US 81 CORRIDOR STUDY
FROM NORTH OF UNION CITY SOUTH TO SH 19 SOUTH OF CHICKASHA
CANADIAN AND GRADY COUNTIES, OKLAHOMA

JULY 2007

PREPARED BY THE RESEARCH AND PLANNING DIVISION
OKLAHOMA DEPARTMENT OF TRANSPORTATION

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1.0 INTRODUCTION

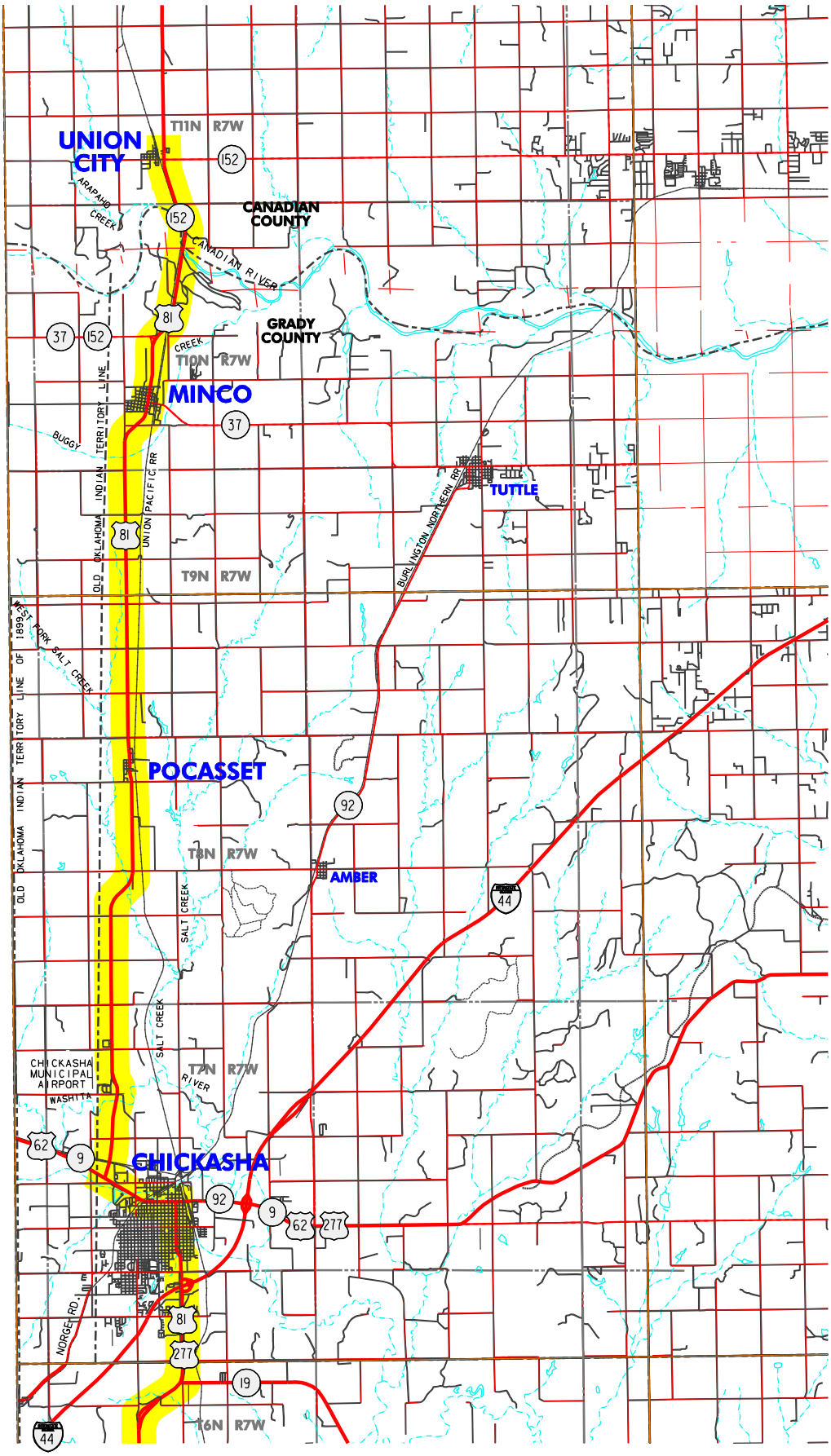
1.1 Background

The scope of this Corridor Study is to evaluate US 81 for improvement to four lanes along an approximate 30-mile segment from the existing reconstruction of US 81 just north of Union City to south of SH 19 in Chickasha. The Corridor Study also evaluates the need for bypasses in the communities of Union City, Minco, Pocasset, and Chickasha. The project extents are illustrated on Figure 1-1.

This Corridor Study report contains the following information:

- Description of the Study Corridor and a summary of previous studies (Chapter One)
- Existing roadway and traffic characteristics, a comparison to current federal safety standards, sufficiency ratings, and environmental conditions along the corridor (Chapter Two)
- Evaluation of baseline traffic, roadway capacity, and intersection capacity, as well as a discussion of the origin-destination (O-D) study performed for the Chickasha Section (Chapter Three)
- A review of projected future traffic under the No-Build Alternative, identification of proposed Build Alternatives and analysis of future traffic under those alternatives, selection of recommended improvements, and a discussion of project segment identification and prioritization (Chapter Four)
- Public involvement with stakeholders, other agencies, organizations, and the public (Chapter Five)
- Summary of recommendations (Chapter Six)

This facility is a north-south US numbered route. The original 1926 highway was a border-to-border route, but decommissioning in the 1990s moved the southern end from Laredo, Texas to Saginaw, Texas, just north of Fort Worth. Currently, the highway's northern terminus is just north of Pembina, North Dakota at the Canadian border.



US 81 CORRIDOR

FIGURE 1-1

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Figure 1-1.dgn

From the Texas border north to US 412 in Enid, Oklahoma, US 81 is part of the National Highway System. Through this section, the majority of US 81 is primarily a four-lane highway that has been greatly improved in recent years. The approximate 30-mile segment of US 81 which is the subject of this Corridor Study will be divided into two (2) distinct sections for purposes of analysis. This report will refer to these two sections as the Northern Section and the Chickasha Section.

1.2 Northern Section Description

The Northern Section extends from the existing reconstruction of US 81 just north of Union City and proceeds southerly approximately 26 miles to the US 62 and US 81 junction northwest of Chickasha. Three (3) towns are located along this section of US 81: Union City, Minco, and Pocasset.

1.3 Chickasha Section Description

The Chickasha Section of US 81 begins at the US 62 and US 81 junction northwest of Chickasha, proceeds east for two miles, then continues south through the City of Chickasha approximately four miles to just south of the US 81 and SH 19 junction south of Chickasha.

1.4 Summary of Previous Studies

A report prepared by ODOT's Rural Transportation Planning Branch in 1978 titled "Preliminary Background Report on US 81 (Chickasha Bypass) in Grady County" indicated that a proposed west US 81 bypass of Chickasha was not a justifiable expenditure of public funds at that time. However, the report concluded that "…if traffic volumes continue to increase, the bypass may prove to be a feasible investment in the future." A subsequent ODOT report dated 1992 and titled "Feasibility Study for a US 81 Bypass Route in Chickasha, Oklahoma" indicated that a West Bypass of Chickasha should be considered for programming when funding became available. Copies of these reports are included in Appendix A.

2.0 EXISTING ROADWAY CHARACTERISTICS

2.1 Surface Width and Type

The Northern Section of the US 81 study corridor is primarily a two-lane, 24-foot wide asphaltic concrete facility. Through the developed areas of Union City, Minco, and Pocasset, the roadway sections range from two-lane to four-lane wide asphaltic concrete facilities.

The Chickasha Section of the US 81 study corridor is constructed as both a divided section and an undivided section roadway. The undivided section is generally located in the downtown Chickasha area, beginning at 11th Street and proceeding easterly to 4th Street, then continuing southerly to Grand Avenue. This undivided section is predominantly a four-lane, 48-foot wide asphalt facility. US 81 has been widened to five-lane cross sections at some of the downtown intersections to accommodate left turn bays. The remaining roadway in the Chickasha Section is divided. The divided section located west of 11th Street is constructed mostly as an asphaltic concrete facility with two 12-foot lanes in each direction and a 40-foot median. The divided section roadway located south of Grand Avenue is constructed as a Portland cement concrete facility, consisting of two 12-foot lanes in each direction and a 16-foot or 24-foot median.

2.2 Shoulder Width and Type

In the Northern Section, paved outside shoulders varying in width from 8 to 10 feet exist along most of the roadway corridor. Some roadway sections have curbs on both sides in place of a shoulder. Through the developed areas of Union City, Minco, and Pocasset, curbs often replace the paved shoulders for the widened segments of US 81.

In the Chickasha Section northwest of Chickasha, shoulders are 10 feet on the outside and 4 feet along the inside. In the downtown area and south of Chickasha, shoulders are paved or curb and gutter is present.

2.3 Existing Right-of-Way Widths

Various right-of-way (ROW) widths exist along US 81 within the study corridor limits. Most of US 81 is a two-lane facility and has a ROW width ranging from 100 to 160 feet. The ROW through the developed areas of Union City, Minco, and Pocasset is 80 feet. From the US 81 and US 62 split northwest of Chickasha proceeding northerly to south of the Chickasha airport, the ROW width is 300 feet or greater. Appendix B contains roadway data for US 81 including ROW widths.

2.4 Access Control

There is currently no access control along US 81. No access control is defined as a facility for which the number of points of ingress and egress onto the roadway are unlimited, except for control over the placement and geometrics of connections as necessary for the safety of the traveling public. In contrast, facilities with full control of access provide connections only at grade-separated interchanges, thus prohibiting at-grade crossings and direct private driveway connections.

2.5 Sufficiency Ratings

Biennially, ODOT prepares a statewide needs study and sufficiency rating report for roadways, bridges, and structures throughout Oklahoma. The latest study was published in 2005 and contains sufficiency ratings as of July 1, 2004. The study assesses the adequacy of the design and condition of the existing State Highway System to serve traffic for the next 20 years. Elements of design and condition are evaluated and assigned relative point values, and the roadway or structure is then assigned a sufficiency rating based upon the total rating value. The total rating value ranges from 0 to 100 points. The factors rated and their maximum point values for roadways are presented in Table 2-1.

Table 2-1: Elements of Roadway Sufficiency Ratings

Rural Roadway	Municipal Roadway

Design Factor	Maximum Value	Condition Factor	Maximum Value	Design Factor	Maximum Value	Condition Factor	Maximum Value
Surface Width	16	Foundation	14	Surface Width	16	Foundation	14
Surface Type	8	Wearing Surface	10	Traffic Control	18	Wearing Surface	10
Shoulder Width & Type	6	Drainage	7	Cross Section	10	Drainage	7
Curvature	8	Shoulders	4	Surface Type	8	Shoulders	4
Gradient	5			Drainage	5		
Stopping Sight Distance	8			Alignment	8		
Passing Opportunity	8						
Hazards	6						
Total	**65**	**Total**	**35**	**Total**	**65**	**Total**	**35**
Total Design & Condition (65 + 35) = 100							

The roadway can then be classified according to adequacy as a result of total points as shown in Table 2-2.

Table 2-2: Roadway Sufficiency Ratings

Sufficiency Rating	Classification
80 - 100	Adequate
70 - 79	Tolerable
60 - 69	Inadequate
59 & Below	Critically Inadequate

Structures are assessed and rated in the terms presented in Table 2-3.

