

July 2006

Norfolk Comprehensive Plan Update

Transportation Plan 2030

For the Norfolk Planning Area

Prepared for
City of Norfolk

Prepared by
**The Schemmer Associates
& HNTB Corporation**



Norfolk Comprehensive Plan Update
Transportation Plan 2030
For the Norfolk Planning Area

Acknowledgements

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Mayor

Gordon D. Adams

City Council

Vicki Saunders, Ward 1

Ron Stauffer, Ward 1

Dave Fauss, Ward 2

Jim Lange, Ward 2

Jim Brenneman, Ward 3

Ivan Van Dyke, Ward 3

Sue Kaspar-Beckman, Ward 4

Erik L. Wilson, Ward 4

Planning and Zoning Commission

Sue Fuchtman, Chair

Scott Adams

Ken Boyer

Suzanne Davis

Leon Engelbart

Merlin Milander

Garry Murren

Maynard Ohl

Vern Steinman

Personnel

Mike Nolan, City Administrator

Dennis Smith, Public Works Director

Dale Bohac, Assistant City Engineer

Scott Cordes, Zoning Administrative Officer

Faythe Petersen, Planning Commission Secretary

Jim Koch, Transportation, Building, & Grounds Director

Jim McKenzie, Information Systems Manager

Sue Beckman, Police Division

TABLE OF CONTENTS

I.	INTRODUCTION.....	1
	Planning Process.....	1
	Planning Factors	1
	Vision Statement.....	2
II.	GOALS AND OBJECTIVES.....	3
	Mobility / Efficiency	3
	Safety	3
	Environment.....	4
	Economic Development.....	4
	Fiscal Responsibility.....	4
	Accessibility.....	5
	Connectivity / Compatibility	5
III.	PUBLIC PARTICIPATION	6
	Newsletter stories	6
	Community Questionnaire	6
	Working Session with City Staff and Officials	10
	Public Meeting and Comments	10
IV.	LAND USE AND DEMOGRAPHICS.....	12
	Existing and Future Land Uses	12
	Population	13
	Employment.....	14
	Housing.....	16
V.	EXISTING TRANSPORTATION CONDITIONS	18
	Existing Transportation System	18
	Field Review and Data Collection Summary	19
	Traffic Safety and Operations Evaluation.....	20
	Summary.....	23
VI.	TRAVEL DEMAND FORECASTING	25
	Model Development	25
	Alternative Analysis for 2030 Network.....	26
	Transportation Alternatives Evaluation.....	28

VII. ALTERNATIVE TRANSPORTATION MODES	36
Transit	36
Intercity Bus Service.....	38
Bicycle and Pedestrian Facilities	39
Aviation	43
Railroads	46
VIII. PROJECT PRIORITIZATION & IMPLEMENTATION .	49
Public Transit Service.....	49
Intercity Bus Service.....	49
Bicycles and Pedestrians.....	49
Aviation	50
Railroads	50
Roadways	50
IX. FINANCING THE PLAN.....	52
Roadways	52
Public Transit Service.....	52
Aviation	53
Other Modes.....	53
Funds Available for All Modes	54
Analysis.....	54
Recommendations	54
X. AMENDMENTS AND REVIEWS	55
APPENDICES	
Public Participation.....	Appendix 1
Existing Transportation Conditions Technical Memorandum	Appendix 2
Travel-Demand Model Technical Report	Appendix 3
Travel Demand Model Alternative Packages V/C Figures	Appendix 4

LIST OF FIGURES

Figure 1-1: Transportation Plan Study Area	Follows Page 1
Figure 4-1: Existing Land Use Map	Follows Page 13
Figure 4-2: Future Land Use Map	Follows Page 13
Figure 4-3: Population Growth Projection 2030	Page 13
Figure 4-4: Employment Projections 2003-2030	Page 15
Figure 4-5: Employment Growth Areas	Follows Page 15
Figure 4-6: Residential Growth Areas	Follows Page 17
Figure 5-1: Existing Functional Classification	Follows Page 19
Figure 5-2: Existing Number of Lanes	Follows Page 19
Figure 5-3: Existing Speed Limits	Follows Page 19
Figure 5-4: Existing Signalized Intersections	Follows Page 19
Figure 6-1: Traffic Analysis Zones	Follows Page 25
Figure 6-2: Growth in Land Use 2003-2030	Follows Page 27
Figure 6-3: 2003 Screenline and Calibration	Follows Page 27
Figure 6-4: Future No Build Traffic Assignment	Follows Page 27
Figure 6-5: Existing (2003) Traffic Assignment	Follows Page 27
Figure 6-6: Package A Traffic Assignment	Follows Page 31
Figure 6-7: Package B Traffic Assignment	Follows Page 31
Figure 6-8: Package C Traffic Assignment	Follows Page 33
Figure 6-9: Package D Traffic Assignment	Follows Page 35
Figure 7-1: Norfolk Trails System	Follows Page 39
Figure 7-2: Norfolk Trails System 2030	Follows Page 43
Figure 7-3: Karl Stefan Memorial Airport Diagram	Page 44
Figure 7-4: Nebraska Central Railroad Route Map	Page 47
Figure 7-5: Norfolk Railroad Crossings	Follows Page 47
Figure 7-6: Proposed Phillip and Park Avenue Spur Line Track Removal	Page 48
Figure 7-7: Proposed 3rd Street Crossing Closure	Page 48
Figure 8-1: Trail Development Prioritization	Follows Page 49
Figure 8-2: Short-Term Roadway Improvements Map	Follows Page 51
Figure 8-3: Mid-Term Roadway Improvements Map	Follows Page 51
Figure 8-4: Long-Term Roadway Improvements Map	Follows Page 51
Figure 8-5: Future Functional Classification Map	Follows Page 51

LIST OF TABLES

Table 3-1: Summary of Public Comments.....	11
Table 4-1: Housing Unit Projection	16
Table 5-1: Intersection Crash Rates	20
Table 5-2: Crash Rates Along Roadway Segments	20
Table 5-3: Summary of Signalized Intersection Analysis.....	22
Table 5-4: Summary of Unsignalized Intersection Analysis.....	23
Table 6-1: System-wide Model Measures.....	27
Table 7-1: Norfolk Handi Bus Operating Statistics.....	36
Table 7-2: Black Hills Stage Lines Route Times.....	38
Table 7-3: K & S Express Route Times.....	38
Table 7-4: Proposed Airport Capital Improvement Program	45
Table 8-1: Short-, Mid-, and Long-Term Roadway Improvements	51

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I. Introduction

This report, entitled *Transportation Plan 2030*, documents the results of a study and planning process conducted to update the long-range transportation-planning element of Norfolk's comprehensive plan of 2001, entitled *The Norfolk Plan*. **A summary of this update's recommendations, and plans for their implementation, is found in Chapter VIII.**

The Schemmer Associates, in conjunction with HNTB Corporation, conducted the study under contract with the City of Norfolk. Funding for the project was provided, in part, through the Nebraska Department of Roads' Comprehensive Plan Assistance Program.

Norfolk is located in Madison County in northeastern Nebraska. The current population of Norfolk, based on a 2004 estimate by the U.S. Census Bureau is 24,072. The study area includes the entire city limits of Norfolk and areas within the 2-mile planning jurisdiction as depicted in **Figure 1-1**.

Planning Process

The planning process for *Transportation Plan 2030* involved Norfolk city staff, elected officials, and citizens to define the future of its transportation system. The process involved a three-part strategic planning program, designed to (1) assess the City's current conditions; (2) establish transportation visions and goals for Norfolk's 24-year future; and (3) consider an action program necessary to achieve that vision.

Members of the community were invited to participate in the strategic planning process through stakeholder and community questionnaires, a working session with City staff and officials, and a public meeting. Additionally, a new tool, called a Travel Demand Forecast Model, was developed to examine Norfolk's roadway system, predict deficiencies and test alternative solutions, or future projects. This tool is described in Chapter VI.

Planning Factors

Seven factors outlined in the Transportation Equity Act for the 21st Century (TEA-21) planning criteria were used to develop goals and objectives for the Norfolk transportation system. Each factor has been applied to the planning process for the Norfolk transportation network.

1. Support the economic vitality of the Norfolk planning area, especially by enabling regional competitiveness, productivity, and efficiency.
2. Increase the safety and security of the transportation systems for motorized and non-motorized users.
3. Increase the accessibility and mobility options available to people and freight.

4. Protect and enhance the environment, promote energy conservation, and improve quality of life.
5. Enhance the integration and connectivity of the transportation system, across and between modes, for people and freight.
6. Promote efficient management and operation of the existing transportation system.
7. Emphasize the preservation of the existing transportation system.

Vision Statement

The vision of *Transportation Plan 2030* is to provide Norfolk with a safe, efficient, and balanced transportation system that provides mobility for all, promotes clean air, conserves energy, preserves neighborhood livability, and enhances the quality of life for its citizens and guests. Norfolk's transportation system will be safely used by people of all ages and income classes, and be supported by a dedicated, sustainable transportation-funding source.

II. Goals and Objectives

The following are general transportation goals and objectives for the Norfolk Transportation System that should be considered during the implementation of *Transportation Plan 2030* and ongoing annual review process.

Mobility / Efficiency

Develop, maintain, and promote the most efficient and effective transportation system for the movement of people and goods.

Objectives:

- Maximize the useful life of existing elements of the transportation system.
- Maintain safe and reasonable levels of service on all highway facilities. The projected traffic volume demand through the Year 2030 will be met by undertaking the projects listed in *Transportation Plan 2030*.
- Develop transportation investment decisions, which maximize the full benefits of the system while considering life cycle costs.
- Preserve corridors for future transportation system development.
- Maintain a transit fleet with appropriate vehicle-to-service match-up.

Safety

Increase the safety and security of the transportation system for motorized and non-motorized users, minimizing the occurrence of crashes that might result in the loss of health, life, and property.

Objectives:

- Develop a transportation plan that gives priority consideration to transportation system improvements that minimize crashes, injuries, and personal loss of life.
- Emphasize safety improvements over expanded capacity and new construction on the existing highway network.
- Work with railroads on pursuing safety improvements at railroad crossings.
- Promote the standardization of geometric design criteria across transportation agencies.
- Closer attention to non-motorized safety improvements where motorized and non-motorized facilities converge.
- Focus on high crash rate areas for transportation improvements.

Environment

Protect and enhance the environment, promote energy conservation, and improve quality of life.

Objectives:

- Minimize adverse impacts of transportation systems on the environment, such as noise and water runoff.
- Initiate and support projects, programs, and services that are designed to improve air quality.
- Undertake and promote energy conservation programs in transportation.

Economic Development

Support the economic vitality of the City of Norfolk and the Norfolk Planning Area, especially by enabling competitiveness, productivity, and efficiency through the efficient movement of people and goods.

Objectives:

- Give priority consideration to transportation projects and a system that facilitates local job creation and retention.
- Promote efficient land-use patterns, appropriate commercial and industrial development locations, and redevelopment opportunities in the Norfolk Planning Area.
- Give consideration to the true cost and benefits of providing the transportation facilities necessary to move goods in the Norfolk Planning Area.

Fiscal Responsibility

Promote efficient system management and operation, ensuring that the transportation system meets the users' needs and remains financially stable.

Objectives:

- Support the proper allocation of transportation funding to ensure detail is given to the appropriate transportation network links.
- Analyze transportation investment decisions that consider the full costs and benefits.
- Give priority to funding those transportation needs identified in state, regional, and local transportation system plans.

Accessibility

Increase the accessibility options available to all potential users of the transportation system.

Objectives:

- Encourage multimodal accessibility to employment, commerce, medical care, and housing and leisure.
- Establish an integrated transportation system supportive of the land use goals of *The Norfolk Plan* and *Transportation Plan 2030*, focusing development along major transportation corridors encouraging infill development within the urbanized areas including public transportation and coordinating transportation planning and land use planning.
- Analyze the needs of those who are underserved by the exiting transportation system and make appropriate adjustments as necessary.
- Give appropriate consideration to the needs and requirements of disabled persons who use the system.
- Facilitate increased communication between governmental agencies and officials, the system users, the public, and other interested parties.

Connectivity / Compatibility

Enhance the integration and connectivity of the transportation system, promoting the efficient and effective movement of goods and people, enabling users access to the entire Norfolk Planning Area.

Objectives:

- Promote the efficient movement of goods and people through appropriate linkage of the various modes of transportation.
- Minimize conflicts between and within vehicular roadways, rail, public transit, bicycle, and pedestrian facilities.
- Encourage the development of efficient intermodal freight facilities to conduct effective shifts among modes within the system.
- Identify future right-of-way needs within the Norfolk Planning Area and establish a program for protection and advanced acquisition prior to the occurrence of development.

III. Public Participation

The process of updating the transportation component to Norfolk's comprehensive plan included public involvement and coordination with City officials, staff and community leaders. These efforts included two City of Norfolk newsletter stories, stakeholder and community questionnaires, a working session with City staff and officials, and a public meeting.

Newsletter stories

Two stories publicized the update effort in the City of Norfolk's official newsletter, *City Outlook*. The first was distributed in August 2005 and solicited input on the community questionnaire. The second was distributed in early May 2006 and served as a notice for the May 22 public meeting.

Community Questionnaire

A key tool for the early stages of this process was a community questionnaire, which provided the public an early opportunity for input on the update to Norfolk's Transportation Plan. It also has provided the City with general areas of public concern regarding its transportation system. More specifically, the effort has assisted the study team in determining a preliminary list of alternatives that could be evaluated through the travel demand modeling process described in Chapter VI of this report.

Background

On June 20 and 21, 2005, community leaders provided input on Norfolk's transportation system by participating in group discussions facilitated by The Schemmer Associates. This effort included the City Council and City Planning Commission. As a part of these discussions, 36 participants completed the questionnaire.

In August and September 2005, the questionnaire was distributed to the general public through the City of Norfolk's newsletter. The questionnaire was also made available electronically on the City website. A total of 95 surveys were submitted (28 via Internet, and 67 via hard copy).

Questions

The questions included ranking and open-ended formats. The questions are listed below. A copy of the Questionnaire is included in **Appendix 1**.

1. Norfolk's transportation system affects your quality of life. How would you rate each of the following on a scale of 1 to 5 with 1 being "Unacceptable/Very Poor" and 5 being "Acceptable/Very Good"?

- Congestion on major streets
- Condition of major streets & roadways
- Travel times between places you go
- Public transit system (Handi Bus)
- Street maintenance & repair
- Condition & availability of sidewalks
- Condition, availability & connectivity of trails

2. If someone asked you to prepare a plan for Norfolk's transportation system, what are the top three actions or projects you would most strongly recommend?

3. If you could change one thing about transportation in Norfolk, what would you change?

4. What is the best thing about transportation in Norfolk?

5. How would you rate your satisfaction with the following aspects of Norfolk's transportation system? (Very Satisfied / Okay / Dissatisfied)

- Roads/Streets
- Sidewalks
- Intersections
- Handi Bus Routes
- Highway System
- Bike Paths
- Trails

6. What do you feel should be emphasized in the Comprehensive Plan Update regarding transportation? Please rate each of the following using a scale of 1 to 5, where 1 means it should have very little emphasis at all and 5 means the item should be strongly emphasized.

- Planning for widening roads
- Planning for ongoing maintenance and preservation of streets & highways
- Planning for **new** interchanges and **new** roads to respond to future growth
- Planning for safety & traffic flow improvements at intersections
- Planning for more bicycle paths and trails
- Improving bicyclist & pedestrian safety
- Investigate more public transit alternatives

Synopsis of Results

More detailed results, including graphics, are available in the **Appendix 1** of this report.

Question 1:

Rating of aspects of Norfolk's Transportation System

- Both stakeholders and the general public rated Norfolk's "travel times between places" highest.
- Both groups gave the lowest ratings to Norfolk's "condition and availability of sidewalks" and "public transit system (Handi Bus)".

Question 2:

If someone asked you to prepare a plan for Norfolk's transportation system, what are the top three actions or projects you would most strongly recommend?

- Stakeholders:
 1. Bypass routes
 2. 25th and 37th Street improvements
 3. Sidewalk improvements
 4. Transit system
- General public:
 1. Transit system
 2. Repair on streets/roadways
 3. Repair/add more sidewalks/connect more trails
 4. Bypass routes

Question 3:

If you could change one thing about transportation in Norfolk, what would you change?

- Stakeholders:
 1. Bypasses
 2. Parallel parking downtown
 3. Transit system
- General public:
 1. Transit system
 2. Return roundabouts to 4-way intersections
 3. Parallel parking downtown

Question 4:

What is the best thing about transportation in Norfolk?

- Stakeholders:
 1. Travel times/traffic flow
 2. Street conditions/maintenance
- General public:
 1. Short travel times
 2. New roundabouts

Question 5:

Satisfaction with the following aspects of Norfolk's transportation system?

- Stakeholders:
 1. Most Dissatisfaction: Bike Paths
 2. Highest Satisfaction: Roads/Streets
- General public:
 1. Most Dissatisfaction: Sidewalks
 2. Highest Satisfaction: Highway Systems

Question 6:

Emphasis in the Comprehensive Plan Update.

- Stakeholders:
 - Highest emphasis:
 1. Planning for new interchanges/roads to respond to growth
 2. Planning for safety/traffic flow improvements at intersections

- Lowest emphasis
 1. Public transit
 2. Planning for widening roads
- General public:
 - Highest emphasis:
 1. Planning for safety/traffic flow improvements at intersections
 2. Planning for ongoing maintenance and preservation of streets and highways
 - Lowest emphasis
 1. Planning for more bicycle paths and trails
 2. Planning for widening roads

Working Session with City Staff and Officials

On February 28, 2006, representatives from City staff, City Council and the Planning Commission attended a presentation/work session to determine various alternatives that should be tested in the travel demand model described in Chapter VI. The participants were given the results of the community surveys, a primer on travel demand modeling and a report on the existing and 2030 conditions of the transportation network.

Public Meeting and Comments

A public meeting was held on May 22, 2006, at the City Council Chambers, with 32 people in attendance. The purpose of the meeting was to share with the public the preliminary recommendations of *Transportation Plan 2030* (as described in Chapter VIII) take comments before the Plan was finalized and formally adopted by the Planning Commission and City Council. The meeting included a presentation, displays, handout and comment sheets.

The meeting was advertised in advance through the *City Outlook* newsletter, fliers, and the *Norfolk Daily News* and local radio stations. The local media also provided news coverage of the meeting. The draft *Transportation Plan 2030* was made available at City offices and the public library. It was also made available electronically on the City's website. The public had two weeks to submit comments. A summary of the comments and responses is provided in **Table 3-1**.

Table 3-1: Summary of Public Comments

Type	Date	Summary	Response
Public Meeting Question	05/22/06	Why are three-lane roads proposed? Why not four-lanes?	Three-lane roads are considered safer than four-lane roads because they allow a lane for through traffic to continue uninterrupted. Because of this, they have similar capacity to four-lanes.
Public Meeting Question	05/22/06	Are utilities, such as storm drainage pipes, etc. included in the cost estimates?	Yes, however the costs are broad-brushed estimates. More precise costs are determined during engineering design.
Public Meeting Question	05/22/06	Does the Nucor Road area include the industrial growth occurring there?	Yes, and as additional development occurs, it can be incorporated into the travel-demand modeling tool.
Letter from Faith Regional Health Services, 2700 Norfolk Avenue	05/24/06	Disappointed that Norfolk Avenue, from 27 th to 30 th Streets, was not included in the City's plans. Would like it to be narrowed to three lanes and be undivided. This would allow direct access to FRHS and allow a possible bridge connection between the west campus and any future facilities south of Norfolk Avenue.	Discussions continue between FRHS, City and Nebraska Department of Roads. This study took a "macro" view of deficiencies. Additional detailed study will likely be performed to determine if additional improvements are necessary along Norfolk Avenue, between 25 th Street and U.S. 275.
Letter from property owner on N. 25 th Street	06/01/06	Concerned about change in plans to widen 25 th Street closer to his house. Driveway has direct access to 25 th Street. Questions need for the project.	City responded with letter. The current recommendation is based on future deficiencies identified through the study effort described in this report. There will be ongoing efforts to keep affected property owners informed.

IV. Land Use and Demographics

Existing and Future Land Uses

Land use and transportation go “hand-in-hand” with each other, as each type of land use has an impact on the transportation modes around it. Transportation can also have an impact on the land uses that it connects.

The residential, and employment projections of this chapter are made based on analysis of a variety of factors including, but not limited to, *The Norfolk Plan*, existing and projected populations, local and regional real estate trends, location, geography, history and public input.

The *Existing Land Use* map in **Figure 4-1** shows the existing land uses of Norfolk within the city’s 2-mile planning jurisdiction. This map, from *The Norfolk Plan*, provides the base from which future land use projections and the expected direction of growth can be derived.

Over the past two decades, residential land development has been the predominant land use type of new growth for Norfolk. Although annexation accounts for some of this growth, the city has witnessed substantial new activity in the residential uses. It is expected that residential growth will continue to consume increasing amounts of land as single-family land uses continue to reduce in density.

Norfolk continues to be a regional hub of commercial activity, and the commercial sector continues to grow with the city and the region. However, the density of commercial developments continues to decrease, having an impact on the future land uses of the city.

The industrial land uses of Norfolk have been growing slowly with most growth occurring outside the City’s limits, but within the two-mile planning jurisdiction. This trend is expected to continue, with most industrial development expected to emerge northeast and southwest of the city.

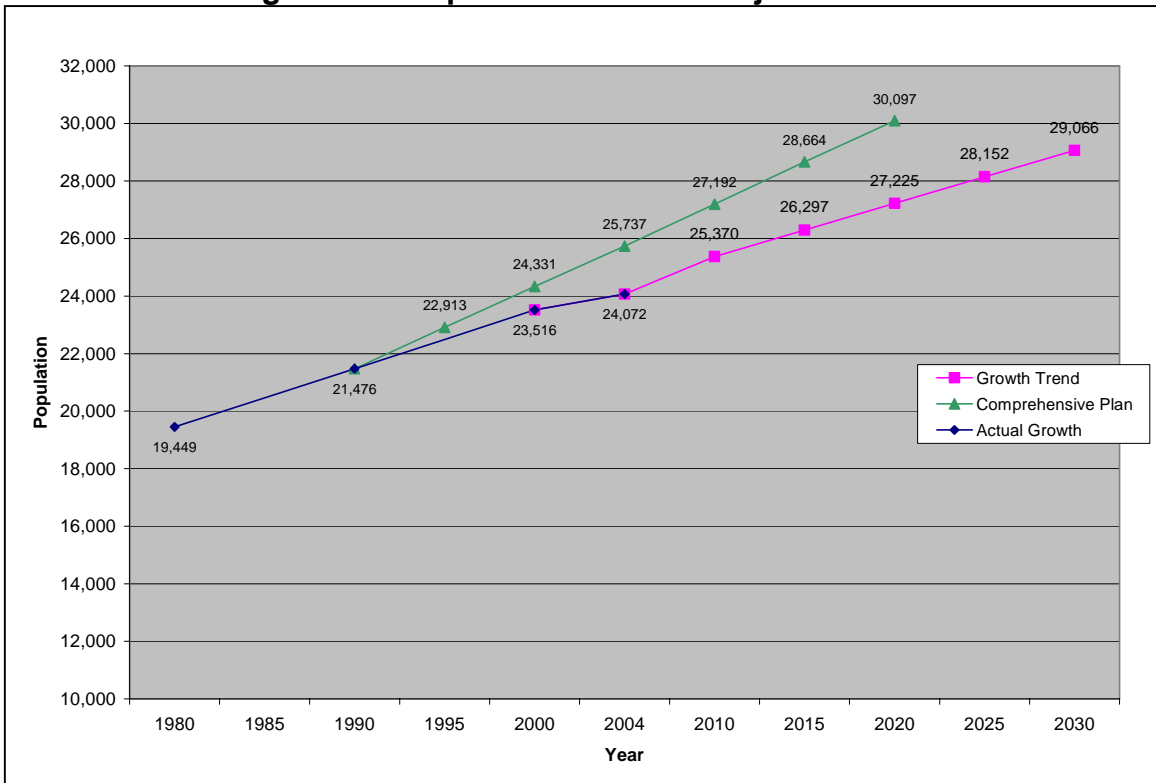
The *Future Land Use* map in **Figure 4-2** shows the future land uses of Norfolk within the city’s 2-mile planning jurisdiction. This map, from *The Norfolk Plan*, is referenced throughout the planning process to assist in the allocation of future land use characteristics.

Population

The Norfolk Plan states, “Population projection is an inexact science to be sure.” The accuracy of a projection can change due to many reasons over the course of time of the projection timeframe. However, projections are still useful in gathering a general vision of the future for planning purposes. The results that are produced through the population projections are used in assessing the future land uses.

Multiple population projection scenarios were outlined in *The Norfolk Plan*, separated by different migration rates. Although the Plan had calculated a lower historical migration rate, it was stated that, “a more aggressive 8-percent migration scenario is likely during the coming years.” However, after additional research into the trends and discussions with various stakeholders throughout the city, a more conservative rate of growth was selected. This rate, closer to a scenario that would include a 5-percent migration rate, was based on a linear progression from historical figures.

Figure 4-3: Population Growth Projection 2030



Source: The Norfolk Plan – RDG Crose Gardner Shukert, 2001, US Bureau of Census, 2006

The population projection from a linear progression, displayed in **Figure 4-3**, resulted in a 2030 population of 29,066. This serves as the population from which employment and land use projections are based.

0 1000 2000
In Feet

Existing Land Use

Madison County Comprehensive Plan: Norfolk

RDG Crose Gardner Shukert
Omaha and Des Moines

Vacant
Agricultural / Open Space
Parks / Recreation
Rural Residential
Single Family Residential
Single Family Residential - Home Occupation
2-4 Plex / Town homes
Multi Family Residential
Mobile Homes
Office / Financial
Restaurants / Entertainment
Services
Automotive
Retail
Downtown / Mixed Use
Wholesale
Warehousing / Distribution / Self-Storage
General Industrial
Salvage
Schools
Public Facilities
Civic Uses
Retirement Home / Assisted Living
Commercial Recreation
Vacant Farm
Ag - Industrial
Resource Extraction - Quarry

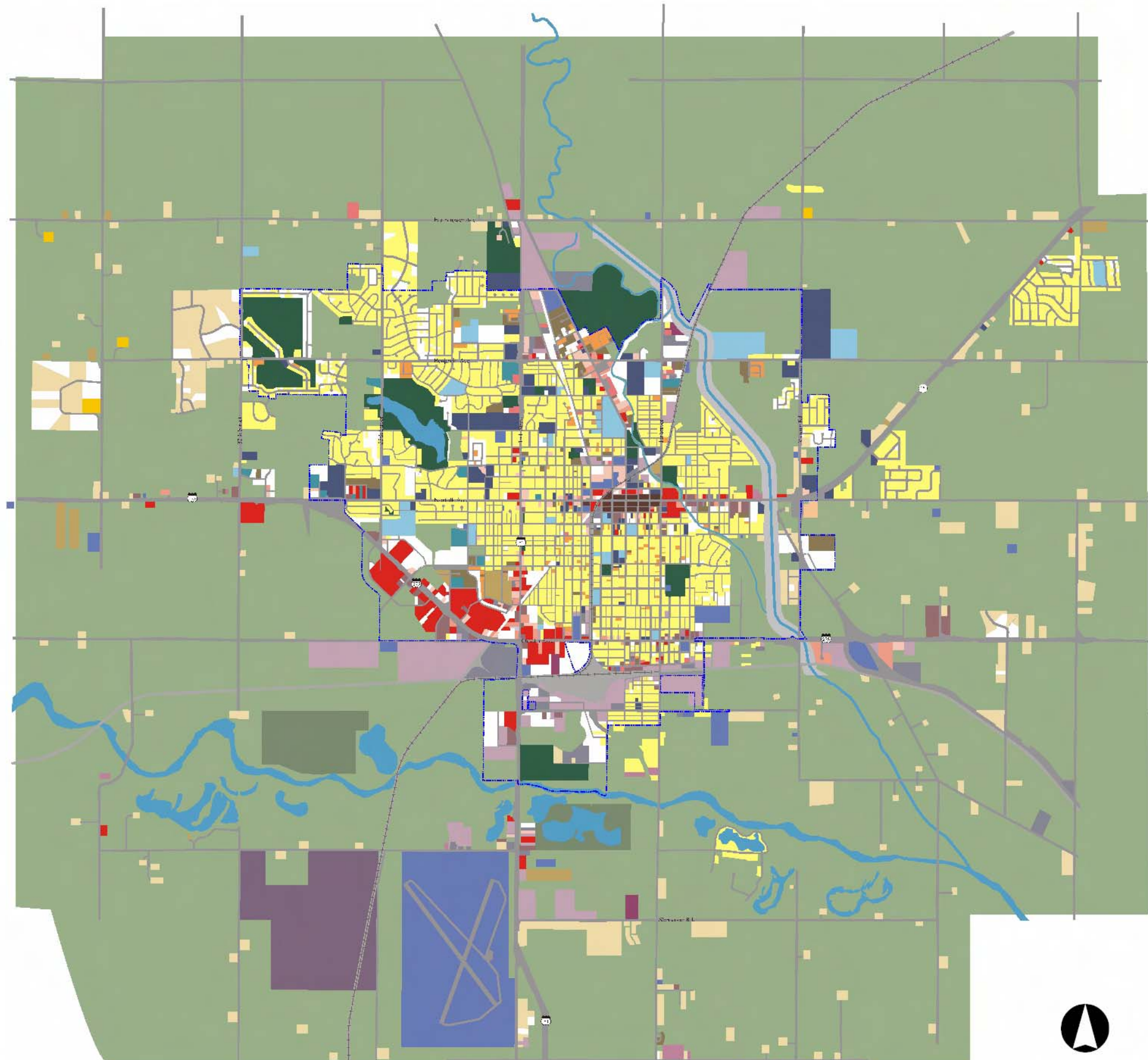


Figure 4-1
Existing Land Use Map



City of Norfolk
Transportation Plan 2030
Norfolk, Nebraska



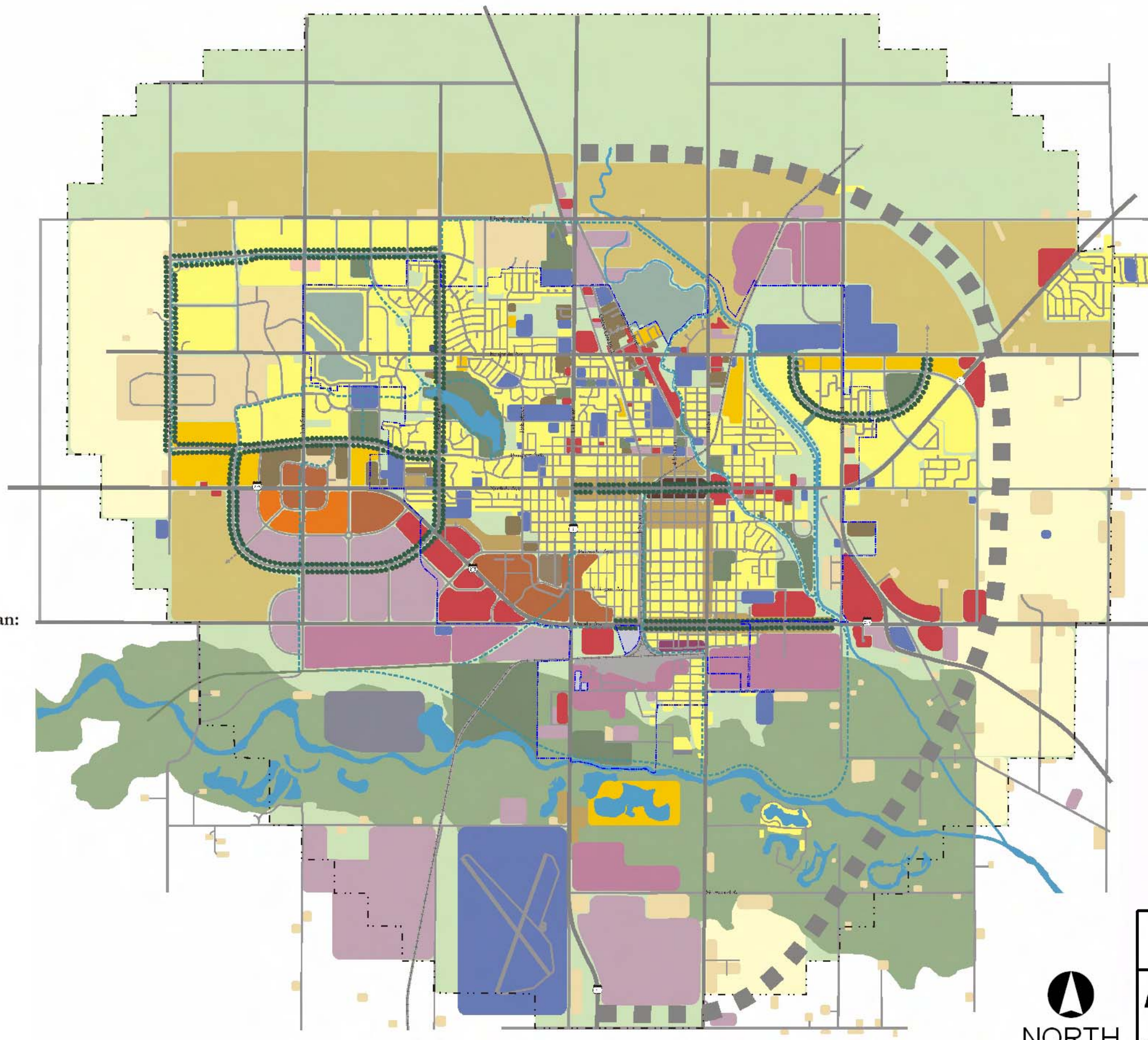
0 1000 2000
In Feet

Future Land Use

Madison County Comprehensive Plan: Norfolk

RDG Crose Gardner Shukert
Omaha and Des Moines

- Parks Rec
- Golf Courses
- Elkhorn River Corridor
- Agriculture/Open Space
- Urban Reserve/Agriculture
- Conservation Development
- Rural Residential
- Single Family Residential
- Medium Density Residential
- High Density Residential
- High Density Residential / Mixed Use
- Neighborhood Center
- Commercial
- Commercial Mixed Use
- Downtown
- Thematic District
- Mixed Use
- Business Park
- Industrial
- County Industrial Districts
- Resource Extraction (Quarry)
- Major Civic Uses
- Future Links
- Cowboy Trail
- Trails
- Corridor Enhancements
- Bypass Corridor Study



**Figure 4-2
Future Land Use Map**



City of Norfolk
Transportation Plan 2030
Norfolk, Nebraska



Employment

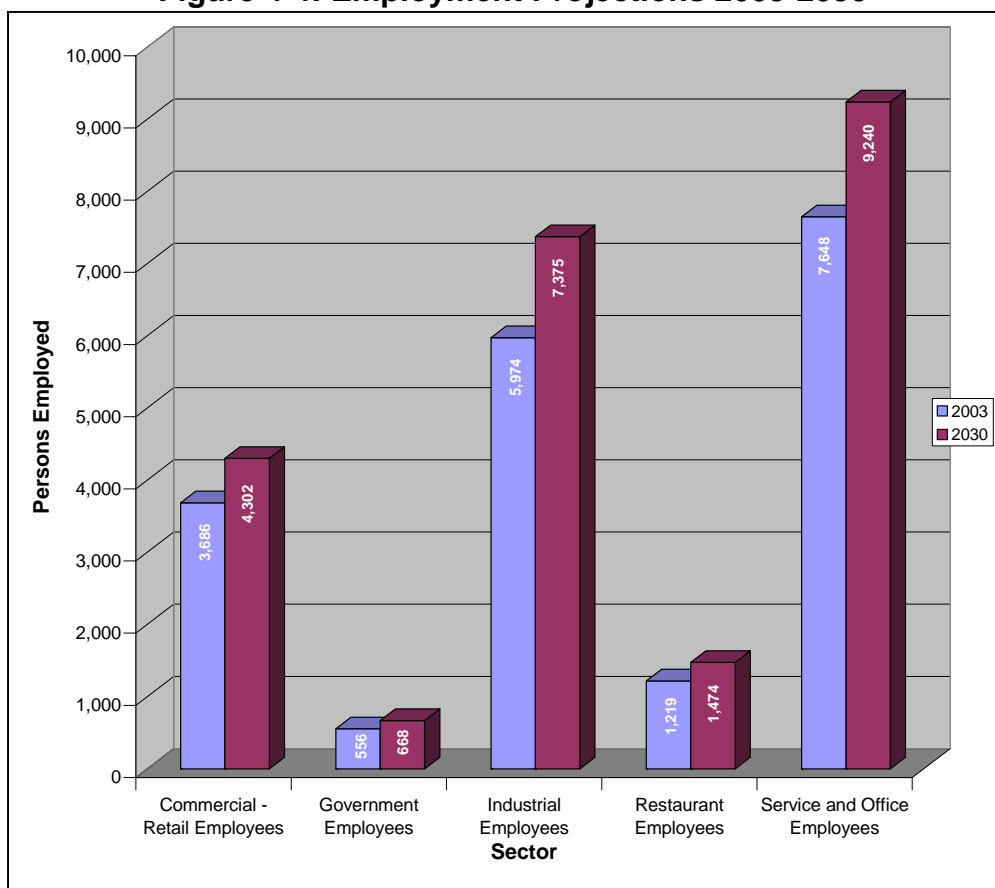
Based on statistics from Nebraska Workforce Development - Department of Labor, the employment for the *Transportation Plan 2030* study area was 19,083 in 2003. This was the most recent year that detailed employment data was available. For the purposes of this study, 2003 was used as the base year for modeling and future year projections.

The 2003 employment data used was generalized from 294 employment categories into five simplified categories. Each category serves a different role in the generation of trips in the Norfolk transportation system. The five categories are:

- Commercial - Retail
- Government
- Industrial
- Restaurant
- Service and Office

Using the population projection for 2030, the employment for each of the aforementioned categories could be derived. Projections for Service and Office represent the employment sector expected to have the largest growth with an increase of 1,592 persons employed. This is followed by the Industrial employment sector with 1,401 persons. Both sectors are expected to continue to lead the other sectors significantly through the year 2030 as shown in **Figure 4-4** on the following page.

Figure 4-4: Employment Projections 2003-2030



Source: U.S. Census Bureau

Once the employment projections were completed, the employment figures for 2030 were assigned spatially throughout the planning area for analysis. To complete this task, the projected employment data was assigned to the Traffic Analysis Zones (TAZ) based on the Future Land Use Map from *The Norfolk Plan*, stakeholder input, and a review of current conditions. The resulting Employment Growth Areas for 2030 are depicted in **Figure 4-5**.

As the figure illustrates, Norfolk's employment growth is expected to develop in many areas throughout the planning area. The most notable area is the continued development along the Highway 275/Norfolk Avenue corridor where the commercial, service and office, and restaurant sectors of employment are expected to dominate development. These three sectors of employment typically coexist in relative proximity to each other. Other areas where the City is projected to experience similar development include areas along Benjamin Avenue and Riverside Boulevard in the northern section of the City, as well as Victory and Channel Roads along the eastern edge.

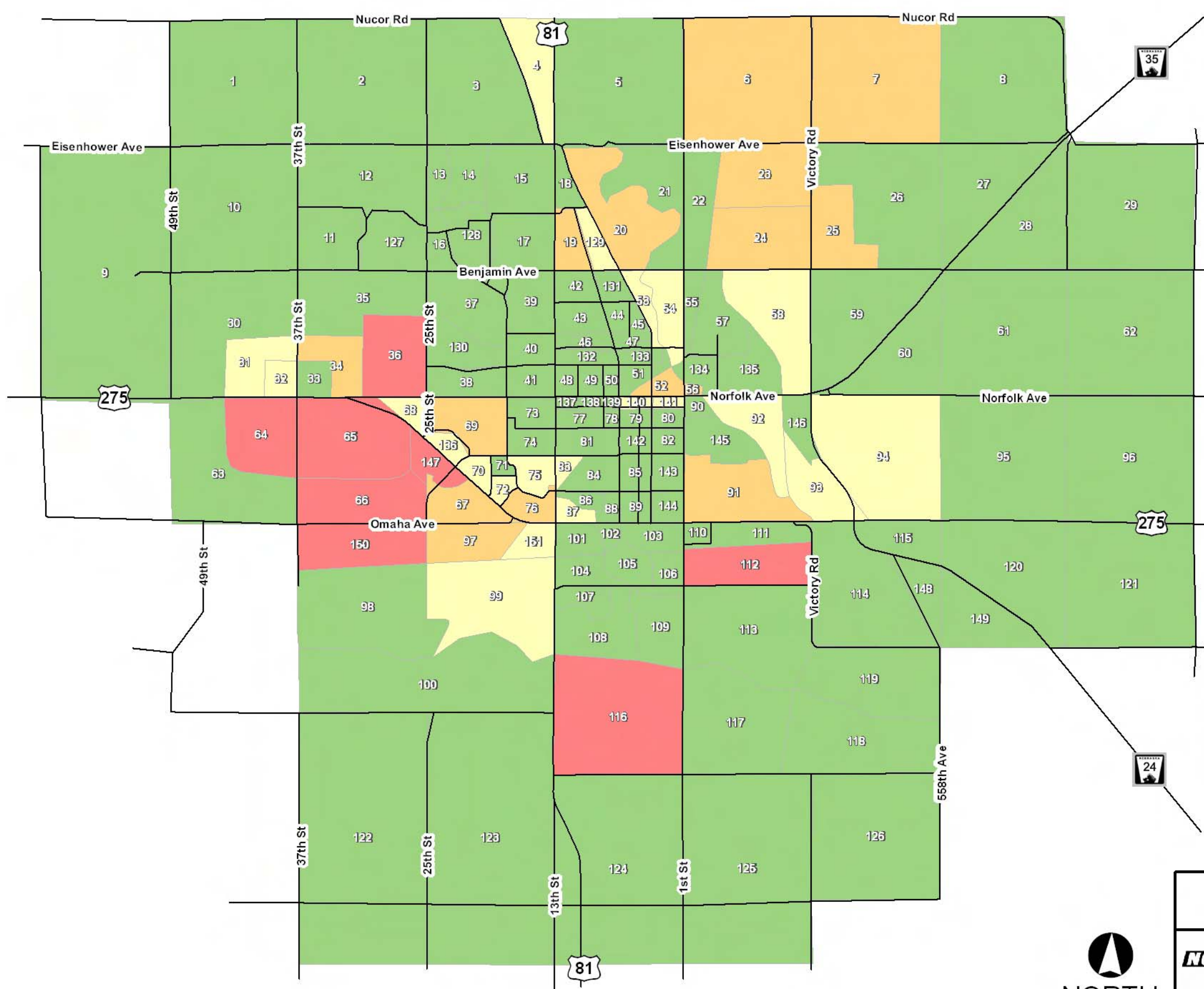


Figure 4-5
Employment Growth Areas

NORFOLK

City of Norfolk
Transportation Plan 2030
Norfolk, Nebraska

THE SCHEMMER ASSOCIATES

HNTB



The Industrial employment sector is expected to grow in three main areas of the City:

1. The traditional industrial growth area in the south
2. The northeast, more specifically along the Victory Road corridor, north of Benjamin Avenue, in the area of the proposed Ethanol Plant (TAZ 6)
3. Along Omaha Avenue, west of Highway 275

Housing

Projecting the future housing stock of the City is important to the transportation planning process as well. When conducting a vehicle trip analysis of the City, housing is connected to many of the trips accounted for in the average daily traffic volumes, as trips commence or terminate at housing units throughout the City. *The Norfolk Plan* also mentioned the importance of transportation and housing as mentioned in the chapter entitled, “A City of Strong Neighborhoods.”

- **CREATE COMMUNITY CONNECTIONS THAT WILL UNITE NEIGHBORHOODS OF THE CITY.**

Source: The Norfolk Plan, 2001

The projections for 2030 resulted in 2,423 additional units that would be constructed between 2003 and 2030 within the planning area.

Table 4-1: Housing Unit Projection

	2003	2030
Units in Norfolk Study Area	11,229	13,652

Source: US Bureau of Census

Once the housing projections are completed, the housing data for 2030 was assigned spatially throughout Norfolk for analysis of its impact to the transportation network. To conduct the analysis, the figures were assigned to the Planning Area’s Traffic Analysis Zones (TAZ) based on the Future Land Use Map from *The Norfolk Plan*, stakeholder input, and a current conditions review process. The resulting Residential Growth Areas for 2030 are displayed in **Figure 4-6**.

The residential area that is expected to have the most significant impact on the City’s transportation network is the northwestern section of the City where large amounts of single-family residential growth are expected to occur in areas between Benjamin and Norfolk Avenues. Anticipated growth in areas to the north of Benjamin Avenue in this section of the City will also have an impact. The main roadways that are expected to carry the additional traffic from these residential areas are 25th Street, 37th Street, Norfolk Avenue, and Benjamin Avenue. However, 49th Street is also expected to take on additional traffic from this growth as well.

