties have been removed from the floodplain (by containing it), property values are expected to increase, and interest is expected to rise in redevelopment of the area, including private rehabilitation and preservation of architecturally unique historic structures in the study area.

No-Action Alternative. The No-Action Alternative would avoid adverse effect to the residence at 2110 P Street, but would not meet an AV MIS goal of constructing the channel to decrease the size of the existing floodplain.

4.18.4 Impacts of Transportation Improvements

Amended Draft Single Package. The new East-West Roadway Bridge over the Burlington Northern Santa Fe Railroad mainline tracks will be a large visual change for the area around the State Arsenal. The closest point of the bridge will be at least 30 meters (about 100 feet) south and east of the Arsenal building. At this distance, and at the higher

Figure 4.19

Figure 4.20

**Table 4.25
NRHP SITES, NRHP-ELIGIBLE SITES, LOCAL AND NATIONAL REGISTER
HISTORIC DISTRICTS, AND ARCHEOLOGICAL SITES**

| SITE NO. | ADDRESS | BUILDING/DESCRIPTION |
|---|------------------------------------|----------------------------------|
| SITES LISTED IN THE NATIONAL REGISTER OF HISTORIC PLACES | | |
| N1 | 1630 K Street | Harris House |
| N2 | 344 S 18 th Street | Tifereth Israel Synagogue |
| N3 | 1944 O Street | Rock Island Depot |
| N4 | 435 N 25 th Street | Eddy-Taylor House |
| N5 | 1545 R Street | Phi Delta Theta Fraternity House |
| N6 | 700 N 16 th Street | Lewis-Syford House |
| N7 | 2212 Sheldon Street | Jasper Newton Bell House |
| N8 | 17 th and Court Streets | State Arsenal |
| N9 | 2406 J Street | Antelope Grocery |
| SITES ELIGIBLE FOR LISTING IN THE NATIONAL REGISTER OF HISTORIC PLACES | | |
| E1 | 1729 K Street | Algonquin Apartments |
| E2 | 1741 K Street | Colonial Apartments |
| E3 | 509 S 18 th Street | Bel Air Apartments |
| E4 | 519 S 18 th Street | Angelo Apartments |
| E5 | 1742 K Street | Fontenelle Apartments |
| E6 | 1907 L Street | Private Residence |
| E7 | 2005 L Street | Private Residence |
| E8 | 2011 L Street | Private Residence |
| E9 | 330 S 21 st Street | LT&T Warehouse |
| E10 | 225 S 25 th Street | Elliott Elementary School |
| E11 | 1600 O Street | Lord Block |
| E12 | 1616 O Street | Lord Block |
| E13 | 1634 O Street | Lord Block |
| E14 | 1701 O Street | BB&R Pawn Shop |
| E15 | 200 N 18 th Street | Private Residence |
| E16 | 1800 O Street | Du Teau Chevrolet |
| E17 | 2110 P Street | Private Residence |

**Table 4.25
(continued)**

| SITE NUMBER | ADDRESS | BUILDING/DESCRIPTION |
|---|---|--|
| E18 | 145 N 22 nd Street | Private Residence |
| E19 | 135 N 22 nd Street | Private Residence |
| E20 | 125 N 22 nd Street | Private Residence |
| E21 | 2246 O Street | Planned Parenthood |
| E22 | 2312 O Street | Hispanic Center |
| E23 | 2315 Q Street | Private Residence |
| E24 | 2200 R Street | Private Residence |
| E25 | 21 st and Vine Streets | Whittier Junior High School |
| E26 | 2101 Holdrege Street | Filling Station |
| E27 | 2229 J Street | Lincoln High School |
| E28 | 1635 L Street | Masonic Lodge |
| E29 | 2601 P Street | Giáo Xú Khiet Tâm Me (Immaculate Heart of Mary) Church |
| E30 | 2535 P Street | Don Critchfield House |
| E31 | 2530 Q Street | Otero C. Reynolds House |
| LOCAL AND NATIONAL REGISTER HISTORIC DISTRICTS | | |
| D1 | Hawley Historic District--Locally Designated | Residential District |
| D2 | Greek Row National Historic District | University of Nebraska Fraternity and Sorority Houses |
| D3 | North Bottoms Historic District--Locally Designated | Residential District |
| ARCHEOLOGICAL SITES | | |
| A1 | Multi-component Site | A-25LC90 |
| A2 | University Place Dump | A-25LC-99 |
| A3 | Capital Mills Foundation | A-25LC-506 |

Source: AV Study Team.

elevation, there will be no noise impacts from the roadway to the Arsenal activities. Noise would actually be reduced because trains would not blow their whistles here and warning bells would be eliminated.

In terms of the change in environs, there is concern that another large nearby construction (The Devaney Center is to the north of the Arsenal) could tend to “overwhelm” the visibility of the Arsenal.

The area directly to the south and east of the Arsenal would not need to be changed – local traffic patterns, pedestrian access and outdoor equipment display area in front of the Arsenal can remain unchanged.

Table 4.26
SUMMARY OF NRHP OR NRHP-ELIGIBLE SITES
IMPACTED BY THE AMENDED DRAFT SINGLE PACKAGE

| HISTORIC SITE | DESCRIPTION OF EFFECTS* | POTENTIAL MITIGATION |
|---|---|--|
| N8 State Arsenal at 17 th and Court Street | Adversely effected by transportation component. | Shift bridge and/or provided enhanced outdoor military equipment display area. |
| E6 Private Residence at 1907 L Street | Adversely effected by transportation component. | Potential Historic American Building Survey (HABS) recordation of site. |
| E17 Private Residence at 2110 P Street | Adversely effected by stormwater component. Requires relocation or demolition of the building. | Relocation of building to Malone Neighborhood, if structurally sound. Historic recordation of site, if unable to relocate. |
| E18 Private Residence at 145 22 nd Street | Adversely effected by community revitalization component. Requires relocation or demolition of the building. | Relocation of building to Malone Neighborhood, if structurally sound. Historic recordation of site, if unable to relocate.** |
| E19 Private Residence at 135 22 nd Street | Adversely effected by community revitalization component. Requires relocation or demolition of the building. | Relocation of building to Malone Neighborhood, if structurally sound. Historic recordation of site, if unable to relocate.** |
| E20 Private Residence at 125 22 nd Street | Adversely effected by community revitalization component. Requires relocation or demolition of the building. | Relocation of building to Malone Neighborhood, if structurally sound. Historic recordation of site, if unable to relocate.** |
| E25 Whittier Junior High School | Conditionally no adverse effect from community revitalization component. Use as “wrap-around center” Primarily interior rehabilitation, with potential parking lot and window improvements as well. | Modifications for future building use to be made in consultation with SHPO based on the current City of Lincoln-SHPO Programmatic Agreement. |
| A1 Multi-component Site (25LC90) | Potential for adverse effect from transportation component. Unknown at this time (access denied to investigate). | Attempt to avoid adverse effect by adjusting the roadway alignment after the extent of the site is known. |
| A2 University Place Dump (25-LC99) | Potential for adverse effect from transportation component. Unknown at this time (access denied to investigate). | Attempt to avoid adverse effect by adjusting the roadway alignment after the extent of the site is known. |
| A3 Capital Mills Foundation (25-LC506) | Potential for adverse effect from transportation component.*** Unknown at this time (access denied to investigate). | Attempt to avoid adverse effect by adjusting the roadway alignment after the extent of the site is known. |

*Criteria of Effect and Adverse Effect: 36 CFR 800.9.

** It is most desirable to relocate the three buildings to new side-by-side sites.

*** As a part of design activities, Nebraska Department of Environmental Quality, Solid Waste Office will be appraised of the dump status at this site.

Source: AV Study Team

The residence at 1907 L Street (SE corner with 19th Street) is eligible for listing in the NRHP. Though this is already an area of high traffic and noise, it will experience an increase in noise levels from additional traffic on both L Street and the North-South Roadway. In addition, the new roadway is considered a change in environs that is an adverse effect of the Amended Draft Single Package. Any remaining residential character for the houses along busy L Street (which are interspersed among largely commercial and industrial land uses) would likely seem to be further lost with the addition of the North-South Roadway. The Amended Draft Single Package shows the area becoming an active redevelopment area for private sector developers.

Under a greatest impact scenario, all three archeological sites would be determined to be eligible for the NRHP, and all would be affected by the Amended Draft Single Package transportation improvements. Under this scenario, three NRHP-eligible sites would be adversely affected by the East-West Roadway and the associated 33rd Street connector (see Table 4.26). However, depending on the actual extent of the sites, there is flexibility in adjusting the roadway alignment to avoid some, or all, of the resources; details of this relationship would remain unknown until access for survey is permitted by the landowners. At this time, a lesser impact scenario assesses the Capital Mills site (A-3) as No Adverse Effect because it is believed the transportation alignment will totally miss this site.

Based on the effects analysis, conducted in consultation with the SHPO and the City of Lincoln historic planner, there would be no other transportation effects on historic properties. A Draft Section 4(f) Statement has been prepared for the study to address transportation impacts to resources protected by Section 4(f) of the U.S. Department of Transportation Act, as amended. (see Chapter 7).

In addition, the transportation improvement would have an indirect beneficial effect on other historic structures in the central core of the city. For example, through traffic in the North Bottoms and Hawley Historic Districts (local) and Greek Row Historic District (NRHP) is redirected onto the new roadways and, therefore, neighborhood character is improved.

Also, congestion is reduced and accessibility is improved, especially in older neighborhoods. Property values are expected to increase along with an interest in redevelopment, and in rehabilitation and preservation of architecturally unique historic structures in the study area. On the other hand, development based pressure may increase for demolition of historic and non-historic structures that are not in sound condition.

No-Action Alternative. Under the No-Action Alternative, the East-West Roadway would not be constructed, the 33rd connector would not be required, and all three archeological sites would be avoided. However, the three sites are already zoned and platted for industrial use, and it is possible that they would be lost to development in the future.

4.18.5 Impacts of Community Revitalization Actions

Amended Draft Single Package. Expansion of Trago Park south towards O Street is part of the Amended Draft Single Package. Taking advantage of the new waterway, the expanded park would offer room for active sports and passive park activities between the waterway and 22nd Street. Although the Community Revitalization expansion of Trago Park will not likely use Federal funds, the park expansion is a secondary effect of the federally funded channel improvement. Therefore, the acquisition of three private residences, which are eligible for listing in the NRHP, between O and P Streets are included in this section

(E18, E19, and E20). These are considered adverse effects. The three residences are considered eligible because the three have similar architectural features and they sit side by side each other (Criterion C). They are in fair condition.

To avoid the adverse effect would require shifting the waterway and parts of Trago Park either east or west from the present location. Either of these shifts would affect other cultural resources; see Section 4.18.3 for a similar discussion of waterway relocation impacts.