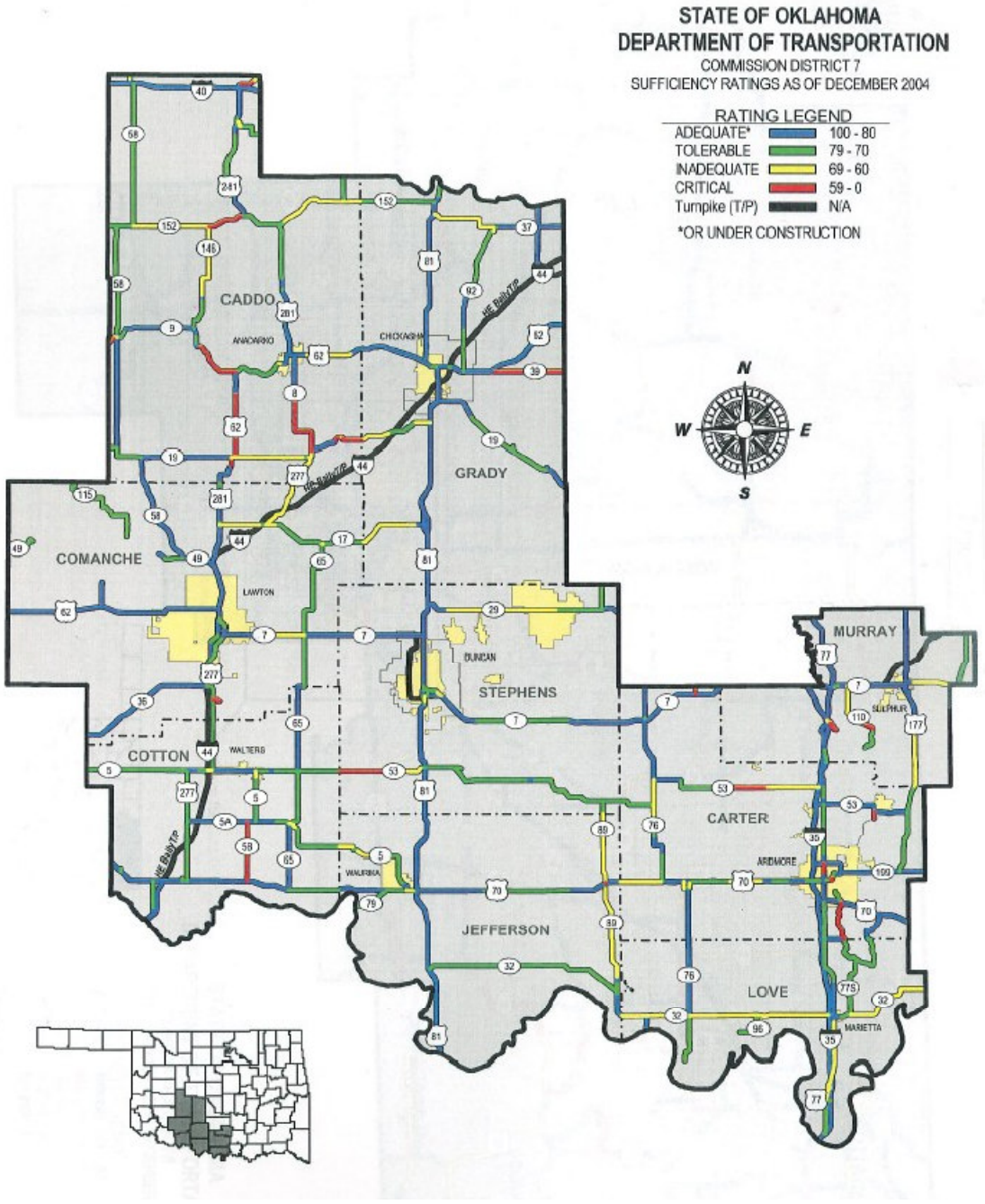
Table 2-3: Structure Sufficiency Ratings

Sufficiency Rating	Description
Adequate (AD)	Meeting minimum design and safety standards
Structurally Deficient (SD)	Physical condition properties below minimum standards
Functionally Deficient (FD)	Geometric properties considered deficient
Not Rated (NR)	Structure underground and cannot be rated

Review of the 2005 needs study and sufficiency rating report indicates that most of the roadways within the US 81 corridor limits are rated as Adequate. Only a short extent within Chickasha has a lower rating of Tolerable. The only structure within the corridor that is not rated Adequate is the Canadian River bridge, located north of SH 37 on US 81. See Figures 2-1 and 2-2 for maps of sufficiency ratings in District 7 and 4, or Appendix C for sufficiency ratings for the project extent.

2.6 Environmental Analysis

Letters soliciting comments relative to anticipated social, economic, and environmental effects of improvement to the US 81 corridor were issued April 26, 2005 to tribal, local, state, and federal agencies. A copy of the solicitation letter, a list of the agencies contacted, and all responses are included in Appendix D, which is bound under separate cover. A database search was also conducted for known environmental issues as reported by Federal, State and/or Local regulatory agencies. Environmental Data Resources, Inc. (EDR) located in Southport, Connecticut, performed the database search and prepared reports of all available environmental information for the corridor, including Leaking Underground Storage Tanks (LUSTs) sites and hazardous and solid waste management sites. Copies of the EDR reports are included in Appendix D. Lastly, a windshield survey of the corridor was conducted to note sensitive areas and facilities. The information collected from the agencies responses, the EDR reports, and



US 81 CORRIDOR STUDY
SUFFICIENCY RATINGS–DIST. 7
FIGURE 2–1

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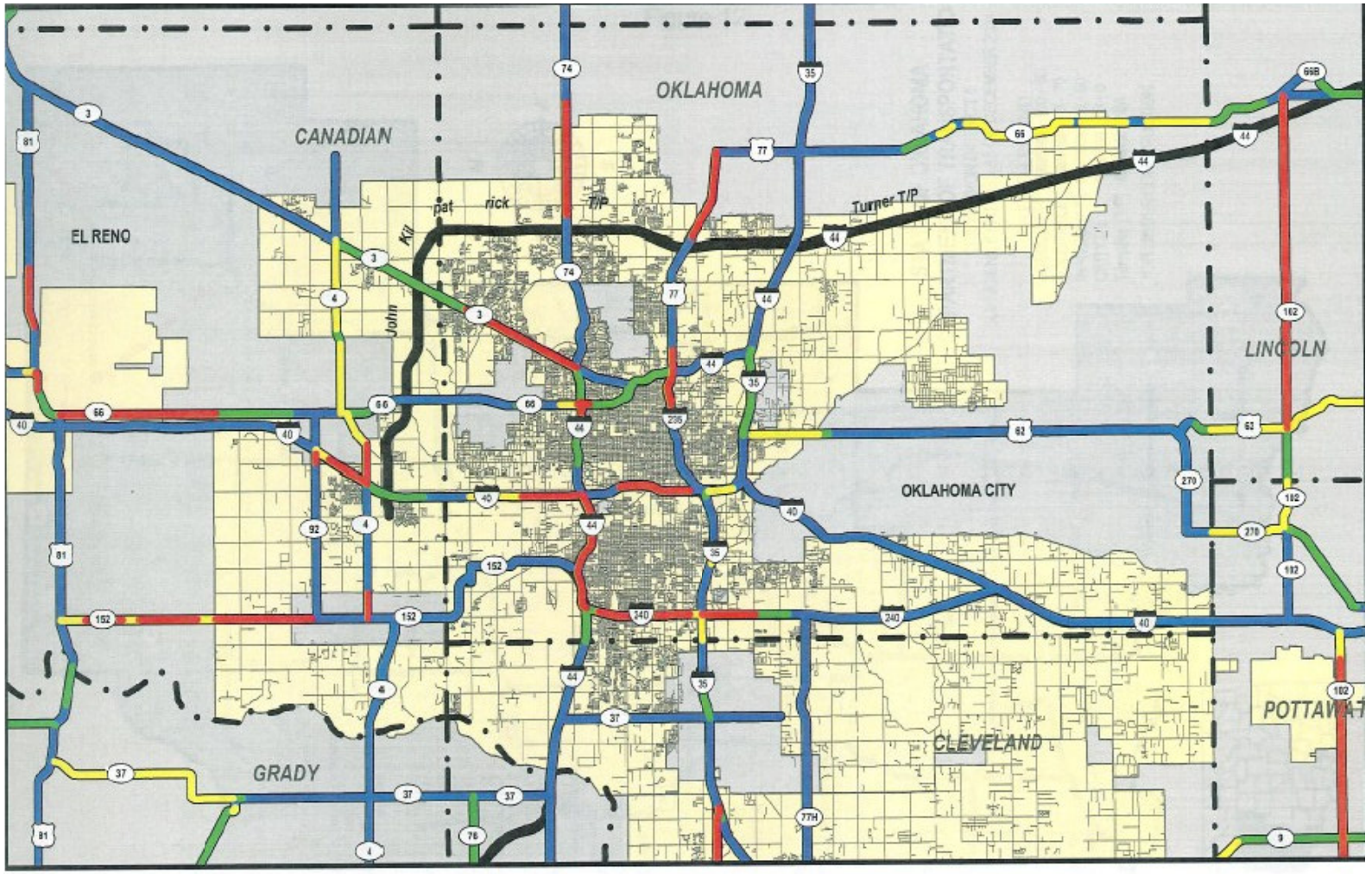
Figure 2-1.dgn

Figure 2-2.dgn



STATE OF OKLAHOMA
DEPARTMENT OF TRANSPORTATION
COMMISSION DISTRICT 4
SUFFICIENCY RATINGS AS OF DECEMBER 2004

RATING LEGEND

ADEQUATE*	100 - 80
TOLERABLE	79 - 70
INADEQUATE	69 - 60
CRITICAL	59 - 0
Turnpike (T/P)	N/A

*OR UNDER CONSTRUCTION

US 81 CORRIDOR STUDY
SUFFICIENCY RATINGS–DIST. 4
FIGURE 2–2

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the windshield survey were compiled to prepare environmental constraints maps, using aerial base maps of the corridor. Selected environmental considerations within the study corridor of approximately 600 feet wide were depicted on these maps. During the public meetings, the public was encouraged to review and comment on the constraints maps. Pertinent information provided by the public was used to finalize the maps. The final environmental constraints maps are included in Appendix D.

3.0 EXISTING TRAFFIC EVALUATION

3.1 Baseline Traffic Conditions

Baseline (2004) traffic conditions along the US 81 Corridor Study area (i.e., traffic volumes, accident data, roadway capacity and level-of-service) were established for the Northern Section and Chickasha Section.

3.1.1 Northern Section

Four (4) methods of traffic data collection were used to establish baseline conditions for the US 81 Northern Section:

- 24-Hour Vehicle Counts
- Peak Hour Turning Movement Counts
- Vehicle Classification
- Accident Summary