Single-family residential growth is also expected on the eastern side of the City. Developable areas to the east of Victory and Channel Roads, as well as tracts of land along Nebraska Highway 35, are planned to contain some of this growth, providing an alternative to the rapidly growing northwestern area.

As *The Norfolk Plan* shows, medium-to-high density residential development is planned for areas to the south of Benjamin Avenue toward the eastern side of the City, near Northeast Community College. Medium and high-density residential areas are also anticipated along Victory/Channel Road between Norfolk and Omaha Avenues.

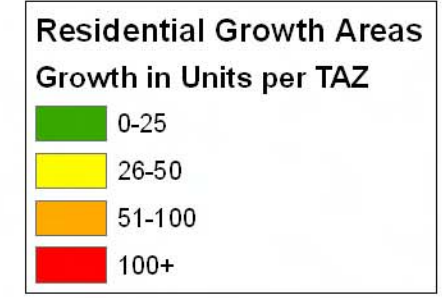
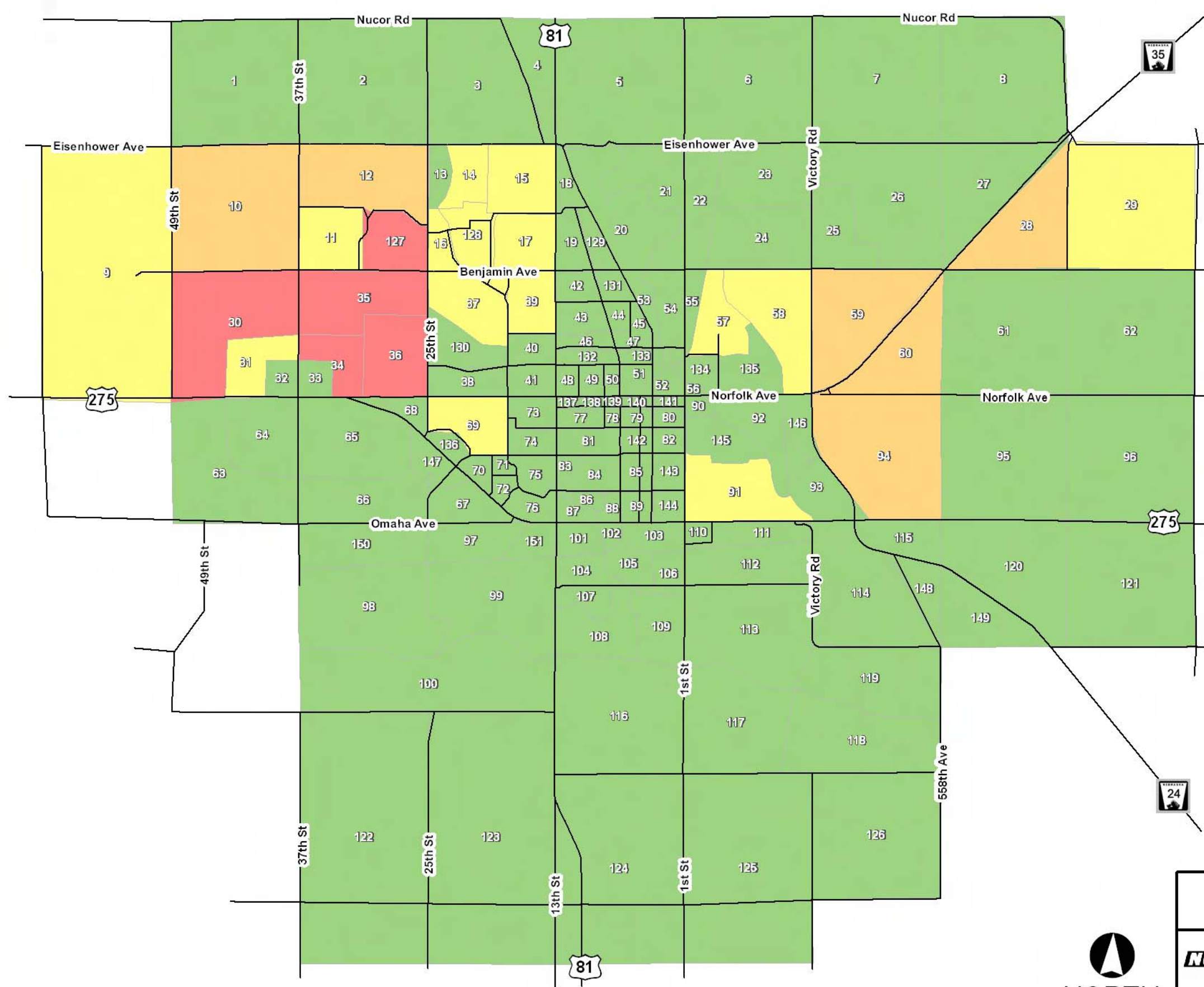


Figure 4-6
Residential Growth Areas



City of Norfolk
Transportation Plan 2030
Norfolk, Nebraska



V. Existing Transportation Conditions

This section summarizes the City of Norfolk's existing transportation conditions with the intent of:

- Accurately reflecting existing conditions within the transportation model developed for this project.
- Aid in identifying existing deficiency areas.

In addition to performing extensive inventories of existing field conditions, a public survey was conducted to gather input from Norfolk residents regarding their specific areas of concern as mentioned in Chapter III. The survey results are provided in **Appendix 1**. Historical crash data was also reviewed to identify safety deficiencies that could potentially be addressed through transportation improvements included in the transportation plan. Also, to better understand existing transportation conditions in the City, information from previous studies and reports was reviewed.

Existing Transportation System

Figure 5-1 illustrates the existing street network and functional classification system for Norfolk. Roadway functional classification describes how a particular roadway is intended to function with respect to capacity, speed, mobility and level of access provided. Higher functional classifications provide greater capacity, higher speeds, and limited access while lower functional classifications provide lower capacity, lower speeds, and high levels of access to adjacent properties.

Although not included in Norfolk's roadway network, freeways and expressways represent the highest functional classification. These roadway types have the ability to move large traffic volumes at high speeds with limited access from cross streets. Major arterials, which the City of Norfolk does have, are also intended to move relatively large volumes of traffic at high speeds (typically 40-45 mph) with limited conflicts from side streets and adjacent properties. Minor arterials, while similar to major arterials, typically have lower speeds (less than 40 mph), less capacity, and more direct access to adjacent properties. Collector and local roadways complete the hierarchy of the functional classification system. Collectors provide access from neighborhoods to the arterial street system, while local roadways are typically the residential streets that access individual neighborhoods.

With the exception of roadways such as Riverside Boulevard and Queen City Boulevard, the majority of the Norfolk transportation system rests within a grid network. Primary north/south roadways within the existing system include the following (from east to west):

- Victory Road
- 1st Street
- 4th Street
- 7th Street
- 13th Street
- U.S. Highway 81
- 18th Street
- 25th Street
- 37th Street

Primary east/west roadways within the existing transportation network include the following (from north to south):

- Eisenhower Avenue
- Benjamin Avenue
- Norfolk Avenue
- Pasewalk Avenue
- Omaha Avenue
- U.S. Highway 275
- Monroe Avenue

Additional primary roadways within the existing transportation system include:

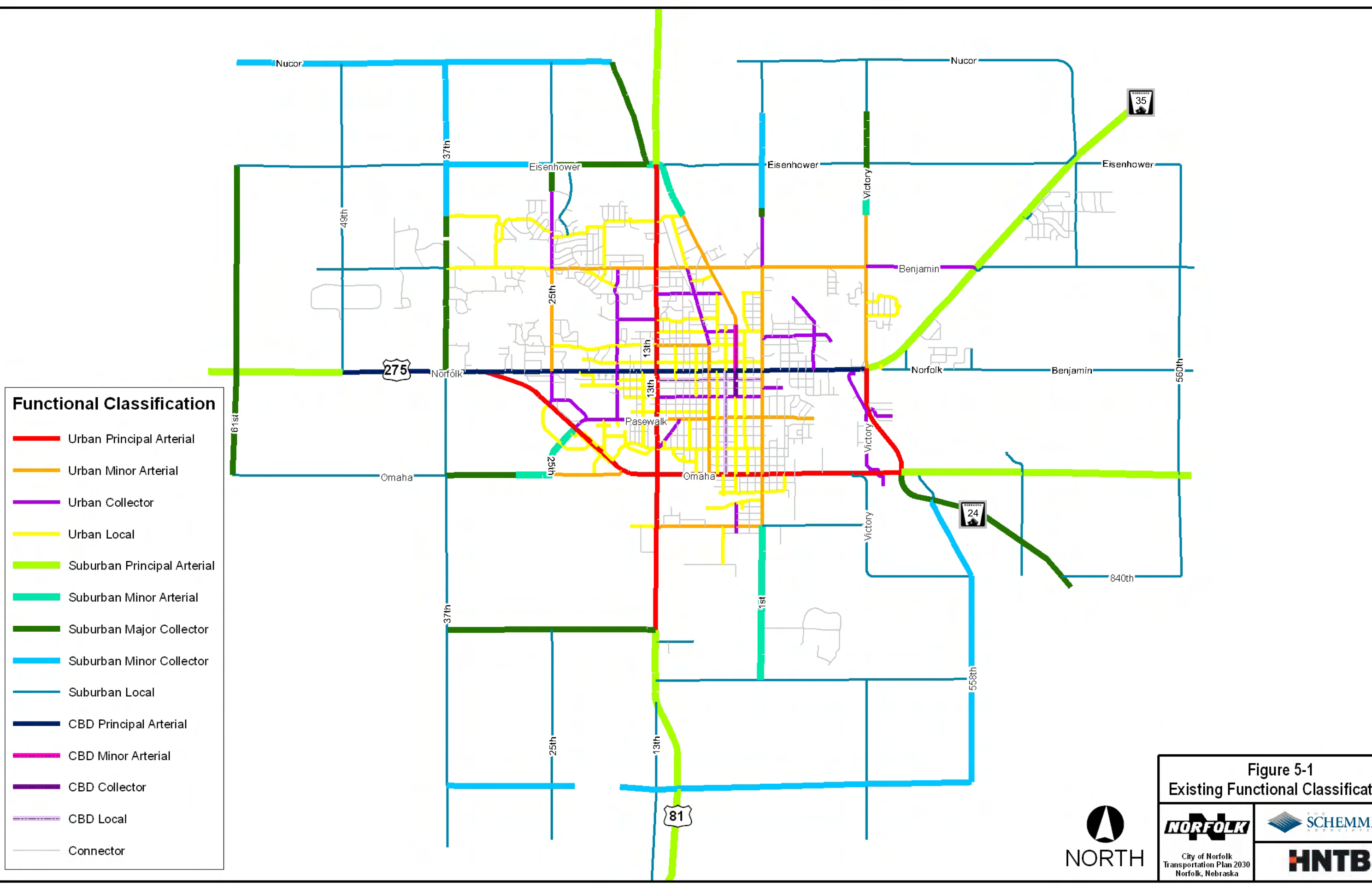
- Riverside Boulevard
- Queen City Boulevard
- Channel Road
- Nebraska Highway 24
- Nebraska Highway 35

Field Review and Data Collection Summary

To fully understand the existing transportation system and to provide inputs to the transportation model, key traffic and roadway characteristics were inventoried and documented. These characteristics include:

- Number of lanes
- Intersection lane configurations
- Speed limits
- Location of signalized intersections




These characteristics are important in establishing the model roadway network and assigning roadway capacities that reflect field conditions. The number of lanes on each roadway within the modeled network, along with existing speed limits and existing signalized intersection locations are illustrated in **Figures 5-2, 5-3 and 5-4**, respectively.



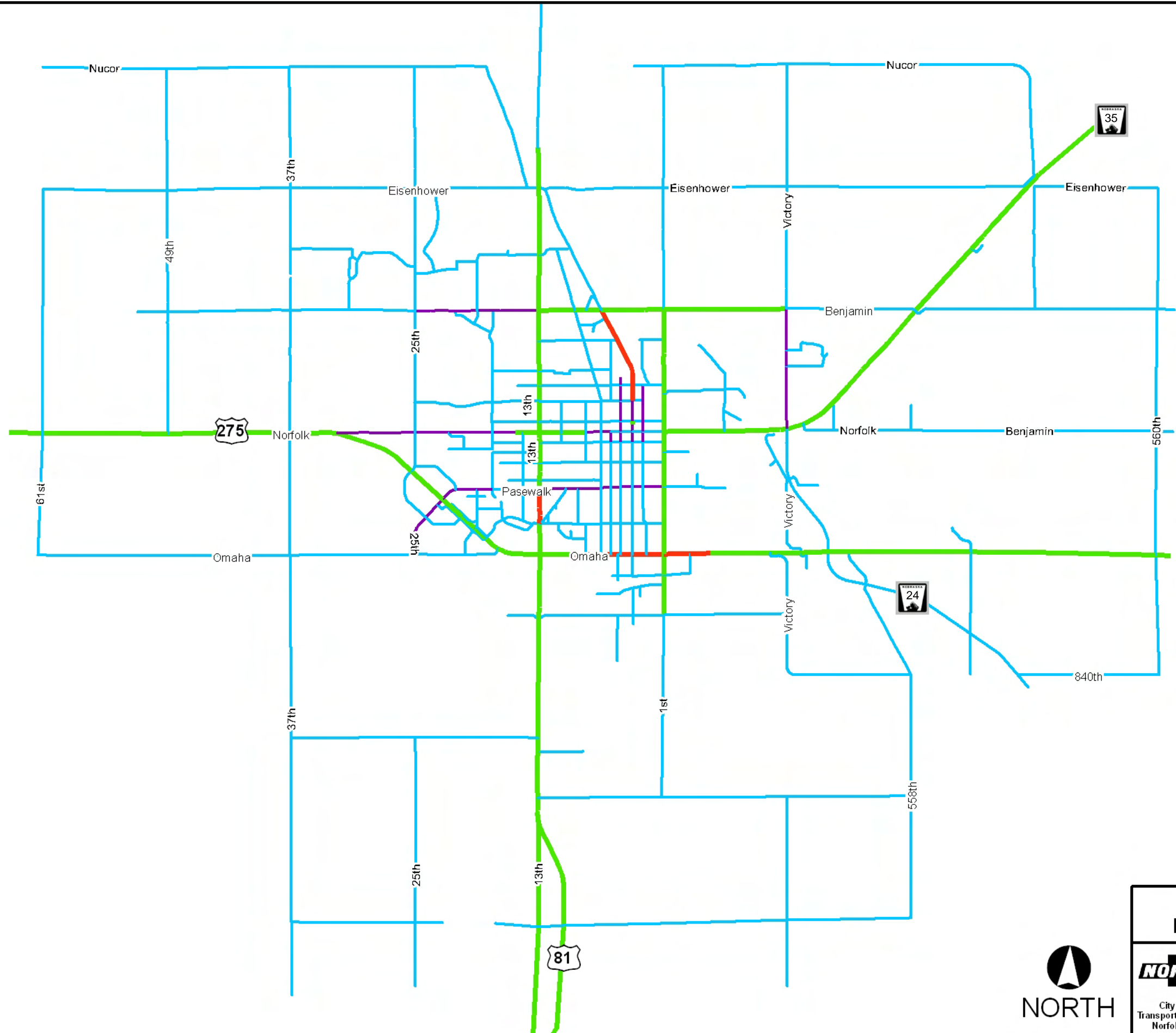
Functional Classification

- Urban Principal Arterial
- Urban Minor Arterial
- Urban Collector
- Urban Local
- Suburban Principal Arterial
- Suburban Minor Arterial
- Suburban Major Collector
- Suburban Minor Collector
- Suburban Local
- CBD Principal Arterial
- CBD Minor Arterial
- CBD Collector
- CBD Local
- Connector

Figure 5-1
Existing Functional Classification



City of Norfolk
Transportation Plan 2030
Norfolk, Nebraska



Existing Lanes

—	2
—	3
—	4
—	5



<p align="center">Figure 5-2 Existing Number of Lanes</p>	
<p>NORFOLK</p>	<p>SCHEMMER ASSOCIATES</p>
<p align="center">City of Norfolk Transportation Plan 2030 Norfolk, Nebraska</p>	

Existing Speed Limits

- Not in Model
- 15-20
- 20-29
- 30-39
- 40-49
- 50-59
- > 60

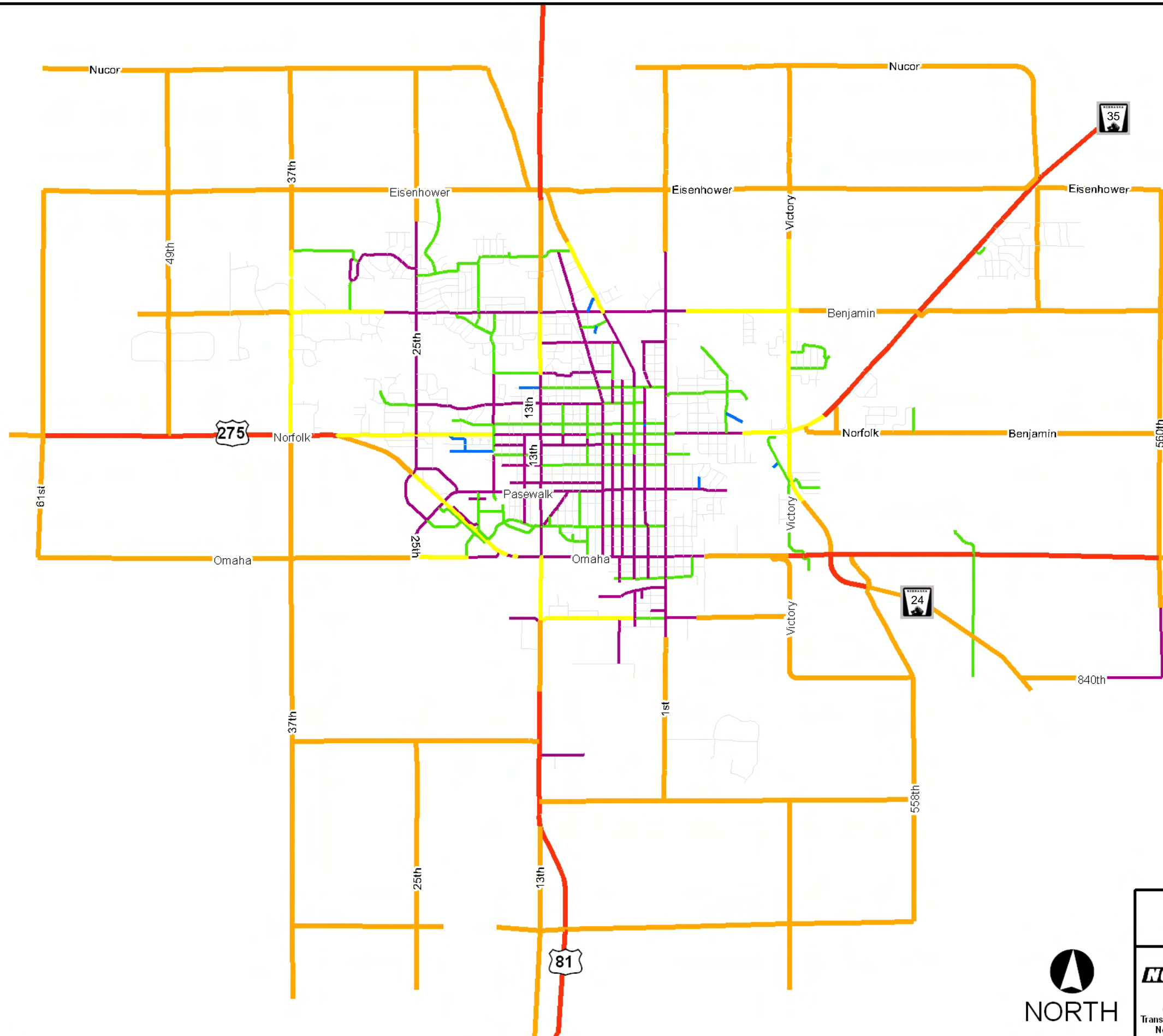
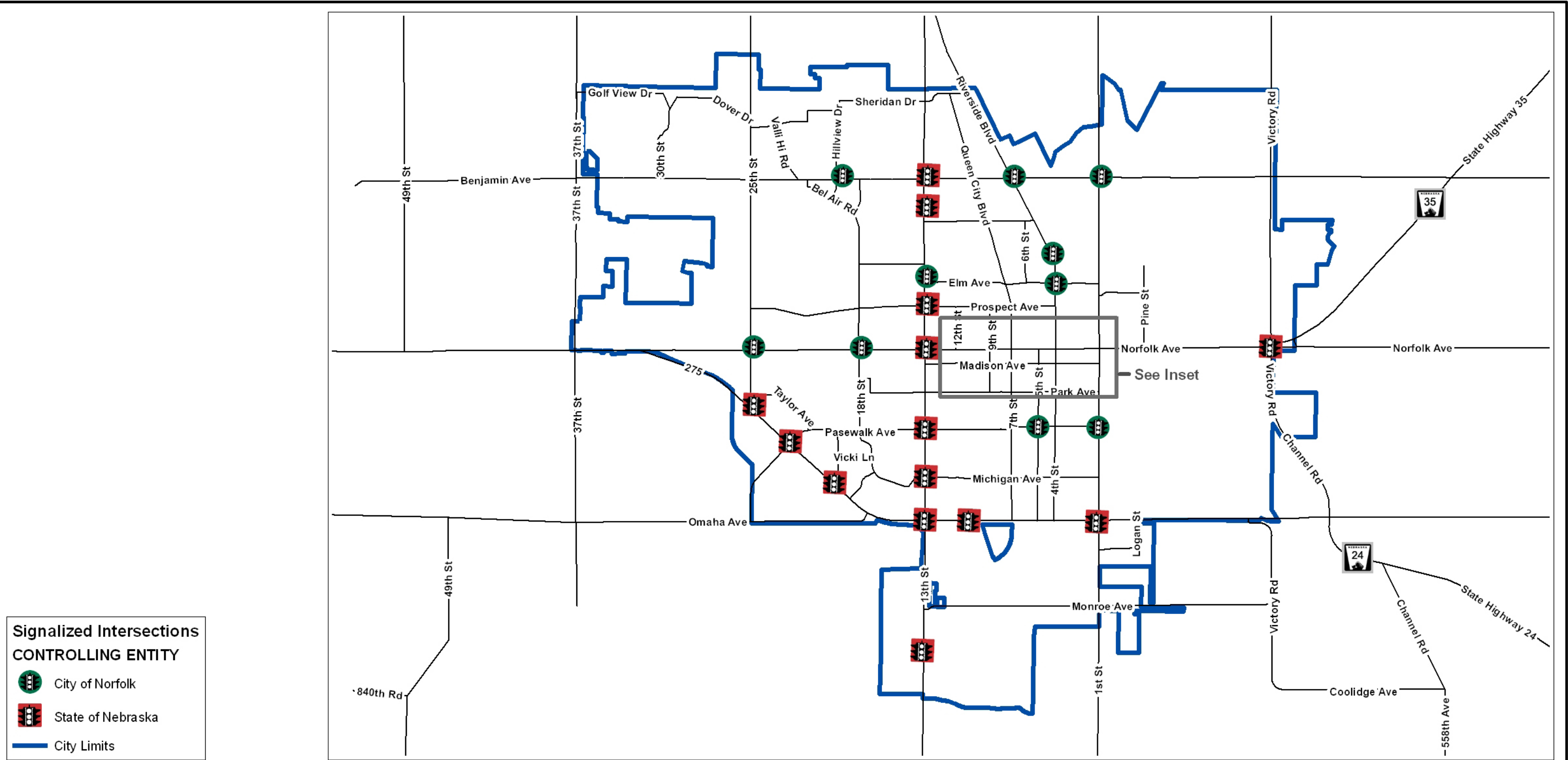


Figure 5-3
Existing Speed Limits



City of Norfolk
Transportation Plan 2030
Norfolk, Nebraska





Signalized Intersections
CONTROLLING ENTITY

- City of Norfolk
- State of Nebraska
- City Limits

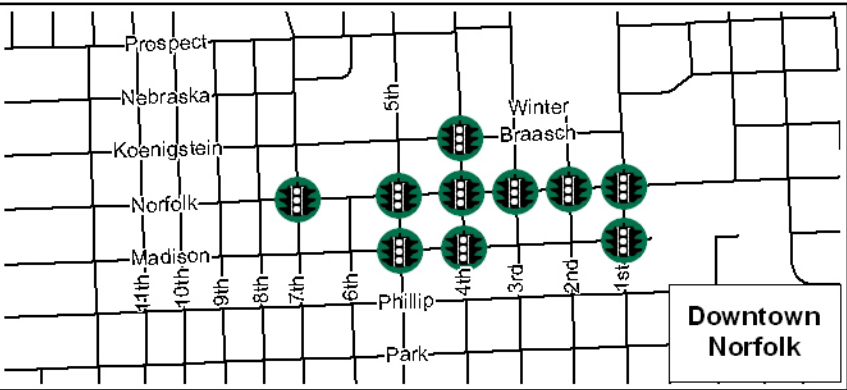


Figure 5-4
Existing Signalized Intersections

City of Norfolk
 Transportation Plan 2030
 Norfolk, Nebraska

Traffic Safety and Operations Evaluation

Although this is primarily a planning study, safety operational analyses for specific locations throughout the city were performed as part of the existing conditions analysis.

Crash data were reviewed for intersections and roadway segments citywide to identify potential safety deficiencies that should be addressed as part of the transportation plan. Crash rates were calculated for locations identified as having a high frequency of crashes. The results from these calculations are summarized in **Tables 5-1** and **5-2**. A detailed summary of this information can be found in the *Existing Transportation Conditions Technical Memorandum* included in **Appendix 2** of this document.

Table 5-1: Intersection Crash Rates

Intersection	ADT ¹	No. of Crashes (3-year)	Crash Rate ²
7 th St./Madison Ave.	6,420	18	2.56
7 th St./Michigan Ave.	3,430	6	1.60
7 th St./Pasewalk Ave.	10,410	18	1.58
7 th St./Prospect Ave.	5,730	8	1.27
U.S. 81/U.S. 275	31,690	40	1.15
18 th St./Norfolk Ave.	13,800	17	1.12
1 st St./Norfolk Ave.	23,050	28	1.11
U.S. 275/20 th St.	20,190	23	1.04
Victory Rd./Norfolk Ave.	14,660	16	1.00
U.S. 275/Pasewalk Ave.	16,230	16	0.90

¹ Daily volume data was not available at all locations. Where necessary, volumes were assumed based on roadway characteristics and volumes along other roadways with similar characteristics.

² Crashes per million entering vehicles (MEV).

Note: Although there are other locations with crash rates greater than 1.0/MEV, they are not reported, as the actual number of crashes is low.

Table 5-2: Crash Rates Along Roadway Segments

Roadway Segment	ADT	No. of Crashes (3-year)	Crash Rate ¹
U.S. 81/S. 13 th St. (Michigan Ave. to Omaha Ave.)	16,850	56	11.9
W. Norfolk Ave. (1 st St. to 7 th St.)	10,685	70	11.8
U.S. 275/W. Omaha Ave. (11 th St. to 13 th St.)	15,055	15	3.6

¹ Crashes per million vehicle-miles.

Traffic operations at key intersections throughout the city were reviewed to identify potential operational deficiencies that should be addressed as part of the transportation plan.

The performance of a street is determined by using “level of service” or LOS, which examines factors such as speed, travel time, maneuverability, interruptions, and safety. The various LOS levels are described below.

LOS A: This describes free-flowing operation. Vehicles face few impediments in maneuvering. The driver has a high level of physical and psychological comfort. Minor accidents or breakdowns cause little interruption in the traffic stream. Stopped delay at signalized intersections is minimal.

LOS B: This condition is a reasonably free-flowing operation. Maneuvering ability is slightly restricted, but ease of movement remains high.

LOS C: This level provides stable operation. Traffic flows approach the range in which increases in traffic will degrade service. Minor incidents can be absorbed, but a local slowdown of traffic will result. In large urban settings, LOS C is a good level of service to work toward.

LOS D: This level borders on an unstable traffic flow. Small traffic increases produce substantial service deterioration. Maneuverability is limited and comfort levels are reduced. LOS D is frequently used as a compromise standard in dense urban settings.

LOS E: This level represents typical operation at full design capacity of a street. Operations are extremely unstable, because there is little margin for error in the traffic stream.

LOS F: This condition is a breakdown in the system. Such conditions exist when queues form behind a breakdown or congestion point. This occurs when traffic exceeds the design capacity of the street.

Average vehicle delay was calculated for locations identified through public survey or comments from city staff as experiencing high levels of vehicle delay. The results of these calculations are summarized in **Tables 5-3 and 5-4**. A detailed summary of this information can also be found in the *Existing Transportation Conditions Technical Memorandum* included in **Appendix 2** of this document.

Table 5-3: Summary of Signalized Intersection Analysis

INTERSECTION	Time Period	DELAY (sec/veh)	V/C	LOS
US 275 & 25 th Street	AM Peak	7.9	0.22	A
	PM Peak	11.5	0.23	B
US 275 & Pasewalk Avenue	AM Peak	9.2	0.18	A
	PM Peak	15.0	0.44	B
US 275 & 20 th Street	AM Peak	6.3	0.20	A
	PM Peak	9.6	0.35	A
US 275 (Omaha Avenue) & 11 th Street	AM Peak	9.5	0.29	A
	PM Peak	10.2	0.34	B
US 81 (13 th Street) & US 275 (Omaha Avenue)	AM Peak	14.9	0.45	B
	PM Peak	22.2	0.59	C
US 81 (13 th Street) & Michigan Avenue	AM Peak	7.0	0.31	A
	PM Peak	9.5	0.54	A
US 81 (13 th Street) & Pasewalk Avenue	AM Peak	13.3	0.52	B
	PM Peak	16.4	0.61	B
US 81 (13 th Street) & Norfolk Avenue	AM Peak	17.2	0.50	B
	PM Peak	18.1	0.56	B
US 81 (13 th Street) & Prospect Avenue	AM Peak	7.4	0.38	A
	PM Peak	6.9	0.55	A
US 81 (13 th Street) & Bel Air Road/Roosevelt Avenue	AM Peak	6.4	0.39	A
	PM Peak	4.4	0.30	A
US 81 (13 th Street) & Benjamin Avenue	AM Peak	21	0.64	C
	PM Peak	22.5	0.59	C
US 81 (13 th Street) & Eisenhower Avenue/Riverside Boulevard	AM Peak	8.9	0.38	A
	PM Peak	8.0	0.43	A
25th Street & Norfolk Avenue	AM Peak	10.1	0.69	B
	PM Peak	11.5	0.23	B
18th Street & Norfolk Avenue	AM Peak	9.2	0.46	A
	PM Peak	8.2	0.39	A
Benjamin Avenue & Riverside Boulevard	AM Peak	19.6	0.74	B
	PM Peak	15.7	0.57	B
1st Street & Benjamin Avenue	AM Peak	9.2	0.65	A
	PM Peak	7.1	0.50	A

Table 5-4: Summary of Unsignalized Intersection Analysis

Intersection	Time Period	Overall		Approach ¹			
				NB/EB		SB/WB	
		Delay	LOS	Delay	LOS	Delay	LOS
US 275 (Norfolk Avenue) & 37th Street	AM Peak	4.0	A	12.8	A	15.2	C
	PM Peak	5.4	A	14.0	B	23.1	C
US 275 & Norfolk Ave.	AM Peak	3.3	A	-	-	18.6	C
	PM Peak	2.4	A	-	-	20.7	C
US 275 & Norfolk Ave. (future)	AM Peak	4.1	A	-	-	12.1	B
	PM Peak	4.6	A	-	-	13.9	B
Benjamin Avenue & Queen City Boulevard	AM Peak	4.8	A	61.3	F	23.1	C
	PM Peak	8.4	A	100.8	F	35.5	E
Benjamin Avenue & McIntosh Road	AM Peak	8.4	A	79.0	F	24.5	C
	PM Peak	4.3	A	33.0	D	13.5	B
Benjamin Avenue & Veterans Road	AM Peak	3.0	A	43.2	E	25.4	D
	PM Peak	4.6	A	27.2	D	13.6	B
1st Street & Park Avenue	AM Peak	1.5	A	21.3	C	16.0	C
	PM Peak	2.2	A	41.6	E	26.4	D

¹ Delay & LOS values shown are for the stopped-controlled approaches.

Summary

The City of Norfolk has been experiencing constant population and traffic volume growth throughout recent years. Therefore, it must take the appropriate steps to plan for the impact this growth will have on its transportation network. Failing to address the impacts of a growing community will result in more severe problems (safety, operations and maintenance) than exist today.

To address some of the deficiencies identified through the evaluation of existing transportation conditions, the following "projects" should be given strong consideration:

- Continued monitoring/studying of the following intersections to control future deterioration in traffic operations and vehicle safety:
 - U.S. Highway 81 (13th Street) & U.S. Highway 275 (Omaha Avenue)
 - U.S. Highway 81 (13th Street) & Benjamin Avenue
 - U.S. Highway 275 & 20th Street
 - U.S. Highway 275 & Pasewalk Avenue
 - U.S. Highway 275 & 25th Street
- To maximize vehicle operations and traffic control efficiency, perform signal timing/coordination study along U.S. Highways 81 and 275.

- Conduct additional study at the intersection of Benjamin Avenue & Queen City Boulevard to address poor traffic operations on the north and southbound approaches.
- Conduct additional study at the intersections of Benjamin Avenue & McIntosh Road and Benjamin Avenue & entrance to Northeast Community College and Norfolk Veterans Home to address poor traffic operations on the north and southbound approaches. This study should consider the installation of a modern roundabout at one or both of these intersections.
- Continue to maximize the safety and operations of major arterial roadways through appropriate access management strategies, including:
 - Traffic signal spacing at half-mile intervals. Other arterial roadways should be planned to allow for spacing of signalized intersections at no less than one-quarter mile.
 - Provide full median break access only at signalized intersections and at one-quarter mile spacing along principal arterials and one-eighth mile spacing along other arterial roadways.
 - Eliminate, consolidate and/or improve existing driveway separation along all arterial roadways.
 - Prohibit direct driveway access onto future principal roadways.
 - Space driveway access no closer than 300 feet from major intersections on arterial and collector roadways.

VI. Travel Demand Forecasting

A travel demand forecast model is a set of data and mathematical equations that attempt to replicate the trip-making behavior of people – more specifically, vehicle-oriented trips. The model is a tool to gather information on impacts of potential changes to transportation infrastructure, land use or public policy without actually implementing those changes.

The travel demand model developed for the City of Norfolk provides a tool for investigating the impacts of planned transportation improvements in the Norfolk vicinity. It was developed as part of the Norfolk Comprehensive Plan Update. **Figure 1-1** (included in the first chapter of this report) shows the study area for the Norfolk travel demand model. Extensive data was collected in support of the modeling effort, and meetings with city staff provided feedback on the modeling process.

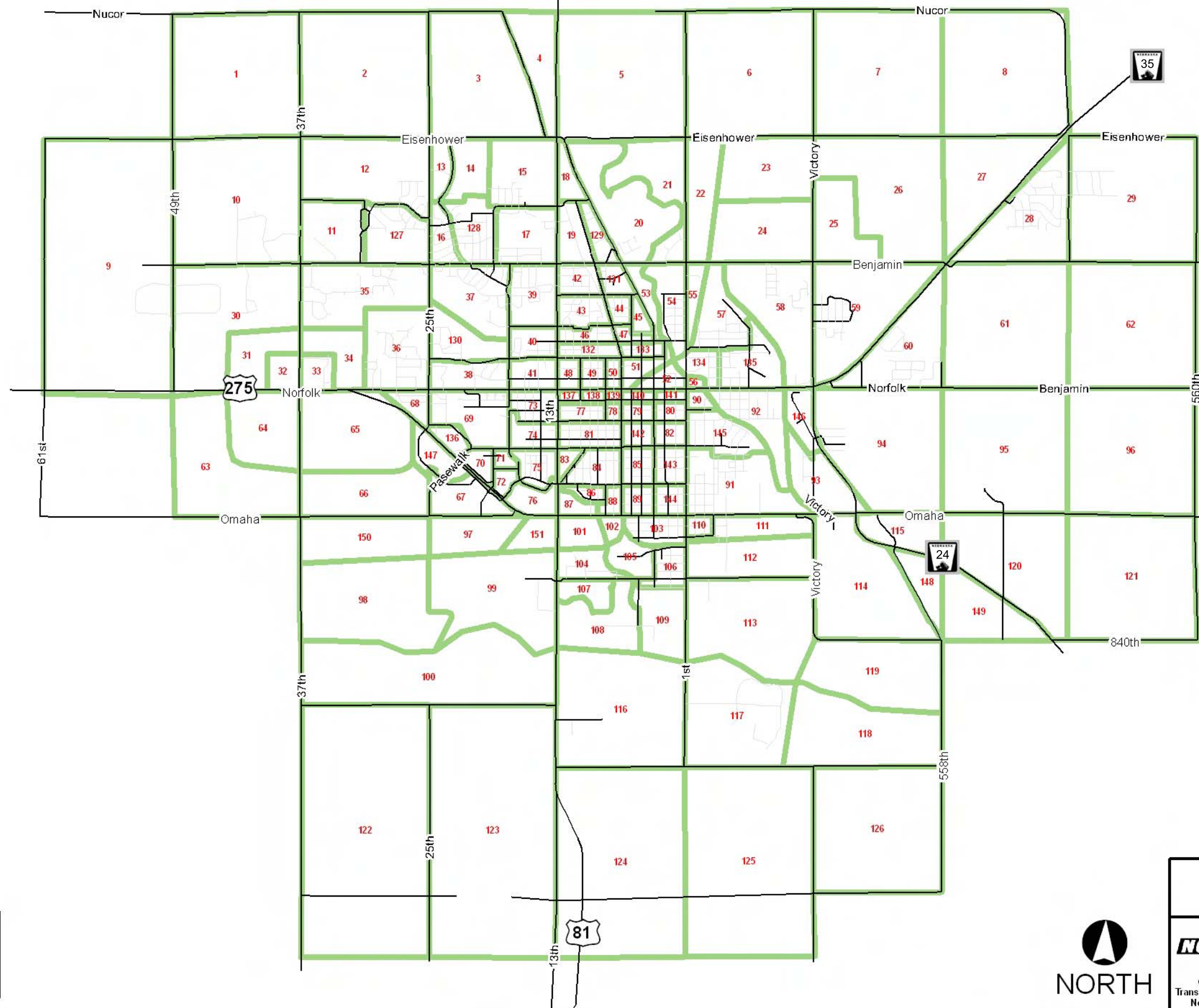
Model Development

The Norfolk travel demand model is a daily model, meaning forecasted traffic volumes are for a 24-hour time period. The travel demand modeling software used for the Norfolk model was TransCAD version 4.7. The TransCAD package uses the traditional four-step modeling concept of trip generation, trip distribution, mode split and traffic assignment to produce traffic demand forecasts. The Norfolk model does not utilize the mode split functionality, however, because the transit ridership within the study area is sufficiently low. Therefore, all forecasts produced by TransCAD are assumed to be vehicle trips only.

TransCAD is a geographic information system (GIS) that contains fully functional travel demand modeling algorithms. This allowed the Norfolk travel demand model network to be created from existing GIS datasets. A majority of the Norfolk model network lies within the limits of the City of Norfolk; therefore, a roadway centerline file was used as a base.

These roadway characteristics were then coded for each link in the Norfolk travel demand model. Roadway capacities were calculated based on NCHRP 365 standards, the functional class of the roadway and the number of lanes. Intersection turning restrictions were added to the Norfolk travel demand model to more accurately reflect existing traffic patterns.




The network area was divided into traffic analysis zones (TAZ's). Each TAZ represents a geographic area within the travel demand model in which land uses are aggregated to produce the origin or destination of trips. TAZ's were created in TransCAD using roadway network, census blocks and land parcel information. In areas where intense development was planned, such as the southwest, TAZ's were divided into smaller zones to allow for more detailed analysis. Since areas outside of the city affect Norfolk travel patterns, there are many TAZ's beyond the city limits. **Figure 6-1** shows the



Traffic Analysis Zones

 TAZ



<p>Figure 6-1 Traffic Analysis Zones</p>	
	
<p>City of Norfolk Transportation Plan 2030 Norfolk, Nebraska</p>	
	

TAZ's for the Norfolk travel demand model. Centroids represent the point at which all trips going to or from a TAZ interact with the model network. To connect centroids to the network, centroid connectors are added. The centroid connectors typically represent the local streets within the TAZ and were constructed so as to connect with the model network similar to the actual local street intersections. Socio-economic data discussed in Chapter IV was aggregated to the TAZ level. Growth in socio-economic activity by TAZ is shown in **Figure 6-2**.

Trip generation is the estimation of the number of trips that occur based on known variables of a land development. The Institute of Transportation Engineers (ITE) Trip Generation Manual¹ provides daily estimates for the various land use categories of the Norfolk model. The national average rates of the ITE manual were supplemented with local data to best match the travel characteristics of the Norfolk study area. Additional information about the trip generation process for the Norfolk travel demand model can be found in **Appendix 3**.

The trip ends estimated in the trip generation process were converted to trip origins and destinations through the process of trip distribution. This process uses the standard gravity model algorithm within TransCAD. The trip distribution process including required inputs and results are shown in more detail in **Appendix 3**. Vehicle trips originating or terminating outside the study area for the Norfolk travel demand model were developed separately from trips generated by Norfolk residents. These external trips are added to the total trips made by Norfolk residents for assignment to the Norfolk roadway network. The external trip development process is described in more detail in **Appendix 3**.

Traffic volumes by link are calculated through the traffic assignment process. This process uses the total resident and external trip table and the roadway network to estimate the number of trips that use each link in the network. The output of the traffic assignment process is a link-by-link forecast of daily traffic volume. The traffic assignment process is outlined in more detail in **Appendix 3**.

Calibration is the process of adjusting parameters to better replicate known conditions. **Figure 6-3** shows the model calibration results, including the various model performance indicators such as Root Mean Square Error (RMSE), R-squared value and the five screenlines for the Norfolk travel demand model. Screenlines are imaginary lines that cross all roadways serving travel between two distinct areas, and compare observed traffic counts with model volumes.

Alternative Analysis for 2030 Network

Next, base future year (2030) traffic volumes were estimated using projected land use information. Although this base future year model does include roadway projects included in the "existing plus committed roadway network" (discussed later in this

¹ Trip Generation, 7th Edition, Institute of Transportation Engineers, 525 School St., S.W. Suite 410, Washington, D.C., 20024, 2003.

section), this model was commonly referred to as the “2030 No-Build” model throughout this planning process.

For purposes of this study, land use and traffic volume projections were prepared for year 2030. Using the future land use plan presented previously in this document, the future year traffic assignments were developed.

Only major roadway improvements included in the City’s current Capital Improvement Program (CIP) or identified by City staff as well as improvements planned by the Nebraska Department of Roads, as documented in their Surface Transportation Program, were assumed to exist in the base future (2030) roadway network. The base future roadway network, also commonly referred to as the “Existing Plus Committed Roadway Network”, included the following improvements to the existing network.