It has been determined that there would be no other adverse effects on NRHP and NRHP-eligible sites from the community revitalization components of the Amended Draft Single Package. The only other site directly impacted by community revitalization is the former Whittier Junior High School (see Table 4.26). The school, constructed in 1922, is a striking example of Neo-Classic Revival architecture in Lincoln. The building was designed as the first junior high school in Lincoln, part of a "6-3-3" system of education aimed at including vocational, domestic and physical education. The former school is now owned by UNL and used for a variety of purposes including the Polar Ice Coring Office, Snow and Ice Research Group, USDA Screw Worm Research Laboratory, a commercial fish farm, and Lincoln Fencing Club. Approximately 30 percent of the space is actively used, with the remaining 70 percent unused or used for storage.

As part of the Amended Draft Single Package, one option under consideration is that a portion of the building could be locally developed as a "wrap-around center" for community services. These services could include a childcare center, senior center, medical clinic, library, educational centers, law enforcement, and/or youth recreation facilities, or as an active educational institution. Other local reuse actions under consideration typically relate to education reuse programs. No detrimental exterior modifications would be required, and all interior modifications would be planned following the Secretary of the Interior's Standards for Rehabilitation. These standards describe how to rehabilitate a building while maintaining the historic integrity. The type of interior modifications would be based on the types of uses identified for this site.

Based on the preliminary effect analysis, conducted in consultation with the SHPO and the City of Lincoln Historic Planner, there would be no other impacts to historic properties.

No-Action Alternative. Under the No-Action Alternative, the three residences would not be acquired and Trago Park would not be expanded. The former Whittier Junior High School would not be rehabilitated for use as a "wrap-around center" or other educational institution. The building would continue to be maintained and operated by UNL for a variety of purposes.

4.18.6 Combined Impacts of the Actions

No additional impacts result from the combined actions.

Under the No-Action Alternative, the cultural resource sites that would be effected by the Amended Draft Single Package would be avoided. The residence at 2110 P Street, a rental property, is already in fair to poor condition, and could continue to deteriorate as it remains in the floodplain. The same conditions of deterioration are expected for the three residences at 125, 135 and 145 22nd Street. The three archeological sites are already zoned and platted for industrial use, and are likely to be lost to development in the future. The former Whittier Junior High School would continue to be used for a variety of purposes.

4.18.7 Potential Impact Mitigation Measures

There are two potential mitigation measures for the State Arsenal area. Shifting the roadway bridge eastward at least 15 meters (about 50 feet) is a possibility (for about one million dollars) if this would reduce or eliminate the adverse visual effect. The additional distance would leave more space around the arsenal, though the bridge would still be a large nearby structure.

A second strategy (whichever bridge location is selected) is to make some changes, in conjunction with State Fair Park plans, to the local roads and display area around the Arsenal.

Some additional land in front of the Arsenal could be arranged for outdoor display of the heavy military equipment. This would have the effect of making the building itself more visible to visitors, and enlarge the display area, too. It is possible the area under the new bridge could be used for further protected display space. Mitigation for the residence at 1907 L Street could be Historic American Building Survey recordation.

Intentions are to relocate, through a separate City community revitalization program, the private residences at 2110 P Street and 125, 135 and 145 22nd Street to other sites in the Malone neighborhood—provided the buildings are in sound enough condition to move. The relocation would be planned in consultation with the SHPO to see that there are no adverse effects on other historic resources in the area or to the buildings when placed at their new sites. If any eligible structure cannot be moved, the building would be documented prior to demolition following procedures of the Historic American Buildings Survey (HABS).

Appropriate mitigation for the three archeological sites is unknown at this time. If it is determined that the sites are NRHP-eligible and may be adversely effected as the Amended Draft Single Package enters final design and if complete avoidance is not possible, the Partners are committed to providing excavation and recordation prior to roadway construction, all in consultation with the SHPO.

The reuse at Whittier Junior High School would have no detrimental exterior modifications, and all interior modification would be made in consultation with the SHPO. The Amended Draft Single Package would include a program for the placement of additional historical markers throughout the area to inform the community of the many sites and area activities of historical importance.

Several meetings have been held with the SHPO and the City of Lincoln historic planner as part of the Section 106 consultation process. After the DEIS public hearing, consultation with the SHPO would continue through the next phases of the study to develop an appropriate mitigation strategy. Agreed-upon mitigation measures would be included in a Memorandum of Agreement (MOA) between FHWA, the Corps, SHPO, and the City. The SHPO and City consider this schedule for development of the potential mitigation acceptable. The MOA will be included in the FEIS (see Appendix H for SHPO coordination letters).

4.19 Environmental Risk Sites

4.19.1 Baseline Environmental Conditions

The study area is comprised predominantly of commercial and residential land uses with some scattered industrial land uses. Consequently, the likelihood of encountering

environmental risk sites in the study area is relatively low compared to more heavily industry-based communities.

Sites considered herein include known and potential sites since both known (identified by regulatory records) and potential environmental risk sites exist in the study area. The majority of known environmental risk sites within the study area are underground storage tanks where there are concerns of releases of petroleum products (leaking underground storage tanks [LUST]). Such releases are generally of low volume (several thousands of gallons or less), resulting in relatively small contaminant plumes (generally less than one block in length and one-half block in width).

The majority of the potential environmental risk sites identified are linked to operating underground petroleum storage (UST) sites. Releases from these sites would also result in low volume spills with relatively small contaminant plumes. Historic above-ground petroleum storage facilities have also been identified. Releases from above-ground facilities could result in more extensive contamination due to the larger volumes stored, absence of spill prevention measures, and length of operation.

Other potential environmental risk sites are linked to hazardous substances and asbestos. There are two reported potential releases of hazardous substances in the study area. Additionally, several grain storage facilities and a major rail transportation corridor are within the study area, both of which are potential sources of hazardous substance releases. Encountering asbestos-containing building material (ACBM) and lead paint within buildings to be acquired in the study area is also possible.

Based on a regulatory record review (as discussed in Section 4.19.2), 51 known petroleum-contaminated sites are within the study area. No known hazardous waste sites defined under Subtitle C of the Resource Conservation Recovery Act (RCRA) were identified within the study area. In addition to known contamination sites, nine potential hazardous substance sites and 59 potential petroleum release sites have been identified. Sites near Amended Draft Single Package components possess the greatest potential for impact and are discussed in the following sections. See the Environmental Risk Sites report for a listing and discussion of known and potential sites in the study area.

4.19.2 Impact Assessment Methodology

Baseline hazardous waste conditions and potential impacts of the Amended Draft Single Package have been reviewed by accessing state and federal records through the Freedom of Information Act (FOIA). Regulatory records examined include Comprehensive Environmental Response, Compensation and Liability Index System (CERCLIS) and the State Spill Track system for hazardous substance releases, Resource Conservation, Recovery Index System (RCRIS, listing for Treatment, Storage and Disposal [TSD] and Generator sites) for hazardous waste management and releases, registered underground storage tanks (UST) and leaking underground storage tanks (LUST-both closed and active) for petroleum storage and releases. In addition, Sanborn Fire Insurance Maps and aerial photographs have been reviewed to identify areas with potential environmental concerns that preceded regulatory databases and/or where no contaminant investigations have been completed.

Regulatory file records for known releases were reviewed for sites within a one-block distance of linear features of the Amended Draft Single Package. For Community

Revitalization, sites within the one-block area surrounding the community revitalization components have been examined. In the areas of potential impact, the identified sites were assessed for likely relationship based on the type and volume of releases, low permeability soils and sediment within the study area and resulting low groundwater flow and contaminant migration velocities.

Much of the records review work was done as the Amended Draft Single Package was formulated. By design, the alignments associated with the Amended Draft Single Package avoid the majority of the known contamination within the study area.

4.19.3 Impacts of Stormwater Management

Amended Draft Single Package Impacts.

- Hazardous Substances: No known or potential hazardous substance release sites are within or adjacent to the stormwater management channel (see Figure 4.21 and Table 4.27). Therefore, no potential impacts from hazardous substance releases are identified.

**Table 4.27
POTENTIAL HAZARDOUS SUBSTANCE SITES
NEAR TRANSPORTATION IMPROVEMENTS***

| File Site Name | File Site Address | Status |
|-----------------------------------|--|----------------|
| Combined Support Maintenance Shop | 1111 Military Road | CERCLIS site |
| U.S. Property Fiscal Office | 1234 Military Road | CERCLIS site |
| Continental Grain Co. | 31 st St. and St. Paul Avenue | Potential Site |
| Farmland Grain Division | 2400 Fair Street | Potential Site |
| Scoular | NE Corner of 27 th St. & Leighton | Potential Site |
| BNSF Rail Corridor Crossings | 17 th , 27 th , 33 rd , and Adams Streets | Potential Site |

Source: Nebraska Department of Environmental Quality, 1998. (for known sites)
None of these sites is a Superfund Program site (NDEQ).

- Petroleum: Based on the regulatory record file review, there are several known and potential petroleum contamination sites near the stormwater management channel. Six LUST sites that appear to have the greatest potential for impacts are summarized in the Table 4.28 below (see Figure 4.22).

There is no anticipated impact on existing, known pollution sites caused by the temporary pumping of groundwater from the existing unused City wellfield adjacent to Antelope Creek.

Figure 4.21

- Existing UST sites were also identified along the stormwater management channel. Sanborn maps (1928 and 1956) document bulk fueling facilities in the 16th to 17th Street and Holdrege Street areas (see Figure 4.23). Construction through or adjacent to these sites could also encounter contamination from unreported releases. If petroleum contamination is encountered during construction, local and state authorities would be contacted and the measures discussed in Section 4.19.7 would be considered.
- Asbestos and lead paint: Based upon review of information available from the office of the Lancaster County Assessor, asbestos is present within the roofing material of four structures. Asbestos may also be present within interior building components. Asbestos abatement, if necessary, would be completed in accordance with the Nebraska Department of Health regulations (Title 178). In addition, homes with paint predating 1978 may contain lead paint.

No-Action Alternative Impacts. The No-Action Alternative has no environmental risk associated with it other than the continued presence of the sites identified.

**Table 4.28
LUST SITES POTENTIALLY IMPACTED BY STORMWATER MANAGEMENT**

| Map Site Number | File Site Name | File Site Address |
|------------------------|--------------------------------------|---------------------------------|
| 7 | Former Doan Rose Auto | 125 N. 21 st Street |
| 26 | NE National Guard | 1420 Court Street |
| 38 | University of Nebraska | 1701 Y Street |
| 46 | University of Nebraska Motor Pool | 1700 Y Street |
| 24 | Mack's Transport Service | 1309 N. 17 th Street |
| 40 | 19 th and U Street | 19 th and U Street |

Source: Nebraska Department of Environmental Quality, 1998.

4.19.4 Impacts of Transportation Improvements

Amended Draft Single Package Impacts. Potential impacts to transportation improvements, including construction of new roadways and modification of existing roadways, would be similar to those discussed above for stormwater management. With the grading, construction, and utility installation that would occur along new alignments and roadway widening, these areas would have the greatest potential for encountering subsurface contamination. Two-way street conversions, such as 16th and 17th Streets, would have minimal subsurface construction and, thus, minimal exposure to contamination.