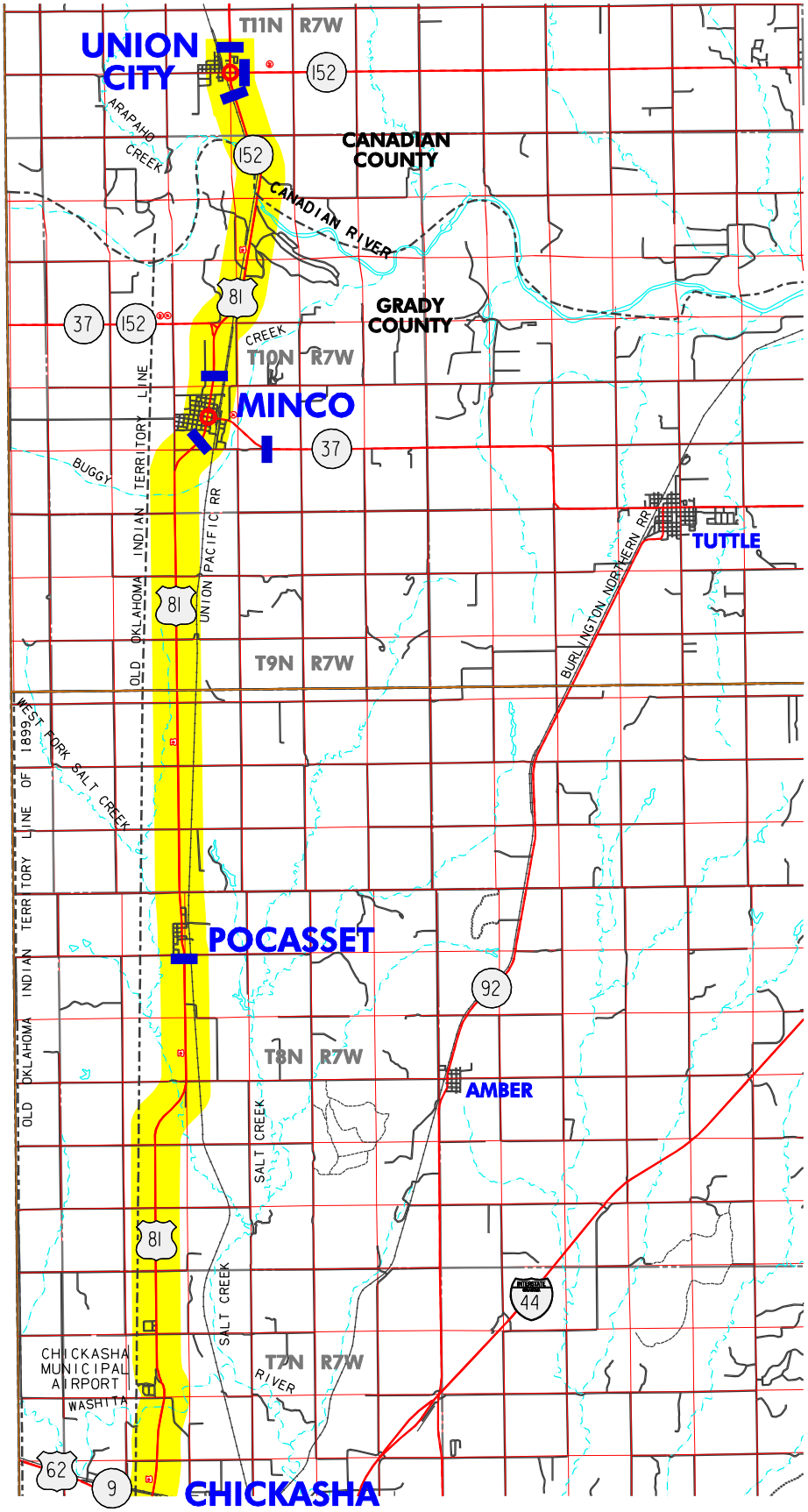
3.1.1.1 Twenty-Four Hour Vehicle Counts

24-hour vehicle counts were conducted at six (6) locations for over a 1-week period from Monday, November 8, 2004 through Wednesday, November 17, 2004. The 24-hour vehicle count for the other location, Station N4, was obtained from the ODOT 2004 Annual Average Daily Traffic (AADT) Map. The locations of the seven (7) vehicle count stations are depicted on Figure 3-1 and can be described as follows:

- Station N1: US 81, South of Pocasset
- Station N2: US 81, South of Minco
- Station N3: SH 37E, East of Minco
- Station N4: SH 37W/SH 152W, North of Minco
- Station N5: US 81, South of Union City
- Station N6: SH 152E, East of Union City
- Station N7: US 81, North of Union City

Table 3-1 summarizes the average daily traffic (ADT) measured at the seven locations. Weekday ADT volumes ranged from 2,050 vehicles on US 81 at SH 37E, east of Minco (N-3) to 5,700 vehicles just south of Union City (N-5). Weekend ADT volumes ranged

FIGURE 3-1



LEGEND

- TUBE COUNTER LOCATION
- TURNING MOVEMENT COUNT LOCATION

TRAFFIC SURVEY LOCATIONS, NORTHERN SECTION

FIGURE 3-1

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12/18/2006

Figure 3-1.dgn

from 1,800 vehicles on US 81 at SH 37E, east of Minco (N-3) to 4,200 vehicles south of Union City (N-5). The daily traffic information for SH 37W/SH 152W, north of Minco (N-4), as AADT obtained from the ODOT Traffic Map, is 4,600.

Table 3-1: 2004 Average Daily Traffic Summary, Northern Section

		2004 Average Daily Traffic (ADT)	
Station	Location	Weekday	Weekend
N-1	US 81, South of Pocasset	4,050	2,700
N-2	US 81, South of Minco	3,300	2,400
N-3	SH 37E, East of Minco	2,050	1,800
N-4	US 81, North of Minco*	4,600	-
N-5	US 81, South of Union City	5,400	4,200
N-6	SH 152E, East of Union City	3,000	2,450
N-7	US 81 North of Union City	5,700	4,800

* Source: ODOT 2004 Annual Average Daily Traffic (AADT) Map

3.1.1.2 Peak Hour Turning Movement Counts

Peak hour turning movement counts were conducted at two locations from 6:00 AM to 9:00 AM and 3:00 PM to 6:00 PM, on Wednesday, November 10, 2004. These counts were performed at the following intersections, as indicated in Figure 3-1:

- US 81 and SH 37E in Minco
- US 81 and SH 152E in Union City

Table 3-2 presents the peak hour turning movement counts measured at the two locations. Review of collected data indicates that the intersection of US 81 and SH 37E carried the highest AM peak hour traffic between 7:15 AM and 8:15 AM and the highest PM peak hour between 4:30 PM and 5:30 PM. The intersection of US 81 and SH 152E carried the highest AM peak hour traffic between 6:00 AM and 7:00 AM and the highest PM peak hour traffic between 4:45 PM and 5:45 PM. These maximum AM and PM peak hour volumes were used to determine existing intersection capacity and delay, as well as to evaluate the need for bypasses.

Table 3-2: 2004 Peak Hour Turning Movement Counts, Northern Section

Intersection Name	2004 AM AND PM PEAK HOUR TURNING MOVEMENT COUNTS													
	Time	Northbound			Southbound			Eastbound			Westbound			TOTAL
		Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
US 81 and SH 37E, Downtown Minco	7:15 AM to 8:15 AM	16	97	26	42	130	46	32	41	6	33	38	29	536
	4:30 PM to 5:30 PM	15	152	39	49	111	22	31	55	11	34	38	43	600
US 81 and SH 152E, Union City	6:00 AM to 7:00 AM	4	96	102	10	56	4	21	39	6	28	10	10	386
	4:45 PM to 5:45 PM	14	86	50	19	164	25	15	22	16	135	47	23	616

For a detailed discussion of intersection operability and functionality, refer to Section 3.3.

3.1.1.3 Vehicle Classification

Manual classification counts were performed at two locations along US 81 to study the different classes of vehicles that use the study corridor. The classification counts were conducted at the intersections of US 81 and SH 37E in Downtown Minco and US 81 and SH 152E in Union City. The counts were performed during the morning peak hours between 6:00 AM and 9:00 AM and evening peak hours between 3:00 PM and 6:00 PM.

Vehicles were classified as either passenger vehicles (cars, vans, half-ton trucks) or trucks (two or more axle trucks, delivery trucks, buses). The observed vehicle classification counts were compared against the recorded traffic volumes to obtain a heavy vehicle percentage using US 81 in the study corridor.

US 81 at SH 37E in Downtown Minco recorded a total bidirectional volume of 376 vehicles during the AM period and 408 vehicles during the PM period. The manual classification counts showed a heavy vehicle factor of 8% during the AM peak and 4% during the PM peak hour along US 81 between Minco and Pocasset.

US 81 at SH 152E recorded a total bidirectional volume of 292 vehicles during the AM peak period and 465 vehicles during the PM peak period. The manual classification

counts showed a heavy vehicle factor of 9% during the AM peak and 8% during the PM peak hour along US 81 between Union City and Minco.

Heavy vehicle percentage data furnished by the ODOT Planning & Research Division indicated a heavy vehicle factor of 24% for the Design Hour Volume (DHV) along US 81 from Chickasha to Union City, which is significantly higher than the observed heavy vehicle factor. It is possible that heavy vehicles may be avoiding US 81 due to the current highway construction work north of Union City, causing the observed heavy vehicle percentage for the corridor to be lower than normal. In order to assess a worse-case scenario, the 24% heavy vehicle percentage furnished by ODOT was used instead of the observed value to perform intersection capacity analyses. Also, the Highway Capacity Manual (HCM) recommended default value of 4% for Recreational Vehicles (RVs) for two-lane rural highways was used.

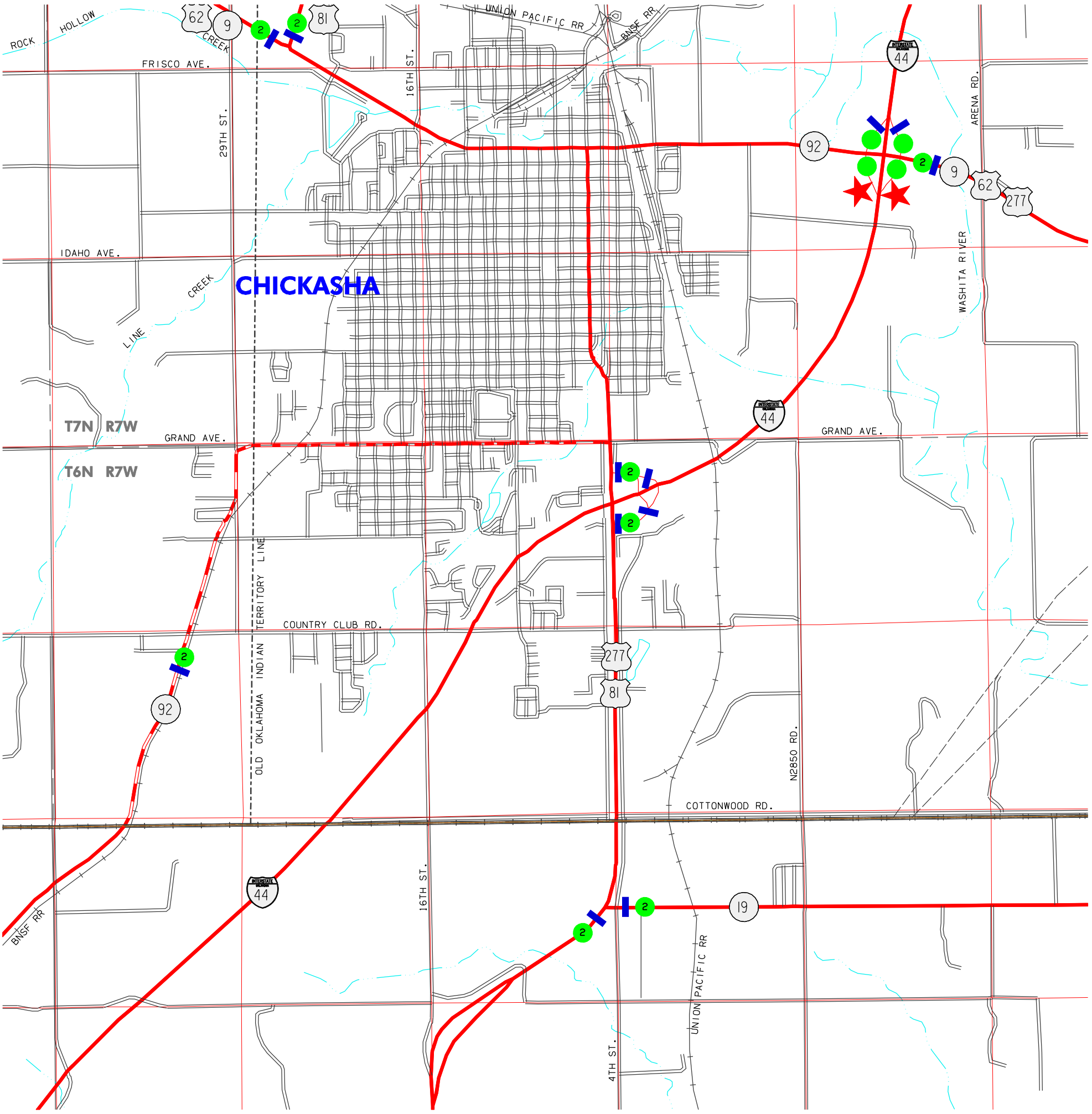
3.1.1.4 Accident Summary

The ODOT Collision Rate Analysis for Statewide Highways for the years 2003-2005 indicates that there are no reported areas with high crash rates north of US 81/US 62.