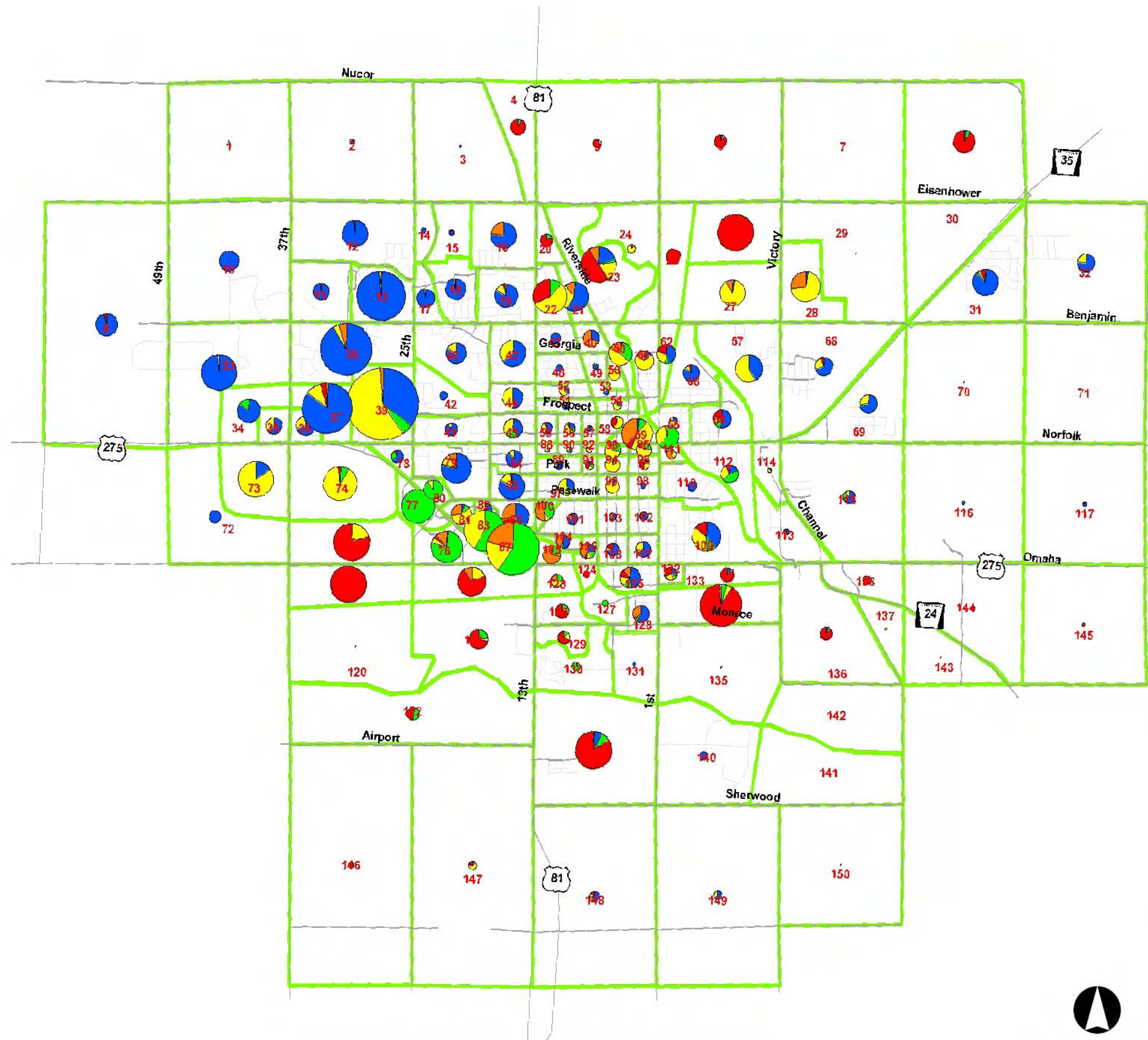
- Benjamin Avenue Widening Improvement (13th Street to 25th Street) – construction of three-lane roadway section. Construction completed in 2005.
- U.S. Highway 275 Widening Improvement (NDOR-Norfolk West) – construction of four-lane, divided roadway section. Construction estimated to begin in 2006.
- Nebraska Highway 35 Widening Improvement (NDOR-Norfolk Northeast) – construction of four-lane, divided roadway section. Construction estimated to begin 2007-2011.

The base future year (2030) traffic assignments on the existing plus committed roadway network (Future No-Build) are shown in **Figure 6-4**. For comparison purposes, the 2003 calibration year traffic assignments are also shown in **Figure 6-5**. In general, the number of vehicle trips (including both internal and external travel) in the Norfolk area increased from 168,400 trips per day in 2003 to 211,000 trips per day in 2030. This equates to approximately a 0.8-percent increase in trips compounded annually as shown in **Table 6-1**. Due to development occurring primarily on the fringes of existing development around the City of Norfolk, the total miles of travel around the City of Norfolk are expected to increase at a slightly higher rate, approximately 1.1-percent compounded annually, as shown in **Table 6-1**. The committed roadway improvements included in the Future No-Build network have a noticeable positive impact on the travel supply as shown by the maintenance of vehicular speed in the Norfolk area through the year 2030.

Table 6-1: System-wide Model Measures

Model Measures (Daily)	2003 Existing	2030 No-Build	Annual Percent Increase
Total Trips	168,400 Trips	211,000 Trips	0.8%
Vehicle Miles	459,700 Miles	624,200 Miles	1.1%
Vehicle Hours	11,230 Hours	15,110 Hours	1.1%
System Speed	41 MPH	41 MPH	0.0%

To better evaluate potential future roadway deficiencies, roadway segments projected to operate at a volume-to-capacity ratio of 0.70, or worse, were identified. The following



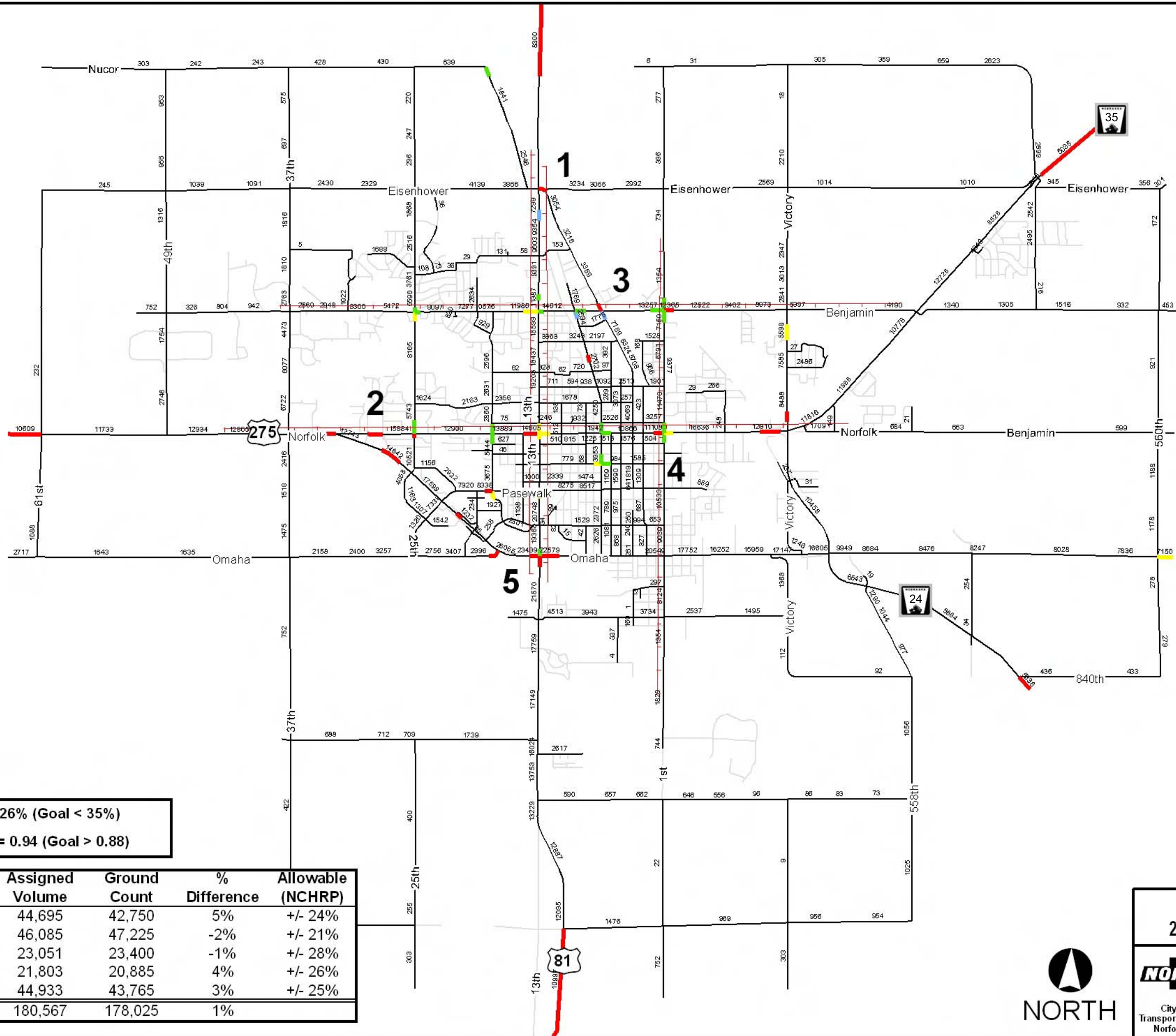
TAZ
Growth in Land Use

- Residential Increase
- Commercial Increase
- Office Increase
- Industrial Increase
- Other Increase



Figure 6-2
Growth in Land Use 2003-2030

City of Norfolk
 Transportation Plan 2030
 Norfolk, Nebraska




RMSE = 15.26% (Goal < 35%)
 R Squared = 0.94 (Goal > 0.88)



Volume to Count

- < 0.70
- 0.70 to 0.85
- 0.86 to 1.15
- 1.16 to 1.30
- > 1.30
- screenline

Screenline	Assigned Volume	Ground Count	% Difference	Allowable (NCHRP)
1	44,695	42,750	5%	+/- 24%
2	46,085	47,225	-2%	+/- 21%
3	23,051	23,400	-1%	+/- 28%
4	21,803	20,885	4%	+/- 26%
5	44,933	43,765	3%	+/- 25%
Total	180,567	178,025	1%	

Figure 6-3
 2003 Screenline Calibration


 City of Norfolk
 Transportation Plan 2030
 Norfolk, Nebraska

2030 Traffic Assignment

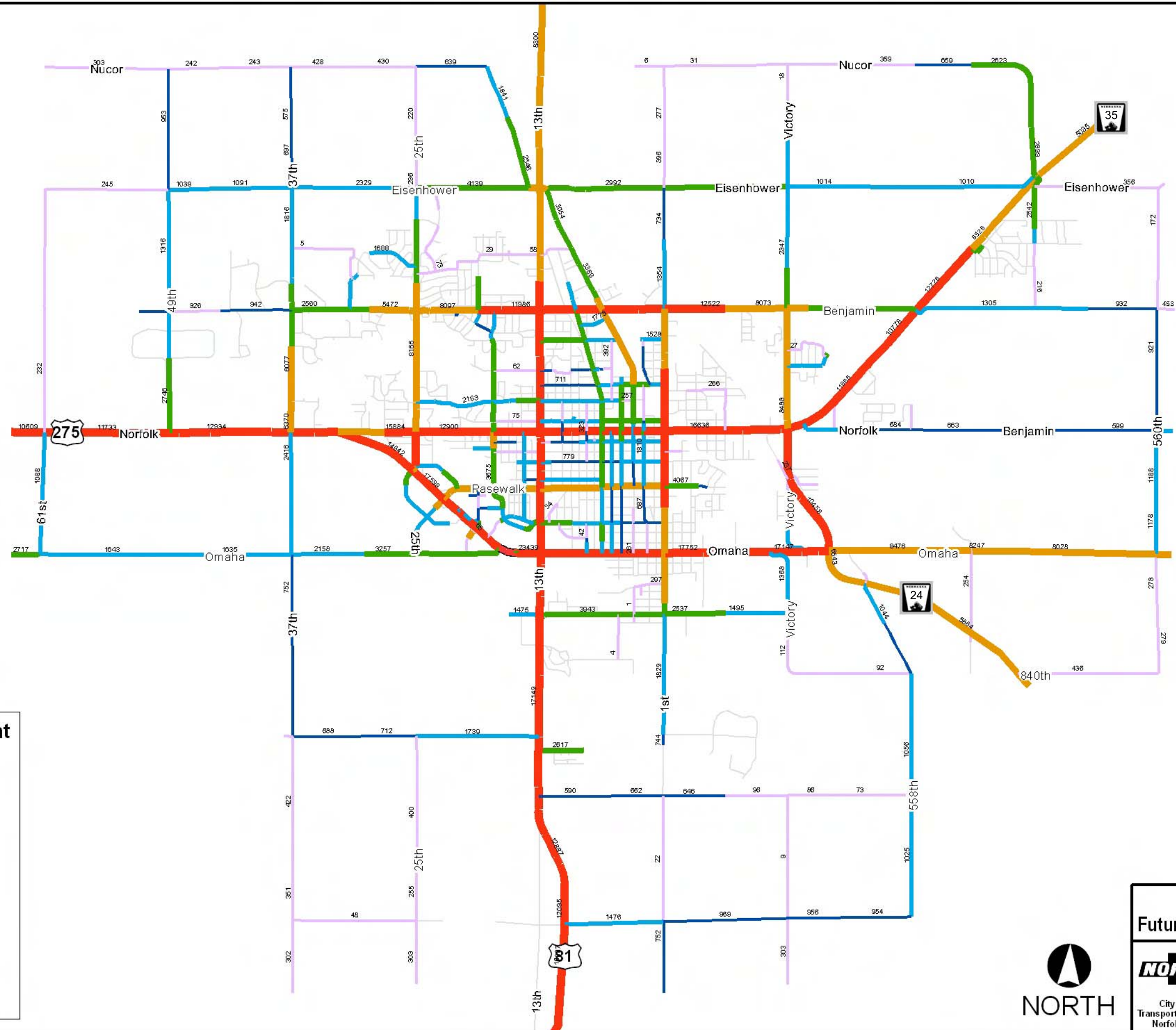
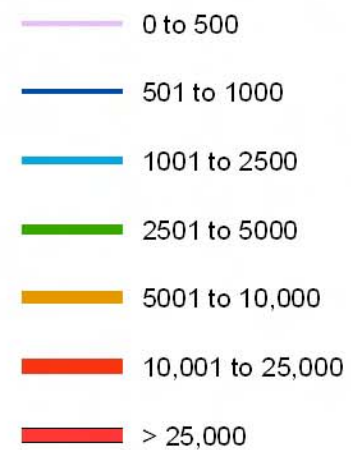


Figure 6-4
Future No Build Traffic Assignment



City of Norfolk
Transportation Plan 2030
Norfolk, Nebraska



2003 Traffic Assignment

- 0 to 500
- 501 to 1000
- 1001 to 2500
- 2501 to 5000
- 5001 to 10,000
- 10,001 to 25,000
- > 25,000

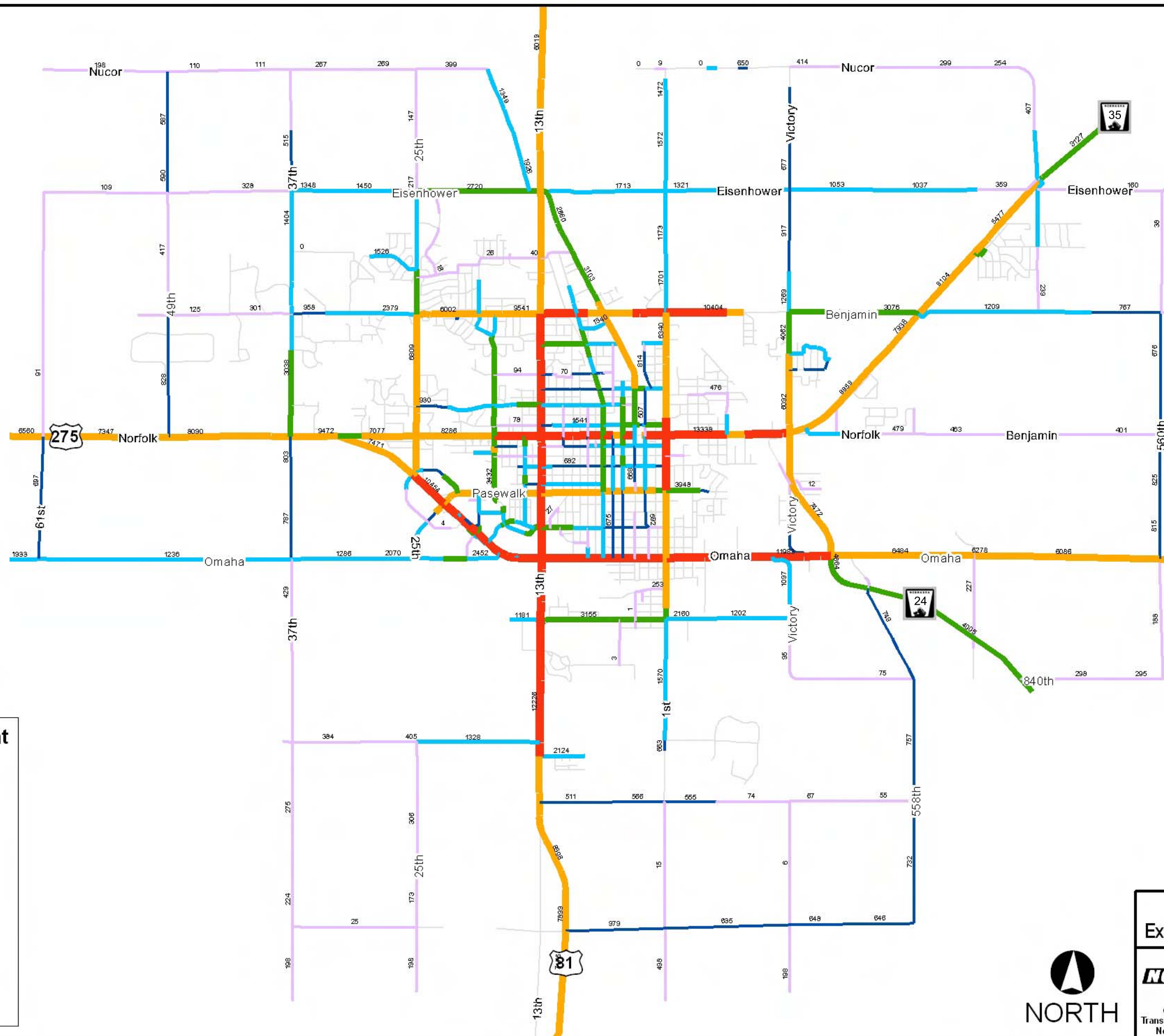


Figure 6-5
Existing (2003) Traffic Assignment



City of Norfolk
Transportation Plan 2030
Norfolk, Nebraska



roadway segments are expected to operate over this threshold based on the future volume assignments:

- Benjamin Avenue (13th Street to Hillview Drive)
- Benjamin Avenue (25th Street to 30th Street)
- Norfolk Avenue (1st Street to 10th Street)
- Norfolk Avenue (14th Street to 27th Street)
- Pasewalk Avenue (13th Street to 20th Street)
- Pasewalk Avenue (Taylor Avenue to U.S. Highway 275)
- Omaha Avenue/U.S. Highway 275 (11th Street to 20th Street)
- 25th Street (Norfolk Avenue to U.S. Highway 275)

Based on the current land use development and roadway improvement projections for the study area, the remaining roadways in Norfolk are expected to operate at a volume-to-capacity ratio below 0.70, based on the 2030 traffic volume projections. This does not mean that there will not be isolated intersection deficiencies at some locations, particularly during peak time periods throughout the day. However, the overall street network, with the noted exceptions, is expected to operate at acceptable levels.

Transportation Alternatives Evaluation

To address existing and future (2030) base year capacity deficiencies, several potential transportation alternatives were evaluated for the Norfolk area. Alternatives were developed based on the existing conditions analysis, existing or projected transportation model results, and discussion and input from City staff, elected officials and public survey. Transportation alternatives were generally identified to address one or more of the following:

- Undesirable traffic operations along roadway segments
- Better compliance with the desired roadway functional classification
- Circulation and network continuity
- Major transportation improvements such as bypass roadways

The transportation alternatives evaluated as part of the modeling effort were grouped into four separate alternative “packages.” These packages, along with the individual alternatives, are outlined below. The discussion that follows includes a description of the improvement as well as a brief discussion regarding the modeled results associated with each alternative package. Traffic volume-to-capacity figures for each alternative package are included in **Appendix 4**.

It should be noted that alternatives, specifically those on the eastern edge of Norfolk, might be impacted by the recommendations that result from the N-35 corridor study and environmental impact statement being performed by the Nebraska Department of Roads. These alternatives may require modifications once these recommendations have been finalized.

Alternative Package A

Description: This package of alternatives contains alternatives that have a high probability of occurring by year 2030, even though they are not specifically identified in the City's Capital Improvement Program. Alternatives within this package are either along roadways where City staff recognizes the need for some improvement and/or address high growth areas in specific areas of the community.

Alternative A1 – New Nucor Road

Description: This alternative includes construction of a new, two-lane roadway along an alignment approximately ½-mile north of Eisenhower Avenue. This roadway, already under design will connect U.S. Highway 81, north of the city limits, to Nebraska Highway 35, also north, and east of the existing city limits. This roadway will provide direct access to Nucor Corporation and the planned ethanol plant. This project also includes the closure of Eisenhower Avenue from 1st Street to 13th Street.

Alternative A2 – 25th Street (Norfolk Avenue to U.S. Highway 275)

Description: This alternative evaluates increased capacity along this segment of 25th Street by upgrading the roadway to a three-lane cross-section, to serve the anticipated residential and commercial growth in the western part of the community. With this upgrade in capacity, it is also envisioned that this roadway would experience an improvement in functional classification as well (from collector to minor arterial).

Alternative A3 – 25th Street (Eisenhower Avenue to Benjamin Avenue)

Description: This alternative evaluates increased capacity along this segment of 25th Street by upgrading the roadway to a three-lane cross-section, to serve the intense residential growth in the northwest quadrant of the community. With this upgrade in capacity, it is also envisioned that this roadway would experience an improvement in functional classification (from collector to minor arterial).

Alternative A4 – 37th Street (Benjamin Avenue to Norfolk Avenue)

Description: This alternative evaluates improved functional classification of 37th Street between Benjamin Avenue and Norfolk Avenue (U.S. 275). Functional classification would be improved from a suburban collector to an urban minor arterial.

Alternative A5 – Benjamin Avenue (1st Street to 13th Street)

Description: This alternative evaluates increased capacity along this segment of Benjamin Avenue by upgrading the roadway to a five-lane cross-section to serve future traffic volume growth along this commercial corridor.

Alternative A6 – Benjamin Avenue (25th Street to 37th Street)

Description: This alternative evaluates increased capacity along this segment of Benjamin Avenue by upgrading the roadway to a three-lane cross-section to serve the intense residential growth in the northwest quadrant of the community. With this upgrade in capacity, it is also envisioned that this roadway would experience an improvement in functional classification (from local to minor arterial).

Package A Model Results:

Package A assigned traffic volumes are illustrated in **Figure 6-6**. The New Nucor Road project provides a high-speed connection between two principal facilities in the Norfolk area, U.S. Highway 81 and Nebraska Highway 35. The demand model shows those vehicles traveling between the two major facilities using New Nucor Road, approximately 1,500 vehicles near Nebraska Highway 35, as well as significant local travel, an additional 4,000 vehicles near U.S. Highway 81.

The improvements along the two segments of 25th Street provide an increase in roadway capacity. The segment between U.S. Highway 275 and Norfolk Avenue is projected to have an increase in vehicle travel of approximately 1,500 vehicles per day due to the increase of capacity, but this increase in volume is more than offset by the increased operational capacity of the three-lane segment.

The improvements along Benjamin Avenue from 25th to 37th Streets are consistent with an increase in functional classification, providing increased capacity to adequately handle projected traffic volumes along this roadway segment.

The diversion of vehicle trips from the Benjamin Avenue corridor due to New Nucor Road, in conjunction with the expansion of the Benjamin Avenue corridor between 1st and 13th Streets should enhance operations and safety along the corridor.

Because alternatives within Package A are likely to occur, the remaining alternatives and alternative packages are in addition to those in Package A.

Alternative Package B

Description: This package contains the single alternative of linking highways U.S. Highway 81, N-35, U.S. Highway 275 and Nebraska Highway 24 with a concept commonly referred to by the community and *The Norfolk Plan* as the “bypass.” Because of the frequency of which this concept has been mentioned throughout this planning effort, and because of its inclusion in *The Norfolk Plan*, it has been modeled separately from all other alternatives (with the exception of Package A).

Alternative B1 – Link connecting Highways 81, 35, 275 and 24

Description: This alternative includes construction of a new, two-lane roadway “bypass.” For purposes of this evaluation, this alignment begins on the north at the intersection of New Nucor Road/Nebraska Highway 35, shifting slightly east of Woodlawn Park subdivision, before continuing south and intersecting with Highways 275 and 24. After intersecting Nebraska Highway 24, the proposed roadway turns west, connecting to U.S. Highway 81 south of Sherwood Road.

It should be emphasized that this alignment was developed simply for purposes of this modeling exercise. The ultimate roadway alignment will likely deviate from this conceptual alignment, in some cases, as much as one mile, or more.

Package B Model Results:

Package B assigned traffic volumes are illustrated in **Figure 6-7**. The demand model results for Package B indicates the bypass will provide a viable alternative for some vehicles traveling through the Norfolk area. The bypass is anticipated to carry approximately 2,500 to 4,500 vehicles per day between Nebraska Highway 35 and U.S. Highway 275 while carrying 2,500 to 3,500 vehicles per day between U.S. Highway 275 and U.S. Highway 81 south of Norfolk.

The bypass connection also increases the traffic projections along the eastern portion of the New Nucor Road from 1,500 to nearly 3,000 vehicles per day. The western portions of New Nucor Road have less significant increases of approximately 200 vehicles per day. Traffic projections along U.S. Highway 81 south of U.S. Highway 275 are shown to decrease by approximately 2,000 vehicles per day as a result of the bypass. Traffic projections for U.S. Highway 81 north of U.S. Highway 275 show minor decreases of 200 to 500 vehicles per day as a result of the bypass. Victory Road between New Nucor Road and U.S. Highway 275 is impacted more by the bypass, with 1,000 to 3,000 vehicles per day diverted off of Victory Road.

Package A Traffic Assignment

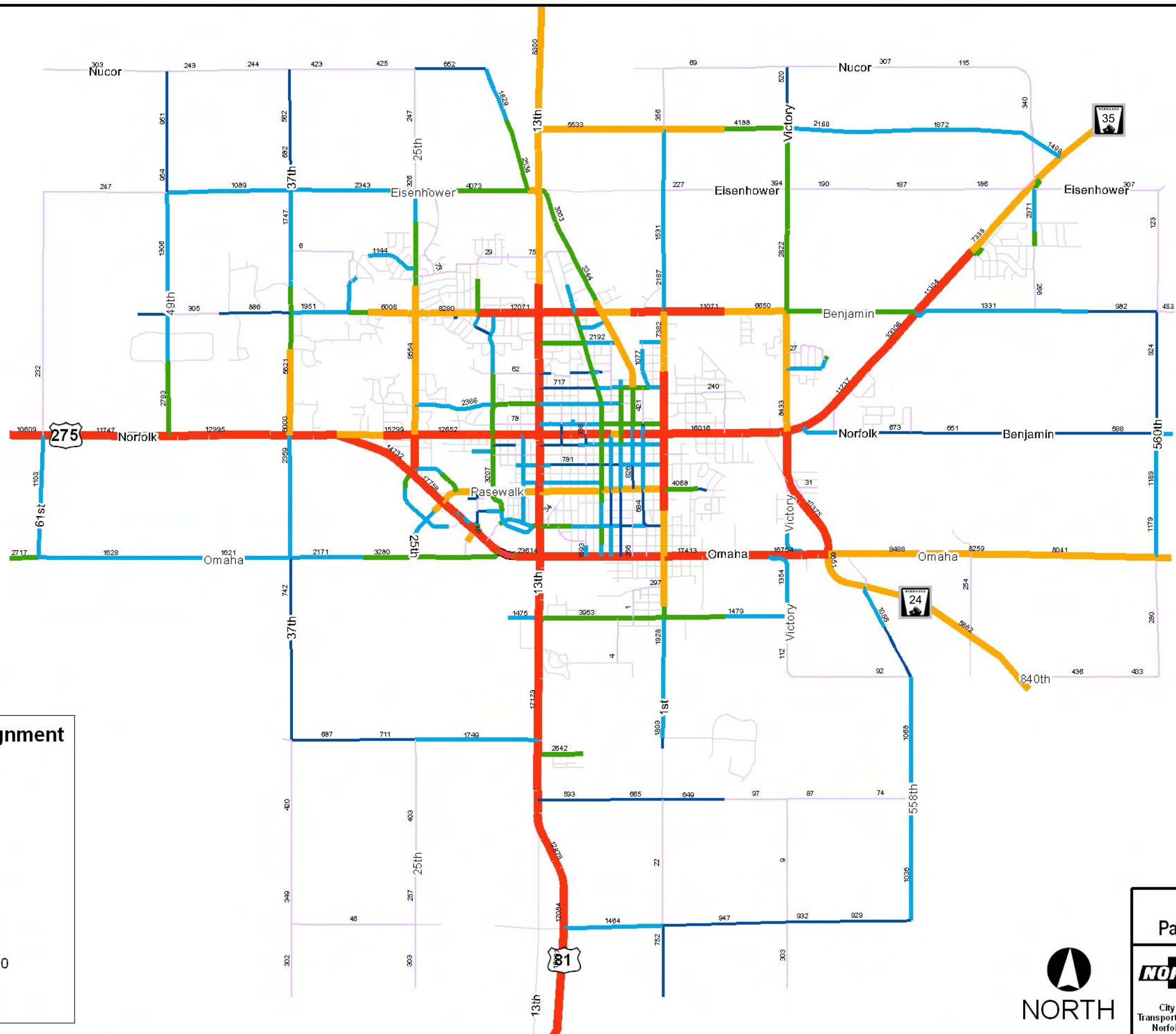
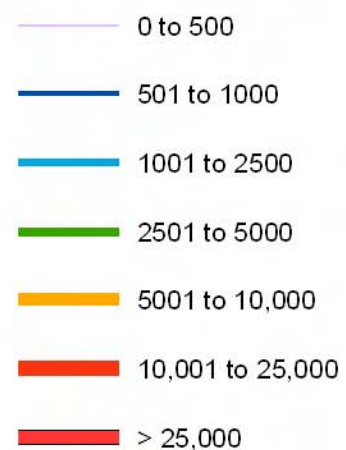


Figure 6-6
Package A Traffic Assignment



City of Norfolk
Transportation Plan 2030
Norfolk, Nebraska



Package B Traffic Assignment

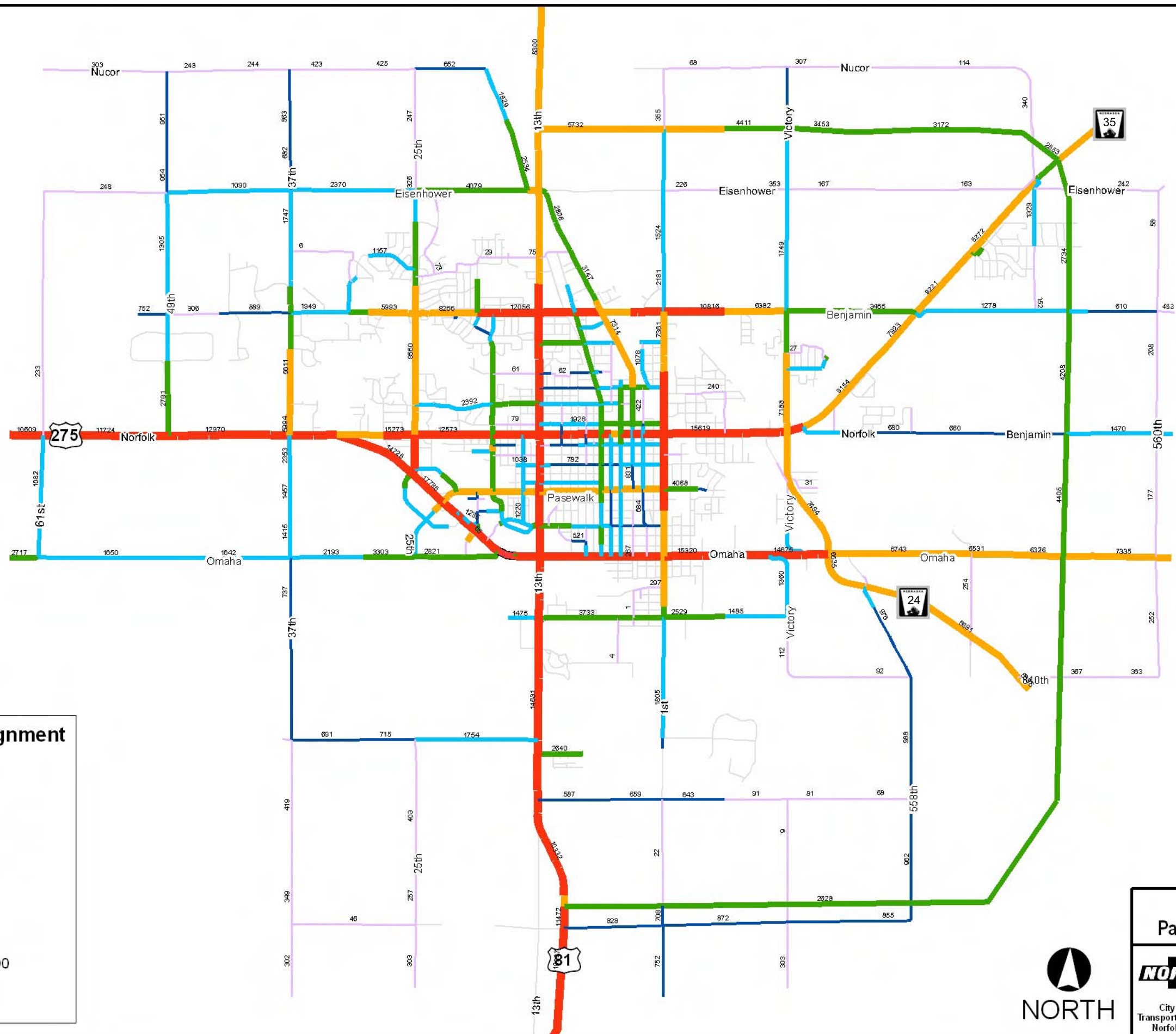


Figure 6-7
Package B Traffic Assignment



City of Norfolk
Transportation Plan 2030
Norfolk, Nebraska



Alternative Package C

Description: This package of alternatives contains alternatives identified in *The Norfolk Plan* that focus on redistribution of traffic around the community as well as access and circulation within new residential growth areas in the northwest quadrant of the city.

Alternative C1 – Inner Beltway

Description: This alternative uses existing roadways to distribute traffic around its growth centers using the concept of an “inner beltway.” This Inner Beltway would distribute traffic around the city’s growth areas and relieve heavy reliance on the 13th Street corridor. The Inner Beltway’s segments include:

- U.S. Highway 275/Omaha Avenue as the southern segment, serving industrial and business areas in the southern part of the city.
- Eisenhower Avenue and New Nucor Road as the northern segment, serving residential growth areas.
- Victory Road as the east segment, serving northeast development and industrial areas on the north.
- 37th Street as the west segment, serving the growing residential development in the northwest quadrant of the city. (This segment should be complemented by a circumferential residential boulevard and other traffic distribution measures to relieve loading.)
- In terms of increasing roadway capacity, the 37th Street component of the Inner Beltway is the only one that experiences changes with this alternative.

Alternative C2 – Circumferential Boulevard

Description: This alternative uses a series of existing and new roadways to provide improved distribution and circulation of traffic in the growing residential development in the northwest quadrant of the city. This Circumferential Boulevard includes the following segments:

- A new roadway, approximately one-quarter mile south of Eisenhower Avenue, as the northern segment.
- A new segment of Pasewalk Avenue, from U.S. Highway 275 continuing west through 37th Street, before turning north to intersect Prospect Avenue at approximately 44th Street.
- 25th Street as the east segment.
- 49th Street as the west segment.

Alternative C3 – Prospect Avenue

Description: This alternative uses a new roadway, Prospect Avenue Parkway, to connect 25th and 49th Streets and the circumferential boulevard.

Package C Model Results:

Package C assigned traffic volumes are illustrated in **Figure 6-8**. Many of the items listed in Alternative C1 exist as part of either the committed roadway system or have already been included in Package A. Therefore, no significant changes in travel demand were identified as a result of Alternative C1 improvements.

The proposed extension of Pasewalk Avenue and the roadway south of Eisenhower Avenue provide local access to land parcels expected to develop in the future. The travel demand model did not utilize these facilities as major traffic diversion routes; therefore traffic volumes will be highly dependent on both local land use and driveway access to these facilities.

The extension of Prospect Avenue west of 25th Street continues an alternative route for east-west travel between U.S. Highway 81 and major traffic generators around the Norfolk Avenue and U.S. Highway 275 intersection. The Prospect Avenue extension draws an additional 1,000 vehicles per day onto the existing segment of Prospect Avenue between U.S. Highway 81 (13th Street) and 25th Street, with a corresponding decrease in travel along the Norfolk Avenue corridor, thus reducing the volume-to-capacity ratio to below the 0.70 threshold west of 18th Street.

Package C Traffic Assignment

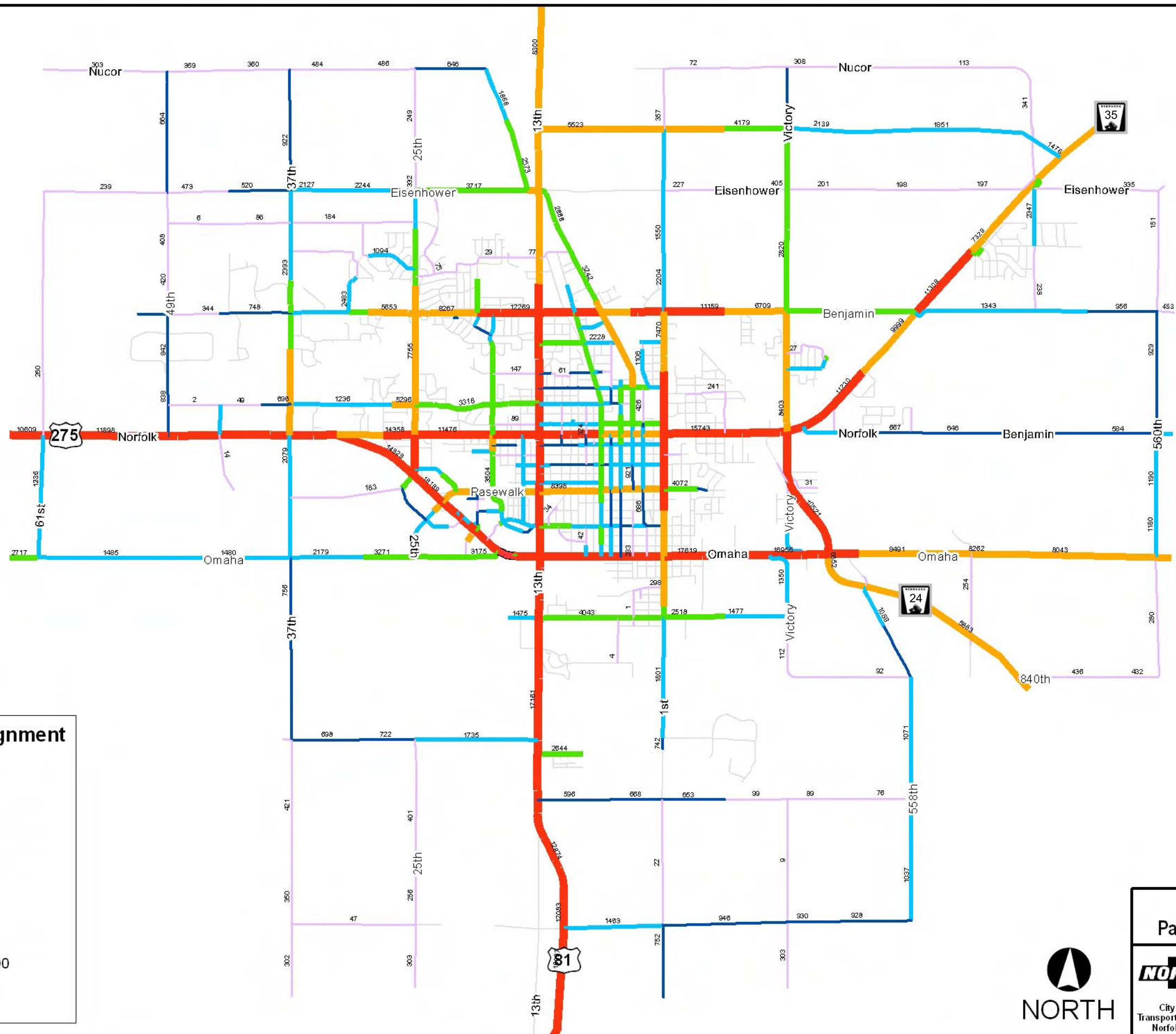


Figure 6-8
Package C Traffic Assignment



City of Norfolk
Transportation Plan 2030
Norfolk, Nebraska



Alternative Package D

Description: This package consists of a single alternative that does not fit within the other packages listed above.

Alternative D1- Pasewalk Avenue

Description: This alternative evaluates increased capacity along the segment of Pasewalk Avenue, between 13th Street and 18th Street, by upgrading the roadway to a three-lane cross-section. With this upgrade in capacity, it is also envisioned that this roadway would experience an improvement in functional classification (from collector to minor arterial).

Package D Model Results:

Package D assigned traffic volumes are shown in **Figure 6-9**. The increase in capacity from two lanes to three lanes along the Pasewalk Avenue corridor between 13th and 18th Streets provides congestion relief to the vehicles traveling through this corridor, reducing the volume-to-capacity ratio to below the 0.70 threshold.

The improvement does increase volume along Pasewalk Avenue by more than 200 vehicles per day, and does provide minimal relief to the Norfolk Avenue corridor by reducing travel on the facility by up to 500 vehicles per day. The congestion relief on Norfolk Avenue is expected to be less significant with the Pasewalk Avenue alternative than what would be anticipated with the Prospect Avenue extension in package C.

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Package D Traffic Assignment

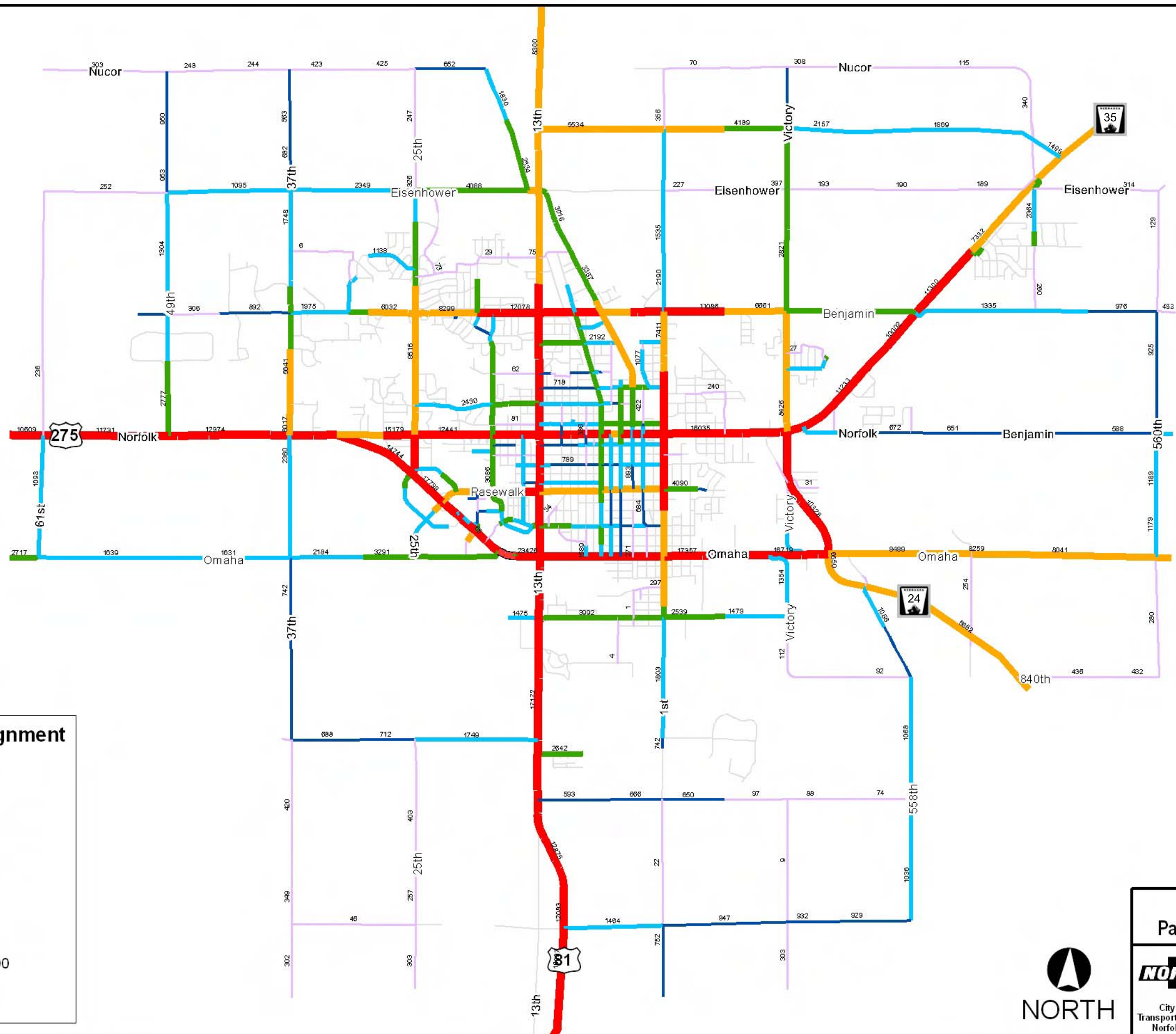


Figure 6-9
Package D Traffic Assignment



City of Norfolk
Transportation Plan 2030
Norfolk, Nebraska



VII. Alternative Transportation Modes

Transit

Norfolk currently has one transit service within the city. Norfolk Public Transportation offers demand-responsive services to Norfolk residents and those within the immediate surrounding area. This service, named “Handi Bus”, has a fleet consisting of:

- 2004 Minivan (1)
- 2003 Lift-equipped Van (1)
- 2001 Lift-equipped Van (1)
- 1996 Lift-equipped Van – Reserve (1)

The Handi Bus fleet is relatively modern with an average age of five (5) years and its three main operating vehicles fall within the Federal Transit Administration (FTA) recommendation of maintaining an operating fleet of less than five (5) years of age. **Table 7-1** shows the Norfolk Handi Bus Operating Statistics. However, maintenance and insurance costs are increasing to near-prohibitive levels as Norfolk Public Transportation tries to keep within an ever-tightening budget. The buses do not have a facility for storage and maintenance, increasing the deterioration rate and maintenance costs of the vehicles.