Excavation work for the transportation improvements would typically be at a shallower depth than groundwater and, thus, contamination concerns are limited to soil and sediment. The exception is the railway underpasses east of 27th Street, at 33rd Street, and bridge support structures for the railway overpass near 16th Street. The railway underpasses would be deep enough to encounter groundwater, and the structures used for the railroad overpass support would extend to the water table.

Figure 4.22

Figure 4.23

In the event of any discovery of substance releases during construction, the City would fulfill its legal responsibilities as property owner to test, evaluate, and mitigate such releases in a timely manner. The City could seek redress and reimbursement as allowed from previous owners.

- Hazardous Substances: No known hazardous substance release sites have been identified. However, several potential hazardous substance sites occur within the area affected by transportation improvements and are summarized in Table 4.28 (see Figure 4.21). No Superfund sites are likely to be impacted by Amended Draft Single Package roadways. Two sites were included in the CERCLIS file, which are located south of the Military Road paving in the Amended Draft Single Package.

Other potential hazardous substance sites exist where the transportation alignments pass near grain elevators, both south of State Fair Park and east of 27th Street, along the BNSF Railroad mainline and at the BNSF Railroad underpasses east of 27th Street and at 33rd Street. Past activities at similar grain storage facilities included the use of hazardous substances (grain fumigants) which have since contaminated soil, sediment and groundwater on the subject property. Therefore testing the soils and ground water is planned prior to property acquisition.

Railroads are transporters of hazardous substances. Existing at-grade roadway crossings are located along the BNSF Railroad mainline at 17th, 27th, 33rd and Adams Streets. Although no records of releases were identified, these crossings are sites of potential vehicle train collisions and subsequent hazardous substance spills. Consequently, these sites are identified as potential areas of hazardous substance contamination. If the grade crossings are replaced with the Amended Draft Single Package grade separations, the risk of these collisions would be eliminated.

Prior to acquisition activities near the grain elevators and at the railroad underpass, soil and groundwater sampling would be conducted. If hazardous substances are found through the sampling program or encountered at any relocation site or along the transportation routes during construction, local and state authorities would be contacted and the measures discussed in Section 4.19.7 would be considered.

- Petroleum: Where the transportation alignment parallels the Antelope Creek channel, areas of known and potential petroleum contamination are similar to those discussed above for stormwater management impacts. Additional LUST sites that could impact transportation alignments (not discussed in the Stormwater Management subsection) are summarized in Table 4.29 (see Figure 4.22).

Table 4.29
LUST SITES POTENTIALLY NEAR TRANSPORTATION IMPROVEMENTS

| Map Site Number | File Site Name | File Site Address |
|------------------------|-----------------------|--------------------------------|
| 8 | Fish Carburetor | 201 N. 19 th Street |
| 41 | Union Bank | 1944 P Street |
| 31 | NE National Guard | 1410 Court Street |

| Map Site Number | File Site Name | File Site Address |
|------------------------|--------------------------|---------------------------------|
| 35 | NE Civil Defense | 1300 Military Road |
| 29 | NE Military Department | 1111 Military Road |
| 12 | Harding Glass | 2740 N. 27 th Street |
| 4 | Cornhusker Intl. | 3131 Cornhusker Hwy. |
| 10 | Gas N Shop | 3010 Cornhusker Hwy. |
| 51 | Wentz Plumbing & Heating | 2949 Cornhusker Hwy. |

Source: Nebraska Department of Environmental Quality, 1998.

Prior to construction activities at the railroad overpass and underpass locations, soil and groundwater sampling would be conducted. If petroleum contamination is verified through the sampling program or is encountered at any location along the transportation route during construction, local and state authorities would be contacted and the measures discussed in Section 4.19.7 would be considered.

- Asbestos and lead paint: Based upon a review of information available from the office of the Lancaster County Assessor, asbestos is present within the roofing material of at least one structure to be acquired. Asbestos may also be present within exterior and interior building components of other structures. Asbestos abatement, if necessary, would be completed in accordance with the Nebraska Department of Health regulations (Title 178). Where lead paint is present in homes that will be acquired, appropriate state regulations will be followed.

No-Action Alternative Impacts. The No-Action Alternative would have no impacts from stationary contaminant sources other than that from the continued presence of the sites identified. The potential problem with at-grade roadway crossings along the BNSF Railroad lines would remain in the No-Action Alternative.

4.19.5 Impacts of Community Revitalization

Amended Draft Single Package Impacts. Subsurface construction may encounter contamination, and building modifications could encounter asbestos. Table 4.30 identifies the environmental risk elements that could impact the concepts.

No-Action Alternative Impacts. The No-Action Alternative would involve no environmental risk other than the continued presence of the sites identified.

4.19.6 Combined Impacts Of The Alternatives

The combined potential for encountering known and potential hazardous substance and petroleum contamination sites is summarized in Table 4.31.

4.19.7 Potential Impact Mitigation Measures

As a part of the design activities, qualified experts will conduct a historical environmental analysis to determine the likelihood of hazardous wastes that may have been released to the environment for the selected alternative. This analysis may or may not lead to media sampling of the potential sites adjacent and within the transportation corridors. This analysis

will need to evaluate the ground water and eroded soils/wastes co-mingling with sediments where it may impact the bridge pier excavation activities and stormwater structures.

Contaminated media encountered in the study area could include contaminated soil and/or sediment and groundwater. Building materials could contain asbestos. Selection of an appropriate mitigation strategy would depend upon the type and concentration of the contaminant and the type and quantity of media contaminated. Potential mitigation measures include avoidance, removal of the contaminated media or building material, or on-site treatment and are discussed below.

Testing of environmental media in suspected areas will be conducted before any right-of-way acquisition occurs. If contamination is found and impacts are unavoidable, coordination with appropriate local, state and federal agencies in developing a plan of action (i.e., avoidance, removal, or treatment) in conformance with their regulatory programs will be completed.

- Avoidance: Wherever possible, contamination would be avoided by aligning the Amended Draft Single Package to avoid known contamination sites. As the Amended Draft Single Package components progress to final design, the process of shifting the alignments away from known sites will continue, as necessary. This approach becomes more difficult as the Amended Draft Single Package is fine-tuned because contamination occurs in the subsurface and the aerial extent is typically uncertain. Furthermore, ROW acquisition may preclude realignment. In the case of railroad crossings, the Amended Draft Single Package transportation improvements eliminate these crossings, thus, removing potential contamination concerns.
- Removal: Contaminated soil and sediment typically would be managed off-site in accordance with state requirements for special waste or hazardous waste. If contaminated soil meets the classification of a special waste, then the most common management option involves disposal at a licensed Subtitle D landfill in accordance with NDEQ Title 132. If contaminated soil is classified as hazardous waste, disposal must be at a licensed hazardous waste disposal site in accordance with NDEQ Title 128.

Asbestos encountered while refurbishing or demolishing structures in the study area would be handled according to Nebraska Department of Health Title 178 and NDEQ Title 129. Removal of structures containing lead paint will be handled in accordance with state law.

- On-Site Treatment: Contaminated water may require treatment prior to discharge. The cost of treatment would vary depending upon the type and concentration of contaminant, receiving waterway, volume of discharge, and treatment system required. Permits issued by NDEQ may be required for the discharge of waste water (NDEQ Title 119) and contaminant emissions to ambient air (NDEQ Title 129).

4.20 Visual Quality

4.20.1 Baseline Environmental Conditions

The City of Lincoln contains many visual resources and views that are valued by both visitors and residents alike. The visual quality in the view sheds along the alignments of the Amended Draft Single Package's roadway and stormwater management corridors is mixed. The roadway and stormwater management alignments generally traverse peripheral areas

Table 4.30
COMMUNITY REVITALIZATION CONCEPTS
POTENTIAL ENVIRONMENTAL IMPACTS

| Community Revitalization Concepts | Potential Environmental Risk | | | |
|--|-------------------------------------|-----------------------------|------------------------|-----------------|
| | Petroleum | Hazardous Substances | Hazardous Waste | Asbestos |
| Neighborhood Vitality | | | | |
| Downtown Supermarket | Yes | No | No | Yes |
| Mixed-Use Development | Yes | No | No | Yes |
| Closer-to-Home Strategies | Yes | No | No | Yes |
| Alter Land Use Patterns | | | | |
| Special Districts | No | No | No | No |
| Improve Downtown Vitality | | | | |
| Rehabilitation of Old Buildings | Yes | No | No | Yes |
| Redevelop Vacant Properties | Yes | No | No | No |
| Employment Center | Yes | No | No | Yes |
| Expand Existing Trail System | | | | |
| Parallel Antelope Creek | Yes | No | No | No |
| North of UNL City Campus | Yes | No | No | No |
| South Through Hay Market | Yes | No | No | No |
| Parallel G Street to Ant. Creek | No | No | No | No |
| Recreation | | | | |
| Northeast Community Park | No | Yes | No | No |
| Trago Park Extension | No | No | No | No |
| Health & Human Services | | | | |
| Medical Clinic | No | No | No | Yes |
| Old Safeway Building—Remodel | No | No | No | Yes |
| Whitter Junior High—Remodel | No | Yes | No | Yes |
| NE Nat. Guard Bldgs--Remodel | Yes | No | No | Yes |

Source: AV Study Team.

Table 4.31
ENVIRONMENTAL RISK SUMMARY*
Combined potential for encountering sites

| Environmental Risk Category | | # Sites: Existing Study Area | # Sites: Amended Draft Single Package | | | | No-Action Alternative |
|-----------------------------|-------------------|------------------------------|---------------------------------------|----------------|--------------------------|-------|-----------------------|
| | | | Stormwater | Transportation | Community Revitalization | Total | |
| Hazardous Substances | Known Release | 0 | 0 | 0 | 0 | 0 | 0 |
| | Potential Release | 9 | 0 | 9 | 0 | 9 | 0 |
| Hazardous Waste | Known Release | 0 | | 0 | 0 | 0 | 0 |
| | Potential Release | 0 | 0 | 0 | 0 | 0 | 0 |
| Petroleum | Known Release | 0 | 6 | 9 | 19 | 34 | 0 |
| | Potential Release | 59 | 7 | 13 | 19 | 39 | 0 |

* For specific sites impacted, refer to Sections 4.19.3 through 4.19.5
Source: AV Study Team.

between neighborhoods and the edges of such visually cohesive areas as State Fair Park and the UNL City Campus. Thus, while the alignments border the edges of visually cohesive areas, the alignments tend to be bordered by visually distinct areas.

The following section provides a general overview of visual quality in the view sheds along the stormwater management and transportation corridors.

Stormwater Management Corridor. The north-south stormwater management corridor is comprised of two sections, with a breakpoint at O Street. North of Trago Park, the corridor is described as part of the transportation corridor.

- **Antelope Park to O Street:** Existing visual quality in this area is dominated by automobile-related uses, including parking lots, low-rise dealership, and automobile repair buildings as well as the street grid. View sheds are limited in this location.
- **O Street to Trago Park:** Visual quality is mixed in this area due to the wide assortment of uses found along 21st street, the propensity of vacant lots, and the relatively poor conditions of many of the structures in the area. Automobile uses line both sides of 21st Street between O and P Streets.