3.1.2 Chickasha Section

Four (4) methods of traffic data collection were used for the US 81 Chickasha Section:

- 24-Hour Vehicle Counts and Oklahoma Turnpike Authority (OTA) Toll Collection Volumes and Classification
- License Plate Survey
- Vehicle Classification
- Accident Summary



TRAFFIC SURVEY LOCATIONS, CHICKASHA SECTION

FIGURE 3–2

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Figure 3-2.dgn

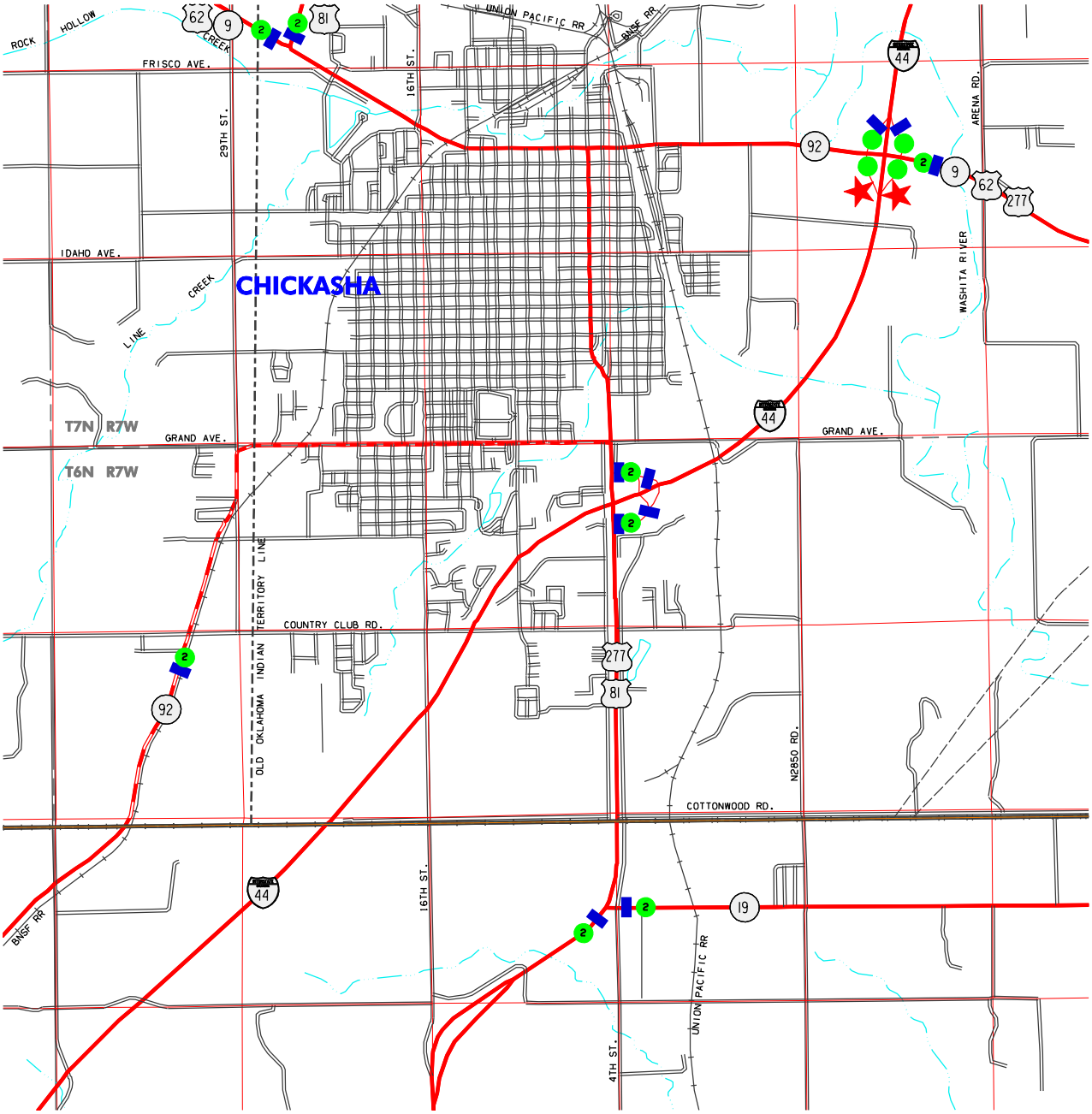
3.1.2.1 24-Hour Vehicle Counts

24-hour vehicle counts were conducted at eight (8) locations which account for the majority of traffic entering or leaving the Chickasha area. The counts were conducted for a 2-week period from Monday, November 29, 2004 through Friday, December 10, 2004. These counts were utilized, along with results of the O-D study, to identify the percentage of traffic that would benefit from using a Northern or a West Bypass of Chickasha. A summary of the O-D study is provided in Section 3.4, and the detailed study is included in Appendix E. The locations of the eight vehicle count stations are depicted on Figure 3-3 and can be described as follows:

- Station 1, US 62 west of US 62/US 81
- Station 2, US 81 north of US 62 /US 81
- Station 3A and 3D, I-44 ramps at US 62
- Station 4, US 62 east of I-44
- Station 5A, 5B, 5C, and 5D, I-44 ramps at US 81
- Station 6, SH 19 east of US 81
- Station 7, US 81 south of SH 19
- Station 8, Norge Road south of Country Club Road

At the I-44 and US 62 interchange, traffic counts for the eastbound off-ramp and westbound on-ramp (i.e., Stations 3B and 3C) were furnished by OTA through their automated toll collection system.

Table 3-3 presents the weekday, weekend, and combined average daily traffic (ADT) for all the eight (8) locations measured during the traffic counts. Weekday ADT volumes along US 81 ranged from 4, 300 vehicles north of US 62/ US 81 to 8,550 south of SH 19.



LEGEND

- LICENSE PLATE SURVEY LOCATION
- TUBE COUNTER LOCATION
- COUNTS FROM OTA

TRAFFIC SURVEY LOCATIONS, CHICKASHA SECTION

FIGURE 3–3

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Figure 3-3.dgn

Table 3-3: 2004 Average Daily Traffic Summary, Chickasha Section

		2004 Average Daily Traffic (ADT)	
Station	Location	Weekday	Weekend
1	US 62 west of US 62/US 81	8,350	5,750
2	US 81 north of US 62 /US 81	4,300	3,350
3A	WB I-44 off-ramp at US 62	2,750	2,750
3B	EB I-44 off-ramp at US 62*	1,200	1,050
3C	WB I-44 on-ramp at US 62*	1,200	1,050
3D	EB I-44 on-ramp at US 62	4,100	2,800
4	US 62 east of I-44	9,650	7,200
5A	WB I-44 off-ramp at US 81	3,200	3,600
5B	WB I-44 on-ramp at US 81	750	650
5C	EB I-44 off-ramp at US 81	800	650
5D	EB I-44 on-ramp at US 81	4,000	3,550
6	SH 19 east of US 81	5,650	3,850
7	US 81 south of SH 19	8,800	8,550
8	Norge Road south of Country Club Road	3,200	2,350

* Traffic counts provided by OTA.

3.1.2.2 License Plate Survey

License plate surveys were conducted at twenty (20) locations surrounding Chickasha (see Figure 3-3 for license plate survey locations). License plate surveys were conducted on Thursday, December 2, 2004 from 6:30 AM to 9:30 AM and from 2:30 PM to 5:30 PM. Data collected from the survey, as well as the ADT from the non-US 81 count locations were used to conduct the O-D study discussed in Section 3.4.

3.1.2.3 Vehicle Classification

Manual classification counts were performed as part of the license plate survey for two locations along US 81 to study the different classes of vehicles that use the study corridor. The classification counts were conducted along US 81 north of US 62 / US81 and US 81 south of SH 19. The counts were performed during the morning peak hours between 6:30 AM and 9:30 AM and evening peak hours between 2:30 PM and 5:30 PM.

Vehicles were classified as either passenger vehicles (cars, vans, half-ton trucks) or trucks (two or more axle trucks, delivery trucks, buses). The observed vehicle classification counts were compared against the recorded traffic volumes to obtain a heavy vehicle percentage using US 81 in the study corridor.

US 81 north of US 62 / US 81 recorded a total bidirectional volume of 334 vehicles during the AM period and 368 vehicles during the PM period. The manual classification counts showed a heavy vehicle factor of 10% during the AM and PM peak periods along US 81 north of US 62 / US 81 in Chickasha.

US 81 south of SH 19 recorded a total bidirectional volume of 536 vehicles during the AM peak period and 771 vehicles during the PM peak period. The manual classification counts showed a heavy vehicle factor of 5% during the AM peak and 8% during the PM peak hour along US 81 south of SH 19 in Chickasha.

Heavy vehicle percentage data furnished by the ODOT Planning & Research Division indicated a heavy vehicle factor of 24% for the Design Hour Volume (DHV) along US 81 from Chickasha to Union City, which is significantly higher than the observed heavy vehicle factor. In order to assess a worse-case scenario, the 24% heavy vehicle percentage furnished by ODOT was used instead of the observed value to perform intersection capacity analyses. Also, the Highway Capacity Manual (HCM) recommended default value of 4% for Recreational Vehicles (RVs) for two-lane rural highways was used.

3.1.2.4 Accident Summary

The ODOT Collision Rate Analysis for Statewide Highways for the years 2003-2005 indicates that one (1) segment located in the Chickasha Section of the US 81 corridor

has a collision rating that is critically high. This segment is described as US 81 from SH 19 north, then west to US 81/US 62 junction. “Critically High” segments are defined by

the number of collisions per 100 million vehicle miles traveled, as compared to all other like roadway segments in the state.

3.2 Baseline Roadway Capacity Analysis

Capacity and LOS analyses were also performed for the highway segments along US 81 in both the Northern and Chickasha Sections to determine the operation of the existing roadway under current demand. Methodologies in the Highway Capacity Manual 2000 (HCM 2000) for rural two-lane and rural and urban multi-lane highways were used for this analysis.

Traffic data required for the analysis, including the peak hour factor (PHF), directional distribution of traffic flow, and heavy vehicle percent (HV%), were extracted from the field collected traffic data discussed previously. The HCM 2000 recommended default values for recreational vehicles (RVs), and PHF for rural and urban highway sections were used at locations where data was not available.

The LOS for Class I two-lane highways is defined in terms of both the percent time-spent-following and average travel speed. Class I includes two-lane highways that are major intercity routes, primary arterials connecting major traffic generators, daily commuter routes, and primary links in state or national highway networks. The HCM 2000-recommended default value of 8 for access-point density was used in the two-lane highway segments analysis. The LOS for multilane highways is primarily determined by the roadway density in terms of passenger car per mile per lane. The five LOS ratings ranging from A to F used to describe roadway capacity and operability are described in Table 3-4.

Table 3-4: Roadway Level of Service Definition Summary

Level of Service	Flow Characteristics	Definition

A	Free flow	Individual drivers are free to select desired speeds, a high degree of maneuverability is present within the traffic stream, and drivers are generally unaffected by the presence of other vehicles. The general level of comfort and convenience is excellent.
B	Low-density stable flow	Drivers remain free to select desired speeds but a slight decline in maneuverability occurs compared with LOS A and the presence of other vehicles becomes noticeable. The level of comfort and convenience is somewhat less than at LOS A.
C	Medium-density stable flow	Selection of speed is affected by the presence of other vehicles, maneuvering within the traffic stream requires substantial driver vigilance, and driver operations are affected significantly by others in the traffic stream. The general level of comfort and convenience is noticeably less at this level than at LOS A or B.
D	High-density stable flow	Selection of speed and freedom to maneuver are severely restricted and small increases in traffic flow will generally cause operational problems. The level of comfort and convenience is generally poor.
E	Unstable flow	Speed is reduced to a low, relatively uniform value and freedom to maneuver is extremely difficult. Operating conditions are at or near the capacity level. Comfort and convenience levels are extremely poor, and driver frustration is generally high.
F	Forced/ Breakdown Flow	Operations are extremely unstable. The amount of traffic approaching a point exceeds the amount that can traverse the point and arrival flow exceeds discharge flow. Queues form behind such locations and operations within the queue are characterized by stop-and-go waves.

3.2.1 Northern Section

The existing US 81 highway segments in the Northern Section, north of Chickasha to Union City, are mostly two-lane roadway sections in the rural areas, with some four-lane roadway sections along the urban areas of Pocasset, Minco, and Union City. The Northern Section was divided into four different segments for analysis purposes, based on the collected traffic volumes and heavy vehicle percentages. The highway segments were analyzed as five to ten-mile long Class I highways located in rolling terrain and comprised of approximately fifty percent (50%) no-passing zones.