Table 7-1: Norfolk Handi Bus Operating Statistics

Fiscal Year 2005

Description	Monthly Average	FY 2005 Total
Number of Vehicle Miles Traveled	5,794	69,528
Number of Passenger Boardings	2,366	28,391

Source: Northeast NE Area Agency on Aging – 2005

As with many entities working with tight budgets, the Handi Bus is limited by the amount of funding it receives to conduct its services. Some requests for service have been turned away due to a lack of funding. Handi Bus, like many other transit operators, has also experienced problems with obtaining affordable insurance coverage. The transit operator has been forced to become self-insured due to this problem.

Civic events should openly promote the use of the Handi Bus in their advertisements. Having users call the transit service to be added to the pre-advertised route time would reduce the number of trips the Handi Bus would take for service and increase the number of riders per vehicle miles traveled as well.

The Norfolk Plan suggests the creation of a demand responsive service route system that could be used to improve the availability of the transit service:

“Norfolk should investigate the development of an innovative transit system that is enhanced by combining aspects of demand responsive and service stems. Service routes are circulators that link major community attractions and traffic generators. The hybrid concept operates as a two-tiered system. For a specific time, a vehicle operates on a demand responsive service, picking passengers up or leaving them near home. It then enters a service route phase, leaving passengers at specific points on the scheduled route and picking up others to distribute at home during the next "demand responsive" phase. Service route stops may vary for different times of the day. For example, the stop and route structure may change during the day for specific demands, such as transportation of children from schools to after-school facilities such as parks and recreational centers and programs.”

“Development of a demand responsive service route system should be investigated through a process that considers and evaluates the specific needs of potential system user.”

Source: The Norfolk Plan – RDG Crose Gardner Shukert, 2001

In addition to the demand responsive service route system, the City and Handi Bus should investigate the feasibility of constructing a joint maintenance facility. Many cities of similar size to Norfolk have constructed such facilities with good results. By combining two or more entities in one facility, typically managed by a “28E agreement,” each entity can benefit by sharing and reducing costs and preventing redundancies.

The cooperation of more than one entity also increases the number of grant funding sources available for this type of project. Although FTA and Federal Highway Administration (FHWA) are often viewed as the main sources of funds to finance joint maintenance facility projects, funding from additional sources can also assist in the overall financial feasibility of the construction of the facility.

Intercity Bus Service

Norfolk has two intercity bus lines that service different route choices. Black Hills Stage Lines, Inc. operates a Norfolk-to-Omaha route, and the K & S Express, which operates from Norfolk to Chadron.

At one time, the Black Hills Stage Lines operated a route line from Omaha to Rapid City, South Dakota. However, the Black Hills Stage Lines reduced the route to a Norfolk-to-Omaha route with stops in Columbus, Schuyler, and Fremont. The route arrives in Omaha at 11:30 a.m. and departs for Norfolk at 1:15 p.m. This service includes the following route stops Mondays through Fridays:

Table 7-2: Black Hills Stage Lines Route Times

Norfolk	8:30 a.m.	4:00 p.m.
Columbus	9:30 a.m.	2:50 p.m.
Schuyler	9:55 a.m.	2:25 p.m.
Fremont	10:35 a.m.	1:55 p.m.
Omaha	11:30 a.m.	1:15 p.m.

Source: Nebraska Transit Directory, Intercity Bus Services, 2005

The K & S Express operates a route that includes 10 cities in a two-day course that commences and ends in Norfolk. This two-day operation starts each Tuesday and ends on Wednesday morning. The easterly route runs by appointment, and neither direction is in operation on holidays.

Table 7-3: K & S Express Route Times

Tuesday		Wednesday	
City	Depart	City	Depart
Norfolk	4:15 p.m. CST	Chadron	11:30 p.m. MST
Neligh	4:40 p.m. CST	Rushville	12:15 a.m. MST
O'Neill	5:30 p.m. CST	Gordon	12:30 a.m. MST
Atkinson	6:00 p.m. CST	Valentine	3:30 a.m. CST
Bassett	6:30 p.m. CST	Ainsworth	4:45 a.m. CST
Ainsworth	6:45 p.m. CST	Bassett	5:00 a.m. CST
Valentine	7:45 p.m. CST	Atkinson	5:30 a.m. CST
Gordon	9:30 p.m. MST	O'Neill	6:00 a.m. CST
Rushville	9:45 p.m. MST	Neligh	6:45 a.m. CST
Arrives in Chadron @ 10:15 p.m.		Arrives in Norfolk @ 10:15 p.m.	

Source: Nebraska Transit Directory, Intercity Bus Services, 2005

Note: CST - Central Standard Time, MST - Mountain Standard Time

Norfolk should work with both intercity bus lines to ensure these two routes are kept in operation. In addition, these bus lines should work with the Norfolk Handi Bus on a continual basis to coordinate activities to and from the bus stops. Promotion of the use of both Norfolk Handi Bus and these intercity bus lines in conjunction with each other should be a priority for both types of service providers and the City of Norfolk.

Bicycle and Pedestrian Facilities

Norfolk has a useful and continually developing trail system. The City has made significant advances in its trail system since the development of *The Norfolk Plan* alone. The three most notable improvements since the Plan have been:

- A trail route from Norfolk Senior High, along Riverside Boulevard, to Norfolk Middle School, the Norfolk YMCA, and the athletic fields to the south of those facilities.
- The paving of a trail route along the west side of the North Fork of the Elkhorn River flood control channel in the North Fork Greenway.
- An extension of the Cowboy Trail that follows the Elkhorn River to Ta-Ha-Zouka Park.

Other elements of the Trails section of *The Norfolk Plan* are depicted in **Figure 7-1**. Although the trail system has witnessed good growth since the development of that plan, the City should continue to focus on the development of the trail system, concentrating specifically on interconnectedness of the system.

NORFOLK SHOULD MAINTAIN A CONTINUOUS PEDESTRIAN NETWORK
COMPLEMENT THE STREET SYSTEM.

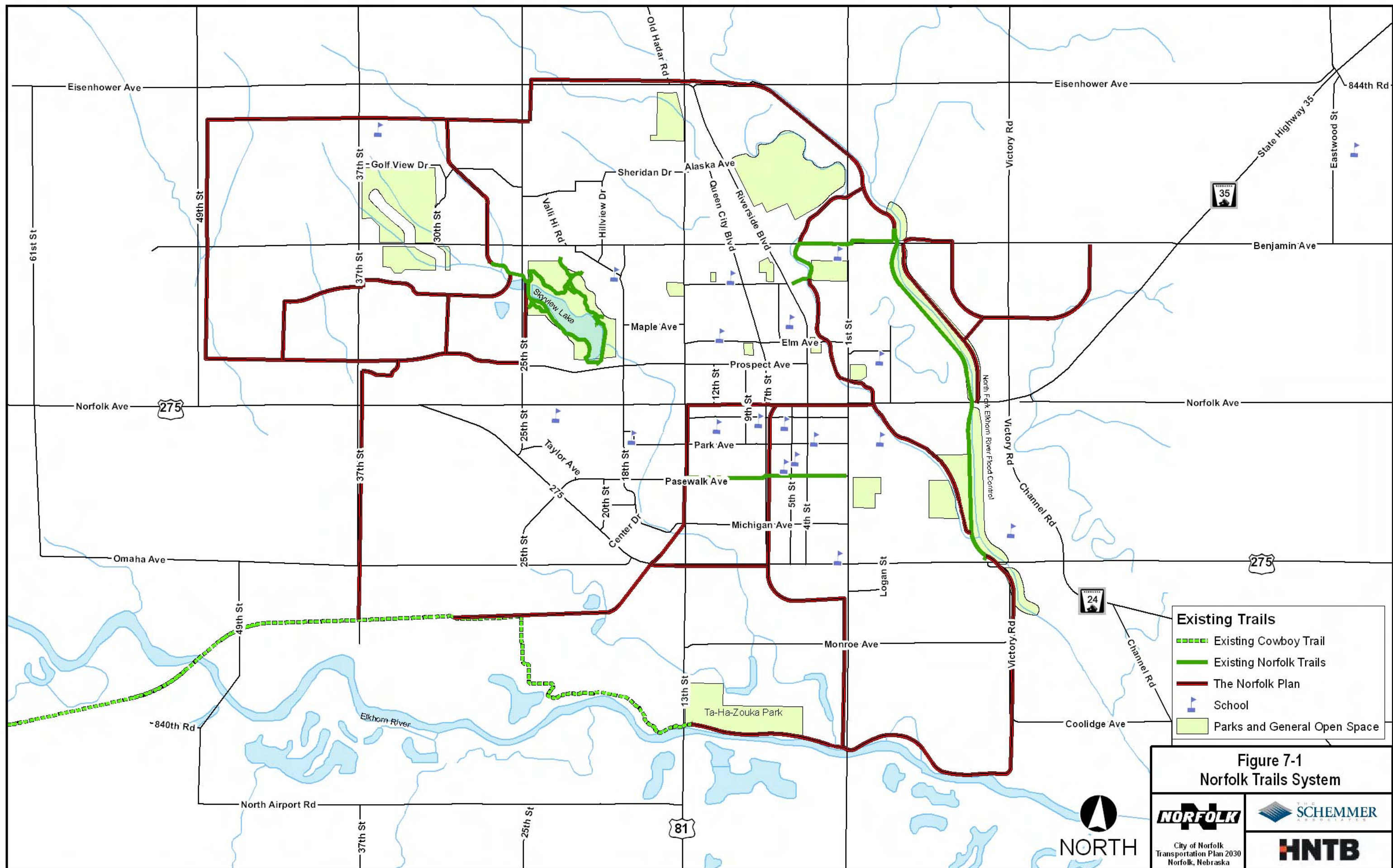
Source: The Norfolk Plan – RDG Crose Gardner Shukert, 2001

The proposed Norfolk trail system consists of five levels of facilities to serve the different aspects of all the system's linkages. These five levels of facilities are:

- Existing Cowboy Trail
- Existing Norfolk Trails
- On-Street Trails
- Off-Street Trails
- Share the Road Segments

Existing Cowboy Trail

The first level, the Existing Cowboy Trail, has been lengthened since the development of *The Norfolk Plan*. The old trailhead was approximately half a mile west of 25th Street, along the abandoned railroad corridor. The Cowboy Trail now continues to 25th Street and proceeds south to the Elkhorn River and follows the river to Ta-Ha-Zouka Park. This park now serves as a major, more appropriate, trailhead for Cowboy trail.



Existing Trails

- Existing Cowboy Trail
- Existing Norfolk Trails
- The Norfolk Plan
- School
- Parks and General Open Space

Figure 7-1
Norfolk Trails System

NORFOLK

City of Norfolk
Transportation Plan 2030
Norfolk, Nebraska

THE SCHEMMER ASSOCIATES

HNTB

Existing Norfolk Trails

In addition to the existing trail around Skyview Lake, Norfolk has developed other notable trail segments since *The Norfolk Plan*.

The most noteworthy segment added was the trail segment that starts at Riverside Boulevard and crosses the "Old Channel" of the North Fork of the Elkhorn River flood control channel before proceeding to Benjamin Avenue and east to the North Fork Greenway. This segment is significant for its connection of many facilities including the Norfolk Senior High School, the Norfolk Middle School and the nearby soccer fields, the Norfolk YMCA, and Northeast Community College.

The addition of a trail in the North Fork Greenway was suggested in *The Norfolk Plan*. The segment along the western side of the flood control channel was constructed from approximately Benjamin Avenue to Omaha Avenue, a major addition to the trail system of over two miles in length. This trail connects the facilities in the northeastern area of the city to Norfolk Avenue and Omaha Avenue, serving as a major north/south route for the system.

Although the sidewalk widening along Pasewalk Avenue from 1st Street to 13th Street was not mentioned within *The Norfolk Plan*, it can play a major role in the Norfolk trail system. Not only does it serve Norfolk Junior High School and Christ Lutheran Elementary, it can also serve as a major connector route amongst the system's other segments.

On-Street Trails

The development of trails alongside the street system of Norfolk serves as a major portion of the proposed Norfolk trail system. Although sidewalks already exist in many areas proposed for trail development, many of these sidewalks should be widened for the purpose of the multiple uses accommodated by the trail system.

The Norfolk Plan mentioned some of the proposed segments, including:

- Trail segments along the proposed circumferential boulevard in the northwestern residential area.
- A segment of the trail connecting the proposed circumferential boulevard at 37th Street and Prospect Avenue, to the existing trail at Skyview Lake.
- Another section connecting the trail along the proposed circumferential boulevard to the trails on the eastern edge of the city through Eisenhower Avenue.
- A Downtown Norfolk segment that travels along Norfolk Avenue to 13th Street and continues southward.

In addition to these portions of the proposed trail system, additional sections of on-street trails are also proposed. These include:

- A segment that connects the southern portion of the trail along the proposed circumferential boulevard to the trail at Skyview Lake and Downtown Norfolk. This assists in the inter-connectivity of the system and provides another route to the Downtown area.
- The continuation of the Downtown Norfolk segment to the North Fork Greenway trail, providing access to a major north – south section of the system.
- A connector from the existing trail north of Norfolk Senior High School to Norfolk Avenue. This connects the many facilities along the existing segment in the northeastern quadrant of the city to Downtown Norfolk and routes to the south and west of Downtown Norfolk.
- A major section along 25th Street, from Omaha Avenue, to Pasewalk and east, through the city. This portion of the trail system would connect the Cowboy Trail to major commercial areas along Highway 275. It would also connect those areas to Downtown Norfolk through trail segments at 13th and 1st Streets. Finally this section would connect to the North Fork Greenway trail via an off-street trail.

Off-Street Trails

Other portions of the proposed trail system will inter-connect the trails through off street trail segments. Three of these segments were mentioned in *The Norfolk Plan*.

- A trail connection from the Eisenhower Avenue to the North Fork Greenway.
- A connection from Skyview Lake to the northern leg of the trail along the proposed circumferential parkway.
- A continuation of the Cowboy Trail along the Elkhorn River from Ta-Ha-Zouka Park to a share-the-road segment that connects to Omaha Avenue and the North Fork Greenway trail.

In addition, another connector off street trail will connect the trail along Pasewalk Avenue to the North Fork Greenway trail.

Share-the-Road Trails

Share-the-road segments round out the proposed Norfolk Trail system. These segments are designated routes for bicycles to share the road with vehicles. Share-the-road trails are a cost-effective approach to connecting trail segments. The three proposed lengths of share-the-road trails are:

- 37th Street – north from the Cowboy Trail to areas of western Norfolk
- 25th Street – north from the Cowboy Trail to the Pasewalk trail segment connection.
- South Victory Road – from the proposed Cowboy Trail extension to the North Fork Greenway trail at Omaha Avenue.

Through the gradual development of the trail system proposed above, the City of Norfolk will have system of trails that will interconnect learning institutions, parks, housing and commercial areas. **Figure 7-2** provides a geographical representation of the proposed trail system.

In addition to continuing the development of the trail system, the City should work to promote its use. Promoting multi-use trails will complement automobile trips and enhance the overall transportation network. Various types of media should be used to promote the trails. These include, but are not limited to:

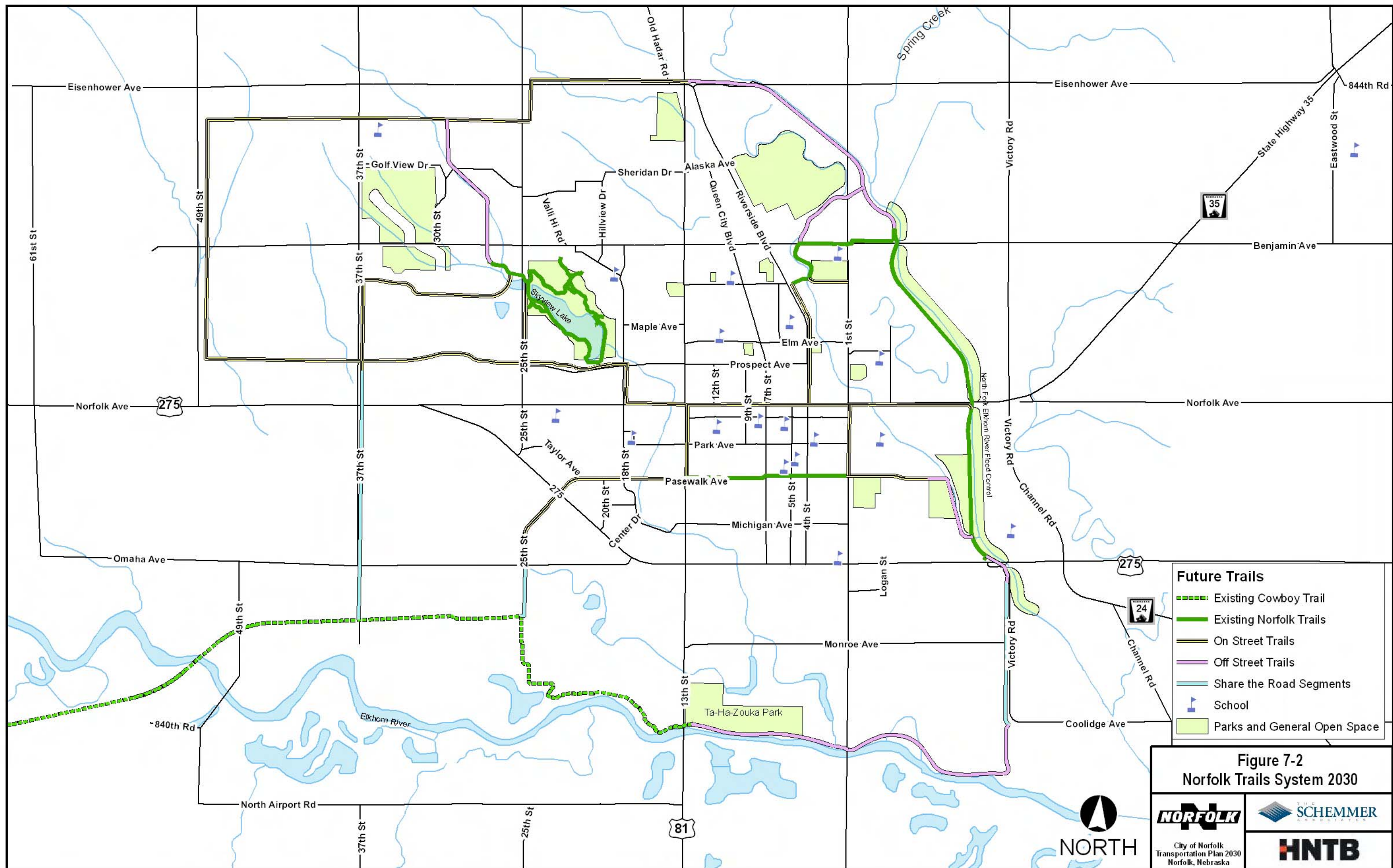
- The City of Norfolk website
- Pamphlets and fliers
- Regional tourism media

Aviation

Karl Stefan Memorial Airport (**Figure 7-3**) is located south of Norfolk, along the west side of U.S. Highway 81. Originally constructed in 1942, the airport has two runways, a terminal building, two storage buildings, 39 hangars, and seven privately owned buildings. The airport is also equipped with VHF Omnidirectional Range navigation system (VOR) and instrument landing systems. The services available include; aviation gas, jet aviation fuel, major and minor airplane repair, air taxi, airplane rental, flight instructions, aerial photography, and aerial spraying.

The airport's two runways are both 5,800 feet in length and 100-foot in width. Although the length accommodates most corporate jets, the Norfolk Airport Authority has an interest in extending the runways to 7,500 or 8,000 feet in the future as the demands increase.

As recently as 2000, the airport was one of seven in Nebraska with over 2,500 commercial service enplanements. Prior to mid-2003, United Express Airlines provided the airport's commercial service. However, due to decreasing enplanement figures and a desire to restructure their air service locations, the airline discontinued service to Norfolk at that time. Although it is the aspiration of many to attract another commercial airline service, the airport is conducting business well without commercial service. The nearest commercial airline service is available through the Sioux City and Omaha airports.

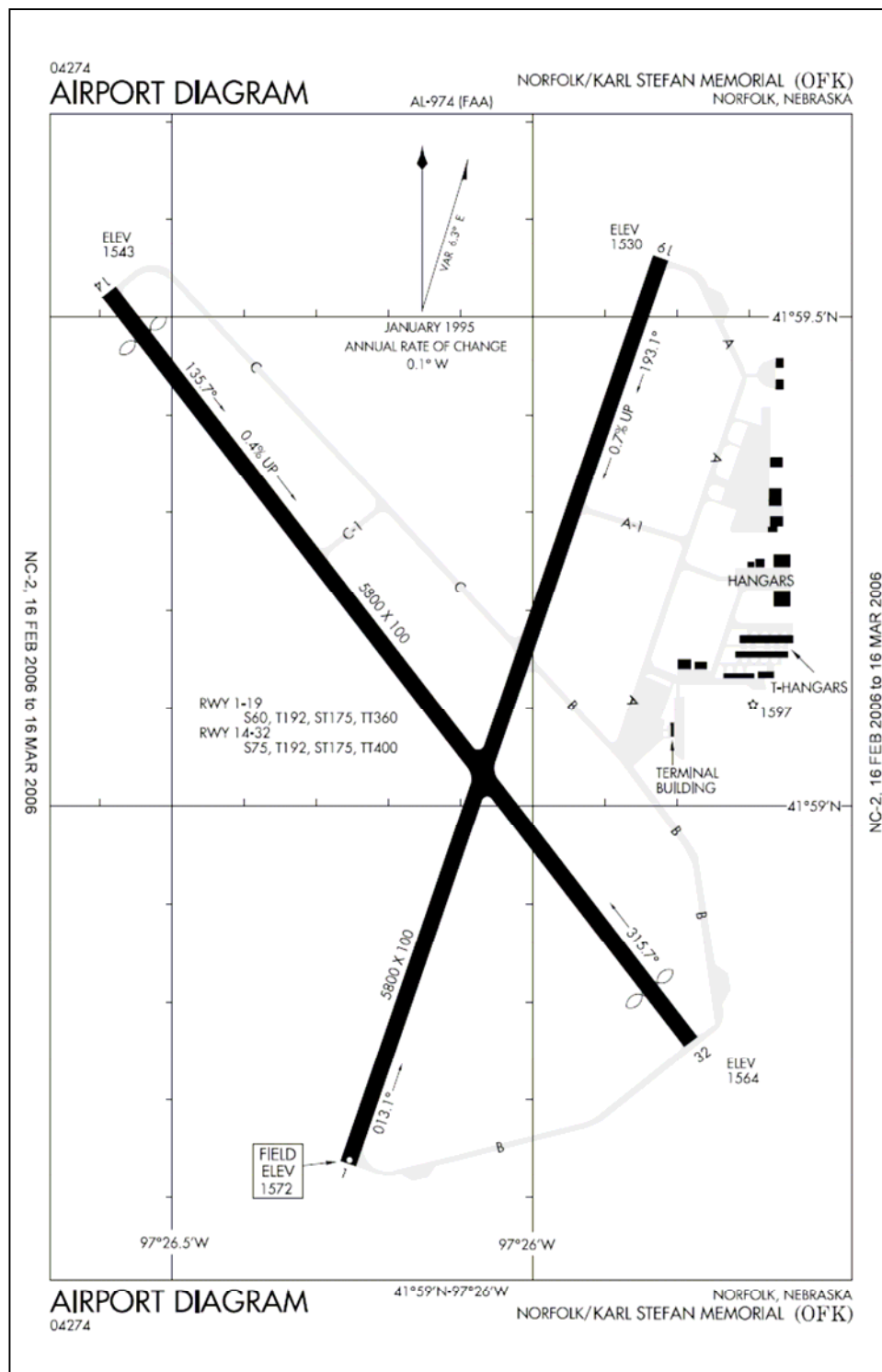


- Future Trails**
- Existing Cowboy Trail
 - Existing Norfolk Trails
 - On Street Trails
 - Off Street Trails
 - Share the Road Segments
 - School
 - Parks and General Open Space

Figure 7-2
Norfolk Trails System 2030

City of Norfolk
 Transportation Plan 2030
 Norfolk, Nebraska

Figure 7-3: Karl Stefan Memorial Airport Diagram



FAA- 2006

**Table 7-4: Proposed Airport Capital Improvement Program
Notable Projects**

Year	Description	Total Cost	Federal	State	Local
2007	Rehab Airport Storm Sewer System	\$ 1,939,688	\$ 1,842,703	\$0	\$ 96,985
2009	T Hangars (45' doors)	450,000	427,500	0	22,500
2010	Replace Airport Terminal Building	500,000	475,000	0	25,000
2011	Marker Runway 32	550,000	0	0	550,000
2011	Glide Slope Runway 32	400,000	0	0	400,000
2011	ILS Runway 32	750,000	0	0	750,000
2013	T Hangars	450,000	427,500	0	22,500
2018	Rehab 1/19, taxiway	1,135,012	1,078,261	0	56,751
2019	T Hangars	450,000	427,500	0	22,500

Source: Proposed Karl Stefan Memorial Airport Capital Improvement Program - 2006

The airport's proposed 20-year capital improvement program includes 19 projects, split into three different phases. **Table 7-4** provides the most notable projects out of the program. Although the rehabilitation of the airport's storm sewer system is the most costly item on the list, other considerable improvements stand out. In addition to improvements to Runway 32 and the rehabilitation of 1/19 and its taxiway, the airport is looking to expand the number of modern, insulated T Hangars available.

Also of note in this program is the replacement of the Airport Terminal Building. The current terminal building rests to the north of the historic KSMA Administration Building. The current concept is to remodel the north end of the Administration Building to make it a more efficient and viable terminal building for current operations.

In addition to the improvements proposed in the airport's proposed capital improvements program, the City and the Airport Authority should also conduct a study to extend water and sewer service to the airport area. This would improve the development opportunities to the area south of the City, near the airport. Improving the development opportunities around the airport may attract another scheduled air service provider to commence operations out of KSMA. The resurrection of this service has been the desire of the KSMA Airport Authority since the discontinuance of daily scheduled services in 2003.

Railroads

The Nebraska Central Railroad Company (NCRC) owns the railroad tracks that traverse through Norfolk. **Figure 7-4** illustrates NCRC's statewide routes. From 1871 to the current ownership, four different companies have owned this track. The initial owner, the Fremont, Elkhorn & Missouri Valley Railroad (FE&MV) was the main operator in the region, creating a corridor of cities that sprouted up along its lines. The Chicago and Northwestern (C&NW) took over operation of the line as it thrived.

"As with other railroads across the country, the C&NW was the dominant transporter of both freight and passengers in northern Nebraska from the 1880s through the 1920s. Indeed, without it, many of the towns and homesteads could not have survived."

"For years ranchers would load cattle out of the Sandhills and ride with them to the Omaha stockyards. In 1932, the C&NW served 66 farm implement dealers, 117 coal dealers, 48 grain elevators, 55 lumber dealers and 128 gas and oil receivers on the line from Fremont to Lander, WY. But, by the 1930s, improved highways and increasingly reliable cars and trucks provided more-flexible alternatives to rail service, and the Great Depression sent the line into an economic tailspin."

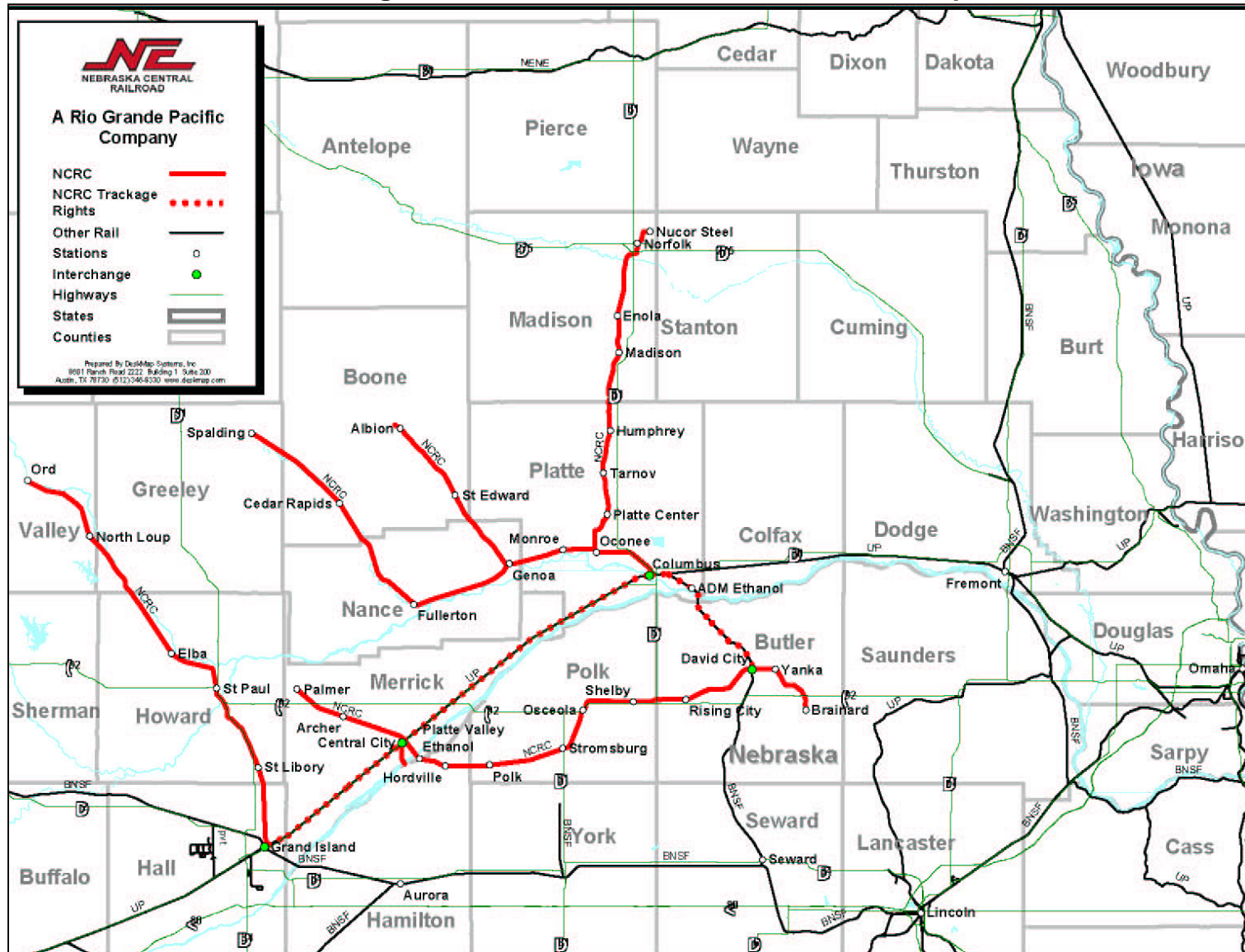
Source: Nebraska Game and Parks Commission, 2006²

As traffic on the line reduced, C&NW started rerouting business before it filed for the abandonment of the Norfolk-to-Chadron portion of the line in 1991; the last trains ran along the line in December of 1992. Eventually, C&NW was purchased by the Union Pacific Railroad (UPRR) and the lines that currently exist are now under the ownership of the NCRC. The NCRC has a 340-mile network through Nebraska that connects to the UPRR and Burlington Northern Santa Fe (BNSF) main lines and serves as an integral part of grain shipments in the area it serves.

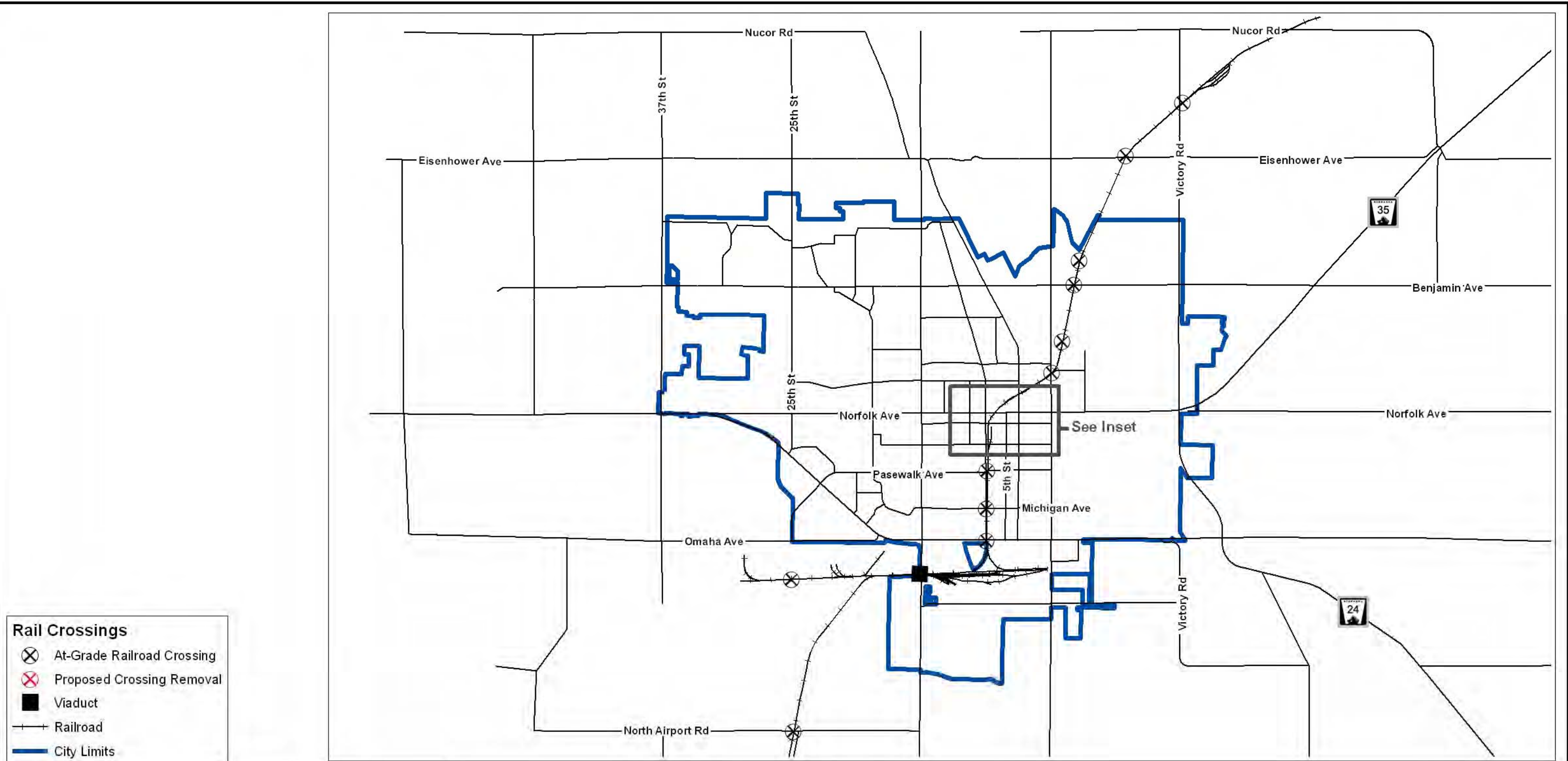
Within the city limits, the railroad has 16 at-grade crossings and one grade-separated crossing on U.S. Highway 81, south of Omaha Avenue. Five more at-grade crossings exist outside the city limits, yet within the planning area. The existing viaduct location and at-grade crossings within the study area are illustrated in **Figure 7-5**. Most of the crossings occur along the mainline that traverses through the City. The NCRC foresees notable additional daily traffic along the rail line in both the short-term and long-term future. This main line serves industries northeast of the city, most notably Nucor Corporation. Between expected future growth of Nucor and the construction of the new ethanol plant, this main line will witness a traffic increase that will likely have enough of an impact on the populace that would be reflected in future public input. Adjustments in the short-term should be made to minimize potential future problems.

² Nebraska Game and Parks Commission - Cowboy Trail, 2006.
<http://www.ngpc.state.ne.us/parks/guides/trails/cowboy/cowboy.asp>

Figure 7-4: Nebraska Central Railroad Route Map



Source: Nebraska Central Railroad, 2006



Rail Crossings

- ⊗ At-Grade Railroad Crossing
- ⊗ Proposed Crossing Removal
- Viaduct
- +— Railroad
- City Limits

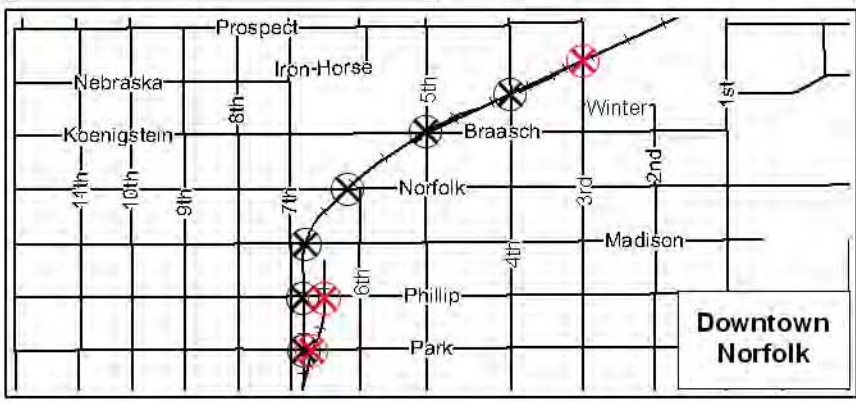


Figure 7-5
Norfolk Railroad Crossings

NORFOLK	SCHEMMER
City of Norfolk Transportation Plan 2030 Norfolk, Nebraska	
HNTB	

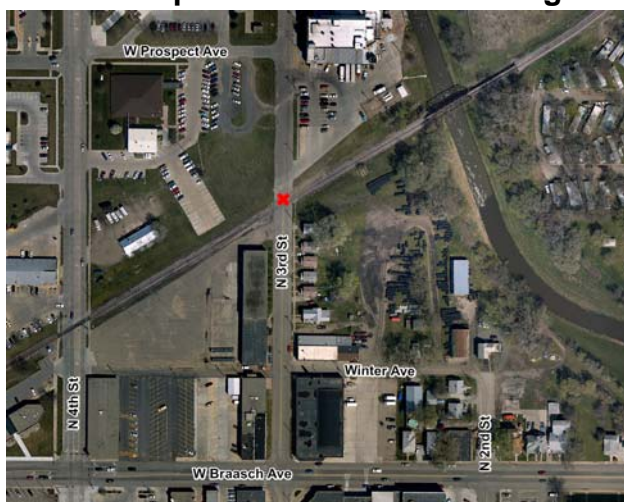
Other than the amount of daily traffic on the line through the city, the only specific comment in the public survey conducted at the start of this planning process was to improve the at-grade crossings on Phillip and Park Avenues. The City of Norfolk is working in conjunction with the NCRC to remove the spur line tracks along Phillip and Park Avenues, a total of two.

Figure 7-6: Proposed Phillip and Park Avenue Spur Line Track Removal



The City of Norfolk is also working with NCRC to close the railroad crossing on 3rd Street. This would also have a minimal impact on the vehicular traffic operations in the general vicinity.

Figure 7-7: Proposed 3rd Street Crossing Closure



Each of these rail-crossing closures would also improve overall safety of the transportation system by reducing the number of rail crossings available.

VIII. Project Prioritization & Implementation

Public Transit Service

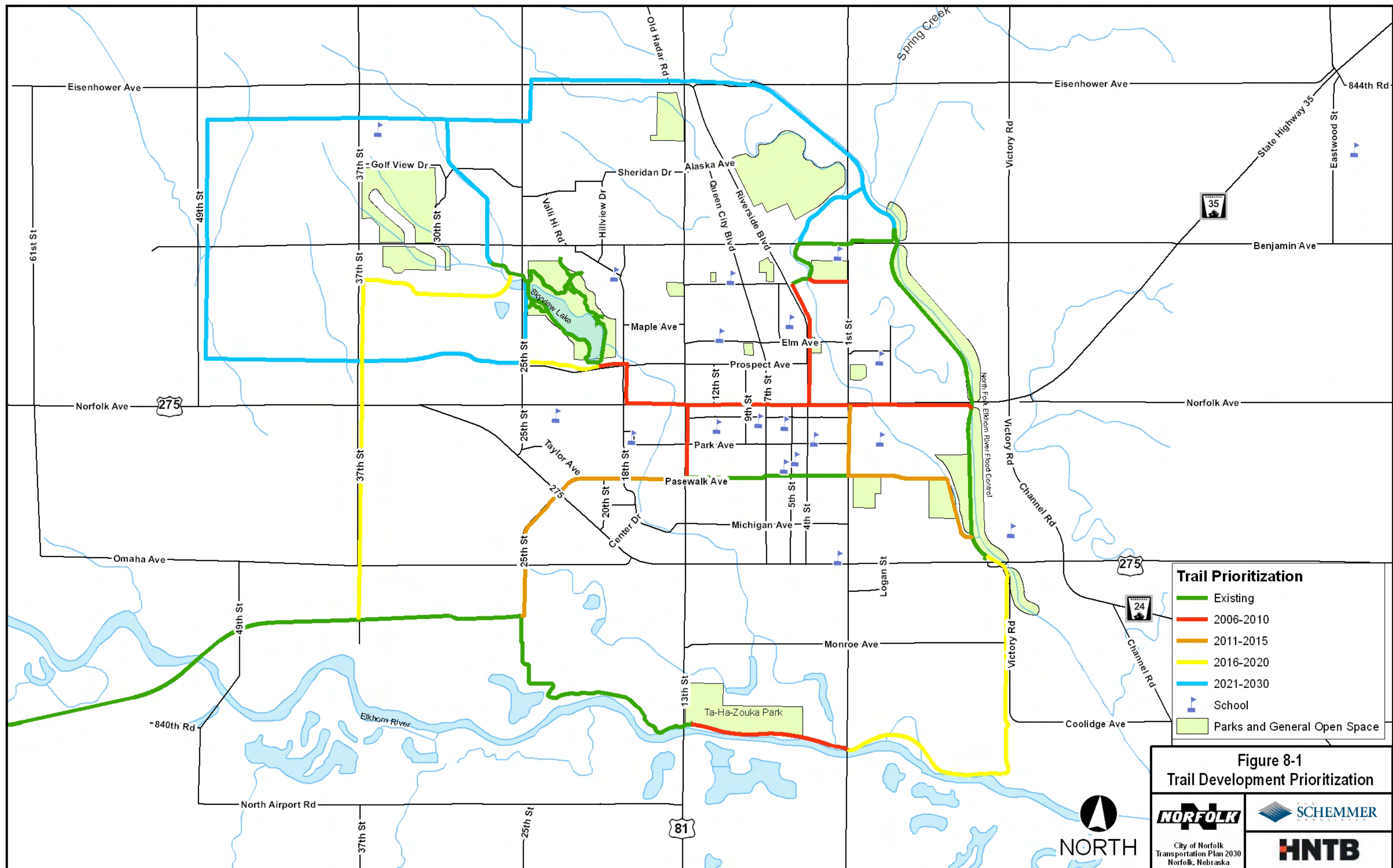
- Investigation into the development of a demand responsive service route system through a process that considers and evaluates the specific needs of potential system users.
- The City and Handi Bus should investigate the feasibility of constructing a joint maintenance facility, one that allows each of the entities benefit from the fiscal appropriateness of such a facility.

Intercity Bus Service

- Work with both intercity bus lines to ensure the two routes that service Norfolk are kept in operation.
- The bus lines should work with the Norfolk Handi Bus on a continual basis to coordinate activities to and from the bus stops.
- The City should work with the Handi Bus, Black Hills Stage Lines, and K & S Express to cross-promote the use of both Norfolk Handi Bus and these intercity bus lines in conjunction with each other.

Bicycles and Pedestrians

- Gradual development of segments of the proposed Norfolk Trail System 2030 as shown in **Figure 8-1**.
- Promote the use of the Norfolk Trail System through various types of media.
- Review gaps in the City's sidewalk system and assess the need for improvements.



Aviation

- Implement the improvements proposed in the airport's proposed capital improvements program.
- The City and the Airport Authority should conduct a study to extend water and sewer service to the airport area.
- Continue efforts towards the resurrection of scheduled commercial air service.

Railroads

- Study the impact of the closure of four rail crossings on Phillip Avenue and Park Avenue, east of South 7th Street.
- Closure of the rail crossing on North 3rd Street.
- Conduct a study to investigate how Intelligent Transportation Systems (ITS) can assist in mitigating railroad-highway intersection delays.
- Study the impacts of Nebraska Legislative Bill 79. This legislation would authorize the closure of railroad crossings that do not have gates, signals, alarm bells or warning personnel and are within one-quarter mile of a crossing that does have such signals.