The block between P and Q Streets is extremely mixed, with small single-family homes, an automobile service business, a new apartment building, and a vacant lot littered with parked vehicles. Vacant lots become more predominant and Trago Park becomes visible to the north. Single-family frame homes and a lone two-story commercial brick building punctuate the landscape. The area north of S Street is predominantly residential, interspersed with large vacant tracts of mowed grass and mature trees. The overall visual effect between P and Q Streets is of an area in transition.

From R Street, the future Antelope Creek alignment veers to the northwest, continues across S Street, and enters Trago Park where it joins the alignment of the North-South

Roadway. The open channel continues to run parallel to and east of the new North-South Roadway from this point to Salt Creek.

Transportation Corridors. The transportation corridors are divided into nine sections. The first three sections comprise the North-South Roadway, the following three sections comprise the East-West Roadway, and the last sections comprise the Adams Street Extension and Adams-Theresa Street Connection.

- **19th Street Section.** Nineteenth Street contains a variety of commercial, residential and automotive uses. Views along the corridor are of mixed quality and the view shed is generally constrained by the various low-rise structures that line both sides of the roadway.

There are three historic properties listed on the NRHP within this section, including the former Tifereth Israel Synagogue, the Duteau Chevrolet showroom and garage building, and the former Chicago, Rock Island and Pacific Railroad Depot.

- **Trago Park Section.** Visual quality in the southern portion of this section is mixed because of the variety of architectural styles and uses, which include an electrical substation, a lumber yard, the newly constructed Daywatch center, older single-family homes, and a new and well-kept weatherboard-sided apartment building.

Visual quality changes between the western edge of Trago Park and the Beadle Center to Vine Street, with expansive views of Trago Park and the Malone neighborhood to the east. The most prominent visual feature is the three-story Beadle Center, which is the largest structure in the area and is visually distinctive with its expansive brick facades, tall chimneys, and multiple gables.

- **Vine Street to BNSF Railroad Section (includes relocated Antelope Creek).** This section of the alignment traverses the northeastern edge of the UNL City Campus and includes a variety of service, recreational, and parking uses. It is adjacent to the Y Street industrial corridor. The alignment of the new North-South Roadway runs in the same general path as that of Antelope Creek. Visual quality along this portion of the alignment is mixed. The creek channel is unattractive and unnatural in appearance, acting both as a physical and visual barrier.

Further north, as the alignment crosses through parking lots surrounding the UNL transportation services building, existing visual quality is poor, with views of paved and unpaved parking areas, random vehicles, elevated wires and utility poles, and older warehouse buildings. The visual environment improves somewhat as the alignment crosses 17th Street near the residential enclave along 16th Street near the BNSF Railroad alignment. Views along this short section include the dormitories and fraternity houses interspersed with landscaped areas to the west and parking lots, and the Antelope Creek channel and 16th Street to the east, with the industrial buildings and surrounding parking areas beyond.

- **BNSF Railroad to 14th Street Section (includes relocated Antelope Creek).** North of the BNSF Railroad crossing, the view shed is quite broad as the alignment traverses open areas including parking lots and an undeveloped tract on the east side of the existing channel. Portions of the eastern edge of the North Bottoms neighborhood, particularly the rear facades of homes on the eastern side of 16th Street, are also visible. Again, the existing Antelope Creek channel is both a physical and a

visual barrier between the parking and special event uses to the east and the residential uses that extend from its western banks. As the alignment continues across Court Street and the State Fair parking lots on the east side of 14th Street, the view shed widens to reveal the undeveloped floodplain leading to Salt Creek and its convergence with Antelope Creek. The Devaney Center remains the dominant visual feature along this portion.

- **14th Street to State Fair Park Section.** The new East-West Roadway would extend east from the current alignment of Holdrege Street near 14th Street. This area is bounded by the BNSF Railroad tracks to the north and UNL parking lots to the south. While certain structures are visible in the distance, the immediate view shed is comprised of rail and automobile-related installations.

Farther east, the existing visual quality in this portion of the alignment is transitional, containing views of an expansive surface parking lot and the Devaney Center looming to the north. Views also include periodic light poles and elevated utility lines, the State Arsenal and State Fair Park entrance in the background.

While it is an NRHP property, the visual quality of State Arsenal is not particularly distinctive. Constructed in 1913, it is an unassuming two-story brick structure with a hip roof. The building is listed on the National Register due to its historic importance as the first arsenal in the state of Nebraska and not because it has notable architectural or visual characteristics. The most notable visual elements in the immediate vicinity of the arsenal are the entrance to State Fair Park, which is immediately east of the structure, and the BNSF Railroad tracks, which are located approximately 50 meters (164 feet) in front of the building.

At State Fair Park, the existing roadway is lined on both sides with mature trees (although many are unhealthy looking), creating the sense of a boulevard. The viewer's eye is drawn down the street, past an enclave of relocated railroad buildings to an Industrial Arts Building. While this structure has seen a number of modifications since its construction in 1913, its venerable brick facade with recurrent arched bays echoes the rhythm of the tree-lined boulevard and to some is an icon associated with State Fair Park. Together, the tree-lined street and the Industrial Arts Building constitute an important view.

East of this area, visual quality along State Fair Park Drive changes, as the topography dips slightly, the road widens to four lanes, and the railroad tracks, grain elevators, manufacturing buildings, and the 27th Street fly over all become visible.

- **27th Street to Cornhusker Highway Section.** The industrial character intensifies as State Fair Park Drive passes below 27th Street and the newer corrugated metal warehouse and industrial buildings between Kimco and Theresa Streets become visible. Past Theresa Street, the alignment veers to the east, passing through an enclave of industries and warehouses served by dirt roads and parking areas and crossing Dead Mans Run. It intersects Cornhusker Highway at a right angle. The industrial nature of the view shed intensifies further as the alignment enters this area.
- **Cornhusker Highway to Superior Street Section.** North of the Cornhusker Highway intersection, the view shed is expansive, as the landscape is largely undeveloped and flat. The alignment traverses a portion of an automobile salvage yard

and then turns north, passing through agricultural fields until its intersection with Superior Street. Views along this portion of the alignment reflect the combination of industrial, floodplain, and agricultural uses on the northern edge of the City of Lincoln. From Superior Street as the viewer looks south along the alignment back towards the City, the view is of a broad expanse of agricultural land, with the grain elevators along the BNSF Railroad tracks and the State Capitol building punctuating the horizon line.

- **35th Street to Huntington Avenue Extension.** Views along this corridor are constrained by the railroad embankment and structures, and are industrial in nature. There are no visual landmarks in this area. Views to the north from 33rd Street are similarly constrained by the railroad embankment, but are more open to the south, with large tracts of land occupied by the City of Lincoln Public Works and Utilities Department and the OL&B railroad plant nursery. Visual character is mixed with views of vehicle maintenance facilities and the almost park-like setting of the nursery parcel. Grain elevators dominate northern views.
- **Adams to Theresa Street Connection.** Views in this short segment are industrial in nature and are constrained by the BNSF Railroad embankment, the grain elevators, and the warehouse buildings.

4.20.2 Impact Assessment Methodology

An inventory of major visual resources in the study area was prepared by reviewing existing documentation, reviewing public involvement materials, and conducting a field survey. They include:

- key views along the Antelope Valley roadways and storm drainage corridors,
- parklands that would be either traversed by Amended Draft Single Package facilities or from which Amended Draft Single Package facilities would be visible,
- individual historic properties located within the study area view sheds, and
- structures which are eligible for historic status that would be visible from the Amended Draft Single Package facilities.

A qualitative assessment of how the Amended Draft Single Package would affect the surroundings and the context of those resources is included in the discussion below. The analysis also considers views from residential areas directly adjacent to facilities as the Amended Draft Single Package has the potential to affect views in residential neighborhoods. Figure 4.24 depicts city view corridors of the State Capital building.

4.20.3 Impacts of Stormwater Management

Amended Draft Single Package. While the introduction of the open creek channel would create dramatic changes in the visual environment, particularly in Downtown Lincoln, these changes would generally be positive. The open channel would be generally perceived as an aesthetically pleasing addition to the local landscape where existing visual quality is often poor, and would enhance the visual quality of surroundings. A typical creek section would feature grassy slopes leading down to the creek bed, with trails, lighting, benches, and landscaping. The development of effective landscaping treatments for the channel has been a particular focus of the study's public involvement program. The open channel would also provide the opportunity to link Antelope and Trago Parks and to introduce new off-street trails serving Downtown Lincoln and UNL.

Figure 4.24

However, this enlarged open area may also disrupt the existing visual flow in the community and may be perceived as a boundary. To mitigate this, there needs to be a strong concern for balancing the type and character of development along this corridor to resist creating both a physical boundary and a perceived “edge” that separates areas. Work to date planning channel aesthetics and nearby redevelopment opportunities has placed a high value on creating design standards that support community expectations. Work on developing such standards is ongoing.

Upon arriving at Trago Park, the new Antelope Creek channel would traverse the western edge of the park, running parallel to and immediately east of the roadway. Between Beadle Center and Malone Center, the creek would be separated from the roadway by a retaining wall, which would provide opportunities for landscaping and public art. The wall has been suggested as a major element of public sculpture or art. A competition for the most creative proposal is contemplated. Hopefully, local pride in this artistic expression would reduce graffiti possibilities, and the wall will be hard to access across the channel. The extension of the Rock Island Trail would be located on the eastern bank of the creek, which would slope gently upwards to meet existing grade. While the creek is adjacent to the park, it would introduce a new and aesthetically pleasing amenity to the park that would complement the surroundings and context. Moreover, visually the creek would separate the park from the new North-South Roadway and the UNL City Campus to the west, providing an attractive visual transition between the two areas. As the channel continues north through the UNL City Campus, it would introduce a new visual element to a portion of UNL where visual quality is poor. The reconstructed channel with its grassy, sloped banks and landscaping would be much more aesthetically pleasing than the existing concrete-lined channel structure.

In order to construct the stormwater management channel, a NRHP-eligible site would be acquired. As discussed in Section 4.18.3, the SHPO has determined there are no visual adverse effects to Section 106 resources as a result of the Amended Draft Single Package’s stormwater management.

No-Action Alternative. The stormwater management component of the No-Action Alternative would not affect the visual quality of the study area.

4.20.4 Impacts of Transportation Improvements

The introduction of the Amended Draft Single Package roadways would affect the visual environment in different ways. The construction of roadways in new corridors would have a greater likelihood to affect visual quality than widening and upgrading existing roadways. Similarly, the construction of elevated roadways can be expected to have a greater impact on the visual context than the introduction of new at-grade facilities. Figure 4.25 designates which roadway sections would be built on existing and new ROW, and which sections would be built on elevated structures.

Building new roadways may also disrupt the existing visual flow in the community and may be perceived as a boundary. To mitigate this, there needs to be a strong concern for balancing the type and character of development along this roadway corridor to resist creating both a physical boundary and a perceived “edge” that separates areas. Work to date planning roadway aesthetics and nearby redevelopment opportunities has placed a high value on creating design standards that support community expectations. Work on developing such standards is ongoing.