Table 3-5 summarizes the LOS calculations for the Northern Section roadway segments. All the Northern Section roadways operated at a LOS C, with the exception of the US 81 roadway segment south of Minco, which provided a LOS B in the AM peak. The worst LOS was for the PM peak on US 81 south of Union City, which reported that vehicles would spend approximately 64% of their time following another vehicle with an average travel speed of 54 miles per hour (mi/h).

Table 3-5: Baseline Roadway LOS Summary, US 81 Corridor, Northern Section

Highway Segment	Capacity Units	Capacity (AM/PM)
US 81, North of US 62 and SH 9 – [T]	Percent Time Spent Following	54.9 / 57.8
	Average Travel Speed, mph	55.7 / 56.1
	Overall LOS	C / C
US 81, Just South of Pocasset - [T]	Percent Time Spent Following	58.0 / 62.1
	Average Travel Speed, mph	56.1 / 55.7
	Overall LOS	C / C
US 81, Just South of Minco - [T]	Percent Time Spent Following	44.9 / 57.5
	Average Travel Speed, mph	56.6 / 56.2
	Overall LOS	B / C
US 81, Just South of Union City - [T]	Percent Time Spent Following	61.5 / 63.9
	Average Travel Speed, mph	54.7 / 54.2
	Overall LOS	C / C
US 81, Just North of Union City - [T]	Percent Time Spent Following	60.6 / 60.1
	Average Travel Speed, mph	55.5 / 55.7
	Overall LOS	C / C

Note: [T] = Two-Lane Highway

3.2.2 Chickasha Section

The segments analyzed in the Chickasha Section include US 81 and other intersecting highways within the study corridor. The roadways are mostly four-lane divided highways through the rural and urban areas of Chickasha and five lane sections with left-turn lanes at intersections in the downtown area. The roadway segments were analyzed as level terrain. Refer to Appendix B for traffic data used in the capacity analysis of the Chickasha Section.

Table 3-6 summarizes the results of the roadway analysis for the Chickasha Section segments. Existing typical sections for some of these segments include two-lane and multilane highways which report LOS differently, i.e., two-lane roadways report an overall LOS based on percent time spent following and an average travel speed, whereas multilane roadways report an overall LOS based on density in passenger cars per mile per lane (pc/mi/ln).

Table 3-6: Baseline Roadway LOS Summary - Chickasha Section

Highway Segment or Intersection	Capacity Units	Capacity (AM/PM)
US 81, South of SH 19 – [M]		
Eastbound	LOS/Density	A(3.3) / A(3.3)
Westbound	LOS/Density	A(1.5) / A(2.6)
US 81/4th St, South of US 62/SH 9– [M]		
Northbound	LOS/Density	--- / B(12.4)
Southbound	LOS/Density	--- / A(10.1)
US 81, South of Grand Ave. – [M]		
Northbound	LOS/Density	--- / B(17.1)
Southbound	LOS/Density	--- / B(13.9)
US 81, South of I-44 – [M]		
Northbound	LOS/Density	--- / B(13.6)
Southbound	LOS/Density	--- / B(16.6)
US 81, North of SH-19 – [M]		
Northbound	LOS/Density	--- / A(10.1)
Southbound	LOS/Density	--- / A(8.2)
Norge Road, South of Country Club Road - [T]	Percent Time Spent Following	52.6 / 53.5
	Average Travel Speed, mph	54.7 / 53.5
	Overall LOS	C / C
US 62 and SH 9, West of US 81 – [M]		
Eastbound	LOS/Density	A(3.8) / A(5.7)
Westbound	LOS/Density	A(3.6) / A(4.1)
US 62/US 277/SH 9, East of I-44 [M]		
Eastbound	LOS/Density	A(3.0) / A(6.0)
Westbound	LOS/Density	A(6.3) / A(4.6)
SH 19, East of US 81 – [M]		
Eastbound	LOS/Density	A(3.8) / A(3.3)
Westbound	LOS/Density	A(3.8) / A(2.9)

Note: [M]=Multi-Lane Highway; [T]=Two-Lane Highway; and Density=passenger cars/mile/lane

The two-lane segment, i.e., Norge Road, operates at an overall LOS C. Drivers on this segment spend approximately 54% of their time following another vehicle; but the highest average speed is reported as approximately 55 mph.

The multilane segments within the business district of Chickasha operated at LOS B, and the segments outside the commercial area operated at LOS A. Peak hour analysis for the multilane segments within the business district was performed only for the PM period due to the lack of available data.

LOS A for multilane highways means that drivers are generally unaffected by the presence of other vehicles and the general level of comfort and convenience is excellent. LOS B for multilane highways means free flow with a noticeable awareness to the presence of other vehicles and a little less freedom to maneuver than LOS A.

3.2.3 Baseline Traffic Operations Summary

The Northern and Chickasha Sections of the US 81 study corridor, when analyzed for intersection capacity and roadway flow characteristics, exhibit no major congestion problems. Sections of US 81 that have been improved to multi-lane segments report the greatest LOS, thereby offering room for future traffic growth. Sections of US 81 that are still two-lane are less accommodative to future traffic growth, and are operating at a LOS that may be approaching conditions that could lead to unstable flows and increased delay in the future.

See Chapter 4 for detailed discussions and analyses based on future traffic growths and proposed alternatives.

3.3 Baseline Intersection Capacity Analysis

Capacity analyses for this Study were performed using Synchro 6, Traffic Signal Coordination Software. Capacity analysis provides a measure of the facility's capacity and the delay that vehicular traffic will experience at specific locations. Delay and operability of intersections is measured using Level of Service (LOS) values ranging from A to F, with F representing failing conditions. Table 3-7 provides an intersection LOS definition summary. A summary of the results of the intersection capacity analyses performed as part of this Study are found in Table 3-8. Signalized intersections are noted with an [S] and unsignalized with an [N].

Table 3-7: Intersection Level of Service Definition Summary

Level of Service	Description	LOS Delay, Unsignalized (seconds)	LOS Delay, Signalized (seconds)
A	Uncongested operations; all queues clear in a single signal cycle.	<= 10s	<= 10s

Level of Service	Description	LOS Delay, Unsignalized (seconds)	LOS Delay, Signalized (seconds)
B	Very light congestion; an occasional approach phase is fully utilized.	>10s and <=15s	>10s and <=20s
C	Light congestion; occasional backups on critical approaches.	>15s and <=25s	>20s and <=35s
D	Significant congestion on critical approaches, but intersection functional. Cars required to wait through more than one cycle during short peaks. No long-standing queues formed.	>25s and <=35s	>35s and <=55s
E	Severe congestion with some long-standing queues on critical approaches. Blockage of intersection may occur if traffic signal does not provide for protected turning movements. Traffic queue may block nearby intersection(s) upstream of critical approach(es).	>35s and <=50s	>55s and <=80s
F	Total breakdown, stop-and-go operation.	>50s	>80s

3.3.1 US 81 at SH 37E, Downtown Minco

The intersection of US 81 and SH 37E in downtown Minco is a four-legged unsignalized intersection with NW Main Street as the west leg. The intersection is stop controlled with flashing red signals at all approaches. The US 81 northbound and southbound approaches provide a shared thru/right-turn lane and a shared thru/left-turn lane. The NW Main Street eastbound and SH 37E westbound approaches provide a shared thru/right/left-turn lane. The existing intersection of US 81 and SH 37E is operating at an overall LOS A for the existing AM and PM peak hours (See Table 3-8).

3.3.2 US 81 at SH 152E, Union City

The intersection of US 81 and SH 152E in Union City is a four-legged intersection with West Division Street as the west leg. The intersection is unsignalized with stop control at all approaches. The US 81 northbound approach provides a shared thru/left-turn lane, an exclusive through lane, and a yield controlled exclusive right-turn lane. The US 81 southbound approach provides a shared thru/right-turn lane and a shared thru/left-turn lane. The SH 152E westbound approach provides a shared thru/left-turn lane with a yield controlled exclusive right-turn lane. The West Division Street eastbound

approach provides a shared thru/right/left-turn lane. The existing intersection of US 81 and SH 152E is operating at an overall LOS A for the existing AM and PM peak hours (See Table 3-8).

Table 3-8: Baseline Intersection LOS Summary

Intersection and Direction of Approach	Calculated LOS
US 81 and SH 37E – [N]	
Eastbound	A/A
Westbound	A/A
Northbound	A/A
Southbound	A/A
US 81 and SH 152E – [N]	
Eastbound	A/A
Westbound	A/A
Northbound	A/A
Southbound	A/A

Note: [N] = Non-Signalized Intersection

3.3.3 US 81 at SH 37W and SH 152W

The intersection of US 81 with SH 37W/SH 152W is three-legged and is located north of its intersection with SH 37E in Minco and south of its intersection with SH 152E in Union City. The intersection is stop controlled along the eastbound minor street (SH 37W/SH 152W) approach and free along the major street (US 81) approaches. US 81 at SH 37W/SH 152W is a two-lane highway with exclusive left and right turn lanes from the northbound and southbound approaches to SH 37W/SH 152W. SH 37W/SH 152W is a two-lane highway with an exclusive right turn lane at the intersection approach to southbound US 81. The primary traffic in conflict is the left turns from the SH 37W/SH 152W westbound approach. Site observations revealed adequate gap between the major street traffic for the entry of minor street vehicles with minimum or no delay. Based on the site observations, intersection geometry, location and traffic control, an intersection capacity analysis was not considered necessary and hence no peak hour turning movement counts were conducted.

3.4 Origin-Destination Study

The Origin-Destination (O-D) study was conducted only for the Chickasha Section. An O-D study was not conducted for the Northern Section as it is assumed that the majority

of traffic would be through traffic and would thereby make use of any proposed bypass. In the Chickasha area, the license plate surveys were conducted to determine the amount of traffic that could potentially make use of a Chickasha bypass.

Traffic for a bypass would consist of 'external local' and 'external through' traffic. External local traffic consists of those vehicles traveling from an origin outside the study area to a destination within the study area, and from an origin inside the study area with a destination outside the study area. External through traffic has both an origin and destination outside the study area and is only passing through the area.

3.4.1 Data Collection Methodology and Execution

License plate surveys were conducted on a typical weekday with at least one surveyor designated at each survey point. This surveyor was responsible for recording the last three characters of a license plate for one direction of traffic. The license plate data of the roadways were recorded for both directions during the morning (AM) and evening (PM) peak hours, from 6:30 AM to 9:30 AM and 2:30 PM to 5:30 PM. A total of twenty (20) survey points were established to collect license plate data. The locations of these survey points are depicted in Figure 3-3.

3.4.2 Factors Affecting Data Collection

Some vehicle license plates were not recorded due to uncontrollable factors in the field common to these types of surveys. These factors included:

- Multiple vehicles traveling at a high rate of speed, and grouped closely together
- Newly-registered vehicles with only a paper license in the rear window
- Dirty license plates
- Inability to read license plates in early AM or late PM, due to no license plate illumination bulbs

These factors may have resulted in some vehicles not being represented in the O-D summary. However, it is assumed that the overall impact of these factors is relatively insignificant.

3.4.3 Chickasha Section Traffic Rationale

A rationale for traffic travel in the Chickasha area was developed in order to identify plausible origin and destination points for vehicles that would potentially make use of a proposed Chickasha bypass. This rationale was based on the assumption that vehicles would use a bypass to avoid traveling US 81 through Chickasha, and that they did not have a secondary destination within Chickasha. The proposed bypass alternatives include:

- West Bypass: A proposed West Bypass having a southern terminus near the intersection of US 81 and SH 19 and a northern terminus at the US 81 and US 62/SH 9 intersection

AND

- North Bypass: A proposed North Bypass having an eastern terminus north of the I-44/US 62 interchange and a western terminus at the intersection of US 81 and County Road 1320

Tables 3-9 and 3-10 summarize the proposed rationales for traffic travel on the West and North Bypasses, respectively.