Roadways

Recommended short-, mid- and long-term roadway improvements are illustrated in **Figures 8-2, 8-3 and 8-4**, respectively. Scope of improvements, cost estimates and program year for each alternative are summarized in **Table 8-1**. The future functional classification map is shown in **Figure 8-5**.

Table 8-1: Short-, Mid-, and Long-Term Roadway Improvements

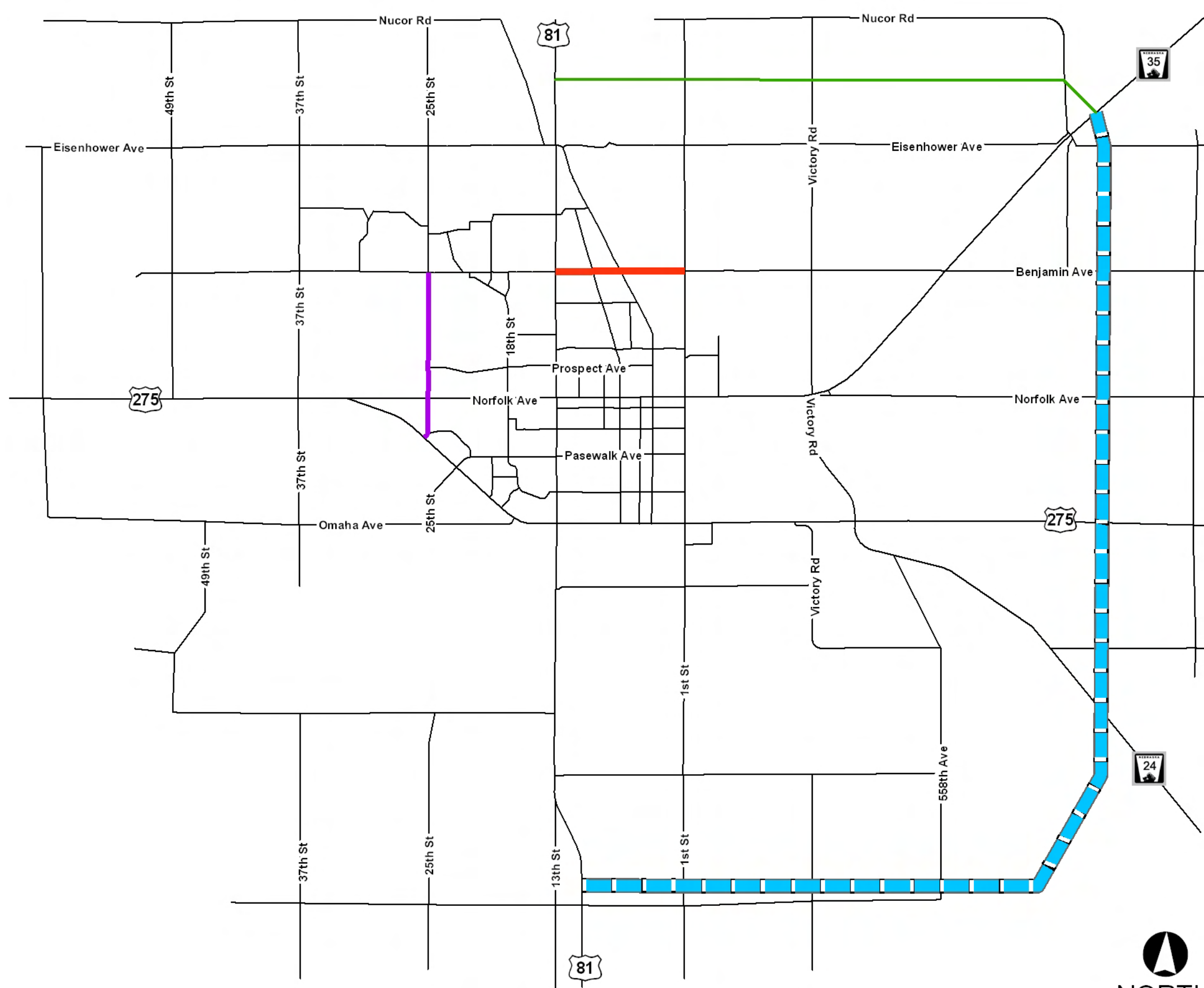
Roadway	Limits	Scope of Improvements	Estimated Cost (2006 \$s) ¹	Program Year (construction)
Short-term projects (2007 – 2012)				
25 th Street	Benjamin Ave. to Norfolk Ave.	Widen from two to three lanes and replace bridge at Skyview Lake	\$2.8 million	2008-2009
25 th Street	Norfolk Ave. to U.S. 275	Widen from two to three lanes	\$0.9 million	2008
Benjamin Avenue	1 st Street to 13 th Street	Widen from four to five lanes	\$3.5 million	2011-2012
Link connecting U.S. 81, N-35, U.S. 275 and N-24	U.S. 81 (south) to N-35 at new Nucor Road	Corridor study	\$35,000	2007 ²
New Nucor Road	U.S. 81 to N-35	Construct new two-lane road	\$9.7 million ³	TBD ⁴
Mid-term projects (2013 – 2021)				
Benjamin Avenue	25 th Street to 37 th Street	Widen from two to three lanes	\$2.3 million	TBD
Pasewalk Avenue	13 th Street to 18 th Street	Widen from two to three lanes	\$0.9 million	TBD
Benjamin Avenue	Victory Road to 1 st Street	Widen bridge at North Fork of Elkhorn River flood control channel (add sidewalk)	\$0.5 million	TBD
Benjamin Avenue	N-35 to Victory Road	Reconstruct two-lane road	\$1.5 million	TBD
37 th Street	Eisenhower Ave. to Deep Hollow Ave.	Reconstruct two-lane road	\$0.7 million	TBD
25 th Street	Eisenhower Ave. to Benjamin Ave.	Widen from two to three lanes	\$2.5 million	TBD
37 th Street	Benjamin Ave. to Norfolk Ave.	Reconstruct two-lane road	\$1.5 million	TBD
Long-term projects (2022 – 2030)				
Link connecting U.S. 81, N-35, U.S. 275 and N-24	U.S. 81 (south) to N-35 at new Nucor Road	Construct new two-lane road	TBD by corridor study ³	TBD

¹ Includes preliminary engineering, construction and construction engineering costs. Does not include right-of-way costs.

² Year study to be performed.

³ Cost shared by Madison County, Stanton County, NDOR, City of Norfolk and others.

⁴ Schedule depends on funding availability.



Improvement Type

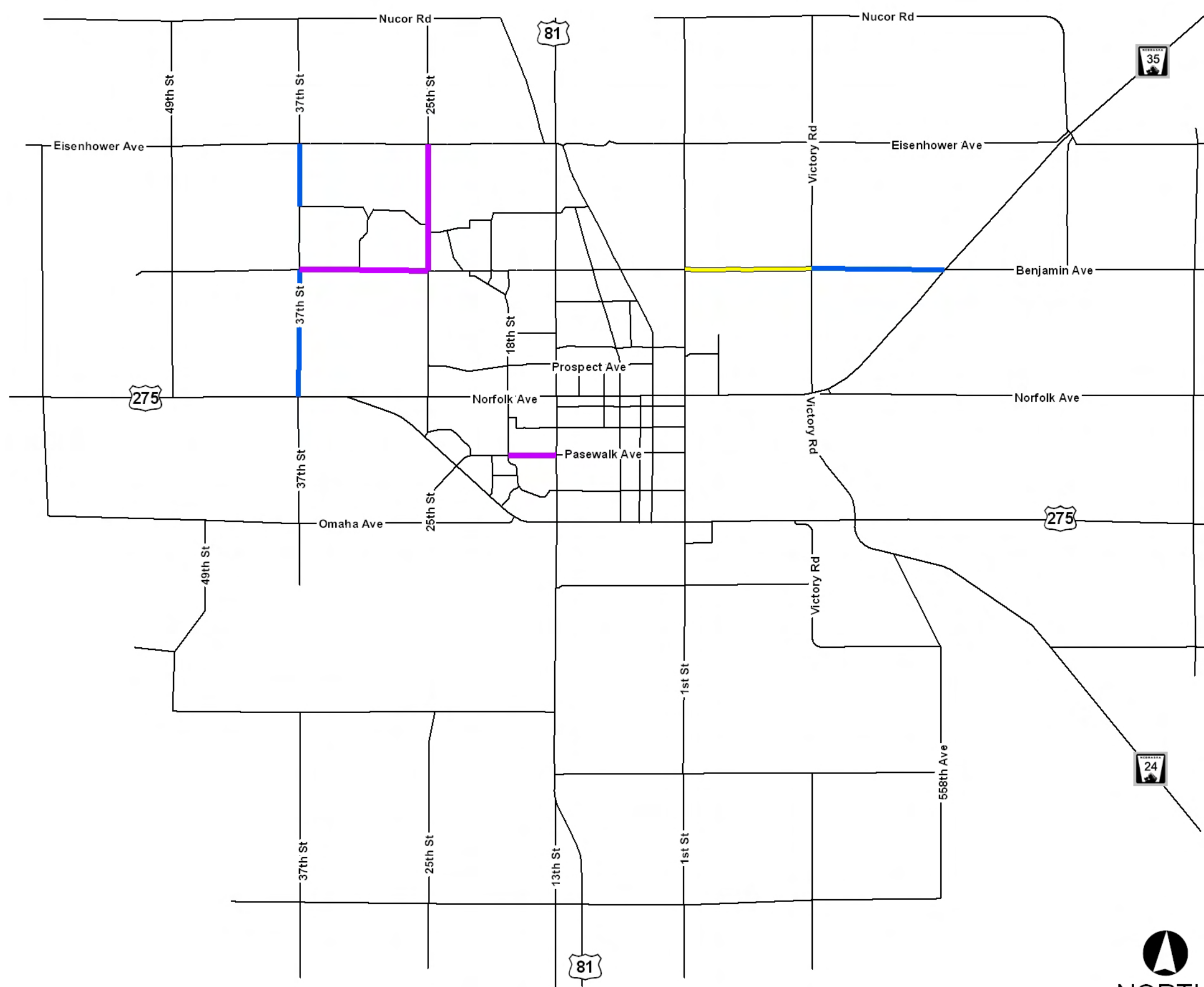
- 4 lane to 5 lane
- 2 lane to 3 lane
- New Construction - 2 lane
- Corridor Study
- Travel Demand Model Network

Figure 8-2 - Short-Term (2007-2012)
Roadway Improvements



City of Norfolk
Transportation Plan 2030
Norfolk, Nebraska



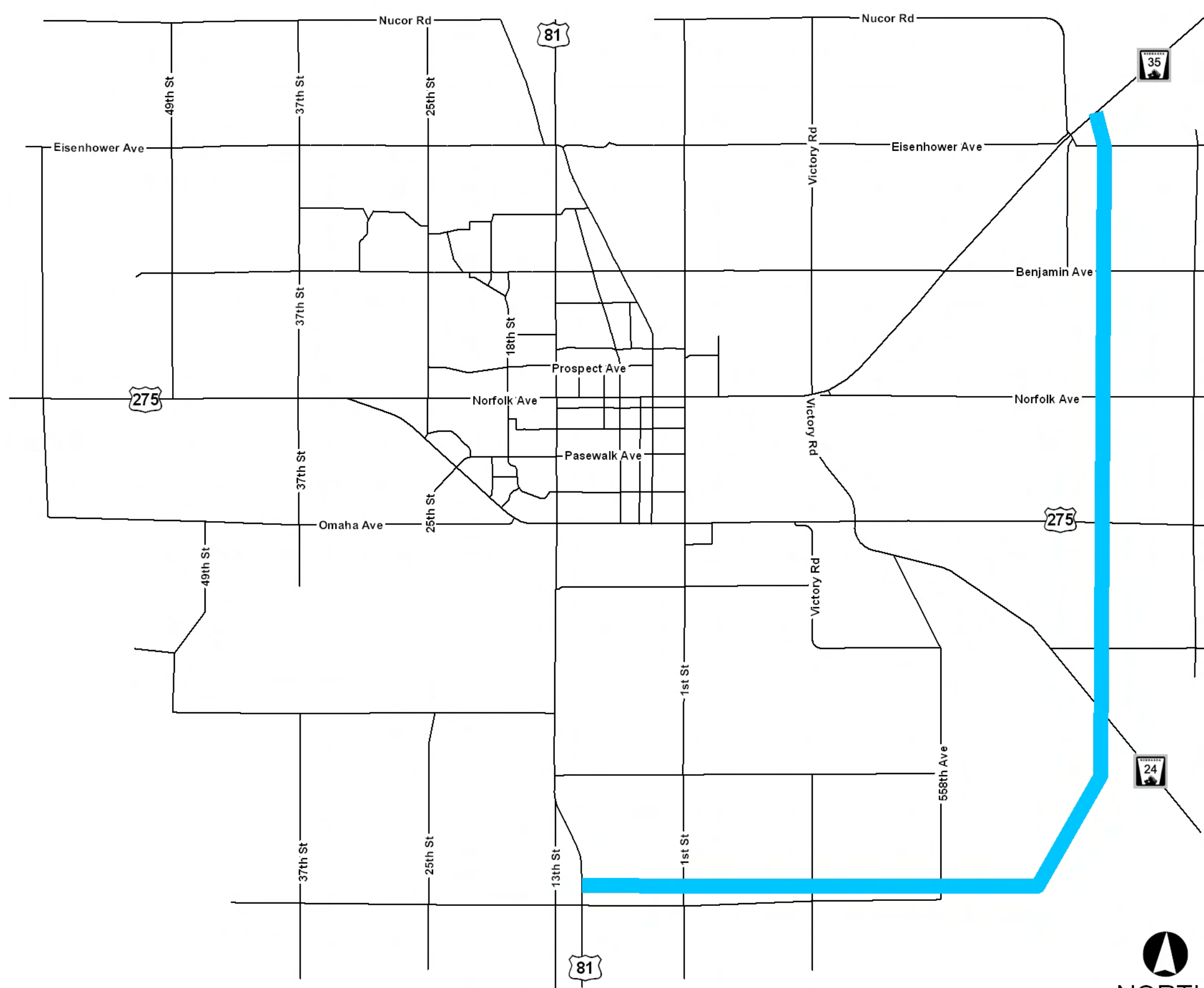


Improvement Type

- 2 lane to 3 lane
- Reconstruct to 2 lane
- Bridge widening (includes sidewalk)
- Travel Demand Model Network

**Figure 8-3 - Mid-Term (2013-2020)
Roadway Improvements**

<p>NORFOLK</p> <p>City of Norfolk Transportation Plan 2030 Norfolk, Nebraska</p>	<p>SCHEMMER ASSOCIATES</p>	<p>HNTB</p>
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Note: This project is dependant on corridor study results

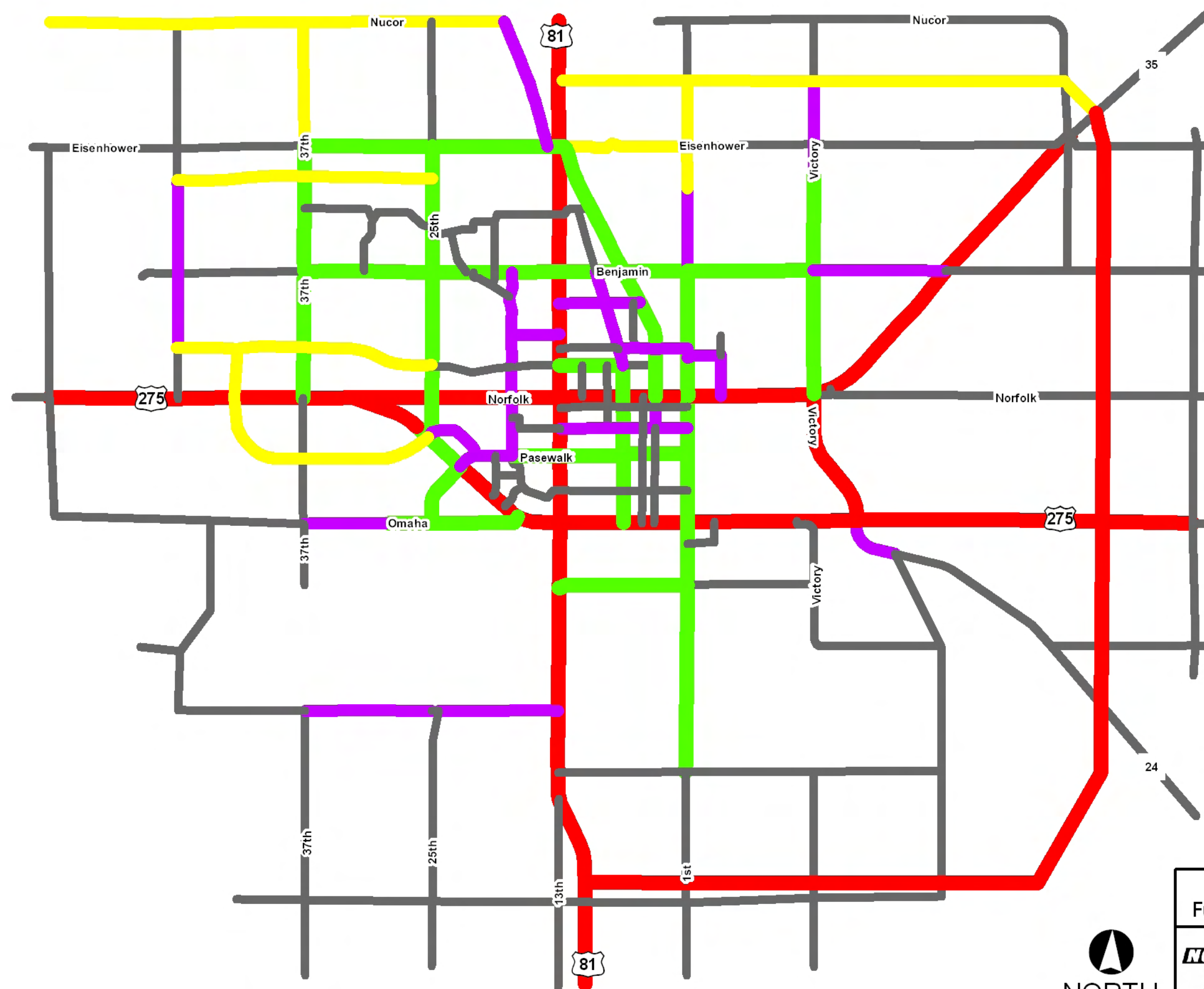


Improvement Type

- New Construction - 2 lane
- Travel Demand Model Network

**Figure 8-4 - Long-Term (2021-2030)
Roadway Improvements**

NORFOLK	THE SCHEMMER ASSOCIATES
City of Norfolk Transportation Plan 2030 Norfolk, Nebraska	HNTB



Federal Functional Classification

- Principal Arterial
- Minor Arterial
- Collector
- Minor Collector
- Local

Figure 8-5
Future Functional Classification

City of Norfolk
 Transportation Plan 2030
 Norfolk, Nebraska

IX. Financing the Plan

To implement *Transportation Plan 2030's* improvements, many funding sources would need to be considered. The following is a brief summary of the sources available.

Roadways

Federal Surface Transportation Program (STP)

Eligible projects include aid to public road jurisdictions with funding for any road or bridge project on the federal aid system (excluding local and minor collectors), transit, capital improvements, bicycle and pedestrian facilities, and transportation planning activities. Any agency with public road jurisdiction, public transit responsibilities, or transportation planning responsibilities is eligible to receive STP funding.

State Highway funds

The Nebraska Department of Roads (NDOR) uses state gas taxes for funding of improvements to the state highway system.

Federal and State Highway Safety funds

Federal or State funding available for improvements to hazardous locations in the transportation system.

Federal Bridge Replacement and Rehabilitation Program

Funding for any agency with public road jurisdiction to replace or rehabilitate structurally or functionally deficient public roadway bridges.

Public Transit Service

Federal Transit Administration (FTA) funds

To provide federal funding for support of transit activities in rural areas and in urban areas of less than 50,000 population.

Federal Surface Transportation Program (STP) funds

Eligible projects include aid to public road jurisdictions with funding for any road or bridge project on the federal aid system (excluding local and minor collectors), transit, capital improvements, bicycle and pedestrian facilities, and transportation planning activities. Any agency with public road jurisdiction, public transit responsibilities, or transportation planning responsibilities is eligible to receive STP funding.

Capital Grants Program

Provides federal funding assistance for transit capital improvements including bus/bus facility replacement or expansions, fixed guide way modernization, and new starts.

Aviation**Federal Aviation Administration (FAA) Airport Improvement Program**

Funding for public agencies to fund public-use airport improvements and airport planning.

State Aviation Programs

Funding for public agencies to fund public-use airport improvements, navigational aids, communication equipment, marketing, education and the development of airport layout and master plans.

Other Modes**Federal Surface Transportation Program (STP) funds**

Eligible project include aid to public road jurisdictions with funding for any road or bridge project on the federal aid system (excluding local and minor collectors), transit, *capital improvements, bicycle and pedestrian facilities, and transportation planning activities*. Any agency with public road jurisdiction, public transit responsibilities, or transportation planning responsibilities is eligible to receive STP funding.

Federal Transportation Enhancement Program

Funds for public recreational trails. Public agencies and private organizations (and/or individuals) are eligible to sponsor. Private sponsorship requires a public agency co-sponsor. Activities fall into three categories: trails and bikeways; historic preservation, restoration, and archeological; and scenic and natural resources.

National Recreational Trails Fund

Provides and maintains motorized and non-motorized recreational trails and trail-related projects. Public agencies and private organizations (and/or individuals) are eligible to sponsor. Private sponsorship requires a public agency co-sponsor.

Federal Rail/Highway Crossing Safety Fund

Funding for railroad companies and public road jurisdictions to improve the safety of railroad/highway grade crossings.

Funds Available for All Modes

Funds from Bonds

Bonds, typically general obligation bonds, are often used to fund transportation maintenance and improvements.

Analysis

The contact point for most of these funding sources is the Nebraska Department of Roads (NDOR). However, the number and cost of potential projects greatly outweighs the amount of funds available to the City from all the sources available, let alone NDOR. This aspect makes the analysis and recommendations throughout this plan key to the future transportation development of Norfolk.

Recommendations

The City should remain in constant communication with their NDOR District Engineer to ensure all funding sources have been reviewed prior to the implementation of any of the actions listed within this plan. In addition, the City should conduct at least an annual review of the transportation projects proposed by this plan and the funding options available to adequately implement the improvements needed to keep up with the transportation needs of the City.

X. Amendments and Reviews

Transportation Plan 2030 is meant to be under constant review and consideration when undertaking transportation decision-making in the Norfolk planning area. The plan should be a continuously evolving document that suits the needs of the City and its citizenry. The Planning Commission should initiate plan reviews on an annual basis, with full updates every five years, utilizing professional planners whenever possible. Public involvement should be incorporated into the review process as well. Any changes to the plan should consider *Transportation Plan 2030's* goals and objectives and be made utilizing the proper procedures for amendments.

At the beginning of each year a report should be prepared by the Planning and Zoning Commission that provides information and recommendations on:

- Whether the Transportation Plan is current in respect to population, economic changes, or recent impacts; and
- The recommended policies are still valid for the City and its long-term growth.

The Norfolk Planning and Zoning Commission should hold a public hearing on the aforementioned report to:

1. Provide citizens and/or developers with an opportunity to present possible changes or additions to *Transportation Plan 2030*;
2. Identify any changes in the status of projects called for *Transportation Plan 2030*; and,
3. Bring forth any issues, or identify any changes in conditions, which may impact the validity of *Transportation Plan 2030*.

Major shifts in policy or substantive changes to *Transportation Plan 2030's* basic assumptions and conditions will likely necessitate revision. When the Commission identifies such changes, it should recommend changes or request further study of those changes. This process may lead to identification of amendments to that would be implemented in accordance with Nebraska Revised Statute, involving a process that includes Planning Commission and City Council public hearings.

Appendix 1

Public Participation

Norfolk City Outlook

MAY, JUNE &
JULY 2006

INSIDE THIS ISSUE:

PAGE 6

May 22 Meeting Set for Update to Norfolk's Transportation Plan

Recommendations on how Norfolk should plan and prioritize its transportation resources from now to 2030 will be shared at a public meeting scheduled for 7 p.m., Monday, May 22 in the City Council Chambers. A presentation will begin shortly after 7 p.m.

Over the past year, engineers from The Schemmer Associates and HNTB Corporation have been studying the City's existing and projected transportation system to determine future needs and to aid in prioritizing those needs. The study process has included a survey conducted last summer to gain input from community leaders and the public on the issues and opportunities to be considered in the study. The study effort has also included developing a computerized model to forecast deficiencies and test the effectiveness of various improvement alternatives.

The summarized survey input and the computer modeling process will be shared at the public meeting. The purpose of the meeting is to share the study recommendations and invite public input prior to their formal adoption as an amendment to the Norfolk Comprehensive Plan. The Planning Commission and the City Council will be considering the amendment in the weeks following the public meeting.

"This update has had the dual benefits of public input and scientific analysis," said Public Works Director Dennis J. Smith. "It will guide Norfolk's short- and long-term planning for future projects."

For more information, contact Andrea Bopp, Public Participation Specialist, The Schemmer Associates, at (888) 877-8127 toll-free, or abopp@schemmer.com.



Roundabouts and Downtown improvements are recent changes to Norfolk's transportation system. Come to the May 22 public meeting to learn about what improvements could be needed in the future.

WHAT:	Public meeting/ presentation on Norfolk's Transportation Plan Update
WHEN:	7 p.m., Monday, May 22
WHERE:	City Council Chambers 309 West Madison Ave.
WHY:	To learn about and provide feedback on Norfolk's transportation system needs from now to 2030

Norfolk Transportation Plan 2030

Short-, Mid-, and Long-Term Roadway Improvements (Preliminary Recommendations)

Roadway	Limits	Scope of Improvements	Estimated Cost (2006 \$s) ¹	Program Year (construction)
Short-term projects (2007 – 2012)				
25 th Street	Benjamin Ave. to Norfolk Ave.	Widen from two to three lanes and replace bridge at Skyview Lake	\$2.8 million	2008-2009
25 th Street	Norfolk Ave. to U.S. 275	Widen from two to three lanes	\$0.9 million	2008
Benjamin Avenue	1 st Street to 13 th Street	Widen from four to five lanes	\$3.5 million	2011-2012
Link connecting U.S. 81, N-35, U.S. 275 and N-24	U.S. 81 (south) to N-35 at new Nucor Road	Corridor study	\$35,000	2007 ²
New Nucor Road	U.S. 81 to N-35	Construct new two-lane road	\$9.7 million ³	TBD ⁴
Mid-term projects (2013 – 2021)				
Benjamin Avenue	25 th Street to 37 th Street	Widen from two to three lanes	\$2.3 million	TBD
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37 th Street	Benjamin Ave. to Norfolk Ave.	Reconstruct two-lane road	\$1.5 million	TBD
Long-term projects (2022 – 2030)				
Link connecting U.S. 81, N-35, U.S. 275 and N-24	U.S. 81 (south) to N-35 at new Nucor Road	Construct new two-lane road	TBD by corridor study ³	TBD

¹ Includes preliminary engineering, construction and construction engineering costs. Does not include right-of-way costs.

² Year study to be performed.

³ Cost shared by Madison County, Stanton County, NDOR, City of Norfolk and others.

⁴ Schedule depends on funding availability.

Other Recommendations

Transit

- Coordinate with intercity bus lines to ensure service and cross-promote
- Investigate City/Handi-Bus joint maintenance facility
- Investigate demand-responsive system

Trails/sidewalks

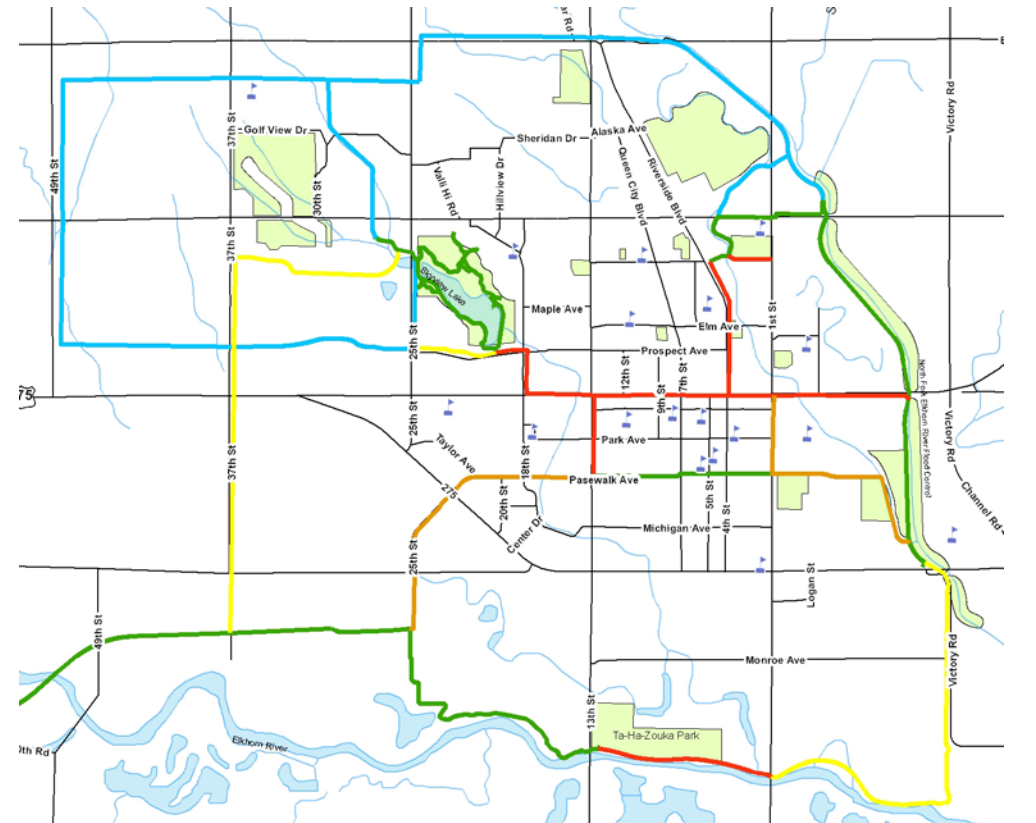
- Phase in 2030 Norfolk Trail System
- Promote trail use through media
- Review/assess sidewalks

Rail

- Close crossing at N. 3rd Street
- Investigate how Intelligent Transportation Systems (ITS) can mitigate crossing delays
- Study impacts of Legislative Bill 79

Aviation

- Implement airport's Capital Improvement Program
- Study possible water/sewer service to airport area
- Continue to pursue commercial air service



Trail Prioritization

- Existing
- 2006-2010
- 2011-2015
- 2016-2020
- 2021-2030
- School
- Parks and General Open Space

City Seeks Public Input on Transportation System Plans



Shown above is one of Norfolk's busiest intersections—13th Street and Omaha Avenue.

How should Norfolk prioritize its limited transportation resources over the next one to 20 years?

The City of Norfolk Public Works Department wants to hear your answers. Citizens are invited to provide their input on problems and opportunities related to Norfolk's streets, sidewalks, and trails by filling out a questionnaire.

Citizens may find the questionnaire in this newsletter and electronically through the City Web site at www.ci.norfolk.ne.us.

The City will incorporate citizen input into the transportation section of the Norfolk Comprehensive Plan. This section of the Comprehensive Plan is being updated to incorporate

a traffic analysis using a computerized model of Norfolk's transportation system.

"The information from the technology – along with the input from the public – will help us to better plan and prioritize the City's future needs," said Public Works Director Dennis Smith.

Citizens may return written surveys by dropping them off at, or mailing them to, the main City office building, 127 N. First St., Norfolk, NE, 68701; or by faxing them to (402) 844-2001.

A public meeting is planned for this fall to share the results of public input and the traffic analysis and to seek feedback on the preliminary recommendations.



Shown above are vehicles maneuvering one of the Norfolk's Round-a-Bouts.



NORFOLK TRANSPORTATION STUDY CITIZEN SURVEY

The City of Norfolk needs your input on the future of its transportation system. Please take a few moments to fill out this survey, or you may fill out this survey electronically through the City Web site at **www.ci.norfolk.ne.us**. Citizens may return written surveys by dropping them off at, or mailing them to, the main City office building, **127 N. First St., Norfolk, NE, 68701**; or by faxing them to **(402) 844-2001**. **Thank you for your input!**

1. Norfolk's transportation system affects your quality of life. How would you rate each of the following on a scale of 1 to 5 with 1 being "Unacceptable/Very Poor" and 5 being "Acceptable/Very Good."

Congestion on major streets 1___ 2___ 3___ 4___ 5___

Condition of major streets & roadways 1___ 2___ 3___ 4___ 5___

Travel times between places you go 1___ 2___ 3___ 4___ 5___

Public transit system (Handi Bus) 1___ 2___ 3___ 4___ 5___

Street maintenance & repair 1___ 2___ 3___ 4___ 5___

Condition & availability of sidewalks 1___ 2___ 3___ 4___ 5___

Condition, availability & connectivity of trails 1___ 2___ 3___ 4___ 5___

2. If someone asked you to prepare a plan for Norfolk's transportation system, what are the top three actions or projects you would most strongly recommend?

3. If you could change one thing about transportation in Norfolk, what would you change?

4. What is the best thing about transportation in Norfolk?

5. How would you rate your satisfaction with the following aspects of Norfolk's transportation system?

Roads/Streets	Very Satisfied _____	Okay _____	Dissatisfied _____
Sidewalks	Very Satisfied _____	Okay _____	Dissatisfied _____
Intersections	Very Satisfied _____	Okay _____	Dissatisfied _____
Handi Bus Routes	Very Satisfied _____	Okay _____	Dissatisfied _____
Highway System	Very Satisfied _____	Okay _____	Dissatisfied _____
Bike Paths	Very Satisfied _____	Okay _____	Dissatisfied _____
Trails	Very Satisfied _____	Okay _____	Dissatisfied _____

6. What would you feel should be emphasized in the Comprehensive Plan Update regarding transportation?
Please rate each of the following using a scale of 1 to 5, where 1 means it should have very little emphasis at all and 5 means the item should be strongly emphasized.

Planning for widening roads	1____	2____	3____	4____	5____
Planning for ongoing maintenance and preservation of streets & highways	1____	2____	3____	4____	5____
Planning for new interchanges and new roads to respond to future growth	1____	2____	3____	4____	5____
Planning for safety & traffic flow improvements at intersections	1____	2____	3____	4____	5____
Planning for more bicycle paths and trails	1____	2____	3____	4____	5____
Improving bicyclist & pedestrian safety	1____	2____	3____	4____	5____
Investigate more public transit alternatives	1____	2____	3____	4____	5____

7. Please provide any additional comments here: _____

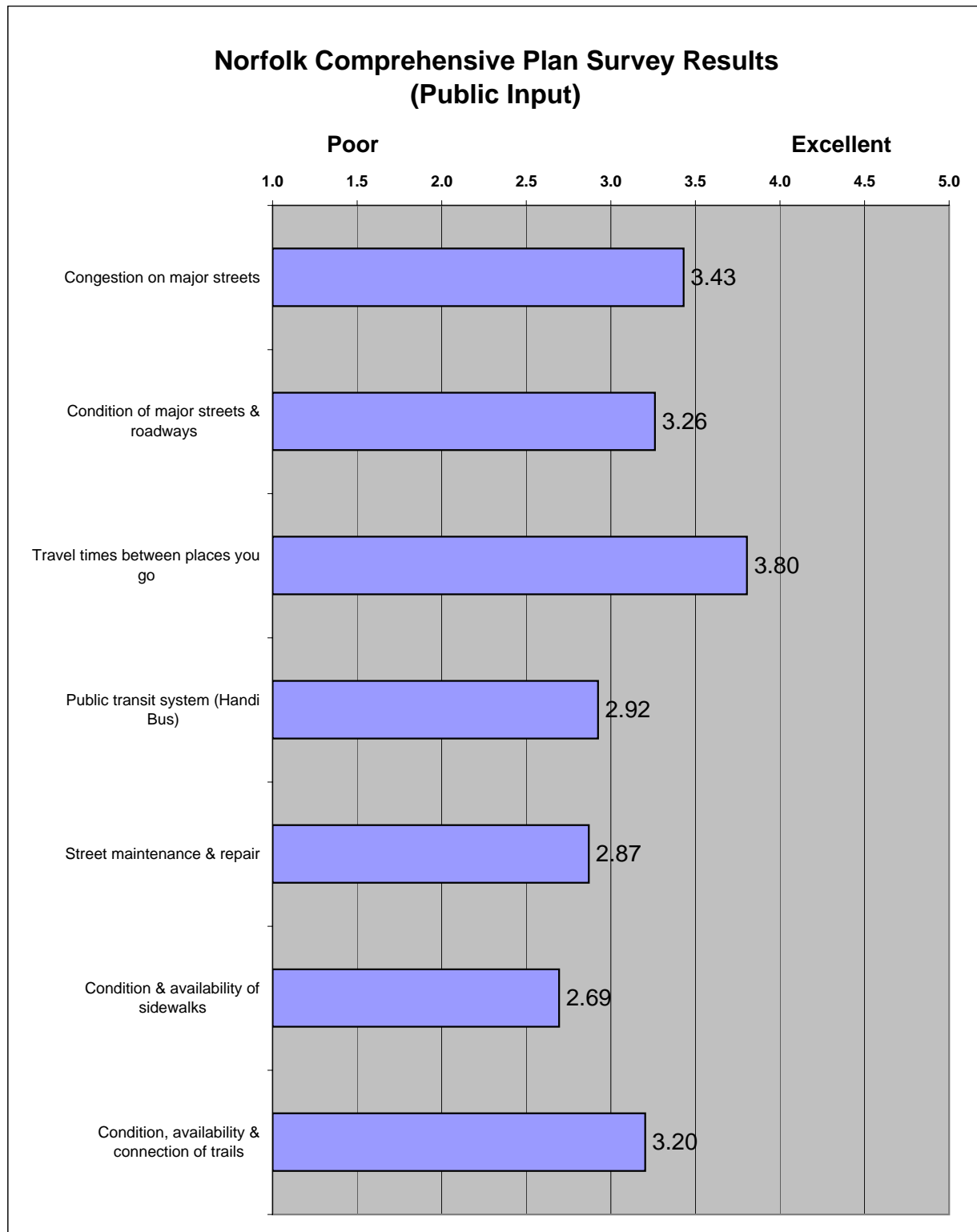
You're your name and mailing address (if you would like to be informed of meetings and other information related to this effort): _____

CITY OF NORFOLK TRANSPORTATION PLAN UPDATE

PUBLIC INPUT SURVEY RESULTS



1. **Norfolk's transportation system affects your quality of life. How would you rate the following on a scale of 1 to 5 being with 1 being Unacceptable/Very Poor and 5 being "Acceptable/Very Good."**



2. If someone asked you to prepare a plan for Norfolk's transportation system, what are the top three actions or projects you would most strongly recommend?

Bypass

- Highway 81 bypass (3)
- Bypass around Norfolk (3)

Cleanliness and Maintained

- Trim trees/bushes that block visibility at intersections (3)
- Clean up streets and sidewalks

Intersection Improvements

- Coordination of traffic signals (4)
- Install adequate number of turn arrows for the amount of turn lanes - 1st & Omaha, 1st & Pasewalk, 1st & Madison, 1st & Norfolk, 13th & Michigan (3)
- Need more dual turn lanes on busy streets (2)
- Traffic signal at Park & 1st Street

Parking

- Parking near trail access (east end of town)*
- Go back to parallel parking on Norfolk Ave.
- Widen diagonals Queen City Blvd

Planning/Public Awareness

- Plan for more usage of bicycles & motor scooters
- Improve public awareness regarding street closings
- Post dead-end signs where needed*
- Continue re-work of existing streets and planning of future roads

Sidewalks

- Repair sidewalks (8)
- Add more sidewalks (8)
- Increase bicyclist & pedestrian safety
- Sidewalk east of BelAir School
- Sidewalks - North 13th (Hwy 81), North of Benjamin, East Norfolk, & Victory Road

Street Maintenance/Improvements/Changes

- Repair the streets and roadways (17)
- No more round-about (4)
- Redo N. 25th Street (3)
- Streets that line up with existing streets (2)
- Resurface Michigan Ave. (2)
- Paved all unpaved streets in city limits
- Remove median on Norfolk Ave.
- More one-way streets
- Make Hwy 81 & 1st Street one way
- No through traffic on Norfolk Ave on 1st to 6th
- Accidents at 275 & Pasewalk
- Putting speed bumps in where needed
- Service alleys behind houses
- Traffic at 1st & Madison
- Make downtown like 3rd Street in Yankton
- Eliminate one-way streets
- Post dead-end signs where needed*
- Fix Riverside & Benjamin; 1st Street & Braasch Ave.

Finishing widening Benjamin Ave. to Hwy 35
Repair track crossing at Philip & Park Ave.
Turn Norfolk Ave into 4 lane
Fix dip at 25th & Norfolk Ave
Better run-off alternatives for residential streets

Traffic Enforcement/Management

Enforce red light runners (4)
Better traffic management at schools (4)
Red light cameras (3)
More roundabouts (2)
Give tickets to motorists talking on cell phones
More enforcement of speed limits
Reducing speed limits
Enforce seatbelt law
Enforce use of sidewalks
Enforce parking restrictions
Slow down north/south traffic on 13th Street from Elm to Benjamin
Slow down traffic on one-ways
Remove trucks from residential streets

Trails

Create/connect more trails (9)
Keep up trails (2)
Trail along Elkhorn River to connect with Levee trail south of Norfolk

Parking near trail access (east end of town)*

Trains

Have trains go through in late evening or early morning (2)

Transportation System

Public bus system (20)
Provide transportation for the elderly (3)
Need more buses
City cannot support public transit system - keep Handi Bus

3. If you could change one thing about transportation in Norfolk, what would you change?

Bypass

Bypass around Norfolk (4)
Change 13th Street to bypass

Cleanliness and Maintained

Get rid of odor on Norfolk Ave in business district

Intersection Improvements

Return to 4-way stops (instead of roundabouts) (8)
13th & Omaha Ave. - busy intersection (2)
Stop-lights in more places - count-down signals for pedestrians
Need wider right turn lanes on Benjamin to Hillview & Norfolk to 4th Street
Need right-turn only lanes - especially Benjamin & 13th; 13th & Omaha Ave.

Parking

Parallel parking downtown (6)
No through traffic downtown - make more ped friendly and easier to get out of parking*

Street Maintenance/Improvements/Changes

Repair and maintain streets (4)
N. 1st Street - a lot of traffic
Get rid of one-way streets on 3rd - 6th Streets
Traffic flow on Hwy 81
Make Victory Road, Eisenhower Road & Nucor Road four lanes
Remove islands downtown
No through traffic downtown - make more ped friendly and easier to get out of parking*

Traffic Enforcement/Management

Traffic speed through residential areas (2)
Better traffic enforcement (2)
Seatbelts law in all vehicles

Trains

Train at noon and 5 p.m.

Transportation System

Public bus system (14)
Add something like Ollie the Trolley (2)
Better cab company (2)
Public bus system is very limited - hours & accessibility - is it really for the public?
24-hour taxi service

4. What is the best thing about transportation in Norfolk?

Intersection Improvements

- New roundabouts (13)
- Left turn signals at 13th & Benjamin
- Traffic light at Benjamin & Hillview
- Signal timings

Other Misc.