Figure 4.25

As discussed in Section 4.18.3, the SHPO has agreed there are no visual adverse effects to Section 106 resources as a result of the Amended Draft Single Package transportation elements.

Amended Draft Single Package.

- **19th Street Section.** 19th Street would be widened in several locations to accommodate the North-South Roadway. The existing roadway would be primarily widened to the west, which would involve the removal of trees on the western side of the existing street, as well as the removal of buildings. South of O Street, the widening and loss of trees and homes would alter the existing residential visual character, particularly between L and N Streets. However, the visual quality of the surroundings and context of historic structures on side streets near 19th Street are not adversely affected by these changes. For example, the 19th Street widening would not affect the visual quality of the former Tiffereth Israel Synagogue, which is located on the corner of L and 18th Streets.

Between O and R Streets, visual quality is not expected to change very much, even with the widening and removal of buildings, because of the area's existing commercial character. Views of the National Register-listed Rock Island Depot would not be adversely effected by the 19th Street widening, and would be improved by making the historic depot more visible.

- **Trago Park Section.** The removal of the Earl Carter Lumber buildings and other adjacent structures would alter views in the southern portion of this section of the alignment. However, existing visual quality would not be compromised, and the opening of new views from this area to Trago Park would enhance the local visual context.

The continuation of the North-South Roadway along the western border of Trago Park between the Beadle and Malone Centers would constitute a major change to the existing visual context. Currently, the tranquility of Trago Park extends visually to the Beadle Center, as the viewer has uninterrupted vistas between these two buildings. The roadway would act as a visual "separator" between them. Without mitigating factors, the roadway also would be viewed by some as detracting visually from Trago Park.

A number of factors would soften potential impacts. Because of the local topography, the road would be located at a higher elevation than the closest portion of the park along the new channel, thereby limiting its visibility from the park. The retaining wall between the creek and the park would extend above the elevation of the roadway and would further shield the road from view. The relocated Antelope Creek channel immediately east of the roadway would introduce an attractive new visual and recreational element to the park, and at the same time would buffer views of the roadway. Landscaping would be provided throughout this area. Several members of the UNL community have expressed concern about a possible negative impact from the proximity of the North-South Roadway to the current front entrance area of the Beadle Center. Potential mitigation of this roadway includes landscaping along both sides of the roadway and in the median. In addition, expansive and aesthetically pleasing views of Trago Park would remain available from the building's upper floors.

Between O and R Streets, visual quality is not expected to change very much, even with the widening and removal of buildings, because of the area's existing commercial character. Views of the National Register-listed Rock Island Depot would not be

adversely effected by the 19th Street widening, and would be improved by making the historic depot more visible.

- **Vine Street to BNSF Railroad Section.** The roadway and open channel would run parallel to each other in this section which passes at the edge of the UNL City Campus. Existing visual quality in this area is poor and the introduction of at-grade roadway sections would not degrade the visual context.

Four service buildings on the UNL City Campus would need to be removed to enable construction of this portion of the roadway and creek alignments.

The introduction of the elevated bridge carrying the roadway across the BNSF Railroad tracks would alter the existing visual context in the area. The structure would be clearly visible from many vantage points. Given the marginal quality of the existing visual context in the far eastern portion of the UNL City Campus and the industrial nature of the land uses found there, the crossing would not likely affect visual quality when viewed from the southeast. The structure would modify views from the Harper/Schramm/Smith dormitories and nearby fraternities to the southwest. However, given the intensive industrial nature of the existing visual context, which includes views of the BNSF Railroad, 17th Street, and the Y Street industrial corridor, it is not expected that the introduction of the bridge would adversely affect overall visual quality from this vantage point.

- **BNSF Railroad to 14th Street Section.** The BNSF Railroad crossing would also alter the existing visual context to the north of the railroad. Major visual landmarks in the area along Court Street include the Devaney Center, the surrounding parking lots, and the concrete-lined Antelope Creek bed. Existing visual quality in the area is marginal and the introduction of the new structure would not degrade existing conditions.

However, visual character becomes more residential on 15th Street, and the introduction of the large elevated structure into the view-scape from the homes lining this block would alter and detract from existing visual quality. Impacts would be mitigated with landscaping and surface treatments of the bridge approaches.

- **14th Street to State Fair Park Section.** Visual quality would be affected in this area. The introduction of the large elevated bridge and approach spans on retained fill would change views along State Fair Park Drive. Views in this section are currently quite open and broad, given that the BNSF Railroad ROW is located at a considerably lower elevation. The long extent of retained fill would constrain the view shed in this area. In addition, the construction of the bridge and approach also requires the removal of several mature trees that currently line State Fair Park Drive. The loss of these trees and the introduction of the visual obstacle posed by the embankment would alter views along State Fair Park Drive. Impacts would be partially mitigated through the use of effective landscaping.
- **27th Street to Cornhusker Highway Section.** The realignment of State Fair Park Drive in this segment would alter local views, but would not adversely affect local visual quality in this industrial area.
- **Cornhusker Highway to Superior Street Section.** The construction of a new road through this predominantly undeveloped floodplain area would open new views to the general public. However, while future development along portions of the roadway

has the potential to alter local views, the introduction of the roadway would not pose an adverse change to local visual quality.

- **35th Street to Huntington Avenue Extension and Adams to Theresa Street Connection.** The construction of the Adams Street Extension and Theresa Street connection would introduce new streets to the urban environment, resulting in changes to local views. However, given that the existing visual context in this area is mixed, with constrained views of industrial, warehouse, and railroad facilities, these changes would have no adverse impact on local visual quality.

No-Action Alternative. The transportation improvement component of the No-Action Alternative would not affect the visual quality of the study area.

4.20.5 Impacts of Community Revitalization Actions

Amended Draft Single Package. The community revitalization measures affect the visual environment to varying degrees as follows:

- **Neighborhood vitality:** The supermarket and mixed-use development would introduce new land uses Downtown. However, these new uses would be designed to be visually compatible with existing uses.
- **Land-use patterns:** Special districts would encourage aesthetically-pleasing development Downtown. Stormwater conveyance-related parks are considered improvements to the current visual environment.
- **Downtown vitality:** New Downtown housing, mixed-use development, and a new employment center would be designed to be visually compatible with existing uses.
- **Trail continuity:** Trails would be landscaped to enhance the existing visual environment.
- **Recreation:** The 13-hectare (33-acre) park would be designed to accommodate outdoor recreational activities. Parks are almost universally considered to be positive for the visual environment.
- **Health and human services:** The new medical clinic and wrap-around centers are not anticipated to adversely affect the existing visual environment. The former Whittier Junior high School, a National Register-eligible site that could become a wrap-around site, would not be subject to detrimental exterior modifications. All interior modifications would be made in consultation with the SHPO (see Section 4.18.5).

No-Action Alternative. The No-Action Alternative would provide none of the improvements to the visual environment listed above.

4.20.6 Combined Impacts of the Actions

As described in the sections above, in many instances the presence of the open channel would soften any visual impacts of the parallel roadway. The transportation improvements are in keeping with the primary urban setting, and would be appropriately landscaped. While the exact composition of the community revitalization components to be implemented has not been finalized at this point in time, community revitalization would involve many positive additions to local views in Lincoln. In particular, many of the Downtown community revitalization initiatives capitalize on the proximity of the new North-South Roadway and the open creek channel, with the aim of highlighting the pleasing aesthetics of the creek.

Together, the combined effect of the Antelope Valley projects would have a positive effect on visual quality in Lincoln, particularly in the Downtown area. There would be no adverse effect to the State Capital view corridors shown in Figure 4.24.

4.20.7 Potential Impact Mitigation Measures

Amended Draft Single Package. A number of mitigation measures are available to avoid, minimize, and mitigate visual impacts. These include landscaping, architectural treatments, surface finishes, and public involvement activities.

Landscaping would be provided with the Amended Draft Single Package. This includes not only landscaping within the stormwater conveyance-related parks, but also within roadway medians, adjacent to historic sites if determined necessary, and along other areas with major views. Landscaping would be further addressed during final design.

Architectural treatments would be encouraged through new design standards to promote appropriate visual quality within established areas of Lincoln's core. These would apply to both infill development and new, larger-scale areas of development. In addition, any modifications to the former Whittier Junior High School would be made in consultation with the SHPO.

Surface finishes to new appurtenances are another means of improving the visual quality. One particularly appropriate application would be surface treatments on the retaining wall, between the North-South Roadway and the stormwater channel adjacent to Trago Park. Again, surface treatments would be considered further during final design.

No-Action Alternative. No mitigation is required as part of this alternative.

4.21 Energy

4.21.1 Baseline Environmental Conditions

To operate on study-area roadways, automobiles directly consume fossil fuels. Since the consumption of fossil fuels may be quantified, it is useful in comparing the energy consumption of the study alternatives.

4.21.2 Impact Assessment Methodology

In the analysis of energy impacts, a comparison between the Amended Draft Single Package and the No-Action Alternative is made. Typically, both direct and indirect energy consumption, would be calculated for a transportation system. The direct energy consumption includes the amount of energy consumed by vehicles operating on the roadway network and is calculated by multiplying the total vehicle miles traveled within a study area by the energy consumption rate per vehicle. Indirect energy requirements include construction and maintenance of roadways and are dependent on such factors as roadway length, pavement type, number of bridges, etc. and is not quantified in this analysis.

The direct energy analysis compares the anticipated direct energy consumption level between the Amended Draft Single Package and the No-Action Alternative for long range planning conditions. The direct energy consumption figures presented here have been calculated using speed-sensitive formulae developed by FHWA in its April 1981 publication, *A Method for Estimating Fuel Consumption and Vehicle Emissions on Urban Arterials and*

Networks (FHWA-TS-81-210). The analysis also makes an allowance for anticipated improvements in vehicle fuel efficiency and assumes that the fleet would consume 23.8 percent less fuel per kilometer traveled than vehicles operating presently.

4.21.3 Impacts of Stormwater Management

Amended Draft Single Package and No-Action Alternative. Since stormwater management doesn't directly impact energy consumption and all indirect traffic impacts are accounted for in the traffic volume forecasts, no analysis of energy consumption was conducted for stormwater management.

4.21.4 Impacts of Transportation Improvements

Amended Draft Single Package. The anticipated annual vehicle miles traveled (VMT), average 24-hour travel speeds, and fuel consumption for the Amended Draft Single Package are presented in Table 4.32. Annual VMT would be minimally higher (less than 0.001 percent) compared to the No-Action Alternative. At the same time, average travel speeds would be 0.13 kilometer per hour (0.08 miles per hour) faster, or 0.2 percent. This increase in travel speeds would enable vehicles to operate in a more fuel-efficient environment, with the savings derived from these conditions offsetting the fuel required to support the minimal increase in VMT. Direct energy consumption under the Amended Draft Single Package is approximately 2,355,000 barrels of oil (bbl), representing a decrease of 0.1 percent over the No-Action Alternative. Therefore, energy consumption associated with the Amended Draft Single Package is considered a small improvement over No-Action Alternative conditions.