Table 3-9: Rationale Matrix for 'Origin' Location Traffic Travel Along West Bypass

Survey Location	Zone No.	Traffic Surveyed	West Bypass		Proposed Travel Route
			Rationale for Traffic Travel*	Survey Locations	
1 - US 62, W of US 81	1B	EB traffic	to 44W, 19E, 81/277S and 92S	to 3B, 5B, 6B, 7A and 8A	S on W Bypass
2 - US 81, N of US 62	2A	SB traffic	to 44W, 19E, 81/277S and 92S	to 3B, 5B, 6B, 7A and 8A	S on W Bypass
3 - I 44 at US 62	3B	WB on ramp	to 19E, 81/277S and 92S	to 6B, 7A and 8A	N or S on W Bypass
	3C	EB off ramp	to 62W and 81N	to 1A and 2B	N on W Bypass
4 - US 62, E of I 44	4A	WB traffic	to 19E, 81/277S and 92S	to 6B, 7A and 8A	N or S on W Bypass
5 - I 44 at US 81	5A	WB off ramp	to 19E, 81/277S and 92S	to 6B, 7A and 8A	N or S on W Bypass
	5C	EB off ramp	to 62W, 81N, 19E, 81/277S, and 92S	to 1A, 2B, 6B, 7A and 8A	N or S on W Bypass
6 - SH 19, E of US 81	6A	WB traffic	to 62W, 81N, 44W, 44E and 92S	to 1A, 2B, 5B, 5D and 8A	N on W Bypass
7 - US 81, S of SH 19	7B	NB traffic	to 62W, 81N, 44W, 44E and 92S	to 1A, 2B, 5B, 5D and 8A	N on W Bypass
8 - SH 92, S of Country Club Road	8B	NB traffic	to 62W, 81N, 9/62/277E, 44W, 44E, 19E and 81/277S	to 1A, 2B, 4B, 5B, 5D, 6B and 7A	N or S on W Bypass

*: The above directions indicate the directions of travel and not the roadway direction.

Table 3-10: Rationale Matrix for 'Origin' Location Traffic Travel Along North Bypass

Survey Location	Zone No.	Traffic Surveyed	North Bypass		Proposed Travel Route
			Rationale for Traffic Travel*	Survey Locations	
1 - US 62, W of US 81	1B	EB traffic	to 44E	to 3D	E on N Bypass
2 - US 81, N of US 62	2A	SB traffic	to 44E and 9/62/277E	to 3D and 4B	E on N Bypass
3 - I 44 at US 62	3A	WB off ramp	to 62W and 81N	to 1A, 2B	W on N Bypass
	3C	EB off ramp	to 81N	to 2B	W on N Bypass
4 - US 62, E of I 44	4A	WB traffic	to 81N	to 2B	W on N Bypass
5 - I 44 at US 81	5C	EB off ramp	to 81N	to 2B	W on N Bypass
6 - SH 19, E of US 81	6A	WB traffic	to 81N	to 2B	W on N Bypass
7 - US 81, S of SH 19	7B	NB traffic	to 81N	to 2B	W on N Bypass

*: The above directions indicate the directions of travel and not the roadway direction.

3.4.4 Data Analysis

Following the license plate survey data collection effort, recorded data was compiled in a database for analysis. Data was analyzed via a computer module to determine the number of vehicles traveling “from” or “to” specific locations in the Chickasha area. Results from this analysis were used to develop matrices summarizing the potential traffic volumes for the West and North Bypasses for the AM peak, PM peak, and average daily traffic (Tables 3-11, 3-12, and 3-13, respectively.)

Table 3-11: Proposed Bypass Routes Trip Distribution Summary-AM Peak

AM SUMMARY

TOTAL 'ORIGIN' POINT SURVEYED VEHICLES	TOTAL MATCHED		PERCENT (%) MATCHED		PERCENT (%) MATCHED vs. TOTAL VEHICLES		BYPASS TRAVEL
4,729	648	1,496	34%	79%	14%	32%	N on W bypass
	848		45%		18%		S on W bypass
	201	409	10%	21%	4%	8%	W on N bypass
	208		11%		4%		E on N bypass
	1,905						

Table 3-12: Proposed Bypass Routes Trip Distribution Summary-PM Peak

PM SUMMARY							
TOTAL 'ORIGIN' POINT SURVEYED VEHICLES	TOTAL MATCHED		PERCENT (%) MATCHED		PERCENT (%) MATCHED vs. TOTAL VEHICLES		BYPASS TRAVEL
6,157	1,223	2,502	37%	76%	20%	41%	N on W bypass
	1,279		39%		21%		S on W bypass
	425	803	13%	24%	7%	13%	W on N bypass
	378		11%		6%		E on N bypass
	3,305						

Table 3-13: Proposed Bypass Routes Trip Distribution Summary-2004 ADT

2004 ADT SUMMARY							
TOTAL 'ORIGIN' POINT VEHICLES	TOTAL MATCHED		PERCENT (%) MATCHED		PERCENT (%) MATCHED vs. TOTAL VEHICLES		BYPASS TRAVEL
29,087	4,592	10,120	34%	75%	16%	35%	N on W bypass
	5,528		41%		19%		S on W bypass
	1,826	3,430	13%	25%	6%	12%	W on N bypass
	1,604		12%		6%		E on N bypass
	13,550						

3.4.5 West Bypass Analysis

As an additional analysis effort, a segmental analysis of the West Bypass was performed to determine the amount of Chickasha area traffic that would benefit from each segment of the West Bypass. The analyzed segments include:

- Segment 1 – Proposed West Bypass from its northern terminus at the US81/US62 intersection and southern terminus at the Norge Road/Country Club Road intersection
- Segment 2 – Northern terminus at the Norge Road/Country Club Road intersection and southern terminus at the proposed I-44/West Bypass interchange near Cottonwood Road
- Segment 3 – Northern terminus at the I-44/West Bypass interchange and southern terminus at US81 south near the US81/SH19 intersection

The license plate survey data was analyzed via a computer module to determine the number of vehicles traveling each segment of the West Bypass for the AM peak, PM peak, and average daily traffic (Tables 3-14, 3-15, and 3-16, respectively).

Table 3-14: Proposed West Bypass Routes Trip Distribution Summary-AM Peak

AM SUMMARY			
WEST BYPASS	**TOTAL SURVEYED VEHICLES**	**TOTAL MATCHED**	**PERCENT (%) MATCHED vs. TOTAL VEHICLES**
Segment 1	2,866	593	21%
Segment 2	4,366	798	18%
Segment 3	4,055	1,016	25%

Table 3-15: Proposed West Bypass Routes Trip Distribution Summary-PM Peak

PM SUMMARY			
WEST BYPASS	**TOTAL SURVEYED VEHICLES**	**TOTAL MATCHED**	**PERCENT (%) MATCHED vs. TOTAL VEHICLES**
Segment 1	3,794	1,199	32%

Segment 2	5,705	1,747	31%
Segment 3	5,392	1,472	27%

Table 3-16: Proposed West Bypass Routes Trip Distribution Summary-2004 ADT

2004 ADT SUMMARY			
WEST BYPASS	**TOTAL VEHICLES**	**TOTAL MATCHED**	**PERCENT (%) MATCHED vs. TOTAL VEHICLES**
Segment 1	17,128	4,724	28%
Segment 2	26,349	6,628	25%
Segment 3	25,096	6,389	25%

As indicated by Table 3-16, an overall 25 - 28% of the total surveyed 'External through' traffic would benefit from the West Bypass Segments 1, 2 and 3. A high of 32% travel during the PM peak was recorded along Segment 1, with its northern terminus at the Country Club Road and SH92 intersection and southern terminus along I-44, immediately south of Cottonwood Road. Therefore, at least 25% or more of the surveyed vehicles would be benefited from the West Bypass.

3.4.6 Origin-Destination Findings

The Origin-Destination study results for the proposed West and North Bypasses were examined for the AM and PM peak hour and average daily traffic conditions. Results indicate that a significantly high percentage of traffic is estimated to travel the West Bypass, while the estimated percentage of traffic likely to travel the North Bypass is low.

The O-D study results indicate that the West Bypass is likely to reduce the total traffic traveled on US 81 through Chickasha by approximately 32% in the AM, 41% in the PM, and 35% daily. The exclusive West Bypass analysis indicates that an approximate 25% to 28% of the 'External through' traffic would bypass downtown Chickasha by traveling the West Bypass.

The O-D study results indicate that the North Bypass is likely to reduce the total traffic traveled on US 81 through Chickasha by approximately 8% in the AM, 13% in the PM, and 12% daily. If traffic traveling only on I-44 and/or US 62 (e.g., a vehicle westbound on US 62 east of Chickasha destined for northbound US 81 north of Chickasha) is

removed from this analysis, only 6% to 7% of ‘external through’ traffic would bypass downtown Chickasha by traveling the North Bypass.

Based on these results, a West Bypass is chosen for further evaluation to improve travel time through the US 81 corridor and decrease fuel consumption and emissions. The North Bypass will be eliminated from any additional evaluations.

The complete detailed O-D study is contained in Appendix E.

4.0 IMPROVEMENT ANALYSIS

4.1 Future Traffic Analysis, No-Build Alternative

The purpose of the Study includes improving the operations of the study corridor to accommodate the existing and future demand. Future traffic demand was developed for the No-Build Alternative and the LOS was determined to assess the operational conditions of the study corridor.

The raw traffic data obtained during the field study were compared against the volumes provided by ODOT Planning & Research Division. Table 4-1 presents the comparison at some locations in the Northern and Chickasha Sections.

Table 4-1: Compared Field Data and ODOT ADT

Ref No.	Location	2003 ADT (ODOT)	2004 Raw ADT
NORTHERN SECTION			
1/1A	US 81, South of Pocasset	3,500	3,474
2	US 81, South of Minco	3,200	3,075
3	SH 37E, East of Minco	2,000	1,974
4	US 81, South of Union City	5,100	5,314
CHICKASHA SECTION			
1	SH 62, West of US 81/SH 62 Split	7,500	7,790
2	US 81, South of Airport Road	4,300	4,106
8	Norge Road, South of Country Club Road	3,000	3,008

Table 4-1 indicates that the volumes obtained from the field study compare favorably with the average daily traffic provided by ODOT. Based on this comparison, it was decided that the ODOT projected traffic volumes for the year 2030 would be used for all the future alternatives analyses (Sections 4.1.1 and 4.3.1).

4.1.1 Future Traffic Demand

4.1.1.1 Northern Section

Table 4-2 presents the existing (2004) and future (2030) average daily traffic volumes for all the segments in the Northern Section for the No-Build Alternative.

Table 4-2: Projected Average Daily Traffic Volumes, US 81 Corridor, Northern Section, No-Build Alternative

US 81 Segment	Existing Traffic Volume (2004)	No-Build Alternative Projected Traffic Volume (2030)
US 81, North of Chickasha	4,100	7,300
US 81 at Pocasset	3,500	5,300
US 81, South of Minco	4,600	7,000
US 81, North of Minco	5,100	7,850
US 81, South of Union City	5,600	8,500
US 81, North of Union City	5,900	9,750

4.1.1.2 Chickasha Section

Table 4-3 presents the existing (2004) and future (2030) ADT along US 81, major intersecting highways, and impacted intersections for the No-Build Alternative. The data was developed in coordination with ODOT Planning & Research Division and information obtained from various sources including ODOT Planning & Research Division, City of Chickasha Urban Counts, ODOT 1992 Feasibility Study, and the field study.