- Short travel times (27)
- Walking and biking trails
- Fast snow removal on streets
- Traffic that brings business to Norfolk
- Fire and Rescue Service
- Good and courteous drivers
- The City's progress
- City is willing to get input from public

Street Maintenance/Improvements/Changes

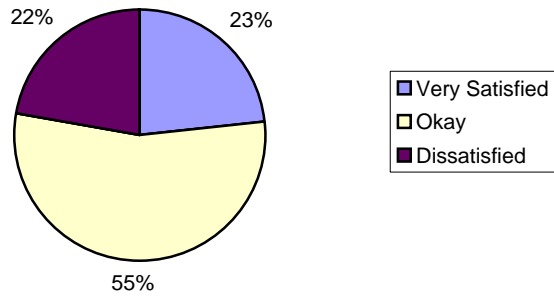
- Street maintenance (5)
- Widening of Benjamin Ave. (3)

Transportation System

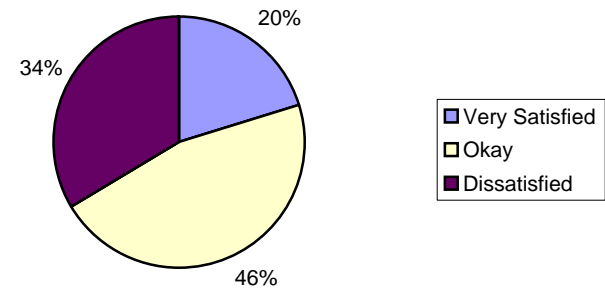
- Handi Bus (5)
- Cab service

5. How would you rate your satisfaction with the following aspects of Norfolk's transportation system?

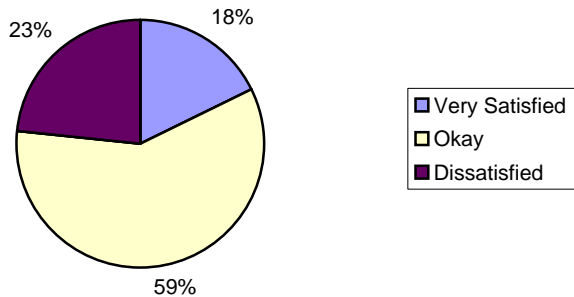
Road/Streets



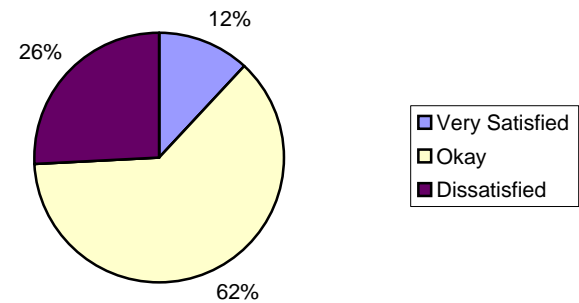
Sidewalks



Intersections

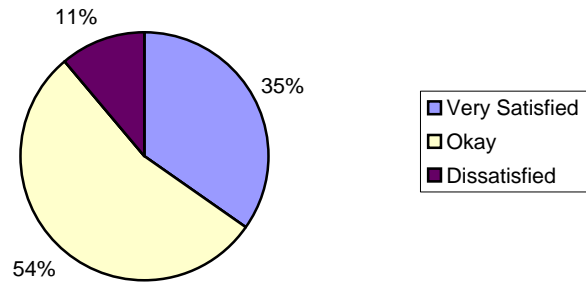


Handi Bus Routes

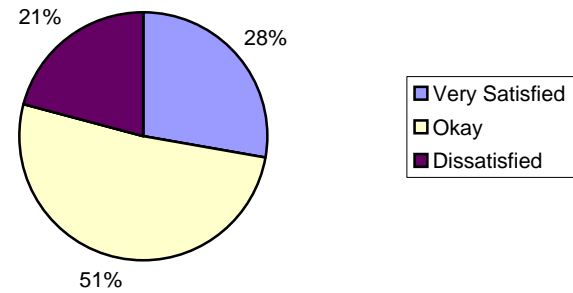


5. How would you rate your satisfaction with the following aspects of Norfolk's transportation system?

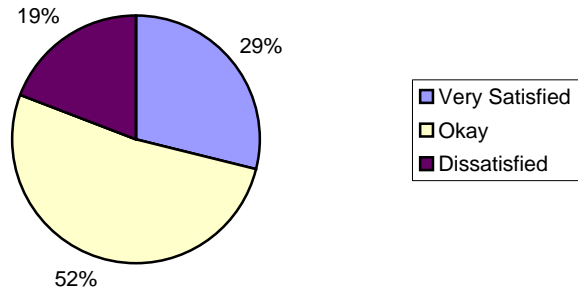
Highway System



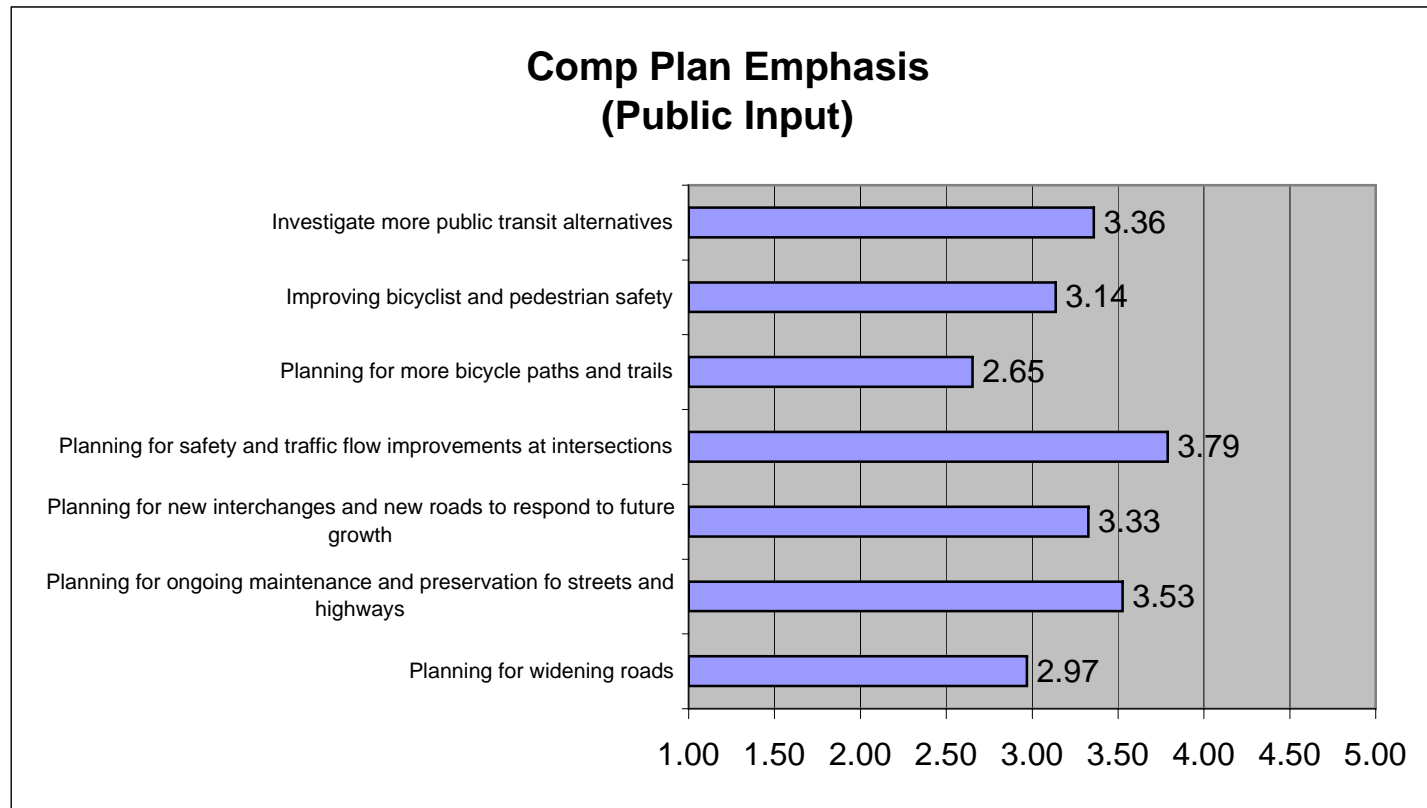
Bike Paths



Trails



**6. What would you feel should be emphasized in the Comprehensive Plan Update regarding transportation?
Please rate each of the following using a scale of 1 to 5, where 1 means it should have very little emphasis
at all and 5 means the item should be strongly emphasized.**



7. Additional Comments:

Bypass

Development around the 275 bypass has
Truck bypass route needed
Need bypass around town

Cleanliness and Maintained

City needs to trim trees/bushes that they planted
(2)
Property owners fined if sidewalks not cleared
within allotted time*
Streets need to be cleared in more timely manner

Intersection Improvements

Traffic light at Riverside & Benjamin only turns
green for cars in intersection, not for cars traveling
opposite direction
Michigan & 13th, Norfolk & 1st, Omaha & 1st need
4 way arrows
Intersection of N. 1st & E. Klug is dangerous
Round-abouts are great
Stop sign on 4th Street between Omaha &
Pasewalk
Round-abouts have improved traffic flow

Planning/Public Awareness

Need better knowledge & policing of round-abouts

Other Misc.

Keep up good work

Sidewalks

Sidewalk need maintained - curbs & ramps
Property owners fined if sidewalks not cleared
within allotted time*
Additional sidewalks - especially south of Meadow
to Pasewalk
Sidewalk between 10th & 11th Streets is horrible
on Phillip Ave.
Need sidewalks on Pennsylvania Ave.
Sidewalks bad on South 5th Street
More sidewalks

Street Maintenance/Improvements/Changes

Need to repair side streets (2)
Severe slope of ramps - especially Braasch &
Norfolk Ave.
Streets are bad - need overlay and too narrow
Need 4 lanes on all highways to Yankton, Sioux
City & West 275
Concerned of street layout and limited access
regarding development in northwest Norfolk
Divots has terrible traffic problems
Benjamin Ave. west of 25th - Fire Station
Traffic on Hwy 81 is becoming unbearable
Pave all city streets

Make streets around schools one-way - to get in and out quickly

Transportation System

Improve Handi Bus and cab company wait times
Need to support railway more & bus transportation

Trails

More trails

Water park

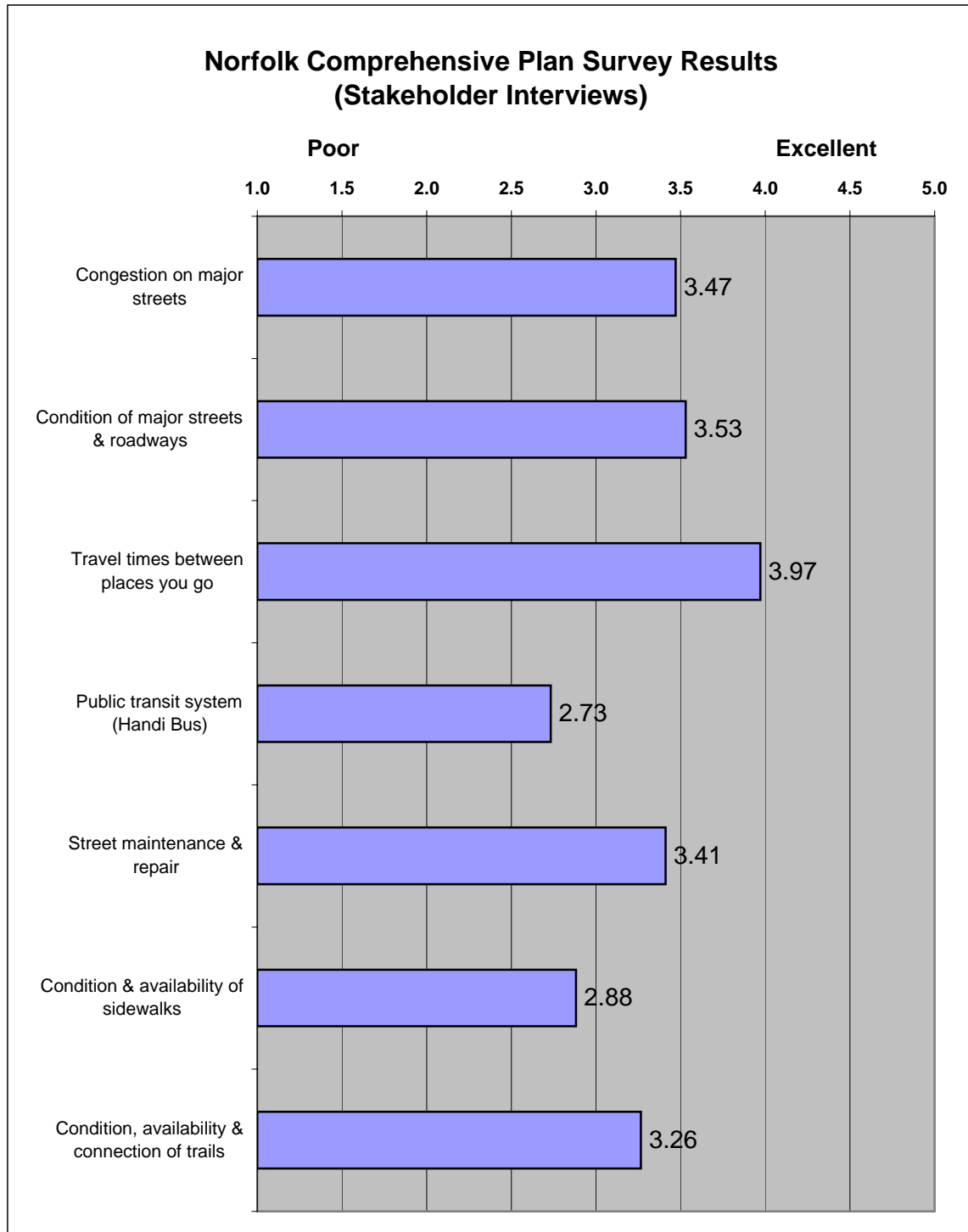
Do not need a water park (4)
More study on water park
Water park should not go at 1st & Benjamin

CITY OF NORFOLK TRANSPORTATION PLAN UPDATE

STAKEHOLDER SURVEY RESULTS



1. **Norfolk's transportation system affects your quality of life. How would you rate the following on a scale of 1 to 5 being with 1 being Unacceptable/Very Poor and 5 being "Acceptable/Very Good."**



2. If someone asked you to prepare a plan for Norfolk's transportation system, what are the top three actions or projects you would most strongly recommend?

Bypass

- Possible Hwy 81 bypass (4)
- Hwy 35 as four-lane expressway with bypass to Hwy 81 southeast (3)
- Explore future bypass routes for Hwy 275, 81 and 35 (2)
- Truck Route established (2)
- Beltway around Norfolk (2)
- Continue expressway construction on Hwy 81, 275 and 35.
- A north-south bypass
- Hwy 35 bypass to Sioux City
- Bypass to divert truck traffic

Cleanliness and Maintained

- Improve presentation of the city when entering from any direction
- Landscaping with street improvements*

Intersection Improvements

- Riverside and Benjamin intersection
- Hwy 81 & 275 intersection congestion
- Affiliated Foods inbound/outbound traffic
- Omaha Ave & 275 intersection
- Change access to state-run highways so the lights don't control city traffic
- Locations and need for additional traffic signals

Sidewalks

- Sidewalks to schools and parks (2)
- Need sidewalks where there aren't any
- Sidewalk on South 25th Street to Wal-Mart
- Sidewalk - west on 25th on Benjamin
- Sidewalk along Pasewalk

Street Maintenance/Improvements/Changes

- 25th & 37th streets improvements (6)
- Relocation of Nucor Road (2)
- Benjamin - 1st to 13th
- 7th Street - Madison to Prospect
- Pasewalk island east side new US 275
- Do away with three-lane streets
- Access from north Hwy 81 to Nucor; Norfolk Iron & Metal; and proposed ethanol plant
- Overall street repair
- Building infrastructure - northwest of town
- Improve traffic access to industries at Hwy 81 & Hwy 275
- Complete four-lane infrastructure
- Continue 25th development south at Benjamin
- Georgia St. - south of middle school

18th Street by Westside
Benjamin - west of 25th Street
Victory Road Improvement
37th St. w/ Parkway on NW Norfolk
Improve Norfolk Ave
Landscaping with street improvements*
Make more four-lane roadways in Norfolk
Connect more four-lane roads to area towns
Another East-West arterial
Reconstruct Victory Road north
Eisenhower St. improvements
Oak Street Project
Pave roads in Skyview park

Traffic Enforcement/Management

More traffic control in residential areas
Maintain good traffic flow
Semi truck traffic
Traffic around schools

Trails

Better trail system
Keep improving trails

Trains

Improve rail system*
Reschedule Nucor Train

Transportation System

Commercial air service (2)
Public Transportation System needed (2)
Need airport shuttle to Omaha
Maintaining Handi Bus
Improve rail system*
Transportation for Elderly improvements

3. If you could change one thing about transportation in Norfolk, what would you change?

Bypass

- Remove truck traffic off city streets (2)
- Maybe implement bypass
- Bypass with all direction access
- Bypass for Hwy 81
- Bypass 81/35/275 connection
- Remove one way streets or add N-S bypass*

Cleanliness and Maintained

- Get rid of odor on Norfolk Ave in business district

Intersection Improvements

- Traffic signal systems
- 13th & Hwy 81
- Timing of signals
- Add more roundabouts

Other Misc.

- Wouldn't change - just improve
- Increase funding

Parking

- Parallel parking downtown (6)
- No through traffic downtown - make more ped friendly and easier to get out of parking*

Street Maintenance/Improvements/Changes

- 25th needs to be 3 or 4 lanes
- Improve N-S and E-W through street availability
- Additional E-W arterial
- Remove one way streets or add N-S bypass*
- Improve quality of streets

Traffic Enforcement/Management

- Traffic flow at peak hours
- Need better flow of traffic on Hwy 81

Trails

- Number of trails

Transportation System

- Public transportation system (2)
- Improve transportation system for handicapped and elderly
- Expansion of time & location & use of Handi Bus

4. What is the best thing about transportation in Norfolk?

Bypass

Upgrades have been made to include the bypass

Intersection Improvements

Roundabouts (2)

Street Maintenance/Improvements/Changes

Condition/Maintenance of streets (8)

Benjamin from 13th to 25th is greatly improved

Most major roadways are 4 lane

Hwy 275, 81 starting to integrate 4 lane

Arterial streets have been improved to meet increased traffic demands

Excellent interior major streets and improvements (2)

Traffic Enforcement/Management

Traffic flow and travel times are pretty good (15)

Small number of cars compared to capacity

Transportation System

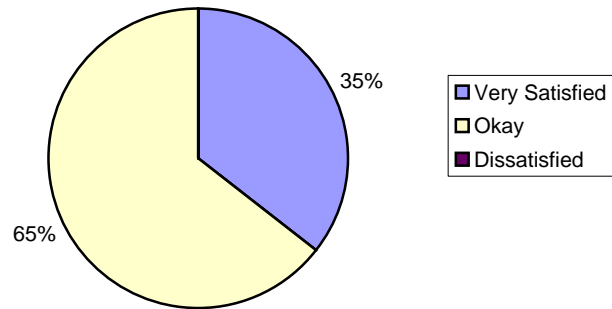
Handi Bus and cab system

Trails

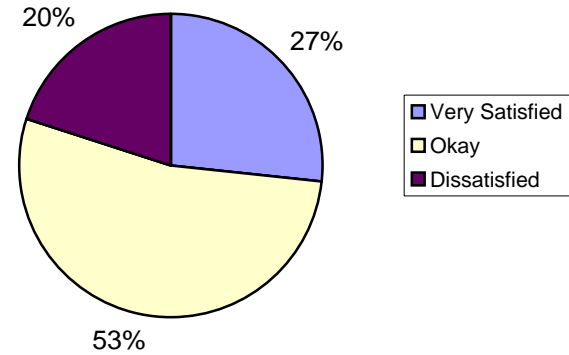
Trail system is excellent (2)

5. How would you rate your satisfaction with the following aspects of Norfolk's transportation system?

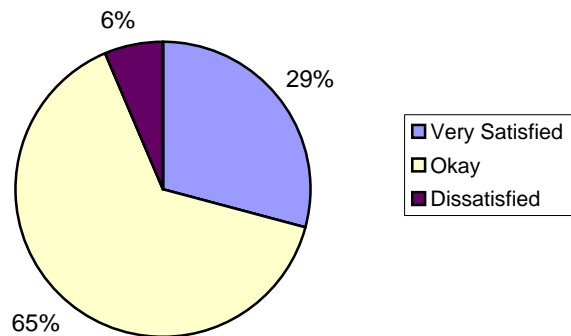
Road/Streets



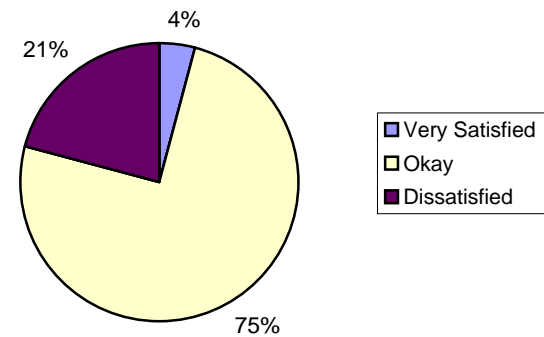
Sidewalks



Intersections

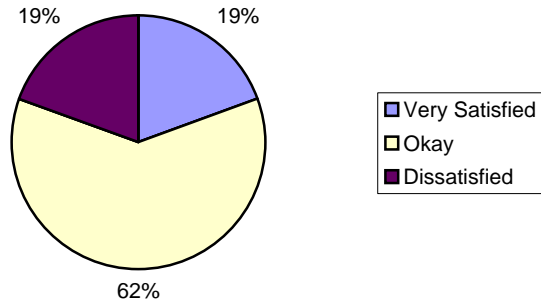


Handi Bus Routes

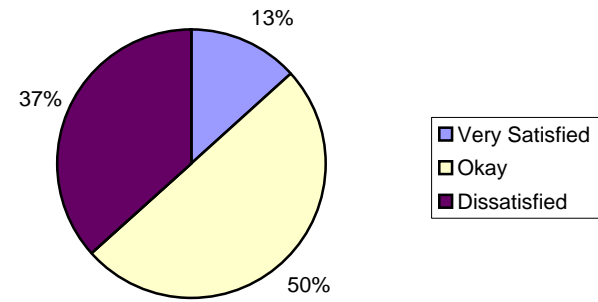


5. How would you rate your satisfaction with the following aspects of Norfolk's transportation system?

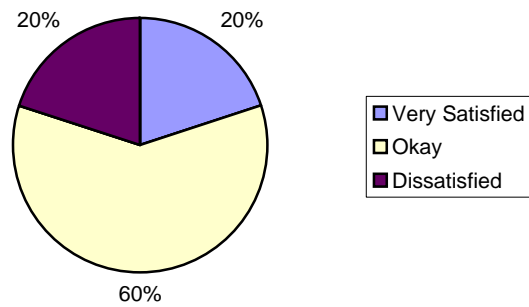
Highway System



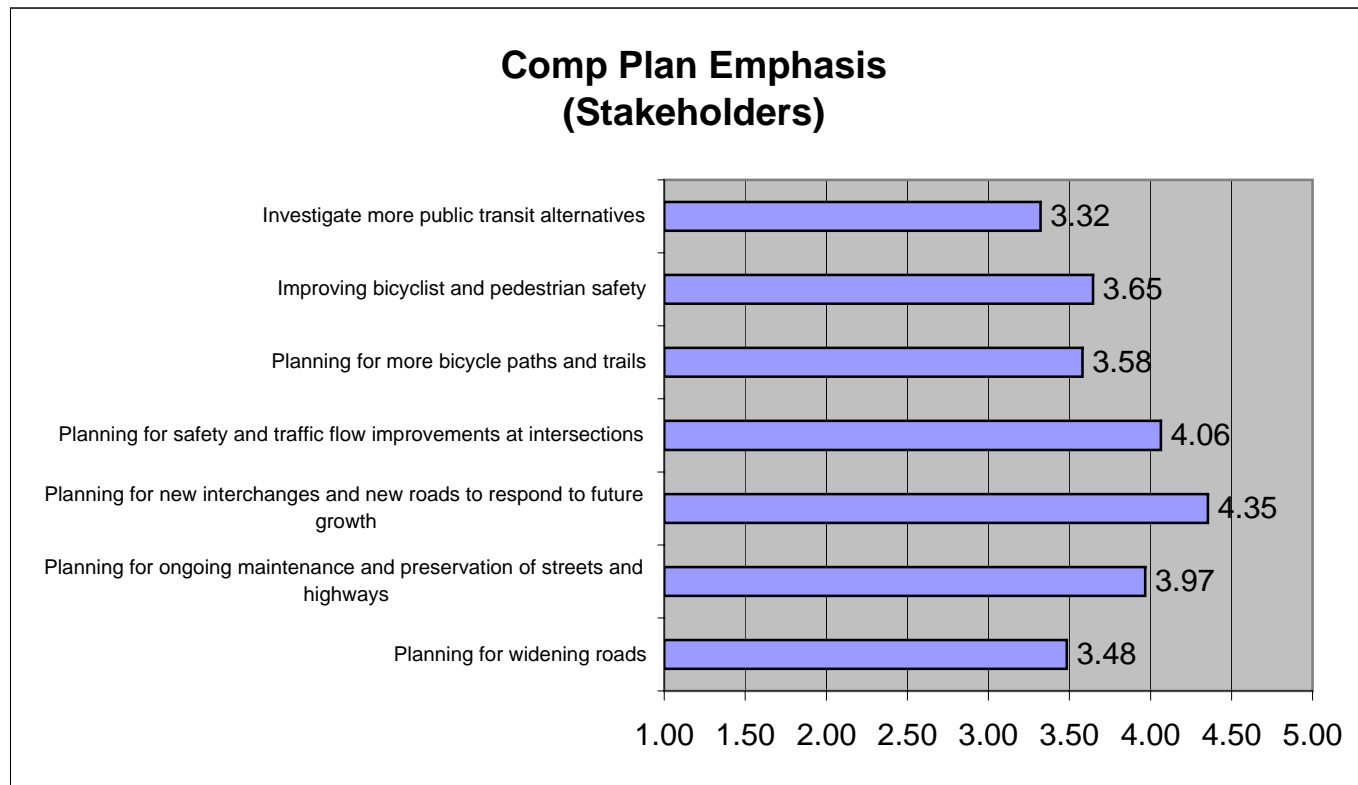
Bike Paths



Trails



**6. What would you feel should be emphasized in the Comprehensive Plan Update regarding transportation?
Please rate each of the following using a scale of 1 to 5, where 1 means it should have very little emphasis at all
5 means the item should be strongly emphasized.**



7. Additional Comments:

Bypass

Plan for bypass

Bypass around east side seems to be a priority.

Intersection Improvements

Traffic control for intersections, stop signs, and lights

Traffic Enforcement/Management

Study rush hour traffic

Transportation System

Currently there is only private transport. Norfolk needs a public transportation system and current street planning must plan and facilitate public transport. The Handi bus is not public and cannot handle large numbers

Other/Misc.

Thanks for looking into future transportation needs

Good job at keeping up with need/changes

Thanks

Appendix 2

Existing Transportation Conditions Technical Memorandum

Memo

To: City of Norfolk

From: Mark Lutjeharms, P.E., PTOE

CC: Linda Beacham (TSA), Mark Pohlmann (TSA), Chris Solberg (TSA), Jerry Shadewald (HNTB), Project File

Date: 6/30/06 (revised)

Re: City of Norfolk Transportation Plan Update
Existing Transportation Conditions
TSA Project No. 461601

This memorandum documents the analyses conducted for existing transportation conditions as part of the City of Norfolk Transportation Plan Update. This existing conditions evaluation was performed to identify present deficiencies in the transportation network and includes various data collection efforts and operational and safety analyses. A summary of the analyses of the existing traffic conditions is included in the following sections of this memo along with the results of this evaluation and recommendations for implementation.

Data Collection

A comprehensive review of existing traffic control signals, speed limits, number of lanes by roadway segment and roadway functional classification was conducted as part of the data collection effort. Year 2003 average daily traffic (ADT) volumes were obtained from the Nebraska Department of Roads (NDOR) and supplemented with additional volumes collected as part of this project. Exhibits summarizing the network data collection efforts are enclosed with this memo.

Other data collection efforts included peak-hour intersection turning movement counts, which consisted of counts taken by City staff as part of this project as well as other counts performed in the past by NDOR and others. A list of the intersections where turning movement volume data was gathered is provided in Table 1. Detailed results of this activity are provided with this memorandum.

Table 1 – Turning Movement Count Locations

Locations counted by City of Norfolk (all conducted in Fall 2005)	Locations counted by NDOR
U.S. 81 (13 th St.)/Benjamin Ave.	U.S. 81 (13 th St.)/Eisenhower Ave. (May '04)
U.S. 81 (13 th St.)/Michigan Ave.	U.S. 275/Norfolk Ave. (Jun '03)
U.S. 81 (13 th St.)/Norfolk Ave.	U.S. 275/Pasewalk Ave. (Jan '04)
Benjamin Ave./Queen City Blvd.	U.S. 81 (13 th St.)/U.S. 275 (Omaha Ave.) (Jan '06)
Benjamin Ave./Riverside Blvd.	U.S. 275 (Norfolk Ave.)/37 th St. (May '03)
1 st St./Park Ave.	U.S. 81 (13 th St.)/Pasewalk Ave. (Jan '06)
1 st St./Benjamin Ave.	U.S. 275/25 th St. (Dec '03)
18 th St./Norfolk Ave.	U.S. 275 (Omaha Ave.)/11 th St. (Dec '05)
U.S. 275/20 th St.	U.S. 81 (13 th St.)/Bel Air Rd. (Jan '06)
25 th St./Norfolk Ave.	U.S. 81 (13 th St.)/Prospect Ave. (Jan '06)
Benjamin Ave./McIntosh Rd.	
Benjamin Ave./entrance to Veterans Home and Northeast Community College	

Note: Additional counts were also performed at intersections within the Central Business District (specifically along Madison Ave., Norfolk Ave. and Braasch Ave.) as part of a 2003 Downtown Traffic Study.

Three-year crash data was also assembled by the City of Norfolk Police Division and provided to the project team for evaluation.

Operations & Safety Analysis

Operations Analysis

Intersection capacity and level-of-service (LOS) analysis was performed for the intersections listed in Table 2 according to procedures and methodologies presented in the *2000 Highway Capacity Manual* (HCM), published by the Transportation Research Board. In accordance with HCM procedures, level-of-service (LOS) has been determined by estimating average vehicle delay of the intersection and intersection movements. The ranges of traffic delay associated with each LOS for unsignalized and signalized intersections are represented in Table 3. Delay thresholds for a given LOS for unsignalized intersections are lower than those of signalized intersections. As explained in the 2000 HCM, this difference is designed to account for greater variability in delay associated with unsignalized movements, and different driver expectations associated with each type of intersection control. Factors such as driver's aggressiveness and gap acceptance vary significantly among drivers; thus the operational effects are more difficult to predict.

Table 2 – List of Intersections for Which Operations Analysis was Performed

Intersection	Traffic Control	Lane Configuration ¹				Speed Limit (MPH by Leg)
		Eastbound	Westbound	Northbound	Southbound	
US 275 & 25 th St.	Actuated Coordinated	1 LT, 1 TH, 1 TH-RT	1 LT, 1 TH, 1 TH-RT	1 LT, 1 TH-RT	1 LT, 1 TH-RT	35(N/S) 45(W) 45(E)
US 275 & Pasewalk Ave.	Actuated Coordinated	1 LT, 2 TH, 1 RT	1 LT, 2 TH, 1 RT	1 LT, 1 TH, 1 RT	1 LT, 1 TH, 1 RT	30(N/S) 45(E/W)
US 275 & 20 th St.	Actuated Coordinated	1 LT, 1 TH, 1 TH-RT	1 LT, 1 TH, 1 TH-RT	1 LT, 1 TH, 1 TH-RT	1 LT, 1 TH, 1 TH-RT	45(W) 40(E) 25(N/S)
US 275 (Omaha Ave.) & 11 th St.	Fully Actuated	1 LT, 1 TH, 1 TH-RT	1 LT, 1 TH, 1 TH-RT	1 LT-TH-RT	1 LT-TH-RT	35(E/W) 25(N/S)
US 81 (13 th St.) & US 275 (Omaha Ave.)	Fully Actuated	1 LT, 1 TH, 1 TH-RT	1 LT, 2 TH, 1 RT	2 LT, 2 TH, 1 RT	2 LT, 1 TH, 1 TH-RT	35(N/S/E/W)
US 81 (13 th St.) & Michigan Ave.	Fully Actuated	1 LT, 1 TH-RT	1 LT, 1 TH-RT	1 LT, 1 TH, 1 TH-RT	1 LT, 1 TH, 1 TH-RT	35(N/S) 25(E/W)
US 81 (13 th St.) & Pasewalk Ave.	Fully Actuated	1 LT, 1 TH-RT	1 LT, 1 TH-RT	1 LT, 1 TH, 1 TH-RT	1 LT, 1 TH, 1 TH-RT	35(N/S) 30(E/W)
US 81 (13 th St.) & Norfolk Ave.	Fully Actuated	1 LT, 1 TH, 1 TH-RT	1 LT, 1 TH, 1 TH-RT	1 LT, 1 TH, 1 TH-RT	1 LT, 1 TH, 1 TH-RT	35(N/S/E/W)
US 81 (13 th St.) & Prospect Ave.	Fully Actuated	1 LT, 1 TH-RT	1 LT, 1 TH-RT	1 LT, 1 TH, 1 TH-RT	1 LT, 1 TH, 1 TH-RT	35(N/S) 30(E/W)
US 81 (13 th St.) & Bel Air Rd./Roosevelt Ave.	Fully Actuated	1 LT, 1 TH-RT	1 LT, 1 TH-RT	1 LT, 1 TH, 1 TH-RT	1 LT, 1 TH, 1 TH-RT	45 (N/S) 25(E/W)
US 81 (13 th St.) & Benjamin Ave.	Actuated Coordinated	1 LT, 1 TH, 1 TH-RT	1 LT, 1 TH, 1 TH-RT	1 LT, 1 TH, 1 TH-RT	1 LT, 1 TH, 1 TH-RT	50(N) 45(S) 35 (E/W)
US 81 (13 th St.) & Eisenhower Ave./Riverside Blvd.	Fully Actuated	1 LT, 1 TH-RT	1 LT, 1 TH-RT	1 LT, 1 TH, 1 TH-RT	1 LT, 1 TH, 1 TH-RT	50(N/S) 40 (E) 55(W)
25 th St. & Norfolk Ave.	Fully Actuated	1 LT, 1 TH-RT	1 LT, 1 TH-RT	1 LT-TH-RT	1 LT-TH-RT	35 (N/S) 40(E/W)
18 th St. & Norfolk Ave.	Fully Actuated	1 LT, 1 TH-RT	1 LT, 1 TH-RT	1 LT, 1 TH-RT	1 LT, 1 TH-RT	25(N/S) 40(W) 35(E)
Benjamin Ave. & Riverside Blvd.	Fully Actuated	1 LT, 1 TH, 1 TH-RT	1 LT, 1 TH, 1 TH-RT	1 LT, 1 TH, 1 TH-RT	1 LT, 1 TH, 1 TH-RT	35(E/W/S) 40(N)
1 st St. & Benjamin Ave.	Fully Actuated	1 LT, 1 TH, 1 TH-RT	1 LT, 1 TH, 1 TH-RT	1 LT-TH, 1 TH-RT	1 LT-TH, 1 TH-RT	35(N/S/E/W)
US 275 (Norfolk Ave.) & 37 th St.	Stop Controlled (NB/SB)	1 LT, 1 TH, 1 TH-RT	1 LT, 1 TH, 1 TH-RT	1 LT-TH-RT	1 LT-TH-RT	45(N) 55(S) 50(E/W)
US 275 & Norfolk Ave.	Stop Controlled (SB)	1 LT, 1 TH, 1 TH-RT	1 LT, 1 TH, 1 TH-RT	1 LT-TH-RT	1 LT, 1 TH-RT	55(W) 55(E) 40(N)
US 275 & Norfolk Ave. (future)	Stop Controlled (SB)	1 LT, 1 TH, 1 TH-RT	1 LT, 1 TH, 1 TH-RT	1 LT-TH-RT	1 LT, 1 TH-RT	55(W) 55(E) 40(N)
Benjamin Ave. & Queen City Blvd.	Stop Controlled (NB/SB)	1 LT-TH, 1 RT-TH	1 LT-TH, 1 RT-TH	1 LT-TH-RT	1 LT-TH-RT	35(E/W) 30(N/S)
Benjamin Ave. & McIntosh Rd.	Stop Controlled (NB/SB)	1 LT, 1 TH, 1 TH-RT	1 LT, 1 TH, 1 TH-RT	1 LT-TH-RT	1 LT-TH-RT	40(E/W) 25 (N/S)
Benjamin Ave. & entrance to NECC/Veterans Home	Stop Controlled (NB/SB)	1 LT, 1 TH, 1 TH-RT	1 LT-TH, 1 TH-RT	1 LT-TH-RT	1 LT-TH-RT	40(E/W)
1 st St. & Park Ave.	Stop Controlled (EB/WB)	1 LT-TH-RT	1 LT-TH-RT	1 LT-TH, 1 TH-RT	1 LT-TH, 1 TH-RT	35(N/S) 25 (E/W)

¹ LT=left-turn, TH=through, RT=right-turn

Table 3 – Level-of-Service Criteria

Level-of-Service	Signalized Intersections Control Delay/Vehicle (sec)	Unsignalized Intersections Control Delay/Vehicle (sec)
A	≤ 10	≤ 10
B	> 10 and ≤ 20	> 10 and ≤ 15
C	> 20 and ≤ 35	> 15 and ≤ 25
D	> 35 and ≤ 55	> 25 and ≤ 35
E	> 55 and ≤ 80	> 35 and ≤ 50
F	> 80	> 50

Analyses were performed for the weekday AM and PM peak time periods using existing traffic volumes, traffic control and lane configurations. Results of the analyses for signalized intersections are summarized in Table 4.

As Table 4 shows, all of the signalized intersections analyzed are operating at an acceptable LOS 'C' or better during both the AM and PM peak time periods. It should also be noted that individual approaches at these intersections also operate at LOS 'C' or better, with the exception of the westbound approach at the intersection of 13th Street/Benjamin Avenue. At this intersection, during the PM peak, the westbound, and more notably, the westbound left-turn movement operates at LOS 'D'. Further analysis indicates that the LOS for the westbound approach could be improved with minor signal timing adjustments. Therefore, no other geometric improvements are needed to improve traffic operations.

It was noted by City staff that the southbound approach at the intersection of 25th Street & Norfolk Avenue experiences significant delay and vehicle queues during the AM peak period. However, capacity and LOS analysis of the intersection was not able to replicate these conditions. City staff did indicate that there might be a malfunctioning detector on the westbound approach, which could affect the actuation of the signal phases. If this field condition should persist once the faulty detector is fixed, the City should consider constructing a left-turn lane on both the northbound and southbound approaches to add additional capacity to those approaches.

Table 5 summarizes the results of the analysis for unsignalized intersections. All unsignalized intersections analyzed were characterized as two-way stop-controlled intersections. The table shows the overall intersection delay and LOS, as well as delay and LOS for the stop-controlled approaches of the intersections.

Table 4 - Summary of Signalized Intersection Analysis

INTERSECTION	TIME PERIOD	DELAY (sec/veh)	V/C	LOS
US 275 & 25 th Street	AM Peak	7.9	0.22	A
	PM Peak	11.5	0.23	B
US 275 & Pasewalk Avenue	AM Peak	9.2	0.18	A
	PM Peak	15.0	0.44	B
US 275 & 20 th Street	AM Peak	6.3	0.20	A
	PM Peak	9.6	0.35	A
US 275 (Omaha Avenue) & 11 th Street	AM Peak	9.5	0.29	A
	PM Peak	10.2	0.34	B
US 81 (13 th Street) & US 275 (Omaha Avenue)	AM Peak	14.9	0.45	B
	PM Peak	22.2	0.59	C
US 81 (13 th Street) & Michigan Avenue	AM Peak	7.0	0.31	A
	PM Peak	9.5	0.54	A
US 81 (13 th Street) & Pasewalk Avenue	AM Peak	13.3	0.52	B
	PM Peak	16.4	0.61	B
US 81 (13 th Street) & Norfolk Avenue	AM Peak	17.2	0.50	B
	PM Peak	18.1	0.56	B
US 81 (13 th Street) & Prospect Avenue	AM Peak	7.4	0.38	A
	PM Peak	6.9	0.55	A
US 81 (13 th Street) & Bel Air Road/Roosevelt Avenue	AM Peak	6.4	0.39	A
	PM Peak	4.4	0.30	A
US 81 (13 th Street) & Benjamin Avenue	AM Peak	21	0.64	C
	PM Peak	22.5	0.59	C
US 81 (13 th Street) & Eisenhower Avenue/Riverside Boulevard	AM Peak	8.9	0.38	A
	PM Peak	8.0	0.43	A
25th Street & Norfolk Avenue	AM Peak	10.1	0.69	B
	PM Peak	11.5	0.23	B
18th Street & Norfolk Avenue	AM Peak	9.2	0.46	A
	PM Peak	8.2	0.39	A
Benjamin Avenue & Riverside Boulevard	AM Peak	19.6	0.74	B
	PM Peak	15.7	0.57	B
1st Street & Benjamin Avenue	AM Peak	9.2	0.65	A
	PM Peak	7.1	0.50	A

Table 5 - Summary of Unsignalized Intersection Analysis

INTERSECTION	TIME PERIOD	Overall		Approach ¹			
				NB/EB		SB/WB	
		Delay	LOS	Delay	LOS	Delay	LOS
US 275 (Norfolk Avenue) & 37th Street	AM Peak	4.0	A	12.8	A	15.2	C
	PM Peak	5.4	A	14.0	B	23.1	C
US 275 & Norfolk Ave.	AM Peak	3.3	A	-	-	18.6	C
	PM Peak	2.4	A	-	-	20.7	C
US 275 & Norfolk Ave. (future)	AM Peak	4.1	A	-	-	12.1	B
	PM Peak	4.6	A	-	-	13.9	B
Benjamin Avenue & Queen City Boulevard	AM Peak	4.8	A	61.3	F	23.1	C
	PM Peak	8.4	A	100.8	F	35.5	E
Benjamin Avenue & McIntosh Road	AM Peak	8.4	A	79.0	F	24.5	C
	PM Peak	4.3	A	33.0	D	13.5	B
Benjamin Avenue & Entrance to Veterans Home and NECC	AM Peak	3.0	A	43.2	E	25.4	D
	PM Peak	4.6	A	27.2	D	13.6	B
1st Street & Park Avenue	AM Peak	1.5	A	21.3	C	16.0	C
	PM Peak	2.2	A	41.6	E	26.4	D

¹ Delay & LOS values shown are for the stopped-controlled approaches.

U.S. 275 & 37th Street – Analysis indicates that this intersection and the stop-controlled approaches operate at an acceptable LOS.

U.S. 275 & Norfolk Avenue – This intersection was analyzed based on both the current configuration and the future configuration that will be constructed by NDOR. The future configuration will eliminate the westbound one-way link between Norfolk Avenue and U.S. 275. Vehicles presently continuing westbound on U.S. 275 from Norfolk Avenue will be redirected through the T-intersection. Analysis indicates that the intersection and southbound approach both operate at an acceptable LOS under both scenarios.

Benjamin Avenue & Queen City Boulevard – The northbound approach of this intersection experiences significant delay during the AM and PM peak time periods. This is due to the high volume of traffic on Benjamin Avenue and the lack of acceptable gaps in traffic. However, as noted later in this report, the volumes on Queen City Boulevard are not significant enough to satisfy the signal warrant criteria. Possible geometric modifications to improve the northbound and southbound LOS would be to restrict turning movements on these two approaches to right-turns only. This would require constructing a raised median in Benjamin Avenue or channelized islands on both approaches of Queen City Boulevard. More detailed analysis would be required to determine the feasibility and impacts of this modification.

Benjamin Avenue & McIntosh Road and Benjamin Avenue & Entrance to Veterans Home and Northeast Community College – Both of these intersections provide access to the community college north of Benjamin Avenue. McIntosh Road also provides access to residential areas to the south of Benjamin Avenue. Analysis indicates that the northbound approaches of these two intersections experience significant delay during the AM peak time period due to lack of acceptable gaps in traffic on Benjamin Avenue. Further discussion of these two intersections can be found later in this report.

1st Street & Park Avenue – The analysis shows that the eastbound and westbound approaches operate at LOS ‘E’ and LOS ‘D’ during the PM peak time period. The delay on Park Avenue is caused by the high volume and lack of acceptable gaps on 1st Street. However, this amount of delay is only experienced by a relatively small number of vehicles. Therefore, no improvements are recommended at this time.

Signal Warrant Analysis

In addition to conducting traffic operations analysis at signalized and unsignalized intersections, traffic signal warrants were also evaluated for the unsignalized intersections.

As outlined in the *2003 Manual on Uniform Traffic Control Devices (MUTCD)*, traffic control signals should not be installed unless one or more traffic signal warrants are met. The satisfaction of a warrant or warrants, however, is not in itself justification for a signal. Additional information should be obtained by means of engineering studies and compared with the requirements set forth in the warrants before implementing a traffic control signal. The engineering study should indicate that the installation of a traffic signal would improve the overall safety and/or operation of the intersection. If these requirements are not met, a traffic signal should not be put into operation.

The following is a list of the traffic signal warrants that were considered to be applicable to these study intersections and evaluated as part of the study:

- Warrant 1, Eight-Hour Vehicular Volume
- Warrant 2, Four-Hour Vehicular Volume
- Warrant 3, Peak Hour

A summary of the signal warrant analysis is provide in Table 6.