The implementation of the Amended Draft Single Package would also require a one-time non-recoverable expenditure of energy for the construction of study-area roadways. However, this non-recoverable expenditure would be compensated for over time by the ongoing annual savings in direct energy requirements. Also, none of the energy resources to be used during construction are in short supply, and no unusual demands on energy supply would result from constructing the Amended Draft Single Package.

No-Action Alternative. Under the No-Action Alternative, regional travel increases and new roadways are included resulting in an overall increase in future travel speeds. Annual VMT in the study area is forecast to be approximately 4.1 billion kilometers (2.5 billion miles) as shown in Table 4.32. Vehicles operating within the study area in that year are expected to consume approximately 2,358,000 bbl of oil.

4.21.5 Impacts of Community Revitalization Actions

Amended Draft Single Package and No-Action Alternative. Since community revitalization actions don't directly impact energy consumption and all indirect traffic impacts are accounted for in the traffic volume forecasts, no analysis of energy consumption was conducted for community revitalization.

4.21.6 Combined Impacts of the Actions

Amended Draft Single Package and No-Action Alternative. The combined energy consumption impacts would be similar to those outlined in Section 4.21.4.

**Table 4.32
ENERGY ANALYSIS**

| ALTERNATIVE | ANNUAL VEHICLE KM TRAVELLED (MILLIONS) | AVERAGE TRAVEL SPEED (KM/H) | TOTAL GASOLINE (MILLIONS of LITERS) | TOTAL DIESEL (MILLION of LITERS) | TOTAL ANNUAL BTU's (BILLIONS) | TOTAL ANNUAL BBL |
|------------------------------|---|------------------------------------|--|---|--------------------------------------|-------------------------|
| 1995 Baseline | 2 418 | 47 | 225 | 16 | 8,300 | 1,428,000 |
| No-Action | 4 100 | 50 | 371 | 26 | 13 ,700 | 2,358,000 |
| Amended Draft Single Package | 4 097 | 50 | 371 | 26 | 13,700 | 2,355,000 |

Source: AV Study Team.

4.21.7 Potential Impact Mitigation Measures

No mitigation is planned or necessary since energy consumption associated with the Amended Draft Single Package is less than that associated with the No-Action Alternative.

4.22 Physiography, Topography, Geology and Soils

4.22.1 Baseline Environmental Conditions

Physiography. Eastern Nebraska lies within the Drift Hills of the Central Lowland Province (Burchett and Reed, 1967). The Drift Hills physiographic region is further divided into topographic regions. The City of Lincoln lies within both the Plains topographic region and Valleys topographic region. The Plains region is characterized by relatively flat uplands typically underlain by sandstone and unconsolidated alluvial deposits. Surficial deposits in this region consist of wind-deposited silts and clays (UNLCSD, 1986). The majority of the study area falls within the Plains region.

The Valleys region consists of areas of low relief that typically overlie unconsolidated clay, silt, and sand (UNLCSD, 1986). Surficial deposits in this region are generally clay and silt with minor amounts of sand. The portion of the study area within the Salt Creek drainage is within the Valley's region.

Topography. Topography in the study area is relatively flat within drainage with low rolling hills in upland areas. The general surface gradient slopes down to Salt Creek. At the outflow of Holmes Lake dam, ground elevation in the Antelope Creek channel is approximately 375 meters (1,230 feet) above mean sea level (msl). At the Antelope Creek - Salt Creek confluence, ground elevation is around 347 meters (1,140 feet) msl. Ground elevation downstream of the confluence and to the northern edge of the study area ranges from 351 meters (1,150 feet) to 347 meters (1,140 feet) msl (USGS, 1980).

Geology. Geology in the study area is dominated by Pleistocene and Quaternary deposits. Within upland areas, surface deposits generally consist of a mantle of Pleistocene loess (Peoria Loess) overlying either Pleistocene interglacial deposits (loess and alluvial deposits [Loveland Formation]), glacial till (clay), or both. Pleistocene upland deposits unconformably over Cretaceous Dakota Group sandstone and shale. No known mineral deposits of economic proportions are known to exist in the study area.

Within study area drainage, Quaternary stream channels have incised most or all of the upland section. Where the upland section is absent, Quaternary alluvial deposits, consisting of clay, silt and sand, overly the Dakota Group. In certain areas, such as the Antelope Creek channel east of the Folsom Children's Zoo, the Dakota sandstone crops out in the stream channel.

Soils. USDA and UNLCSD (1980) have classified surficial soils across the study area. Soils within drainage areas include Wabash, Kennebec, Colo, Salmo, Crete, and Urban land-Crete-Sharpsburg complex. Wabash, Colo, and Salmo soils are characterized as poorly drained soils in lowland areas. Kennebec, Crete, and Urban land-Crete-Sharpsburg soils are classified as moderately well-drained soils. In upland areas, soils fall within the Urban complexes, which consist of moderately well-drained soils. Soils rated as prime farmland are discussed in Section 4.15.

4.22.2 Impact Assessment Methodology

The study alternatives would not affect surface or subsurface characteristics within the study area. Therefore, no assessment methodology was developed and no further analysis is necessary.

4.23 Wild and Scenic Rivers

Information provided by the Department of Interior-National Park Service (NPS) confirms that neither Salt Creek nor any of its tributaries are classified as Wild/ Scenic Rivers. Therefore, the Amended Draft Single Package would have no impacts on Wild and Scenic Rivers.

4.24 Coastal Barriers and Zones

No coastal areas are located within or adjacent to the study area. Thus, no impacts would occur as a result of either the Amended Draft Single Package or the No-Action Alternative.

4.25 Permits

A number of permits and/or approvals must be secured before this study can move forward and become constructable projects. The most immediate and critical of these is the successful completion of a process specified under NEPA, of which this DEIS is a requirement. NEPA also requires that a public hearing be held on the findings of this DEIS, and that all agency and public comments be addressed in a Final EIS (FEIS). FHWA, acting as lead agency under NEPA, would then use the FEIS to decide whether to move forward with the Amended Draft Single Package. The FHWA would issue its decision on the FEIS in a formal Record of Decision (ROD). The Amended Draft Single Package may only move forward with federal funding if the FHWA issues an ROD in favor of the Amended Draft Single Package.

There are a number of permits and major approvals associated with the Amended Draft Single Package in addition to NEPA. Necessary permits and processes identified while preparing this DEIS include:

Section 404 Permit. The Corps requires a permit for the discharge of dredge and fill materials in waters of the US, which include wetlands. There are wetlands and stream crossings within the study area that would be affected by the Amended Draft Single Package, so a permit pursuant to Section 404 of the Clean Water Act is required.

Appropriate mitigation measures would be provided to offset any impacts. Additional information is provided in Section 4.12 (Also see the *Wetland Delineation Report*).

Section 401 Water Quality Certification. Section 401 of the Clean Water Act requires that Section 404 permit applicants obtain a letter from the state verifying that the discharge associated with the Section 404 permit complies with state water quality standards. Section 401 Water Quality Certification is necessary for both general (i.e., Nationwide) and individual permits, and would be sought for the Amended Draft Single Package from NDEQ. Additional information is provided in Section 4.12.

City of Lincoln/Lancaster County's Floodplain Development Permit.

Construction within the 100-year floodplain of Antelope Creek, Salt Creek, and Dead Mans Run must comply with the City of Lincoln/Lancaster County's Floodplain Development Permit. This requirement would apply to all development mentioned in Section 4.13.

Consistency with Section 106 of the National Historic Preservation Act (NHPA) of 1966.

Section 106 of the NHPA requires that federal projects consider the effects of actions on properties included in or eligible for inclusion in the NRHP. Since there are existing and eligible NRHP sites within the study area, the 106 process is being carefully followed. Additional information is provided in Section 4.18.

Consistency with Section 4(f) of the US Department of Transportation Act of 1966.

Section 4(f) restricts the use of public land developed as a park, recreation area, significant wildlife refuge, or significant historic site for a transportation project unless there is no feasible and prudent alternative and the project minimizes adverse impacts to the greatest extent possible. Since historic sites and parks would be affected by the Amended Draft Single Package, the Section 4(f) process is being carefully followed. The Draft 4(f) statement is provided in Chapter 7.0.

National Pollutant Discharge Elimination System (NPDES) Permit.

The Clean Water Act, as amended, requires EPA to control pollution from stormwater discharges. NPDES stormwater discharge permits are required for construction activities disturbing five or more acres. To see that pollution in stormwater discharges from construction sites is within accepted standards, stormwater pollution prevention and erosion and sediment control plans must be developed and implemented to meet pollution prevention objectives that are included in the permit. Construction of the Amended Draft Single Package would disturb more than 2.0 hectares (5.0 acres), so a general NPDES permit would be sought from the NDEQ prior to construction.

Railroad Coordination.

Formal agreements between the BNSF Railroad and the City of Lincoln for construction within or over railroad rights-of-way would be necessary prior to construction of the Amended Draft Single Package. The railroad would require that plans allow all necessary tracks to remain in service and that structures are designed in a manner consistent with railroad requirements. Coordination with the railroad has been ongoing throughout the plan development and functional design phases of AV MIS The ADSP and designs do conform to BNSF Railroad requirements.

4.26 Construction Impacts

The construction of the Amended Draft Single Package would extend over several different neighborhoods of the City of Lincoln and involve a variety of stormwater management improvements, at-grade and elevated roadways, and community revitalization actions. This section describes the effects expected to arise during the construction process. It is based on the level of conceptual engineering analyses available in mid-1998.

The availability of funding would be a critical determinant in the overall implementation schedule, which is currently anticipated to extend over 15 to 20 years. A preliminary construction phasing plan, discussed in Chapter 6.0, includes the elevated North-South and East-West Roadway intersection and stormwater conveyance channel in the initial phase. A funding program is also discussed in Chapter 6.0. In most cases, the contractors retained to construct the various facilities would determine the precise phasing and construction techniques to be used. Therefore, while the descriptions provided in this section are illustrative of the overall construction process anticipated, it is not possible at this time to provide final determinations. Also, contract provisions would require contractors to comply with all appropriate rules, regulations, and ordinances.

The major features that would be constructed include a stormwater management channel, at-grade and elevated roadways, and a railroad underpass. The community revitalization projects are less construction-intensive.

4.26.1 Impacts of Stormwater Management

Construction of the new stormwater conveyance channel would be undertaken from north to south, working upstream. Generally, the existing channel would be maintained in place while the new channel is built to see that drainage is maintained in the study area at all times. Once the new channel is functional, then the old exposed channel just south of where the system meets Salt Creek would be filled (the existing conduit would remain in use). Construction of the new channel would require extensive excavation; this would be preceded where necessary by demolition work. The City of Lincoln has many uses for the excavated material from the new channel, including using it as fill for the relocated portions of the old channel and fill for the new East-West Roadway north of Cornhusker Highway.

The new channel bed would be located 4.9 to 6.1 meters (16 to 20 feet) below grade in most places, and the permanent channel bottom would be concrete-lined to minimize maintenance and enhance drainage flows. Between O and Vine Streets, the channel would be built with 1:6 (6:1) side slopes that would be planted with grass. Elsewhere, 1:2 (2:1) and 1:3(3:1) side slopes would be landscaped with natural materials. Retaining walls would be used in certain areas where there are space constraints and the channel is close to project roadways, such as between the Beadle and Malone Centers.