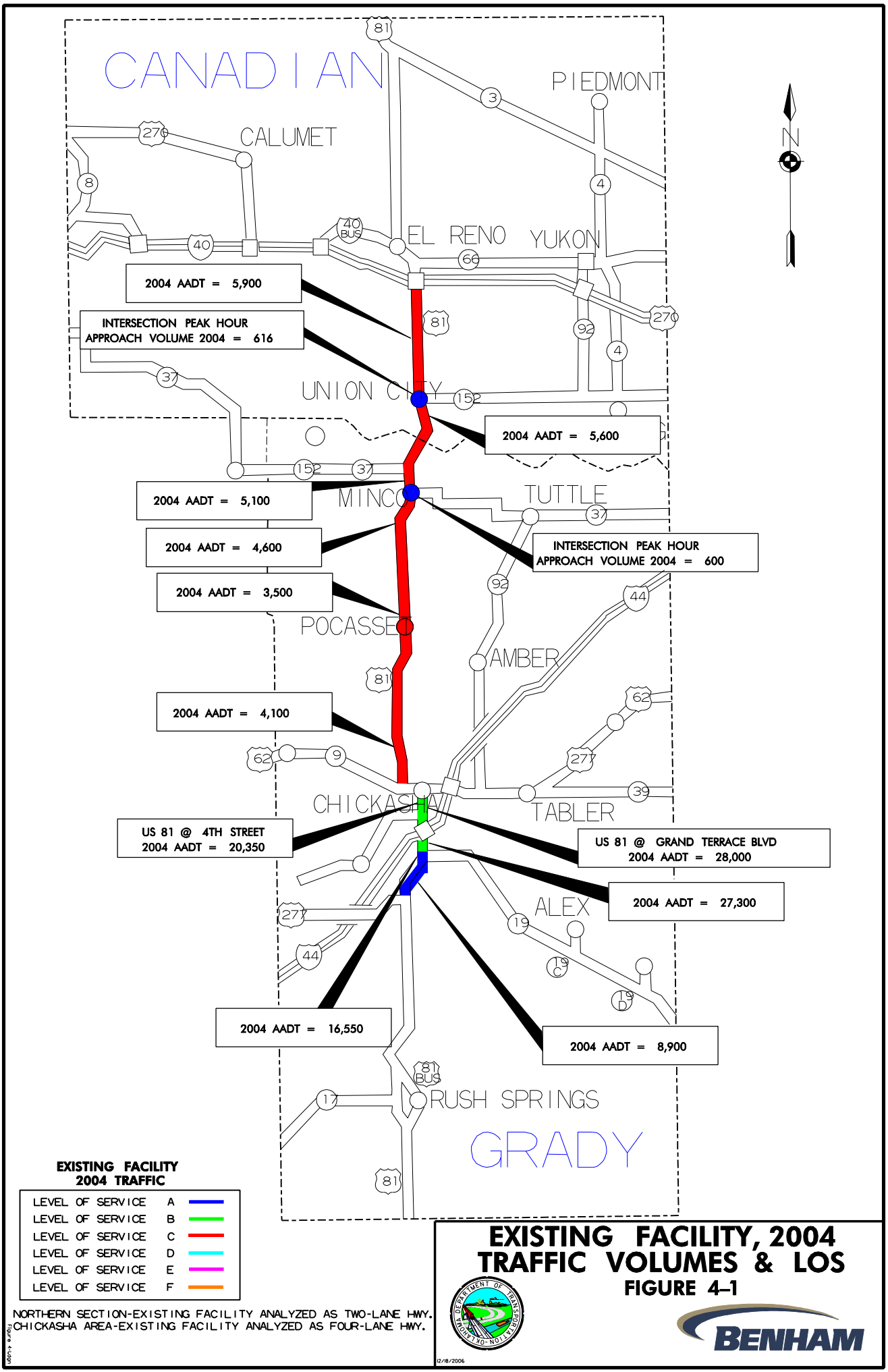
Table 4-3: Projected Average Daily Traffic Volumes, US 81 Corridor, Chickasha Section, No-Build Alternative

Arterial Description	Existing Traffic Volume (2004)	No-Build Alternative Projected Traffic Volume (2030)
US 62/SH 9, West of US 81	8,300	12,500
US 81, North of US 62/SH 9	4,300	8,900
US 62/US 277/SH 9, East of I-44	9,200	21,200
US 81/4th Street, South of US 62/SH 9	20,350	46,750
US 81 at Grand Avenue	28,000	49,850
US 81, South of I-44	27,300	47,850
US 81, North of SH 19	16,550	31,600
SH 19, East of US 81	5,500	9,400
US 81, South of SH 19	8,900	15,400

The existing (2004) and future (2030) design hour traffic volumes for the No-Build Alternative are presented in Figures 4-1 and 4-2.

4.1.2 Future Roadway Capacity Analysis

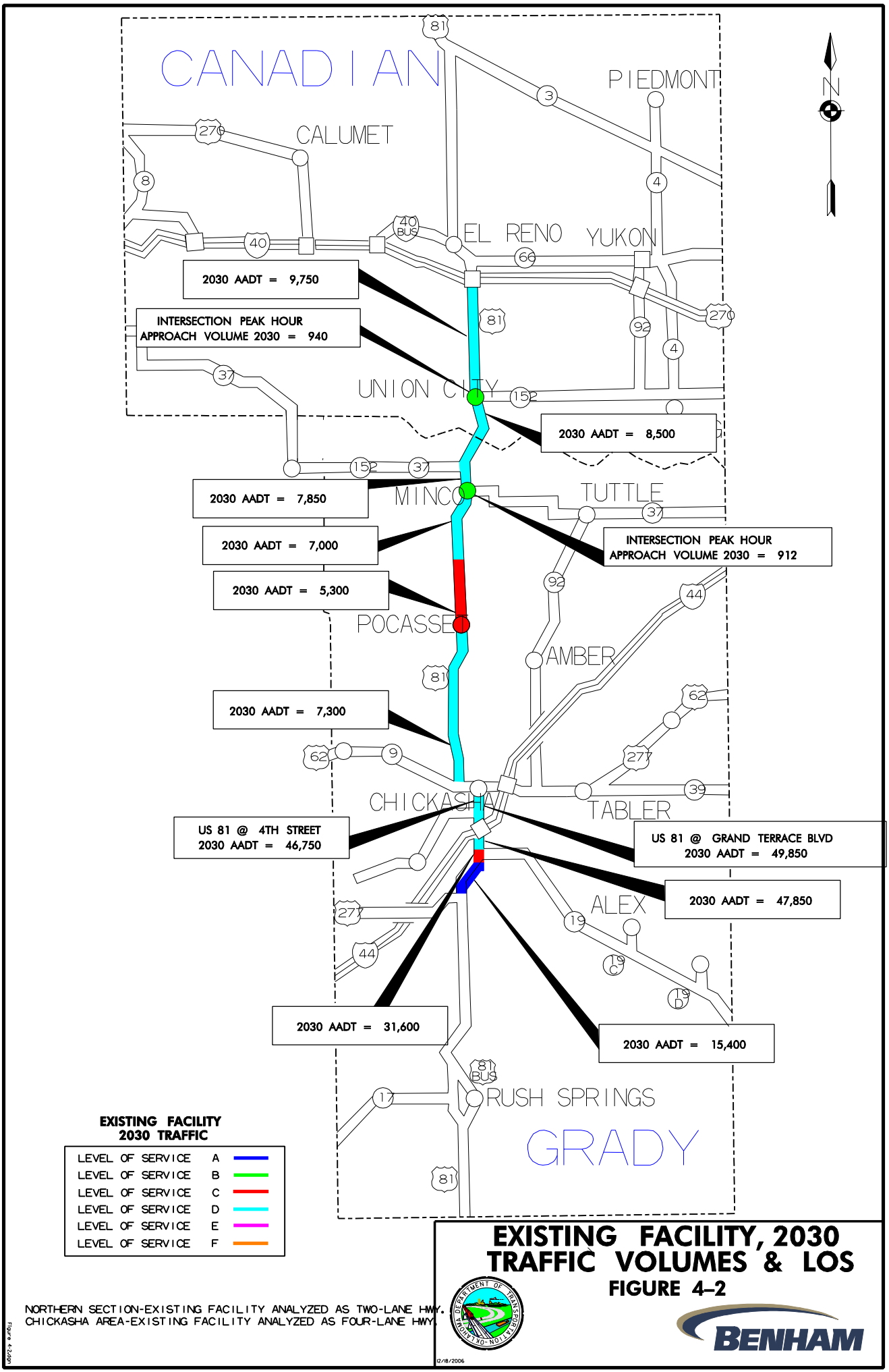
Capacity and LOS analyses were performed for the US 81 study corridor in both the Northern and Chickasha Sections for the No-Build Alternative to determine the roadway capacity for future 2030 traffic demand. Methodologies in the Highway Capacity Manual 2000 (HCM 2000) for rural two-lane and rural and urban multi-lane highways were used for this analysis.



EXISTING FACILITY, 2004 TRAFFIC VOLUMES & LOS

FIGURE 4-1

BENHAM



EXISTING FACILITY, 2030 TRAFFIC VOLUMES & LOS

FIGURE 4-2

NORTHERN SECTION-EXISTING FACILITY ANALYZED AS TWO-LANE HWY.
CHICKASHA AREA-EXISTING FACILITY ANALYZED AS FOUR-LANE HWY.

BENHAM

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Figure 4-2.dgn

4.1.2.1 Northern Section

The future 2030 traffic demand on the No-Build Alternative, as outlined in Table 4-2, was used to determine the future roadway capacity and LOS. Traffic data required for the analysis include peak hour factor, K factor, directional distribution, percent of heavy and recreation vehicles and topography. The peak hour factor (PHF) is an adjustment to fix the variation of flow during the peak hour. A PHF ranging from 0.66-0.90 was observed from the site studies for the Northern Section study corridor. The proportion of total daily traffic that occurs in the peak hour is defined by the K-factor. The K-factors for Union City and Minco were identified by comparing the peak hour turning movement counts and average daily traffic information from the Northern Section count locations. The Highway Capacity Manual (HCM 2000) recommends default values of 0.095 and 0.100 for rural developed and rural undeveloped regions. A default value of 0.100 was used for deriving the peak hour volumes for Pocasset from the ADT. The heavy vehicle factors used for the Northern Section No-Build Alternative are shown in Table 4-4. Directional distribution identifies the traffic characteristic when volume may be greater in one direction than in the other. HCM recommends a default value of 60/40 for rural highways. Traffic data from the field, which was used in the study, revealed a directional split ranging from 55/45 to 70/30 in the Northern Section study corridor. Terrain type is used in the capacity analysis in lieu of a specific grade and HCM classifies it as level, rolling and mountainous. Rolling terrain was used in the capacity analysis for the Northern Section US 81 study corridor. Rolling terrain is a combination of horizontal and vertical alignments causing heavy vehicles to reduce their speed substantially below that of passenger cars but not to operate at crawl speeds for a significant amount of time.

As indicated in Table 4-4, most of the Northern Section roadway segments operate at unacceptable LOS D, except for the segment through Pocasset, which operates at LOS C. The capacity analysis indicates that the LOS for the Northern Section US 81 segments would deteriorate under the No-Build Alternative.

Table 4-4: Future 2030 Capacity and LOS Analysis, US 81 Corridor, Northern Section, No-Build Alternative

No	Arterial Description	2030 ADT	% Trucks	Percent Time Spent Following	Average Travel Speed (mph)	v/c Ratio	LOS
1	US 81, North of Chickasha	7,300	23	71.4	53.1	0.33	D
2	US 81 at Pocasset	5,300	23	62.6	54.1	0.28	C
3	US 81, South of Minco	7,000	10	65.1	54.0	0.29	D
4	US 81, North of Minco	7,850	10	68.1	53.3	0.32	D
5	US 81, South of Union City	8,500	11	75.2	51.2	0.43	D
6	US 81, North of Union City	9,750	11	78.8	49.8	0.49	D

4.1.2.2 Chickasha Section

The future 2030 traffic demand for the No-Build Alternative as outlined in Table 4-3 was used to determine the future roadway capacity and LOS. Traffic data required for the analysis include peak hour factor, K factor, directional distribution, percent of heavy and recreation vehicles and topography. The peak hour factor (PHF) is an adjustment to fix the variation of flow during the peak hour. A PHF ranging from 0.73-0.93 was observed from the site studies for the Chickasha Section study corridor. The proportion of total daily traffic that occurs in the peak hour is defined by the K-factor. The K-factor for Chickasha was identified by comparing the peak hour counts from the license plate survey and average daily traffic information from the Chickasha Section count locations. The Highway Capacity Manual (HCM 2000) recommends default values of 0.091 and 0.093 for urbanized and urban regions. A default value of 0.092 was used at locations where field data was not available. The heavy vehicle factors used for the Chickasha Section No-Build Alternative are shown in Table 4-5. Directional distribution identifies

the traffic characteristic when volume may be greater in one direction than in the other. HCM recommends a default value of 60/40 for urban highways. Traffic data from the field, which was used in the study, revealed a directional split ranging from 55/45 to 60/40 in the Chickasha Section study corridor. Terrain type is used in the capacity analysis in lieu of a specific grade and HCM classifies it as level, rolling and mountainous. Rolling terrain was used in the capacity analysis for the Chickasha Section US 81 study corridor. Rolling terrain is a combination of horizontal and vertical alignments causing heavy vehicles to reduce their speed substantially below that of passenger cars but not to operate at crawl speeds for a significant amount of time. Table 4-5 summarizes the results of the LOS and capacity analysis for the four-lane Chickasha Section US 81 study corridor under the No-Build Alternative.