Table 6 – Traffic Signal Warrant Analysis

INTERSECTION	Warrant 1	Warrant 2	Warrant 3
	8-Hour	4-Hour	Peak Hour
	<i>Is Signal Warrant Satisfied?</i>		
US 275 & 37th Street (Norfolk Ave.)	No	No	No
US 275 & Norfolk Ave. (future)	No	No	No
Benjamin Avenue & Queen City Boulevard	No	No	No
Benjamin Avenue & McIntosh Road	No	No	No
Benjamin Avenue & Entrance to Veterans Home and Northeast Community College	No	No	No
1st Street & Park Avenue	No	No	No

As Table 6 summarizes, none of the intersections evaluated satisfy the criteria of Warrants 1, 2, and 3. Therefore, the installation of a traffic signal at any of these locations is not recommended.

In response to concerns expressed in a recent newspaper article dated October 27, 2005, the intersections on Benjamin Avenue at McIntosh Road and the entrance to the Veterans

Home/Northeast Community College (NECC) were further investigated for possible traffic pattern modifications. The analysis investigated the redistribution of left-turning and through vehicles from the northbound approach of McIntosh Road to the road directly servicing the Veterans Home. The result would be to limit access at McIntosh Road to only right turns onto Benjamin Avenue. Although this would improve traffic operations at McIntosh Road, this would negatively impact traffic operations at the intersection formed by the entrances to the Veterans Home and NECC. However, even with the additional traffic, volumes would not be high enough to satisfy the signal warrant criteria at the Veterans Home/NECC entrance intersection. The reciprocal scenario was also evaluated, with all northbound left-turn and through movement traffic volumes similarly redistributed from to McIntosh Road. Again, additional traffic volume at McIntosh Road would not be high enough to satisfy the signal warrant criteria. Therefore, no improvements with regard to traffic signalization are recommended at these two intersections at this time. It is, however, recommended that a westbound left-turn lane, with storage distance measuring 125 feet (not including taper), be constructed at the intersection, which provides access to the Veterans Home.

A possible improvement to consider in the future would be the construction of a modern roundabout at one of the two intersections while providing a roadway connection between the Veterans Home and McIntosh Road south of Benjamin Avenue. However, this improvement requires more detailed analyses to assess the feasibility of this concept both physically and economically. In the meantime, volumes should continuously be monitored to evaluate the satisfaction of signal warrant criteria.

Safety Analysis

Using citywide crash data, crash rates were calculated for intersections and roadway segments where high frequency of crashes has been reported. Intersections with crash rates near or above 1.0 crashes per million entering vehicles are summarized in Table 7.

Table 7 – Intersection Crash Rates

Intersection	ADT ¹	No. of Crashes (3-year)	Crash Rate ²
7 th St./Madison Ave.	6,420	18	2.56
7 th St./Michigan Ave.	3,430	6	1.60
7 th St./Pasewalk Ave.	10,410	18	1.58
7 th St./Prospect Ave.	5,730	8	1.27
U.S. 81/U.S. 275	31,690	40	1.15
18 th St./Norfolk Ave.	13,800	17	1.12
1 st St./Norfolk Ave.	23,050	28	1.11
U.S. 275/20 th St.	20,190	23	1.04
Victory Rd./Norfolk Ave.	14,660	16	1.00
U.S. 275/Pasewalk Ave.	16,230	16	0.90

¹ Daily volume data was not available at all locations. Where necessary, volumes were assumed based on roadway characteristics and volumes along other roadways with similar characteristics.

² Crashes per million entering vehicles (MEV).

Note: Although there are other locations with crash rates greater than 1.0/MEV, they are not reported, as the actual number of crashes is low.

Of the intersections listed in Table 7, the project team identified specific intersections to investigate in further detail. For these locations, a site investigation was conducted that included, but was not limited to the following:

- Photographs of all approaches and significant features
- Measurements of auxiliary lanes
- Diagrammatic sketch of intersection geometry and traffic control
- Evaluation of traffic control devices' compliance with the Manual on Uniform Traffic Control Devices (MUTCD)
- Examination of any visual obstructions to drivers
- Adjacent land use
- General comments regarding traffic operations

Each intersection was examined to identify the most common types of crashes that occurred over the three-year period and to identify potential counter-measures that would reduce the frequency of those types of crashes at each intersection. The results of the analysis and the recommended counter-measures for each intersection are presented below.

7th Street/Madison Avenue

Both 7th Street and Madison Avenue are two-lane urban roadways serving north-south and east-west directions of travel, respectively, and a posted speed limit of 30 mph. Stop sign control is provided for the north and southbound approaches to the intersection with no auxiliary (turn) lanes on either of the roadways. The intersection is bordered by the Nebraska Public Power District facility in the northwest quadrant, Christ is King Community church/school in the southwest quadrant and industrial uses, including a spur railroad track, east of 7th Street.

Between June 15, 2002 and June 15, 2005, 18 crashes were reported at this intersection. The crashes are summarized in Table 8.

Table 8 – Summary of Three-year Crash History at 7th Street/Madison Avenue

Type	6/15/02 – 6/14/03	6/15/03 – 6/14/04	6/15/04 – 6/15/05	Total
Right-angle	7	4	6	17
Turning	0	0	1	1
Total	7	4	7	18

The most common type of crash reported at this intersection is right-angle. Several crashes reports clearly identified one driver, traveling either northbound or southbound on 7th Street, as “failing to yield.”

One possible reason for the high crash rate at this location is the sight distance obstruction to southbound vehicles caused by the chain-linked fence in the northwest quadrant of the intersection. However, it appears that the fence is already located along the property line and further setback of the fence would require the City to purchase property from NPPD. A second possible reason for the high crash rate is the size of the stop sign on the northbound approach. This sign is noticeably smaller than the sign on the southbound approach. It is recommended that this sign be replaced with a larger sign, similar in size to the one on the southbound approach, thus increasing the conspicuity of the sign. (Note: larger sign was installed in February 2006.) If right-angle crashes continue to be an issue at this location, consideration of converting this intersection to “all-way stop control” or a modern roundabout should be given.

Although it does not appear to have been the cause of crashes in the past, there does appear to be the opportunity to improve driveway access conditions in the southwest quadrant of the intersection by consolidation of driveways and separating the resulting driveway as far from 7th Street as possible.

7th Street/Michigan Avenue

Both 7th Street and Michigan Avenue are two-lane urban roadways serving north-south and east-west directions of travel, respectively. 7th Street has a posted speed limit of 30 mph while Michigan Avenue has a posted speed limit of 25 mph. Stop sign control is provided for the east and westbound approaches to the intersection. Additionally, auxiliary (turn) lanes are not provided on either of the two roadways. A single Union Pacific Railroad track, operated by Nebraska Central Railroad, runs east of and parallel to 7th Street and intersects Michigan Avenue less than 100 feet from 7th Street. The intersection is bordered by residential uses in the northwest and southeast quadrants, a running track in the northeast quadrant and industrial use(s) in the southwest quadrant of the intersection.

Between June 15, 2002 and June 15, 2005, 6 crashes were reported at this intersection. The crashes are summarized in Table 9.

Table 9 – Summary of Three-year Crash History at 7th Street/Michigan Avenue

Type	6/15/02 – 6/14/03	6/15/03 – 6/14/04	6/15/04 – 6/15/05	Total
Right-angle	1	1	3	5
Turning	1	0	0	1
Total	2	1	3	6

The most common type of crash reported at this intersection is right-angle. Several crashes clearly identified one driver, traveling either eastbound or westbound on Michigan Avenue, as “failing to yield.”

A maximum of three crashes in a one-year time period is not an uncommon occurrence for a stop-controlled intersection of two roadways such as Michigan Avenue and 7th Street. Therefore, if any countermeasures were implemented to mitigate these crashes, it would be difficult to determine whether a possible decrease in crashes was a result of the implemented countermeasure or a result of “chance.” Therefore, to specifically address the three-year history of crashes, no recommendations are being made for this location.

However, similar to the situation at the intersection of 7th Street/Madison Avenue, the stop sign on the westbound approach to this intersection is noticeably smaller than the stop sign on the eastbound approach. It is recommended that this sign be replaced with a larger sign, similar in size to the one on the eastbound approach, thus increasing the conspicuity of the sign. (Note: larger sign was installed in February 2006.)

7th Street/Pasewalk Avenue (roundabout)

At the intersection (roundabout) of 7th Street/Pasewalk Avenue, Pasewalk Avenue is a three-lane urban roadway (one lane in each direction with a continuous, center turn lane) and a posted speed limit of 30 mph. At the roundabout, the center turn lane along Pasewalk Avenue is dropped such that there is only a single entry lane and a single exit lane. According to information from NDOR, the 2003 daily traffic volume along Pasewalk Avenue was approximately 7,850 vehicles. At the roundabout, 7th Street is a two lane urban roadway with a posted speed limit of 30 mph and a 2003 daily traffic volume of approximately 3,650 vehicles. As with all modern roundabouts, the 7th/Pasewalk roundabout is controlled by yield signs on all approaches (entry lanes). A single Union Pacific Railroad track, operated by Nebraska Central Railroad, runs parallel to 7th Street and intersects Pasewalk Avenue less than 100 feet from the yield line of the westbound approach. The roundabout is bordered by residential uses in all four quadrants of the intersection.

Between June 15, 2002 and June 15, 2005, 18 crashes were reported at this intersection. The crashes are summarized in Table 10.

Table 10 – Summary of Three-year Crash History at 7th Street/Pasewalk Avenue

Type	6/15/02 – 6/14/03	6/15/03 – 6/14/04	6/15/04 – 6/15/05	Total
Right-angle	2	3	7	12
Rear-end	2	1	1	4
Other	0	0	2	2
Total	4	4	10	18

The most frequently reported types of crashes at this intersection are “right-angle” and rear-end, which are the most common types of crashes experienced by most modern roundabouts. Fortunately, only one of the 18 crashes resulted in personal injury, which is also a common characteristic to modern roundabouts because of the low speeds at which vehicles operate while entering and traversing the roundabout. It should be noted that snow or icy roadway conditions were reported for seven of the 18 crashes. Removal of these seven crashes from the crash rate calculations results in a crash rate slightly below 1.0/MEV. As a result, it is recommended that specific attention, in terms of snow removal and/or material application, be given to the approaches to this roundabout when snowy or icy conditions are present.

During the site investigation at this intersection, it was noted that minimal deflection is provided for the eastbound and westbound approaches, thus increasing the potential for higher speeds of vehicles entering the roundabout. Although the crash reports do not indicate this as a significant problem at this location, future roundabouts should be constructed as to provide additional deflection so that the speeds of entering vehicles are better controlled.

It was also noted during the site investigation that the row of large trees along the west side of the southbound approach may obstruct driver's view of the “Yield Ahead”, “Yield” and “Pedestrian Crosswalk” signs. If possible, these signs should be relocated such that they are clearly visible to drivers while meeting roundabout design requirements.

7th Street/Prospect Avenue

Both 7th Street and Prospect Avenue are two-lane urban roadways serving north-south and east-west directions of travel, respectively. Immediately north of Prospect Avenue, 7th Street veers to the northwest, becoming Queen City Boulevard. 7th Street has a posted speed limit of 30 mph while Prospect Avenue has posted speed limits of 30 mph west of 7th Street and 25 mph east of 7th Street. Stop sign control is provided for the east and westbound approaches to the intersection. Additionally, auxiliary (turn) lanes are not provided on either of the two roadways. The intersection is bordered by industrial uses in the northwest and northeast quadrants, office buildings in the southeast quadrant and residential in the southwest quadrant of the intersection.

Between June 15, 2002 and June 15, 2005, 8 crashes were reported at this intersection. The crashes are summarized in Table 11.

Table 11 – Summary of Three-year Crash History at 7th Street/Prospect Avenue

Type	6/15/02 – 6/14/03	6/15/03 – 6/14/04	6/15/04 – 6/15/05	Total
Right-angle	1	4	1	6
Rear-end	0	0	1	1
Run off road	1	0	0	1
Total	2	4	2	8

The most common type of crash reported at this intersection is right-angle. Several crashes clearly identified one driver traveling either eastbound or westbound on Prospect Avenue as “failing to yield.”

A maximum of four accidents in a one-year time period is not an uncommon occurrence for a stop-controlled intersection of two roadways such as Prospect Avenue and 7th Street. Therefore, if any countermeasures were implemented to mitigate these crashes, it would be difficult to determine whether a possible decrease in crashes was a result of the implemented countermeasure or a result of “chance.” Therefore, to specifically address the three-year history of crashes, no recommendations are being made for this location.

18th Street/Norfolk Avenue

Norfolk Avenue is a three-lane (one lane in each direction and a continuous, center turn lane), principal urban arterial serving east-west traffic with posted speed limits of 35 mph east of 18th Street and 40 mph west of 18th Street. 18th Street is a two-lane, north-south urban collector street with a posted speed limit of 30 mph and relatively short (approximately 50-75 ft.) left-turn lanes at Norfolk Avenue. Additional characteristics of the intersection include:

- Steep grade (south to north), with no platforms (grades less than 3%) of significant length at 18th Street.
- Elementary school located approximately four blocks south of Norfolk Avenue – 20 mph speed zone when children are present.
- Intersection is traffic signal controlled.
- Minor sight distance obstruction (hedges) in the southwest quadrant of the intersection resulting in restrictions to northbound drivers attempting to make a right-turn-on-red maneuver.
- Residential land use borders the intersection in all four quadrants.

Between June 15, 2002 and June 15, 2005, 17 crashes were reported at this intersection. The crashes are summarized in Table 12.

Table 12 – Summary of Three-year Crash History at 18th Street/Norfolk Avenue

Type	6/15/02 – 6/14/03	6/15/03 – 6/14/04	6/15/04 – 6/15/05	Total
Right-angle	2	0	5	7
Rear-end	1	1	0	2
Turning	4	0	3	7
Run off road	0	1	0	1
Total	7	2	8	17

The most common types of crashes at this intersection are right-angle and turning. Unfortunately, right-angle crashes are common at signalized intersections. Probable causes for a high incidence of this type of crash at signalized intersections include:

- Restricted sight distance
- Excessive speed
- Inadequate roadway lighting
- Poor traffic control device (signs and signals) visibility
- Inadequate signal timing
- Inadequate advance intersection warning signs
- Large total intersection volume

Turning crashes, primarily involving left-turning vehicles are also common at signalized intersections. Probable causes for this type of crashes include:

- Large turn volume
- Restricted sight distance
- Amber phase (yellow) too short
- Absence of left-turn phase
- Excessive speed

Through our site investigation and review of the detailed crash reports, none of these traditional probable causes for crashes of these types appear to be characteristics of this intersection, aside from the obvious steep grade along 18th Street. Although the intersection is lighted by only a single street light luminaire, very few crashes were reported with “dark” conditions. It should also be noted that vehicle speed data was not collected at this location. Other than continuous monitoring of this intersection, no recommendations have been made for this location.

Roadway segments with a high crash rate are summarized in Table 13.

Table 13 – Crash Rates Along Roadway Segments

Roadway Segment	ADT	No. of Crashes (3-year)	Crash Rate ¹
U.S. 81/S. 13 th St. (Michigan Ave. to Omaha Ave.)	16,850	56	11.9
W. Norfolk Ave. (1 st St. to 7 th St.)	10,685	70	11.8
U.S. 275/W. Omaha Ave. (11 th St. to 13 th St.)	15,055	15	3.6

¹ Crashes per million vehicle-miles.

For these segments, site investigations identical to those performed for intersections with high crash rates were conducted. Each roadway segment was examined to identify the most common types of crashes that occurred over the three-year period and to identify potential counter-measures that would reduce the frequency of those types of crashes at each location. The results of the analysis and the recommended counter-measures for each are presented below.

U.S. Highway 81 (S. 13th Street)

The northern two-thirds (approximately) of this segment of S. 13th Street is a five-lane (two lanes in each direction with a continuous, center turn lane), principal arterial and is designated U.S. Highway 81. The southern one-third of this segment is a four-lane, median divided principal arterial with auxiliary (turn) lanes at Omaha Avenue. Signalized intersections are located along this four-block stretch of S. 13th Street at Omaha Avenue (U.S. Highway 275) and Michigan Avenue. All other intersections provide stop sign control on the side street (east-west) approaches. S. 13th Street carries north-south traffic at a posted speed limit of 35 mph. This segment of S. 13th Street is positioned within a highly commercialized area and is characterized by a high density of commercial driveways.

Between June 15, 2002 and June 15, 2005, 56 crashes were reported along this roadway segment. The most common type of crash reported between the 900 and 1300 blocks of S. 13th Street are turning crashes, involving vehicles turning into, or out of the numerous commercial driveways as well as rear-end crashes at the intersection of S. 13th Street/Omaha Avenue.

Because the majority of crashes along this portion of S. 13th Street are primarily attributed to the presence of commercial driveways, the methods that would result in the most significant improvement are also likely to be the most controversial. These improvements include:

- Consolidation (sharing) of driveways along property lines to reduce the total number of driveways, thus reducing the number of conflict points.
- Extend median north to Michigan Avenue with potential median openings at strategic locations to allow for left-turns into driveways and possible u-turn movements.

W. Norfolk Avenue

The majority of this six-block stretch of Norfolk Avenue, which is located in the central business district, provides one lane of travel in each direction with the two opposing directions separated by a raised median and designated left-turn lanes at the intersections with north-south cross streets. The western end of this roadway segment is a three-lane roadway (one lane in each direction with a continuous, center turn lane). Throughout this entire roadway segment, diagonal parking is provided on both the north and south sides of Norfolk Avenue. Signalized intersections are located at all intersections, with the exception of 6th Street/Norfolk Avenue, which is controlled by stop signs on the northbound approach. Norfolk Avenue has a posted speed limit of 25 mph.

Between June 15, 2002 and June 15, 2005, 70 crashes were reported along this roadway segment, however, many of these crashes were also reported to occur in off-street parking lots as well as public alleys. The most common types of crashes reported between the 100 and 600 blocks of W. Norfolk Avenue are rear-end crashes at signalized intersections and various scenarios of crashes involving parked vehicles or vehicles entering or exiting parking stalls. The majority of these crashes resulted in only minor property damage with most of the crashes being caused by driver inattention. As a result, no recommendations are being made to mitigate this pattern.

U.S. Highway 275 (Omaha Avenue)

Omaha Avenue, also designated U.S. Highway 275, is a four-lane, median divided principal arterial. Turn lanes are provided at 13th Street, 11th Street and the equivalent of 12th Street, a non-public roadway. Signalized intersections are located along this two-block stretch of Omaha Avenue at 13th Street (U.S. Highway 81) and 11th Street. The remaining intersection is controlled by stop signs on the northbound and southbound approaches. Omaha Avenue carries east-west traffic at a posted speed limit of 35 mph. This segment of S. 13th Street is positioned within a highly commercialized area, however, with the exception of the private roadway at "12th Street", no other curb cuts are provided, thus greatly improving access management and vehicle safety.

Between June 15, 2002 and June 15, 2005, a relatively low number of crashes (15) were reported along this roadway segment. The most common type of crash reported between the 1100 and 1300 blocks of W. Norfolk are rear-end crashes at the two signalized intersections. As stated previously in this memorandum, rear-end crashes commonly occur at signalized intersections. Therefore, no recommendations are being made for this location.

N. and S. 7th Streets

It should be noted that originally, N. and S. 7th Streets were also identified as roadway segments to further evaluate in terms of vehicle safety. However, after further review of the available crash data, very few crashes were occurring throughout this corridor, aside from those at the intersections of Michigan Avenue, Pasewalk Avenue, Madison Avenue and Prospect Avenue. Therefore, no additional investigation of this corridor was performed.

Appendix 3

Travel-Demand Forecast Model Technical Report



Norfolk, Nebraska Travel Demand Model Technical Report

1.0 Introduction

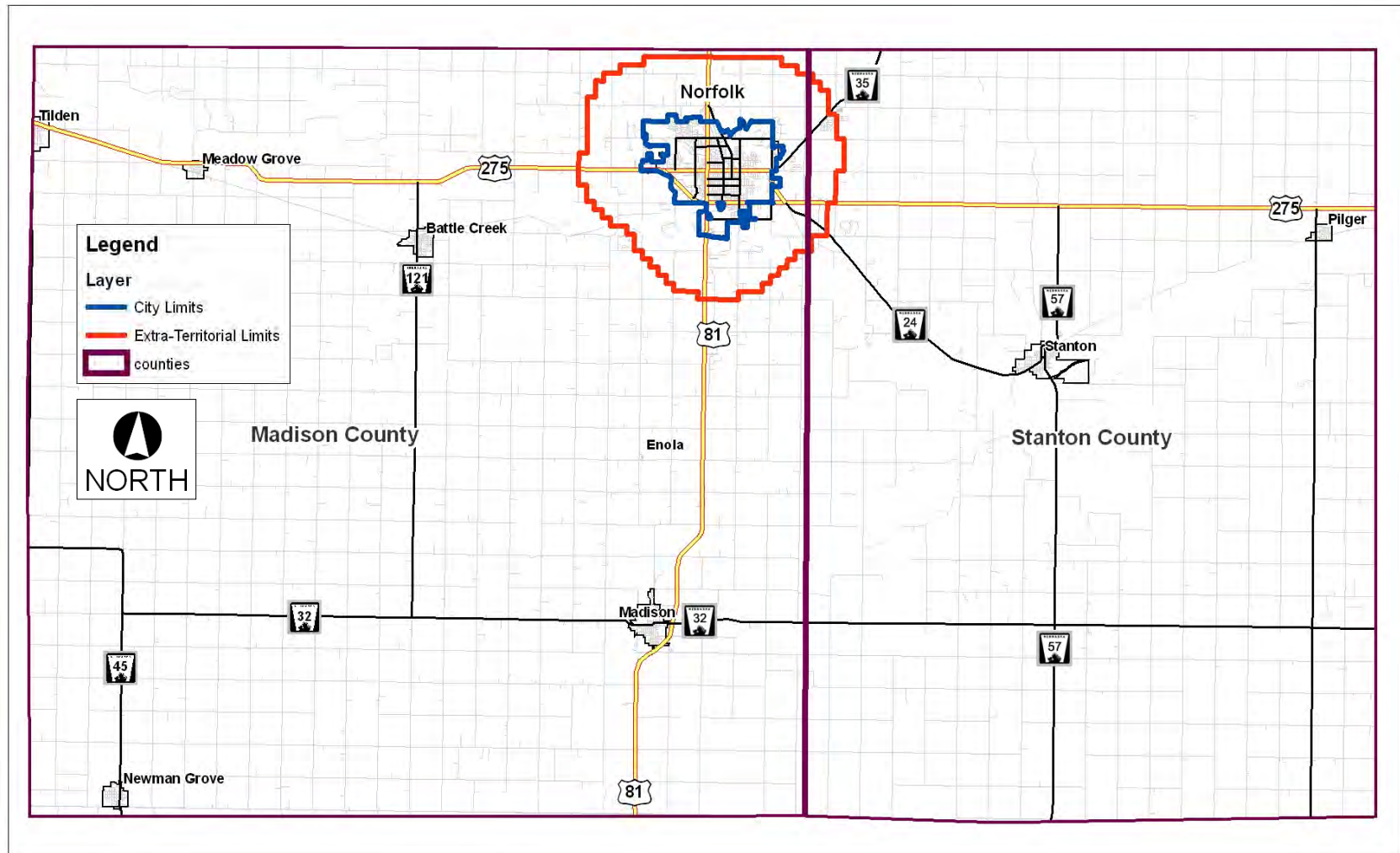
The following document outlines the process used in developing a travel demand model for the City of Norfolk, Nebraska. A travel demand model is a set of data and mathematical equations that attempt to replicate the trip making behavior of people, specifically, vehicle-oriented trips. This is typically done through the four-step process of trip generation, trip distribution, mode choice and traffic assignment. Through this four-step process, information regarding the impacts resulting from changes to transportation infrastructure, land use or public policy can be obtained without implementation. The travel demand model developed for the City of Norfolk provides a tool for investigating the impacts caused by the construction of the planned transportation improvements in the Norfolk vicinity. **Figure 1.1** shows the model area for the Norfolk travel demand model.

The Norfolk travel demand model was developed as part of the Norfolk Comprehensive Plan Update. Data collection performed in support of the modeling effort. Additionally, meetings with city staff provided feedback on the modeling process.

2.0 Model Development

The Norfolk travel demand model is a daily model, meaning forecasted traffic volumes are for a 24 hour time period. The travel demand modeling software used for the Norfolk model was TransCAD version 4.7. The TransCAD package uses the traditional four-step modeling concept of trip generation, trip distribution, mode split and traffic assignment to produce traffic demand forecasts. The Norfolk model does not utilize the mode split functionality of TransCAD as the transit ridership within the study area is sufficiently low. Therefore, all forecasts produced by TransCAD are assumed to be vehicle trips only.

Figure 1.1
Norfolk Travel Demand Model Study Area



2.1 MODEL NETWORK

TransCAD is a geographic information system (GIS) with contains fully functional travel demand modeling algorithms. This allowed the Norfolk travel demand model network to be created from existing GIS datasets. A majority of the Norfolk model network lies within the limits of the City of Norfolk, therefore, a roadway centerline file was used as a base. Many roadway data attributes needed for the demand model such as speed and number of lanes were provided by The Schemmer Associates within this attribute and centerline file. A centerline file for Madison County, Nebraska was used to develop the network for areas outside of Norfolk. The Norfolk and Madison County roadway centerline data sets were combined within TransCAD to form one street coverage for the Norfolk model network. **Figure 2.1** shows the 2003 Norfolk model network.

Roadway attributes were then coded for each link in the Norfolk travel demand model. Speed, functional class and number of lanes were obtained from The Schemmer Associates. Capacities were calculated based on NCHRP 365¹ standards, the functional class of the roadway and the number of lanes. **Table 2.1** shows the standard capacity of roadways within the model network based on their functional classification and **Figure 2.1** shows the model network by functional classification. **Figure 2.2** shows the number of lanes in the 2003 model network. Intersection turning restrictions were added to the Norfolk travel demand model to more accurately model traffic patterns. **Figure 2.3** shows the speed for the roadways in the 2003 Norfolk model.

Table 2.1
Roadway Capacity

Functional Classification	Roadway Capacity (vpdpl) ^a		
	Urban	Suburban	CBD
Major Arterial	7,900	13,500	7,100
Minor Arterial	6,400	8,600	5,600
Major Collector	-	7,900	-
Collector	4,900	-	4,500
Minor Collector	-	6,000	-
Local	2,600	2,600	2,300

^aVehicles per day per lane

¹ National Cooperative Highway Research Program, Report 365, Travel Estimation Techniques for Urban Planning, Transportation Research Board, National Research Council, National Academy Press, Washington, D.C., 1998.

Figure 2.1
2003 Base Model Network

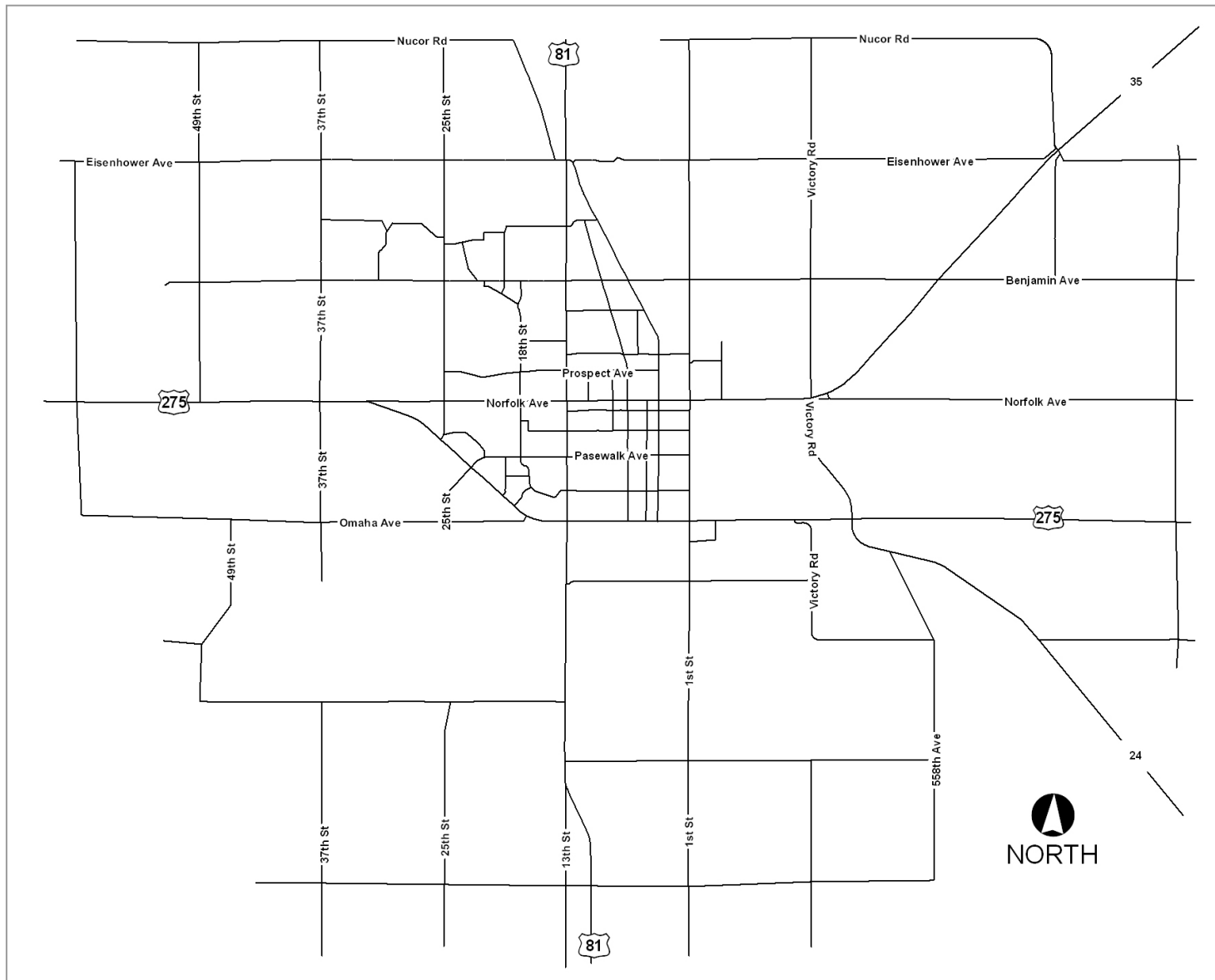


Figure 2.2
2003 Base Network Number of Lanes

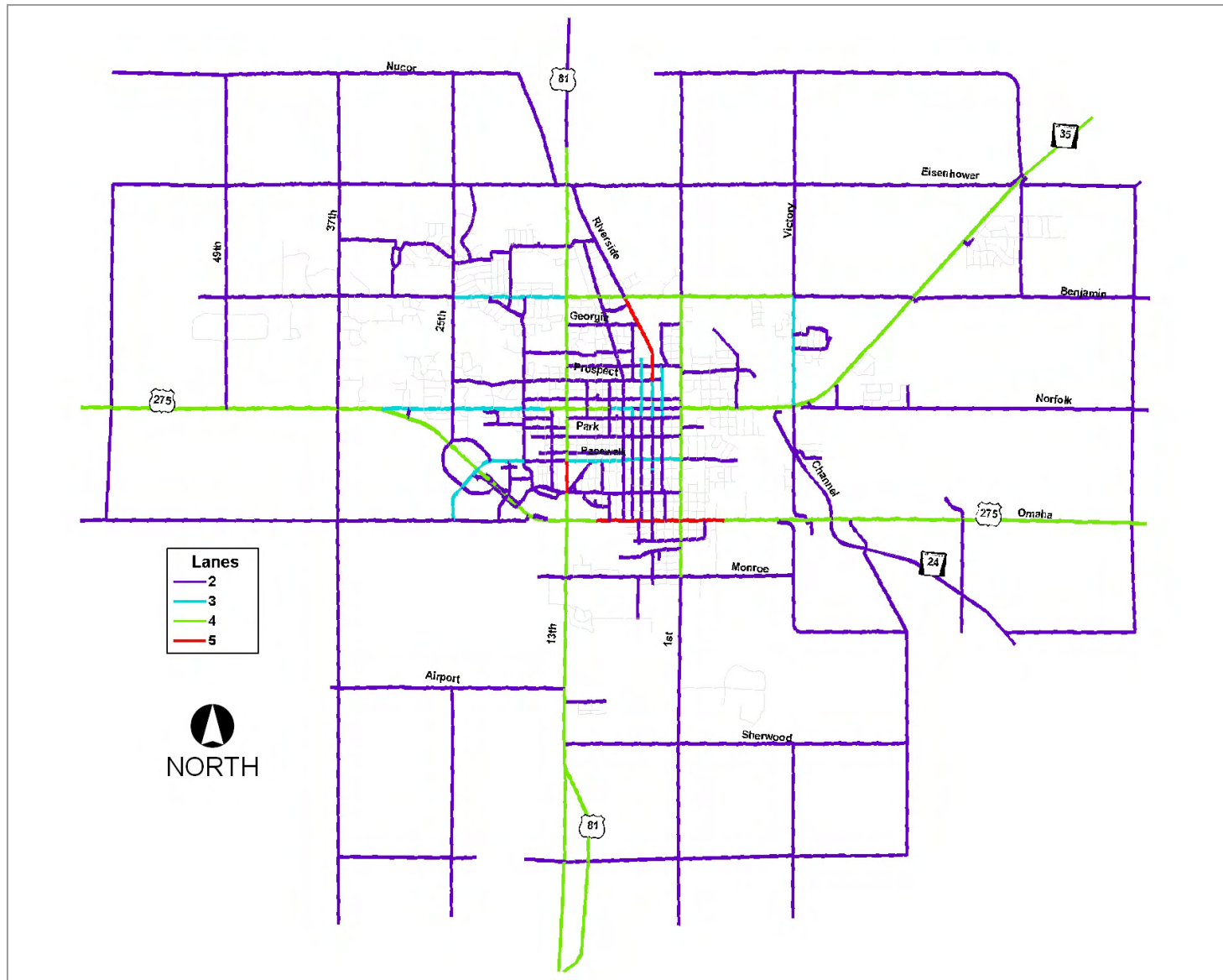
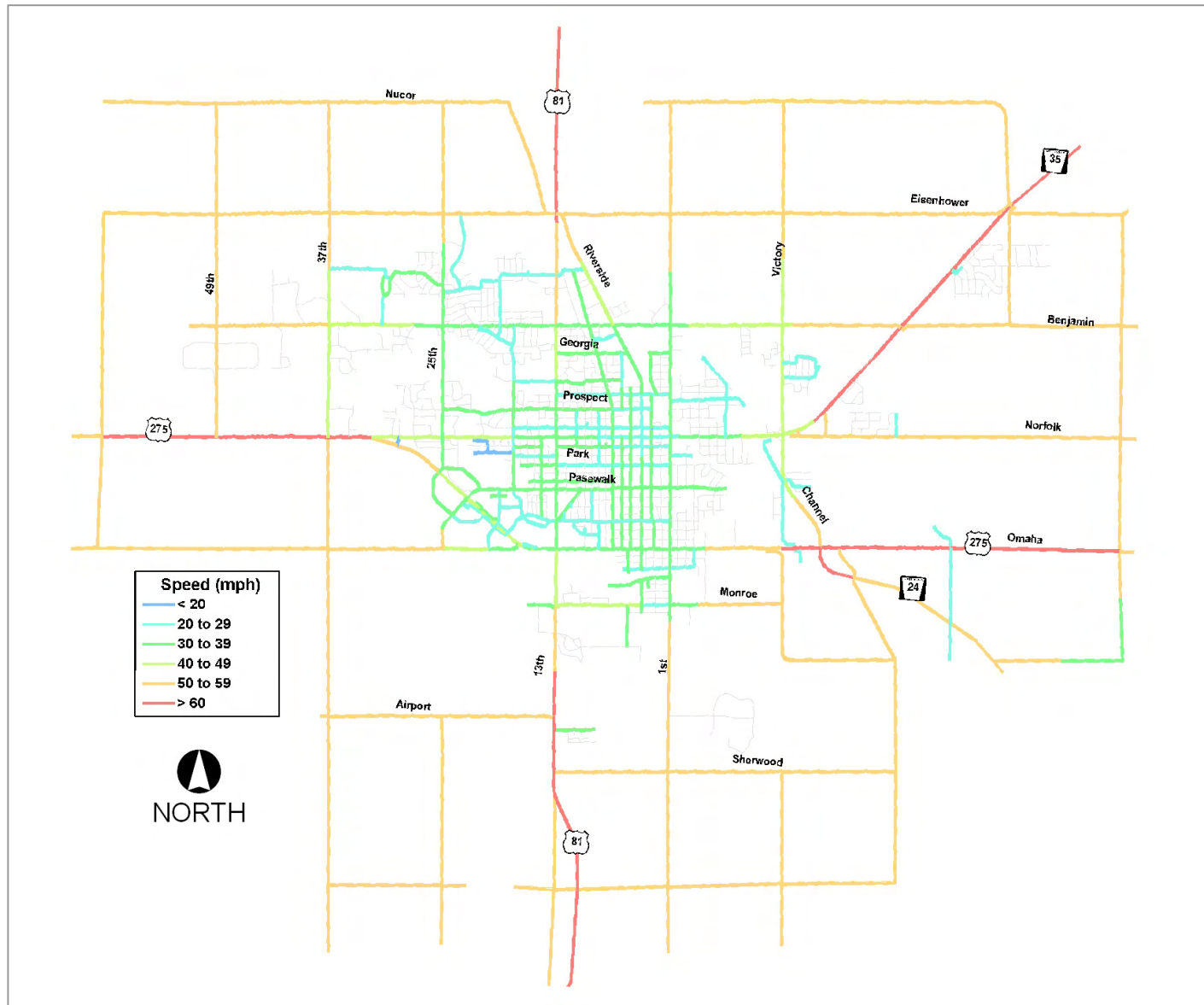


Figure 2.3
2003 Base Network Speed



2.2 TRAFFIC ANALYSIS ZONES

Traffic analysis zones (TAZ) represent a geographic area within the travel demand model in which land uses are aggregated to produce the origin or destination of trips. TAZ's were created in TransCAD using roadway network, census blocks and land parcel information. In areas where intense development was planned, such as the southwest area of Norfolk, TAZ's were divided into smaller zones to allow for more detailed analysis. Since areas outside of Norfolk affect Norfolk travel patterns, there are many TAZ's beyond the city limits of Norfolk. **Figure 2.4** shows the TAZ's for the Norfolk travel demand model.

Centroids represent the point at which all trips going to or from a TAZ interact with the model network. To connect centroids to the network, centroid connectors are added. The centroid connectors typically represent the local streets within the TAZ and were constructed so as to connect with the model network similar to the actual local street intersections.

2.3 SOCIO-ECONOMIC DATA

Socio-economic data, such as household and employment location information, were used as inputs to the travel demand modeling process. These data are used in the trip generation process that produces an estimate of the number of trips that originate or terminate at each TAZ. Typically, the decennial census provides a reliable source of socio-economic data. For the Norfolk travel demand model, the socio-economic data was collected for the Norfolk model area. This data was formatted to provide the input into the trip generation process.

The socio-economic data was divided into categories reflecting the trip making attributes of the land use type. The household data was first collected in single-family equivalents by number of dwelling units within each TAZ. Non-residential land uses were divided into six categories. Non-residential land use data was collected by the number of employees of each category. The land use categories for the Norfolk model include:

- Single-Family Housing	Dwelling Units
- Commercial/Retail	Employees
- Service/Office	Employees
- Industrial	Employees
- Government/Other	Employees
- Restaurant	Employees
- School	Enrollment

Future socio-economic data was developed for a 2030 forecast year. Planned developments and future zoning plans were translated into residential and non-residential units in the same manner as the existing socio-economic data. **Figure 2.5** shows the growth in land use throughout the Norfolk travel demand model study area.

Figure 2.4
Traffic Analysis Zones

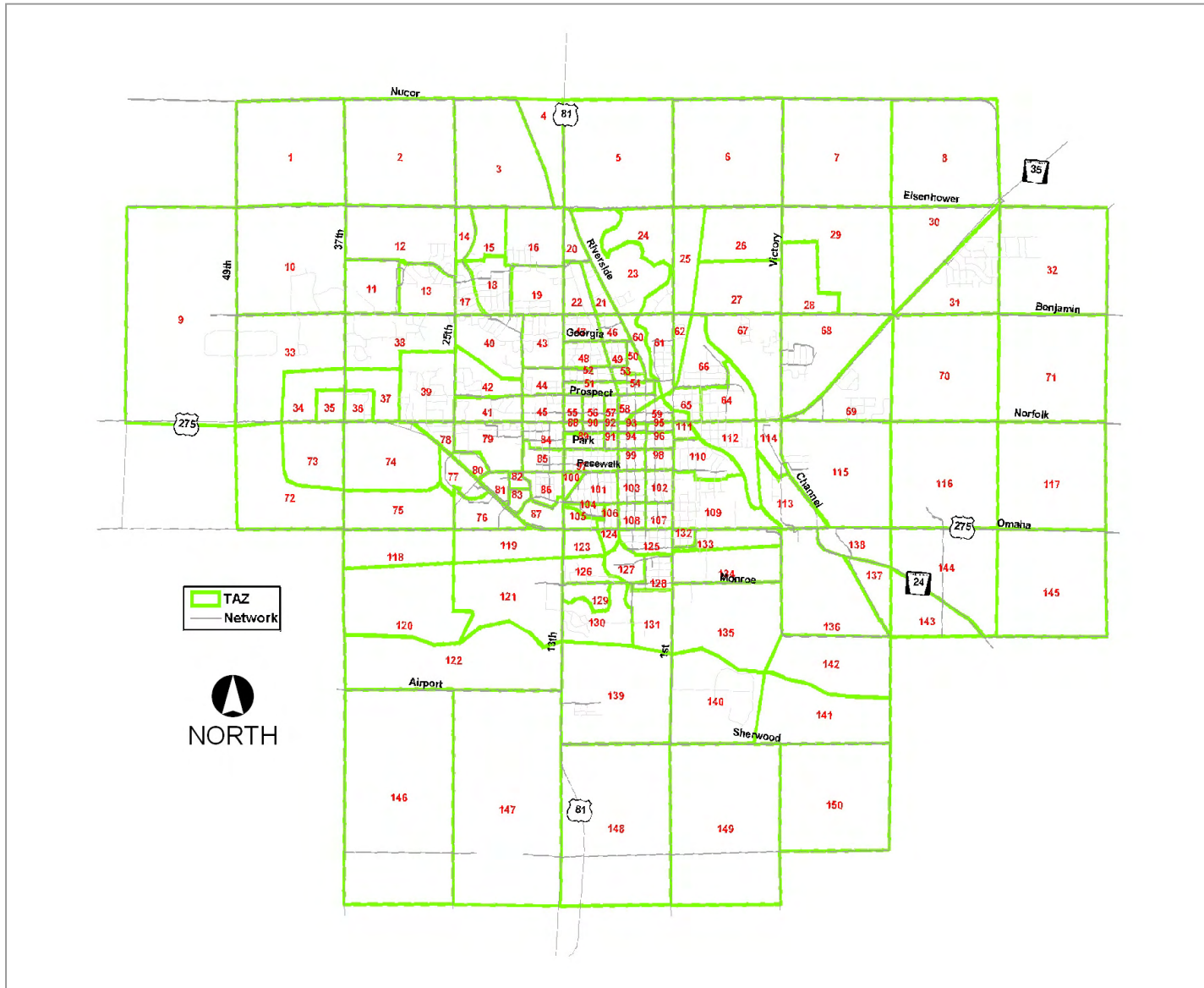
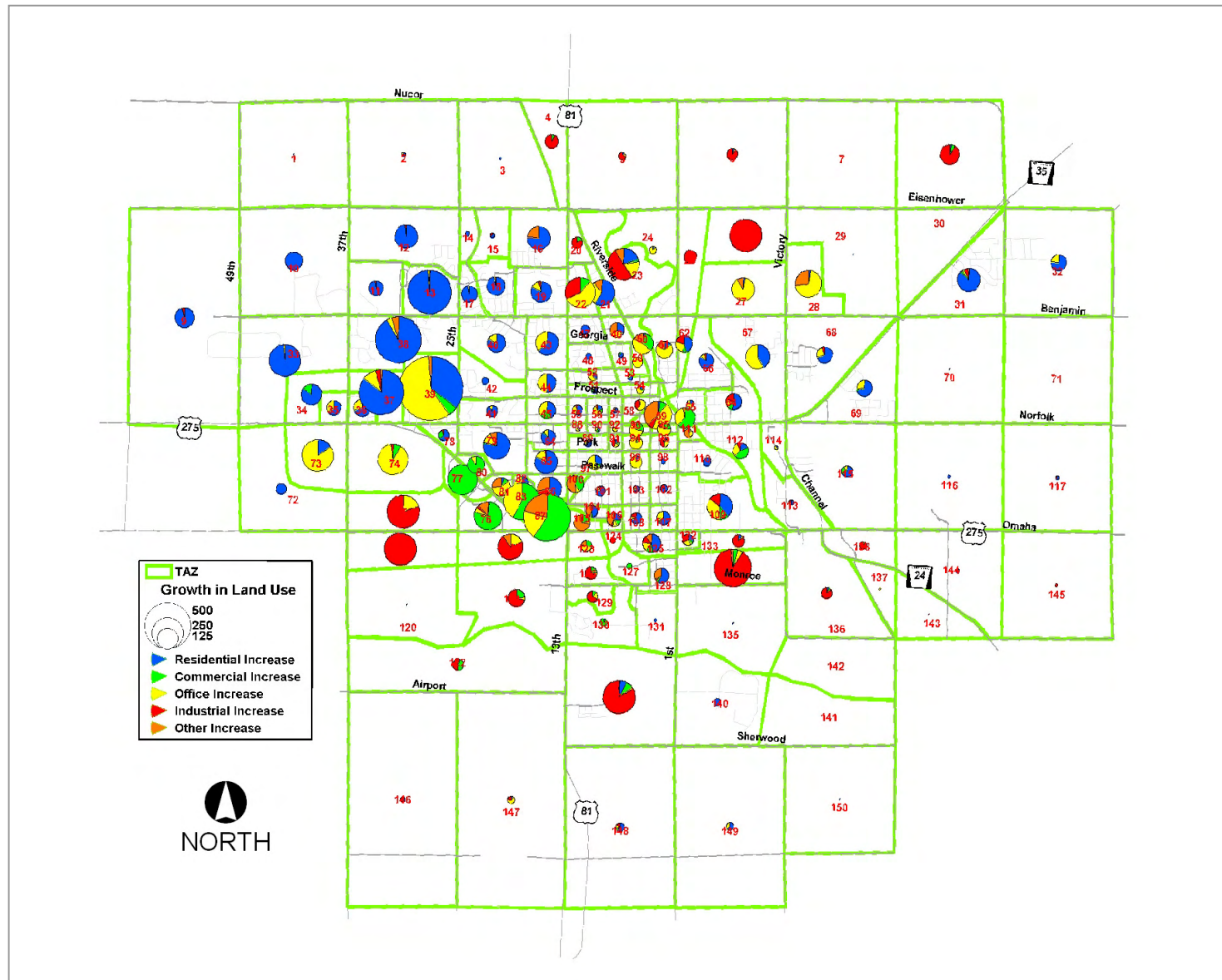


Figure 2.5
Growth in Land Use from 2003 to 2030



2.4 MODEL ALTERNATIVES

The 2003 base model was used to calibrate the modeling parameters to existing traffic counts. The 2030 scenarios provide the long-range component to the Norfolk travel demand model. The six model scenarios represent a combination of land use and roadway network modifications as defined in **Table 2.2**. The committed and planned projects included in these scenarios are listed in **Tables 2.3 and 2.4**.