4.23.2 Impacts of Transportation Improvements

At-Grade Roadways. The majority of the roadway construction for the Amended Draft Single Package would take place in ROW already owned by either the City of Lincoln or the State of Nebraska. In addition, most study area roads would be constructed at-grade. The construction sequence involved would be similar for these roadways and would involve the following basic steps:

- ROW acquisition and relocation (see Section 4.5),
- Demolition, clearing and grubbing,
- Utility relocation and storm drainage construction,
- Grading,
- Paving, and
- Landscaping, signs and lighting.

When construction takes place in existing roadway ROW, maintenance of traffic would be a critical issue. However, when construction takes place in new corridors the contractors would have more flexibility, as access would only be an issue where the alignment crosses existing streets.

While construction proceeds on the 19th Street alignment between K and Q Streets, it is likely that 19th Street would be closed temporarily to through traffic. However, local access would be maintained at all times and the length of closure would be minimized, with temporary blockages coordinated with local residents and business owners. The construction of major intersections such as L and O Streets would be phased, with work contained to one side or the other to maintain through traffic movements at all times. However, minor intersections are likely to be closed during the construction, with motorists rerouted to nearby parallel streets. Delay would be minimized and adequate signage would be provided throughout the construction period.

Although it is possible that some fill or excavation would be needed at times to meet existing grade on either side of the ROW, the construction of at-grade roadways would not involve major excavations. However, earth-moving activities have the potential to suspend air-borne particles. Airborne dust impacts are usually mitigated through periodic wetting of construction sites, by washing the tires of construction vehicles before they leave a construction site, and by requiring construction vehicles to follow designated routes. Limiting the amount of exposed soil during construction can also minimize erosion. An erosion and sedimentation control plan would be developed and typically include measures such as grass, ditches, runs, or fiber mats to control erosion. These measures are typically described in the construction specifications.

Consistent with City of Lincoln and NDOR policy, coordination with utility operators would be required of all contractors and would be documented through a Status of Utilities Reports, which would be appended to each construction contract. The report provides the date of all contacts with utility operators, documents what relocation and other utility work they intend to do, and provides the anticipated duration and completion date for that work.

Between Q and 14th Streets, the new North-South Roadway would run along new ROW, approximately 95 percent of which is owned by the State of Nebraska. The interlocal agreement process would transfer this right-of-way to the City or LPSNRD for project construction. As described above, the construction in this area would be phased to maintain traffic flows on major cross-streets. Careful coordination would be necessary in areas where the channel and the roadway are parallel, such as between the Beadle and Malone Centers.

The East-West Roadway would be built entirely at-grade (except at the intersection of the North-South Roadway) using the same steps identified above. The portion of the roadway within State Fair Park would be built along the same alignment as State Fair Park Drive. The current two-lane road in State Fair Park is a private thoroughfare and would likely be closed throughout the construction period. To avoid encroaching on the Industrial Arts Building,

additional ROW will be necessary from the BNSF Railroad. The railroad has given initial indication that the narrow strip of ROW would not interfere with its plans to build a third track through Lincoln. Fill would be required in portions of the railroad property to provide adequate surface area for the eastbound lanes. Scheduling construction of this portion of the project would be coordinated with event sponsors to minimize impact.

In the eastern portion of State Fair Park, adequate ROW is available along State Fair Park Drive, and grading and earthwork would be minimal. The new East-West Roadway would continue in the alignment of State Fair Park Drive through a point approximately 180 meters (600 feet) northeast of the Theresa Street intersection. At this point it would veer to the east and then to the north to meet Cornhusker Highway at a right angle. This portion of the roadway would be built on new ROW, and construction would require the removal of some existing industrial buildings in the area and earthwork and filling. This portion of the alignment would also cross Dead Mans Run and would require the construction of a single-span bridge.

To the north of Cornhusker Highway, the East-West Roadway would be built on entirely new right of way through a predominantly undeveloped area, part of which contains floodplains. The roadway would be built either at-grade or on two to three meters (six to nine feet) of fill to place it at least at the elevation of the 50-year flood. A bridge would be built to carry the new East-West Roadway over Salt Creek.

The final at-grade Antelope Valley roadway work would involve the extension of Adams Street from its current terminus at 35th Street to the southwest, parallel to the BNSF Railroad track, to an intersection with an extension of Huntington Avenue. Then, it would travel below the railroad ROW to meet the new East-West Roadway at the Theresa Street intersection. Thirty-third Street would also be constructed below the railroad ROW south of Cornhusker Highway. This would require the removal of a number of storage structures, but would involve relatively little earthwork except at the railroad.

The seasonal activities of businesses in the northern portion of the study area would be taken into consideration as construction schedules are developed. For example, full access would need to be maintained to the grain elevators in the area during harvest time, and construction activities should not limit operations at the UPS depot during the busy holiday season.

Elevated Roadway. The Amended Draft Single Package would require the construction of a large elevated structure to carry both the new North-South and the East-West Roadways across the BNSF Railroad and provide connections between these important new arterials. The viaduct structure would involve entirely new construction. The construction would require changes in local traffic patterns at times, including the closure of the 17th to Court Street crossing of the BNSF Railroad tracks. However, access to the Devaney Center would be maintained, and construction activities would be scheduled to minimize conflicts with special events. The viaduct would require a 23-foot clearance over the railroad and would be built as a combination of retained fill and elevated structure. The exact extent of the different types of construction would be determined at the conclusion of the engineering work.

The erection of the viaduct would begin with the construction of piers and abutments. Piers would be constructed with pile-supported foundations, using either driven piles or drilled

shafts, with reinforced concrete footings and shafts. The bridge superstructure would likely consist of a reinforced concrete deck resting on continuous steel girders.

Installation of the piers as well as other construction activities can result in short-term impacts to sensitive land uses within the study area. Sensitive land uses typically include parks, residences, and places where outdoor events are held. A variety of construction equipment would be used during construction, with noise and vibrations controlled through various measures including contract provisions for operative mufflers, properly maintained equipment, advance warning of activities and hour/day limits to avoid noise-sensitive periods.

Because of its expense and the fact that adjoining roads would not be constructed and operating at the same time, it is likely that the viaduct would be built in a phased manner over a period of two to three years. Recommendations for phasing would be made in the Construction and Phasing and Funding Scheme. However, given that construction activities within the BNSF Railroad ROW would require special coordination, it is likely that all foundation work on the railroad's property would be completed at one time. Careful attention would be given to the design of the structures above the BNSF Railroad tracks, especially constructibility issues and any possible effects on railroad operations. The coordination process with the railroad is described below.

Given the proximity of the viaduct to both State Fair Park and the Devaney Center, access issues during special events would require careful coordination. As stated earlier, existing circulation patterns, including the 17th Street at-grade railroad crossing, would remain in effect for most of the construction period. Any temporary closures can be timed to avoid conflicts with special events. The overall extent of the construction period would likely be controlled by limitations on certain contracts, which would typically include incentives and liquidated damage clauses to encourage contractors to complete the construction on time.

Railroad Underpass. The construction of the roadway underpasses below the BNSF Railroad tracks at 29th Street and 33rd Street would be accomplished by building bridge structures to support the tracks and then constructing the roadways below. To accomplish this, the existing tracks would be supported on temporary timber trestles and anchored sheet pile bulkheads while the permanent bridge substructures are constructed below.

When the substructures are completed, train traffic would be shifted off one track onto the adjacent track and the bridge superstructure would be erected for the track that is out of service. This same process would be repeated for all tracks. The new bridge would likely consist of pile-bent piers and abutments supporting a superstructure of steel beams and a ballast concrete deck. Once the permanent bridge is in place, then excavation work would take place below it and the roadway would be constructed. It is possible that some hazardous materials would be encountered during excavations near the railroad. Any such materials would be disposed of in a properly licensed facility pursuant to the procedures described in Section 4.19 of the DEIS.

Railroad Coordination. Particular attention would be paid to the phasing of all work in and around the BNSF Railroad ROW to avoid adversely affecting railroad operations. There are currently over 50 trains operating on the two tracks running through Lincoln daily, and those levels are expected to grow in the future. Vertical and horizontal clearances would be maintained to allow trains to operate throughout all construction procedures.

Construction activities would be closely coordinated with the railroad. The General Provisions of the Standard Contract Specifications would require that the contractors present their proposed construction procedures and schedules to the railroads for review and approval whenever working close to the railroad ROW. This type of coordination would avoid conflicts. For example, the railroad may require contractors to protect pier excavations with sheet piles to avoid erosion.

Pursuant to American Railway Engineering Maintenance of Way Association (AREMA) (the governing body regulating freight railroads in the United States) standards, when construction activities or equipment are located within 7.6 meters (24.9 feet) horizontally, or 7.0 meters (23.0 feet) vertically of the centerline of track, flagmen and protective services are required. Flagmen would watch for trains and warn construction workers when a train is approaching. Protective service staff would include railroad employees paid through a force account agreement between the public contracting agency and the railroad. If construction activities, such as driving piles, need to take place within the clearance zone, scheduling must be coordinated with the railroad and could only take place within designated times. The design of project elements would be reviewed to provide minimal touch-down points within railroad property.

Construction of the viaduct will not require realignment of tracks to accommodate intermediate piers, however, construction of the 29th and 33rd Street underpasses will require some temporary track realignment to accommodate construction of new bridge structures for the railroad tracks.

4.26.3 Impacts of Community Revitalization Actions

Amended Draft Single Package. Community revitalization actions would be undertaken as public and private sector forces allow, and some are independent of the stormwater management and transportation improvements. Likely community revitalization impacts include many of those listed below under Combined Impacts. Individual developers would be responsible for identifying, assessing, and mitigating the potential impacts.

No-Action Alternative. The No-Action Alternative would involve constructing the City and UNL's projects as outlined in the CIP.

4.26.4 Combined Impacts of the Actions

Amended Draft Single Package. Potential impacts include:

- **Traffic**, including temporary blockages of through streets, and some congestion and delay,
- **Air Quality**, including airborne particles during construction,
- **Soil Erosion**, including exposure to wind (see above) and water,
- **Water Quality Degradation**, including potential sedimentation of receiving waters, and
- **Noise and Vibration**, including equipment operating, noise and vibration.

No-Action Alternative. The No-Action Alternative would incur no direct construction impacts other than those associated with the City of Lincoln's CIP and UNL's Master Plan.

4.26.5 Potential Impact Mitigation Measures

Amended Draft Single Package. Appropriate mitigation includes:

- **Traffic**, including detours with adequate signage and timed disruptions to avoid seasonal events,
- **Air Quality**, including periodic wetting of construction sites, washing the tires of construction vehicles, and requiring construction vehicles to follow designated routes,
- **Soil Erosion**, including the measures outlined above as well as limiting the amount of exposed soil during construction and developing and implementing an erosion and sedimentation control plan,
- **Water Quality Degradation**, including the need for and implementation of measures contained in a National Pollutant Discharge Elimination System (NPDES) permit. This permit is required because construction activities would affect at least two hectares (five acres),
- **Noise and Vibration**, including fostering good community relations to inform the public about particularly noisy operations, locating haul routes away from sensitive areas, controlling noise at the sources, and limiting construction to less sensitive noise times (see Technical Memoranda in Appendices B and C for additional information).

No-Action Alternative. No mitigation is required as part of this alternative.

4.27 Relationship Between Local Short-term Uses of Man's Environment and the Maintenance and Enhancement of Long-term Productivity

Based on the qualitative analysis below, the short-term uses of resources to construct the Amended Draft Single Package are necessary for the long-term benefits described throughout Chapter 4.

4.27.1 Functions of the Stormwater Management, Transportation, & Community Revitalization Improvements

The goal of the Antelope Valley Study is to adequately provide for the stormwater management, transportation, and community revitalization needs identified in Chapter 1 of this DEIS. By containing the designated 100-year floodplain within the channel, providing through routes and safety improvements for traffic, and revitalizing central Lincoln, the City's core would be improved, thus encouraging and sustaining revitalization through the foreseeable future. These investments in the core would ultimately benefit all citizens of Lincoln, and would avoid incurring costs associated with the continued threat of serious flooding. These investments would also reduce congestion and safety hazards on the City's roadways, as well as encourage the development of a center city area able to meet its full potential as a vital residential, commercial, and cultural center. Therefore, the short-term use of resources during construction would have numerous long-term benefits directly related to the study's purpose and need.

4.27.2 Land-Use Patterns

While land-use patterns would be affected through the removal of buildings and residences in the study area with the Amended Draft Single Package, these changes are intended to improve land-use patterns in the long run, consistent with the City Comprehensive and

UNL's Master Plans. Ultimately, a healthy mix of land uses appropriate to the Downtown of Nebraska's state capital city would be encouraged through the improvements.

4.27.3 Socioeconomic Systems

Implementing the study would favorably impact socioeconomic systems. Potential impacts include the following:

- Improvements to the stormwater system would encourage private investment in the Antelope Valley, thereby improving the quality of housing and retail opportunities for area residents.
- Improvements to the transportation system would discourage traffic from using neighborhood streets, thereby improving the quality of life for people in targeted residential areas.
- Neighborhood improvements in Lincoln's core would make this area a more vital place to live, with ready access to goods and services, support service facilities nearby, and physical improvements in sidewalks and neighborhood streets.
- Air quality improvements would be realized as congestion is relieved and vehicles idle less (idling vehicle emissions are major contributors to carbon monoxide).

4.27.4 Ecological Systems

Impacts to ecological systems would be minimal. No protected species of plants or animals would be affected, and impacts to wetlands would be minimized. Minor amounts of landscape vegetation would be removed, but re-vegetation and landscaping, particularly in the stormwater channel, would restore and enhance the existing ecological systems in the study area.

4.28 Any Irreversible and Irretrievable Commitments of Resources which Would be Involved in the Proposed Action

Implementing the Amended Draft Single Package involves committing a range of natural, physical, human, and fiscal resources in the short- and long-terms. These commitments include land, fossil fuels, labor, and construction materials, and are discussed briefly below.

Land used to construct the stormwater conveyance, transportation, and community revitalization improvements are considered an irreversible commitment of resources during construction activities, but is not considered irreversible in the long term. If a greater need arises for use of the land or if the improvements are no longer needed following construction of the Amended Draft Single Package, the land can be converted to another use if considered appropriate and consistent with the City's Comprehensive Plan. At present, there is no reason to believe such a conversion would ever be necessary or desirable given the amount of forethought invested in planning. Land to be used for Antelope Valley improvements includes approximately 53 hectares (130 acres) for roadway improvements and approximately 15 hectares (36 acres) for stormwater management improvements.

Considerable amounts of fossil fuels, labor, and highway construction materials such as cement, aggregate, and bituminous material would be required for the Amended Draft Single Package. Additionally, large amounts of labor and natural resources would be used in the fabrication and preparation of construction materials. These materials are generally

not retrievable. However, they are not in short supply and their use would not have an adverse effect upon continued availability of these resources in the future. Any construction activities would also require a substantial one-time expenditure of local, State, and Federal funds, which are not retrievable.

The commitment of these resources in the short- and long-terms is based on the idea that residents in central Lincoln and throughout the region would benefit by containing the 100-year flood, improving the quality of the transportation system, and encouraging the community revitalization improvements. These benefits would consist of reduced flood insurance costs and fewer restrictions on the location, cost, and characteristics of construction in central Lincoln; improved accessibility and safety as well as savings in travel time; and greater availability of quality services. These benefits outweigh the commitment of resources described above.

4.29 Secondary Impacts

Secondary or indirect impacts result from secondary actions and, unlike the direct impact discussed in previous sections of this chapter, they include all reasonably foreseeable actions that may occur *later in time or in another location*. The list of these impacts most commonly includes land use patterns, population distribution and characteristics, and natural systems. Secondary impacts of the Amended Draft Single Package are discussed below:

4.29.1 Land Use Patterns

The majority of the secondary land use impacts include the community revitalization actions included in the Amended Draft Single Package. The secondary actions, which are a subset of the total list of community revitalization actions, include:

- Downtown supermarket
- Downtown mixed-use development/redevelopment
- Stormwater conveyance-related parks
- New Downtown housing
- Trails

Many of those actions, which were thoroughly described in Chapter 3, are not possible or would certainly be made more difficult or expensive to implement without containing the floodplain of Antelope Creek. These improvements are designed to encourage a renaissance of the study area's heart, with the end result being higher and better uses of ideally located Lincoln property. Impacts of these secondary actions are discussed in the previous impact discussions.

Other secondary land use impacts separate from the list of community revitalization actions include redeveloping State Fair Park, constructing a new health clinic, and relocating housing. While these activities are not included in the Amended Draft Single Package, they may be pursued by others in the future.

State Fair Park. Separate from this study, the State Fair Park Board is currently studying ways to better use State Fair Park. If developed/redeveloped, land uses at that site would undoubtedly benefit from an improved transportation network.

New Health Clinic. A new health clinic is shown in the central area. The convenience of having a clinic in a neighborhood setting would enhance the quality of life for those living in the vicinity. Additional information is provided in Chapter 3.0.

Relocate Existing Housing. It may be possible to relocate some of the project required housing that would be displaced by the stormwater conveyance and transportation elements of this study through a separate City community revitalization program. Relocating some of the existing houses affected by the study would be beneficial since it promotes the reuse of existing resources and provides architecturally compatible housing in Lincoln's core area. The ability to relocate housing would be based on the structural soundness of the housing, the availability of vacant properties, and the desires of the homeowners.

In addition, there is a large area of industrially-zoned land that is currently farmed just south of Superior. Following implementation of the Amended Draft Single Package, this property would be ideally located, with frontage on Superior Street and the new North-South Roadway. This is the last large undeveloped tract of property within the study area, and would likely become more attractive to developers following implementation of the Amended Draft Single Package. Or, it could be preserved as public natural space. From a land use perspective, development of the property for industrial use would be compatible with development occurring elsewhere along Superior Street. From a natural resources perspective, however, the natural area would be consistent with the need to build less in the Salt Creek floodplain and to restore area wetlands. Development would be hindered to some degree by the presence of wetlands (see Section 4.12 for further discussion of this area's wetlands).

4.29.2 Population Distribution/Characteristics

Through its stormwater conveyance, transportation, and community revitalization components, the Amended Draft Single Package is designed to revitalize the central core of Lincoln. Undoubtedly, these improvements would raise the quality of life for residents living in the area while also attracting more people to there based on quality of life and proximity to Downtown. The types of people attracted to the revitalized core would, in part, depend on the housing types constructed by private developers. At this juncture, however, it is likely that a variety of housing types may be provided, thereby attracting a wide mix of people to live in the area. One potential outcome over many years of this influx of people may be the raising of the income characteristics of the neighborhood as young, upwardly mobile types take advantage of living closer to where they work and play.

Even as Lincoln grows at the edges, generally the inner neighborhoods have seen a reduction in residential density (smaller families and fewer rental units occupied). At the same time, many new families have resettled refugees from many parts of the world. The refugees are living in these neighborhoods with the lower cost housing.

The City's housing strategies are working to continue a wide range of area housing types. The availability of wrap-around centers, and health and human services in this area, too, would help see a retention of lower income, and less mobile families in the general core neighborhoods, but not concentrated as much within the flood prone areas. Active redevelopment of housing and business structures for lower income families, or starter businesses, respectively, needs to be considered and implemented by the City. These actions would preserve and enhance opportunities for newcomers, including the many refugees who bring great diversity to the City.

4.29.3 Natural Systems

The stormwater conveyance channel, linear park improvements, and the new Northeast Community Park shown in the Amended Draft Single Package, would provide additional wildlife habitat. This is considered a beneficial secondary impact.

4.30 Cumulative Impacts

Cumulative impacts of the Amended Draft Single Package would result from the implementation of that alternative in the context of the collection of past, current, and other proposed/planned actions in the region. Like secondary impacts, cumulative impacts also include the impacts of all reasonably foreseeable actions that may occur *later in time or in another location*.

The traffic forecasts used to design the Amended Draft Single Package and to characterize the No-Action Alternative include all reasonably foreseeable actions since future traffic volumes include projects considered in the City's CIP. These projects, which are discussed in more depth in Section 2.5, include:

- Replacing the Cornhusker Highway bridge at Salt Creek
- Replacing the Charleston Street bridge at Salt Creek
- Widening Cornhusker Highway from 18th to 33rd Streets
- Revitalizing the community, including:
 - O, P, R/North Haymarket Redevelopment (Block 35 and Journal-Star Haymarket Square)
 - 12th Street Revitalization Area
 - Haymarket Area Pedestrian Improvements (along O Street from 7th to 9th Streets)
 - Block 55 Redevelopment Project (landscape improvements along O Street from 10th to 11th Streets)
 - North 27th Street Redevelopment (economic revitalization along 27th Street from N Street to the overpass at Leighton Street)
 - Focus Area Revitalization Activities (typically includes sidewalk construction, alley construction, park development and tree planting)
 - Market Place Improvements (street and pedestrian improvements along six blocks of P Street from Haymarket at 19th Street to Centennial Mall)
 - O Street Landscape Redevelopment (9th to 10th Street and 13th to 16th Streets)

Since traffic volumes from all reasonably foreseeable City of Lincoln projects have been considered in this study, cumulative impacts have been covered in the direct impacts discussions, and no additional cumulative impacts are anticipated as a result of implementing the Amended Draft Single Package.

There are no known future City of Lincoln or LPSNRD projects associated with Antelope Valley that have not been considered. Therefore, there are no known cumulative impacts on wetlands. In addition, there are relatively few wetlands in the project area. The only potential wetland impacts that might be anticipated with the large area of industrially-zoned land that this is currently farmed just south of Superior Street. The potential for private development or preservation for public natural space has been discussed under secondary impacts.