Table 2.2
Travel Demand Model Alternatives

Model Name	Model Year	Model Description
Base	2003	Calibrated base model replicating conditions in 2003.
Future No-Build	2030	Existing and committed model for year 2030, no planned projects.
Package A	2030	Future No-Build network with Package A projects.
Package B	2030	Package A network with Package B projects.
Package C	2030	Package A network with Package C projects.
Package D	2030	Package A network with Package D projects.

Table 2.3
Committed Projects

Committed Roadway Improvements	
Roadway	Improvement
Benjamin Avenue (13 th Street to 25 th Street)	Widen existing roadway (2-lane to 3-lane)
U.S. Highway 275 (NDOR – Norfolk West)	Widen existing roadway (2-lane to 4-lane)
Nebraska Highway 35 (NDOR – Norfolk Northeast)	Widen existing roadway (2-lane to 4-lane)

**Table 2.4
Planned Projects**

Planned Roadway Improvements	
Roadway	Improvement
A1 – Nucor Road (U.S. 81 to N-35)	Construct new 2-lane roadway
A2 – 25 th Street (Norfolk Ave. to U.S. 275)	Widen existing roadway (2-lane to 3-lane) Upgrade functional classification (collector to minor arterial)
A3 – 25 th Street (Eisenhower Ave. to Benjamin Ave.)	Widen existing roadway (2-lane to 3-lane) Upgrade functional classification (collector to minor arterial)
A4 – 37 th Street (Benjamin Ave. to Norfolk Ave.)	Upgrade functional classification (suburban collector to urban minor arterial)
A5 – Benjamin Avenue (1 st St. to 13 th St.)	Widen existing roadway (4-lane to 5-lane)
A6 – Benjamin Avenue (25 th St. to 37 th St.)	Widen existing roadway (2-lane to 3-lane) Upgrade functional classification (local to minor arterial)
B1 – Link connecting N-35, U.S. 275, U.S. 81 and N-24	Construct new 2-lane roadway
C1 – Inner Beltway	<ul style="list-style-type: none"> Eisenhower Ave. (13th St. to 37th St.) – upgrade functional classification to urban minor arterial 37th Street (Eisenhower Ave. to Benjamin Ave.) – upgrade functional classification to urban minor arterial
C2 – Circumferential Boulevard (See Transportation Comprehensive Plan map)	<ul style="list-style-type: none"> 25th Street – widen existing roadway (2-lane to 3-lane) upgrade functional classification to urban minor arterial 49th Street – upgrade functional classification to suburban major collector Pasewalk Avenue – construct new 2-lane roadway ¼-mile south of Eisenhower Ave. – construct new 2-lane roadway
C3 – Prospect Avenue Parkway (25 th St. to 49 th St.)	Construct new 2-lane roadway
D1 – Pasewalk Avenue (13 th St. to 18 th St.)	Widen existing roadway (2-lane to 3-lane) Upgrade functional classification (collector to minor arterial)

3.0 Model Process

3.1 TRIP GENERATION

Trip generation is the estimation of the number of trips that occur based on known variables of a land development. The Institute of Transportation Engineers (ITE) Trip Generation Manual² provides daily estimates for the various land use categories of the Norfolk model. The national average rates of the ITE manual were supplemented with local data to best match the travel characteristics of the Norfolk study area.

Based on the different land uses in the study area various trip rates were generated. **Table 3.1** shows the trip generation rates for each land use type, along with an estimate of the percent of total trips by trip type. NCHRP 365³ Table 42 provided an estimate of the percent of total trips by trip type.

There are many different reasons for making a trip. These different reasons may impact the characteristics of these trips. Therefore, the generated trips are divided into trip types, each with a set of unique characteristics. The trips in the model are divided into the following three internal types.

- Home-Based Work (HBW)
- Home-Based Other (HBO)
- Non-Home Based (NHB)

Table 3.1
Trip Generation Rates

Land Use Types	Units	Trip Rate	HBW	HBO	NHB
Single Family	DU	12.8	21%	55%	24%
Commercial	Employees	13.7	12%	64%	24%
Service/Office	Employees	5.8	29%	47%	24%
Industrial	Employees	2.4	48%	29%	23%
Government/Other	Employees	8.8	16%	60%	24%
Restaurant	Employees	19.5	10%	65%	25%
School	Students	1.9	25%	53%	22%

Source: HNTB Corporation

The total number of trips generated for each the three trip types are shown in **Table 3.2**. The percent of trips in each of the three trip types is consistent with national practices outlined in the NCHRP 365 manual.

² Trip Generation, 7th Edition, Institute of Transportation Engineers, 525 School St., S.W. Suite 410, Washington, D.C., 20024, 2003.

³ National Cooperative Highway Research Program, Report 365, Travel Estimation Techniques for Urban Planning, Transportation Research Board, National Research Council, National Academy Press, Washington, D.C., 1998.

Table 3.2
Total Trips by Purpose

Trip Purpose	Year 2003 Trips	Percent of Total
HBW	35,089	22%
HBO	85,642	54%
NHB	39,065	24%

Source: HNTB Corporation

3.2 TRIP DISTRIBUTION

The productions and attractions generated for each trip type were converted to trip origins and destinations through the process of trip distribution. This process uses the standard gravity model algorithm within TransCAD. In addition to the balanced productions and attractions, a friction factor table, and shortest path matrix and K-factor matrix are required inputs for trip distribution. The friction factor table used for the Norfolk travel demand model is found in the NCHRP 365. The K-factor matrix was used to eliminate productions or attractions at external stations from matching with a corresponding trip end at another external station. A trip with both ends at externals is by definition an external to external trip, those trips are being estimated and calculated in a different process.

The shortest path matrix is created by TransCAD and represents the shortest travel time between all zone pairs. An intrazonal travel time of 2 minutes is added to replicate the approximate time to travel within a traffic analysis zone. The TransCAD algorithm to calculate this intrazonal time is used, by calculating the average travel time to the ten closest zones and using a factor of 3.

Productions and attractions for the three trip types were input into the gravity model. This produced three trip tables, one each for home-based work, home-based other and non-home based. These three trip tables were then combined with the external trip table to produce one trip table for input into the traffic assignment process.

3.3 EXTERNAL TRIPS

The external trip tables used for the Norfolk travel demand model were derived using the guidelines outlined in the NCHRP 365 report. Traffic count information was available from Nebraska Department of Roads data sources for the major facilities at the edge of the Norfolk model area. Approximately 52 percent of all vehicles on principal arterials were assumed to travel through Norfolk as pass-through trips. Minor arterials were estimated to have 36 percent through movements while local streets were estimated at 5 percent through movements. The through movement trip table was then developed by manually assigning logical through movements that meet the target percent for each location. The resulting trip table was provided to the City of Norfolk and the Nebraska Department of Roads for review and acceptance.

External-to-internal movements were divided into the three internal trip purposes based on NCHRP 365 guidelines and the level of internal activity within Norfolk. These external-to-internal, as well as internal-to-external movements were then distributed with all internal-to-internal movements using the gravity model as discussed in Section 3.2.

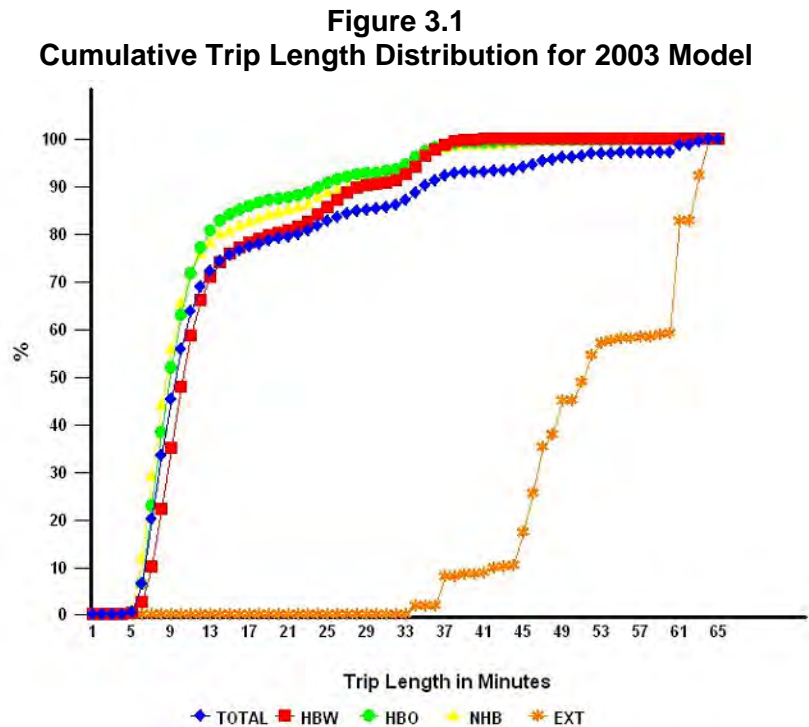
Future external travel was estimated using total traffic growth projections from 2003 to 2030 as provided by NDOR at the following major locations:

USH 275 West	62%
USH 81 North	37%
Highway 35	60%
USH 275 East	29%
USH 81 South	54%
Highway 24	40%

Remaining external locations were estimated to increase between 40 and 50 percent.

3.4 TRIP LENGTH DISTRIBUTION

The trip length distribution for the year 2003 model shows that the model through trips have the largest proportion of long trip lengths. This would be expected as these trips must travel across the entire study area and include an estimated travel time outside of the Norfolk study area. Home-based work trips have the longest trip length of the internal trip types, while the home-based other and non-home based trips are the shortest trips. **Figure 3.1** shows the cumulative trip length distribution for the three internal trip types, the external trips and the total trip table for the year 2003 model.



The trip length distribution is expected to change slightly as more development continues to occur farther from the existing areas of Norfolk. The length of trips are expected to increase over time as development continues to occur farther from the center of the Norfolk.

3.5 TRAFFIC ASSIGNMENT

Traffic volumes by link are calculated through the traffic assignment process. This process uses the trip table and the roadway network to estimate the number of trips that use each link in the network. Several traffic assignment methods within TransCAD were investigated, but the user equilibrium method was found to best replicate existing traffic counts through the calibration process.

The user equilibrium method is described in the Travel Demand Modeling with TransCAD 4.0 User's Manual⁴ as "an iterative process to achieve a convergent solution, in which no travelers can improve their travel times by shifting routes. For each iteration, network link flows are computed, which incorporate link capacity restraint effects and flow-dependent travel times." This simply states that each trip is assigned to the route with the shortest travel time when delay due to congestion is considered. The travel times are recalculated using the following formula:

$$T = T_f [1 + \alpha (v/c)^\beta]$$

T = Computed Travel Time

T_f = Uncongested Travel Time

α = Alpha

v = Assigned Volume

c = Capacity

β = Beta

Alpha and beta parameters, which dictate how travel time is impacted by increasing traffic congestion, were input into the network and were based on functional class.

$$\alpha = 0.15 \quad \beta = 4.0$$

The output of the traffic assignment process is a link by link forecast of traffic volume. Congested travel speeds by link are also output and are used to estimate the amount of delay experienced by vehicles. Volume-to-capacity ratios indicate the expected level of congestion on each link.

3.6 CALIBRATION

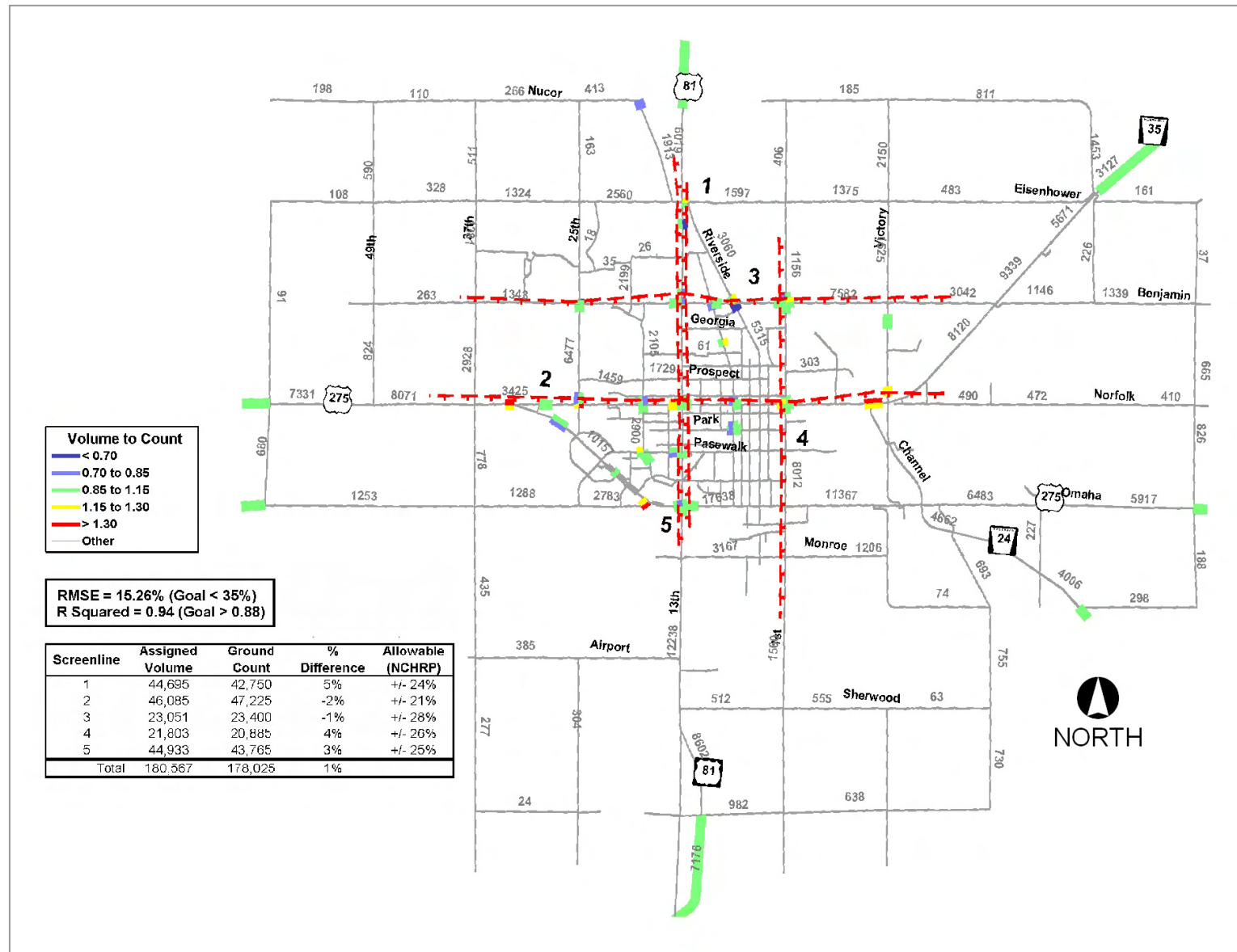
Calibration is the process of adjusting parameters to better replicate known conditions. Trip generation rates and trip type percentages were varied to best match NCHRP recommendations for percent of trips by trip type. Overall volume to ground count ratios were also used to revise trip generation rates. Alpha and beta parameters were adjusted to more accurately predict the impacts of traffic congestion.

Five screenlines were constructed to analyze the major movements through the study area. Screenlines are imaginary lines that cross all roadways serving travel between two distinct areas, and compare observed traffic counts with model volumes. NCHRP 255⁵ established acceptable values for the ratio between model volumes and ground counts. System effectiveness was also established through the use of the root mean square error (RMSE) and R-squared measures. **Figure 3.2** shows the screenline results and the RMSE and R-squared measures for the Norfolk travel demand model and the acceptable ranges established by NCHRP 255. The Norfolk travel demand model is well within all acceptable ranges for error.

⁴ Travel Demand Modeling with TransCAD 4.0 User's Manual, 2001 Caliper Corporation

⁵ National Cooperative Highway Research Program Report 255, Highway Traffic Data for Urbanized Area Project Planning and Design, Transportation Research Board, National Research Council, National Academy Press, Washington, D.C., December, 1982.

Figure 3.2
2003 Model Screenline and Calibration Results



3.7 FUTURE ANALYSIS

Next, base future year (2030) traffic volumes were estimated using projected land use information. Although this base future year model does include roadway projects included in the “existing plus committed roadway network” (discussed later in this section), this model was commonly referred to as the “2030 No-build” model throughout this planning process.

For purposes of this study, land use and traffic volume projections were prepared for year 2030. Using the future land use plan presented previously in this document, the future year traffic assignments were developed. Using information from this plan, detailed land use characteristics (population, employment, number of dwelling units, square footage of commercial or retail development, etc.) were defined for each TAZ in the model. Future year traffic assignments were then developed for each roadway through the traditional trip generation, distribution and assignment process. Because the percentage of total trips using modes other than passenger vehicle is relatively small in Norfolk, the fourth step, mode split, was not incorporated into this modeling process.

Only major roadway improvements included in the City’s current Capital Improvement Program (CIP) or identified by City staff as well as improvements planned by the Nebraska Department of Roads, as documented in their Surface Transportation Program, were assumed to exist in the base future (2030) roadway network.

In general, the number of vehicle trips (including both internal and external travel) in the Norfolk area increased from 168,400 trips per day in 2003 to 211,000 trips per day in 2030. This equates to approximately a 0.8% increase in trips compounded annually as shown in **Table 3.3**. Due to development occurring primarily on the fringes of existing development around the City of Norfolk, the total miles of travel around the City of Norfolk are expected to increase at a slightly higher rate, approximately 1.1% compounded annually, as shown in **Table 3.3**.

Table 3.3: System-Wide Model Measures

Model Measures (Daily)	2003 Existing	2030 No-Build	Percent Increase
Total Trips	168,400 Trips	211,000 Trips	0.8%
Vehicle Miles	459,700 Miles	624,200 Miles	1.1%
Vehicle Hours	11,230 Hours	15,110 Hours	1.1%
System Speed	41 MPH	41 MPH	0.0%

4.0 Model Operations

A GISDK script was developed for operating the Norfolk travel demand model. The script adds a new pull-down menu “Norfolk.” The “Base” option under the “Norfolk” menu initiates the model run. The user is prompted to provide the name of the network selection set that contains the links making up the model network (ie, excludes local streets) and the working directory. The user is also prompted to provide the location of the network geographic file, the location of turn penalty/prohibitor file, the location of the balanced production/attraction file and the location of the trip table file. A “Parameters” folder under the working directory must be present and contain the friction factor file and the k-factor matrix.

Appendix 4

Travel-Demand Model Alternative Packages V/C Figures

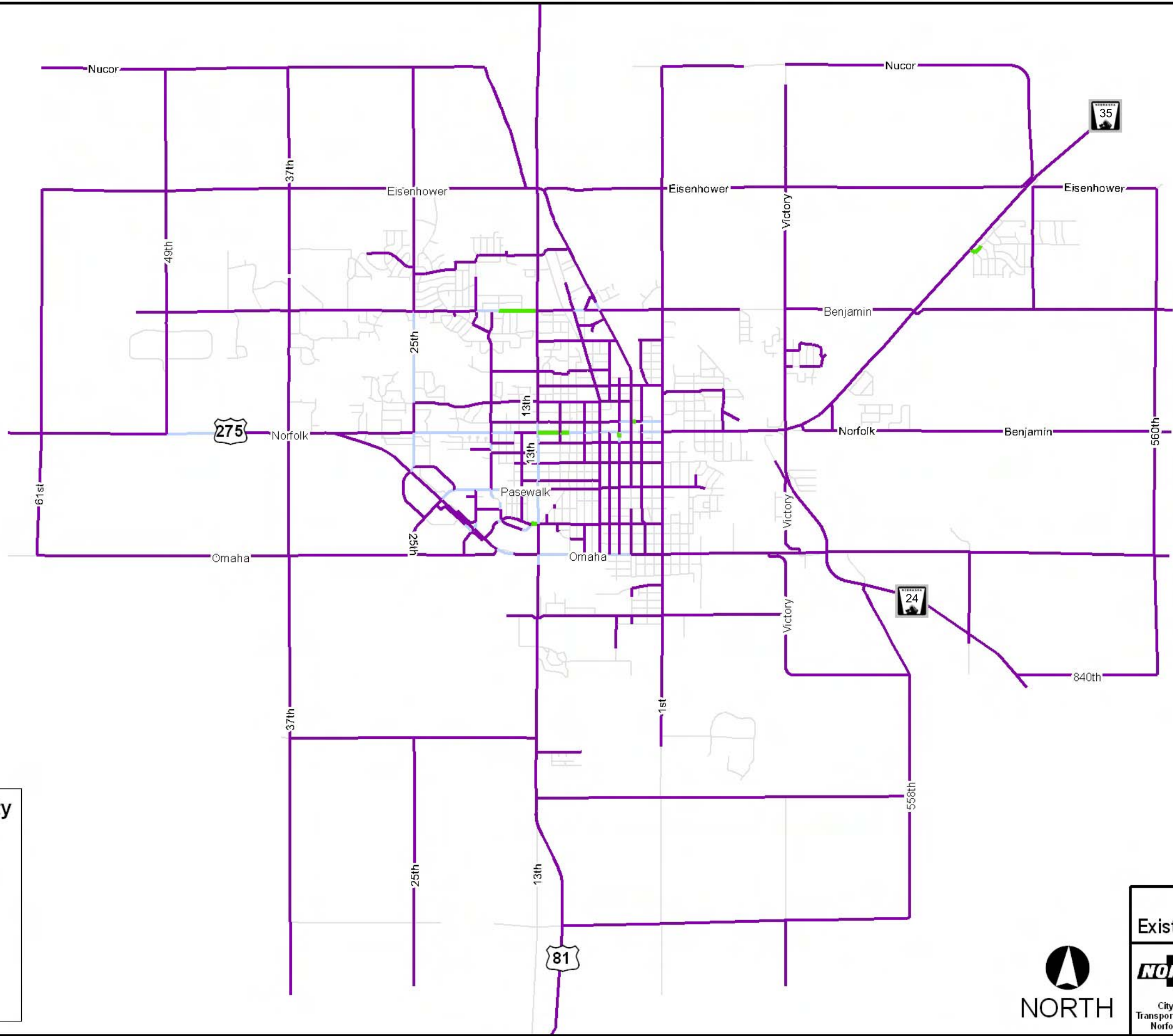
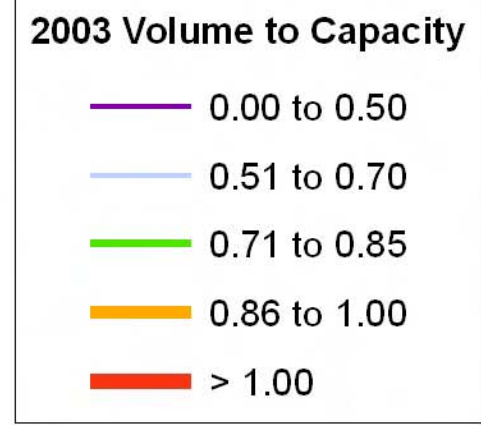


Figure A-1
Existing (2003) Volume to Capacity

NORFOLK

City of Norfolk
Transportation Plan 2030
Norfolk, Nebraska

THE SCHEMMER
ASSOCIATES

2030 Volume to Capacity

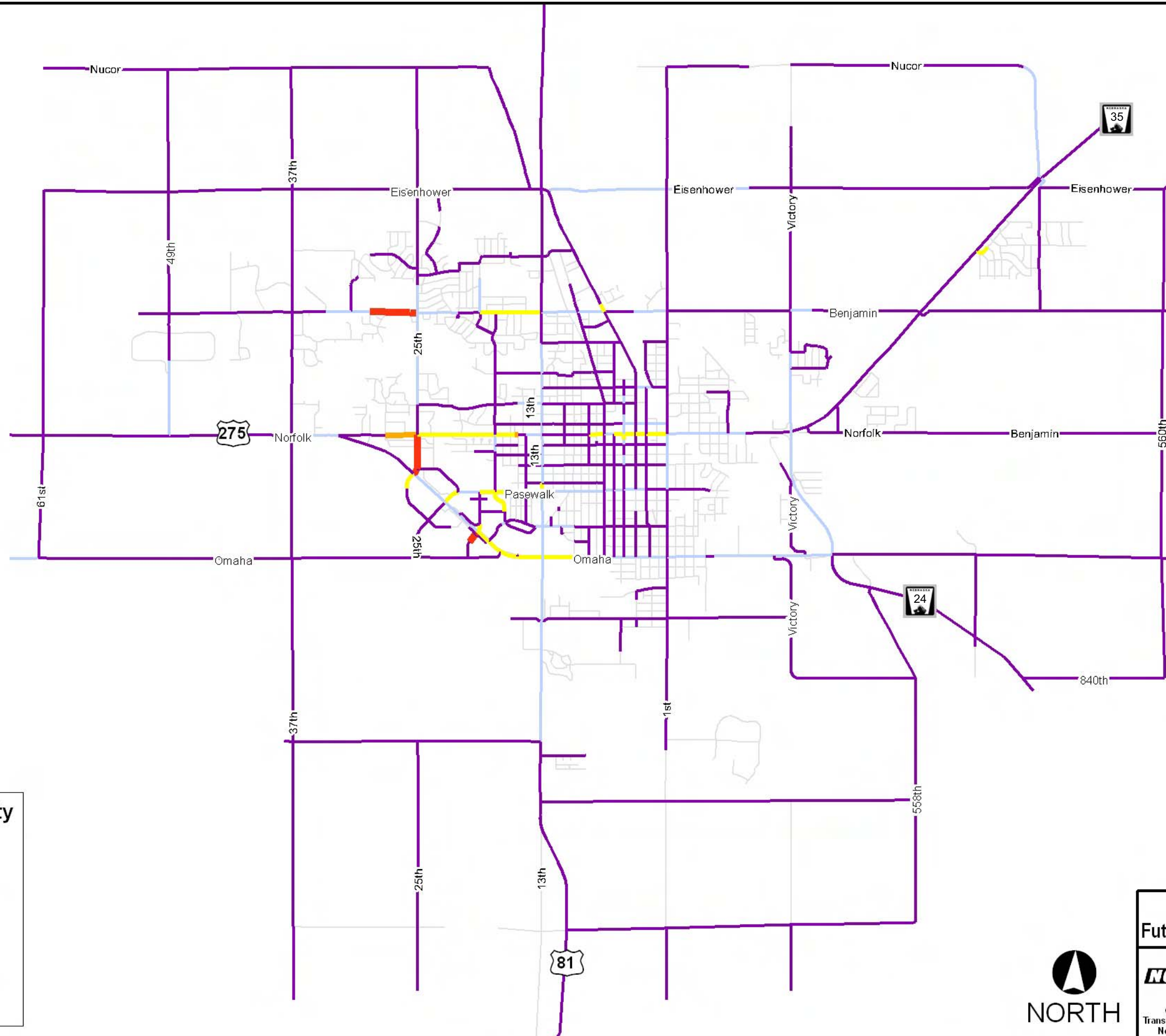
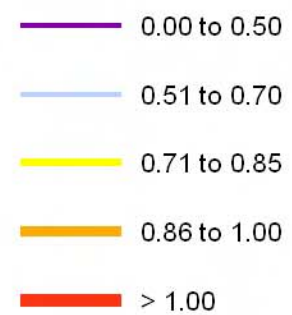
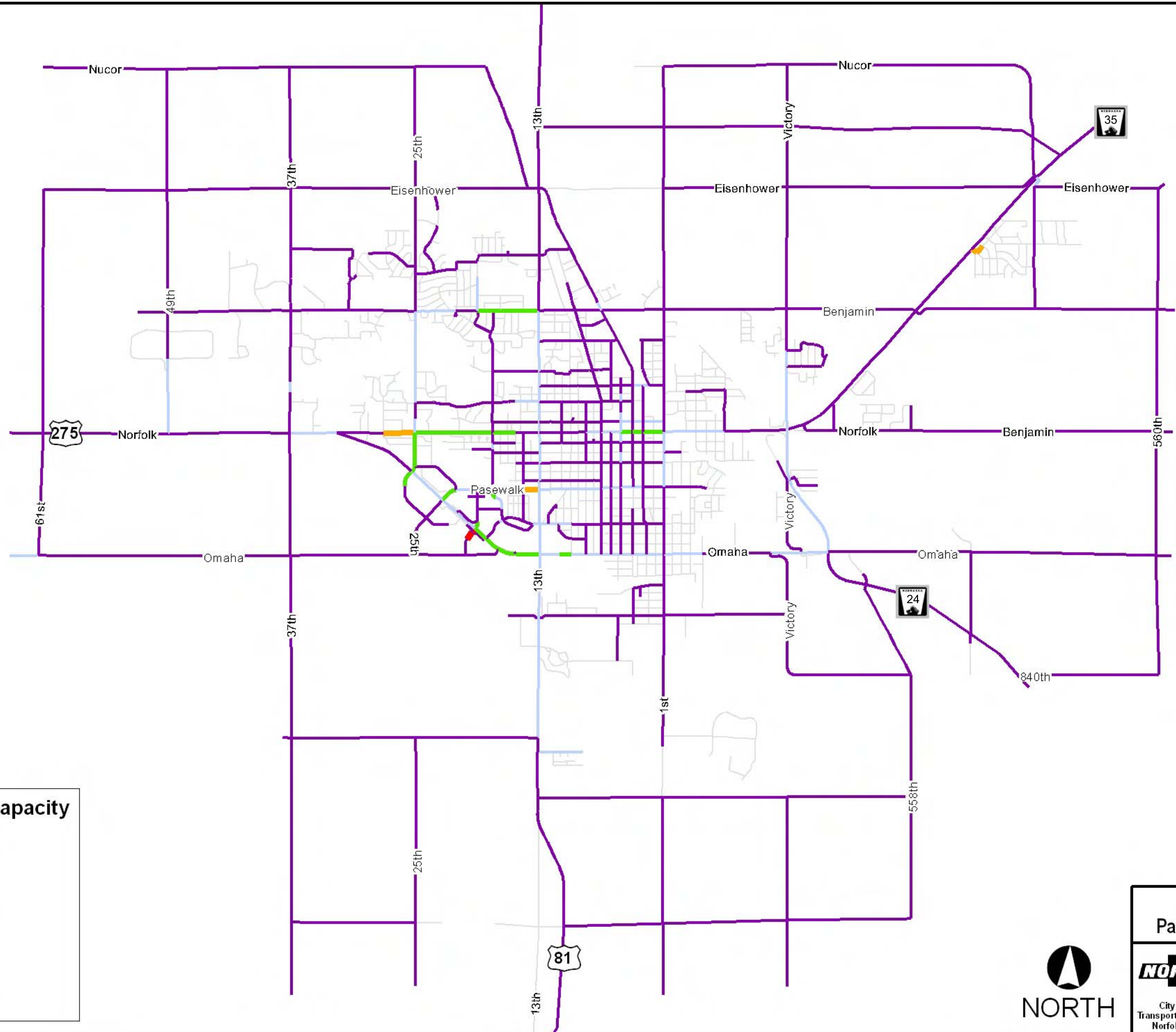


Figure A-2
Future No Build Volume to Capacity



City of Norfolk
Transportation Plan 2030
Norfolk, Nebraska





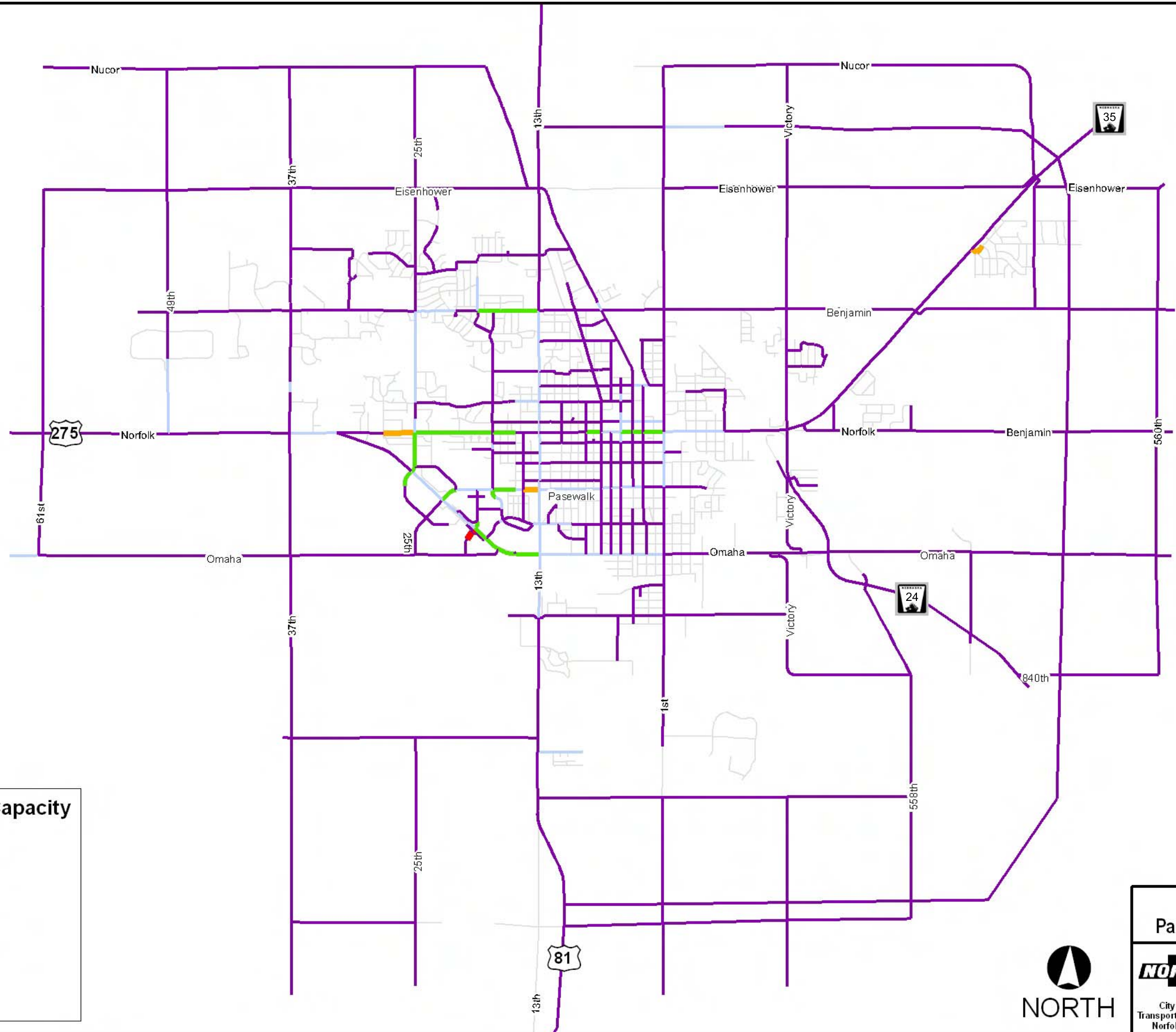
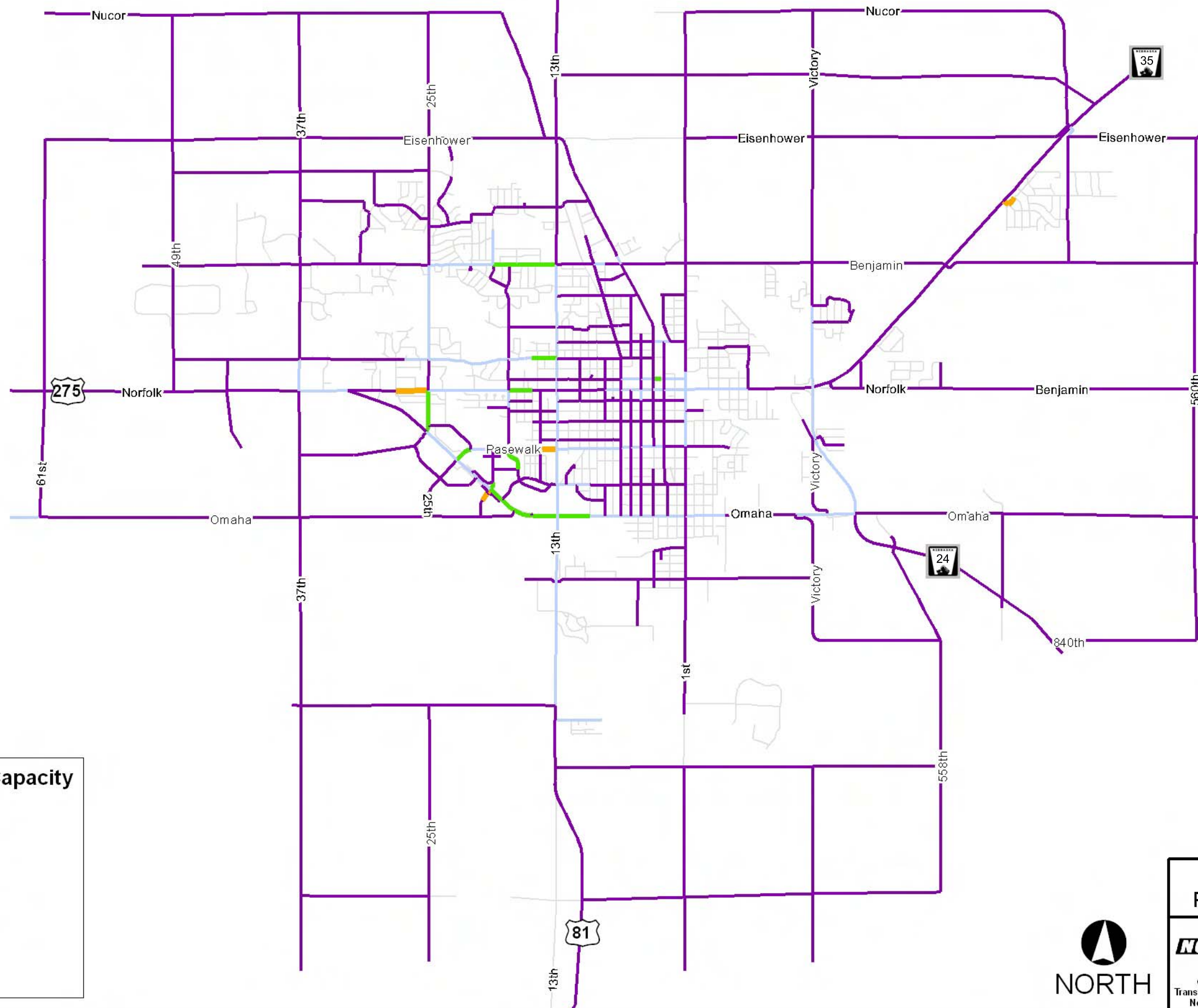


Figure A-4
Package B Volume to Capacity



City of Norfolk
Transportation Plan 2030
Norfolk, Nebraska





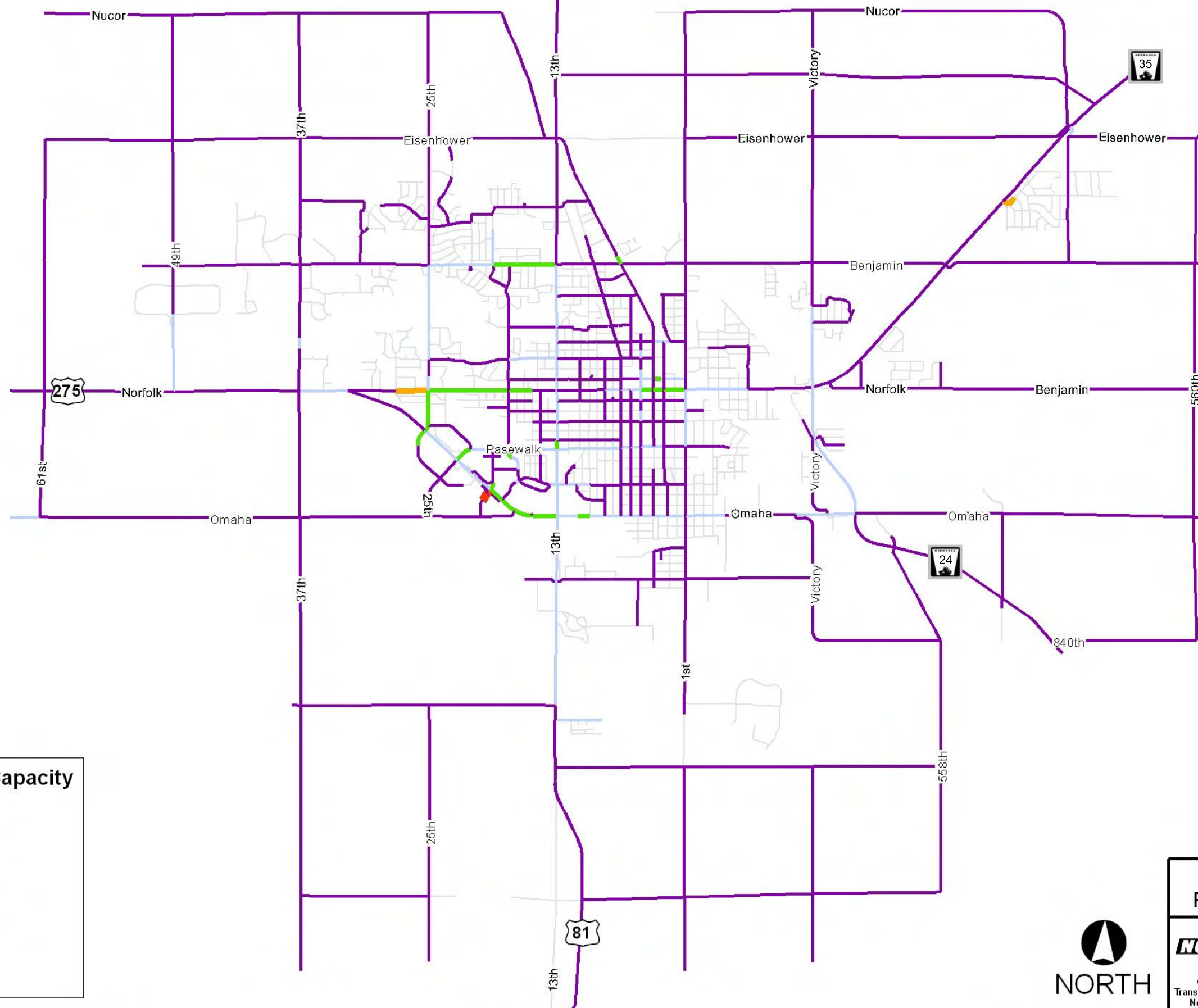


Figure A-6
Package D Volume to Capacity



City of Norfolk
Transportation Plan 2030
Norfolk, Nebraska