Table 4-5: Future 2030 Capacity and LOS Analysis, US 81 Corridor, Chickasha Section, No-Build Alternative

No	Arterial Description	2030 ADT	% Trucks	Density (pc/mi/ln)		LOS	
				NB	SB	NB	SB
1	US 81/4th Street South of US 62/SH 9	46,750	15	24.2	30.6	C	D
2	US 81 South of Grand Avenue	49,850	10	26.3	33.5	D	D
3	US 81 South of I-44	47,850	15	25.4	32.3	C	D
4	US 81 North of SH 19	31,600	15	16.5	20.2	B	C
5	US 81 South of SH 19	15,400	15	8.2	10.0	A	A

Table 4-5 indicates that under the No-Build Alternative the US 81 segments through the Central Business District (CBD) of Chickasha operate at an unacceptable level of LOS D. The roadway segments south of the business district operate at LOS C and A. The capacity analysis indicates that the LOS for the US 81 Chickasha Section would deteriorate under the No-Build Alternative.

4.2 Development of Build Alternatives

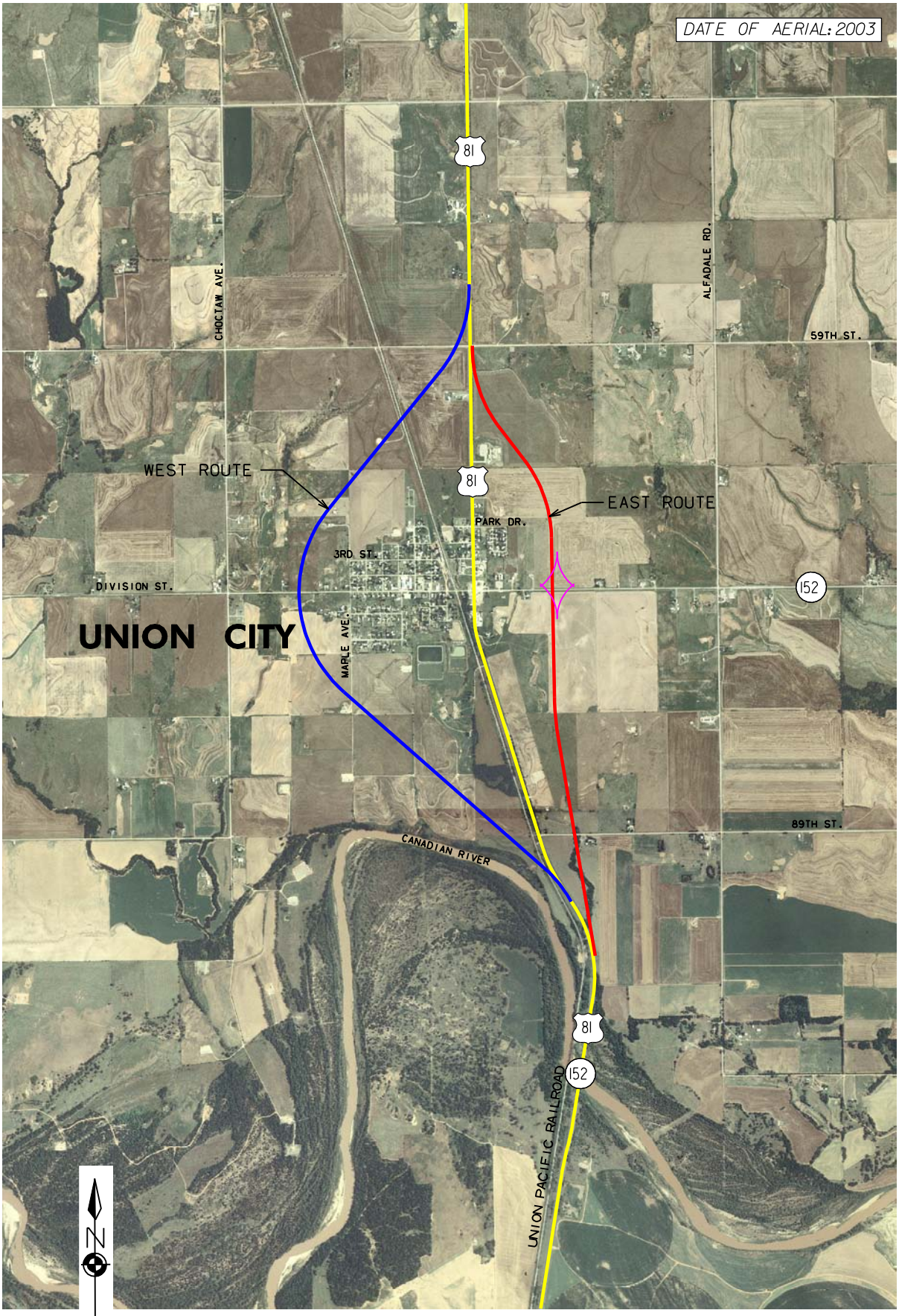
4.2.1 Northern Section

Because the future average daily traffic volumes and roadway LOS for the Northern Section indicate that the facility's ability to effectively handle future traffic will deteriorate to an unacceptable level under the No-Build Alternative, three build alternatives for the Northern Section were developed for evaluation, as follows:

- Alternative 1 is the improvement of US 81 to four lanes along the existing alignment.
- Alternative 2 would be the same as Alternative 1, except at the south edge of Minco, where the existing facility would be realigned to eliminate the three and four degree curves.
- Similarly to Alternative 2, Alternative 3 would be the same as Alternative 1, except for bypasses around Pocasset, Minco and Union City.

The realignment of US 81 in Alternative 2 is located slightly east of the existing alignment, starting on the south at County Road 1200 and proceeding north to South Street in Minco, where the original US 81 alignment would be resumed. Alternative 3 includes a bypass either to the east or to the west of each city. Descriptions of each bypass alignment are provided in the following text.

Union City: General alignment of the west bypass began on the south at approximately one quarter mile south of 89th Street, traversing Union City to the west of Maple Avenue to a point approximately one half mile north of 59th Street. The general alignment of the eastern bypass began on the south at one half mile north of 89th Street, traversing Union City to the east to approximately 59th Street. The Union City bypass alignments are indicated on Figure 4-3.



UNION CITY BYPASS ALIGNMENTS

FIGURE 4-3

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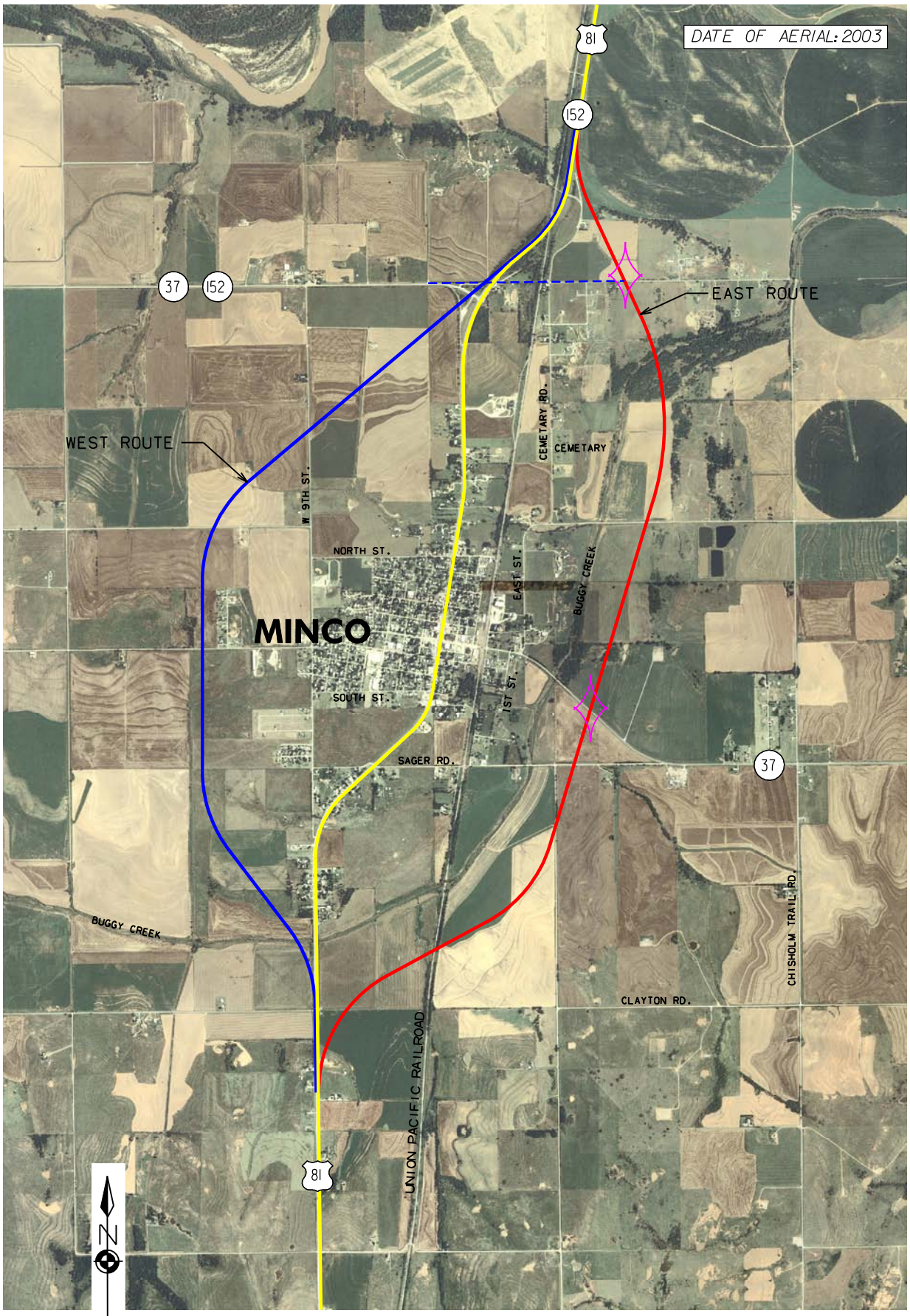
Minco: The general alignment of the west bypass began near the US 81 and Clayton Road intersection, traversing Minco to the west of West 9th Street to a northern terminus near the intersection of US 81 with SH 37 and SH 152. The general alignment of the eastern bypass began south of Clayton Road, traversing Minco to the east of Buggy Creek and Cemetery Road, to a northern terminus north of SH 37 and SH 152. The Minco bypass alignments are indicated on Figure 4-4.

Pocasset: The general alignment of the west bypass began roughly a half-mile south of Cardinal Street, traversing Pocasset to the west of the City's boundary to a point north of Dutton Road. The eastern bypass general alignment began roughly a quarter-mile south of Cardinal Street, traversing Pocasset to the east of the City's boundary to a point north of Dutton Road. The Pocasset bypass alignments are indicated on Figure 4-5.

4.2.2 Chickasha Section

Similarly, traffic analysis of the Chickasha Section indicates that its ability to effectively handle future traffic will deteriorate to an unacceptable level under the No-Build Alternative. Therefore, West and North Bypass alignments for the Chickasha Section were developed for evaluation. Either bypass would be an access-controlled, 4-lane, divided facility. The general alignment for the West Bypass was from a southern terminus point connecting to US 81 near SH 19, proceeding west of Chickasha to a northern terminus point with US 62 near US 81, with access proposed to I-44, Norge Road, Grand Avenue, and Idaho Street. Figure 4-6 depicts this general West Bypass alignment.

The general alignment for a North Bypass was from the intersection of US 81 and County Road 1320, proceeding east along County Road 1320 for approximately 2 ½ miles, continuing east through unimproved land for another 2 ½ miles before joining I-44 with a new interchange. The North Bypass would then follow I-44 south to just south of Pikes Peak Road, then exit via a new Toll Plaza and I-44 interchange, proceeding southeast back to existing US 81. This alternate will require construction of two new



MINCO BYPASS ALIGNMENTS

FIGURE 4-4

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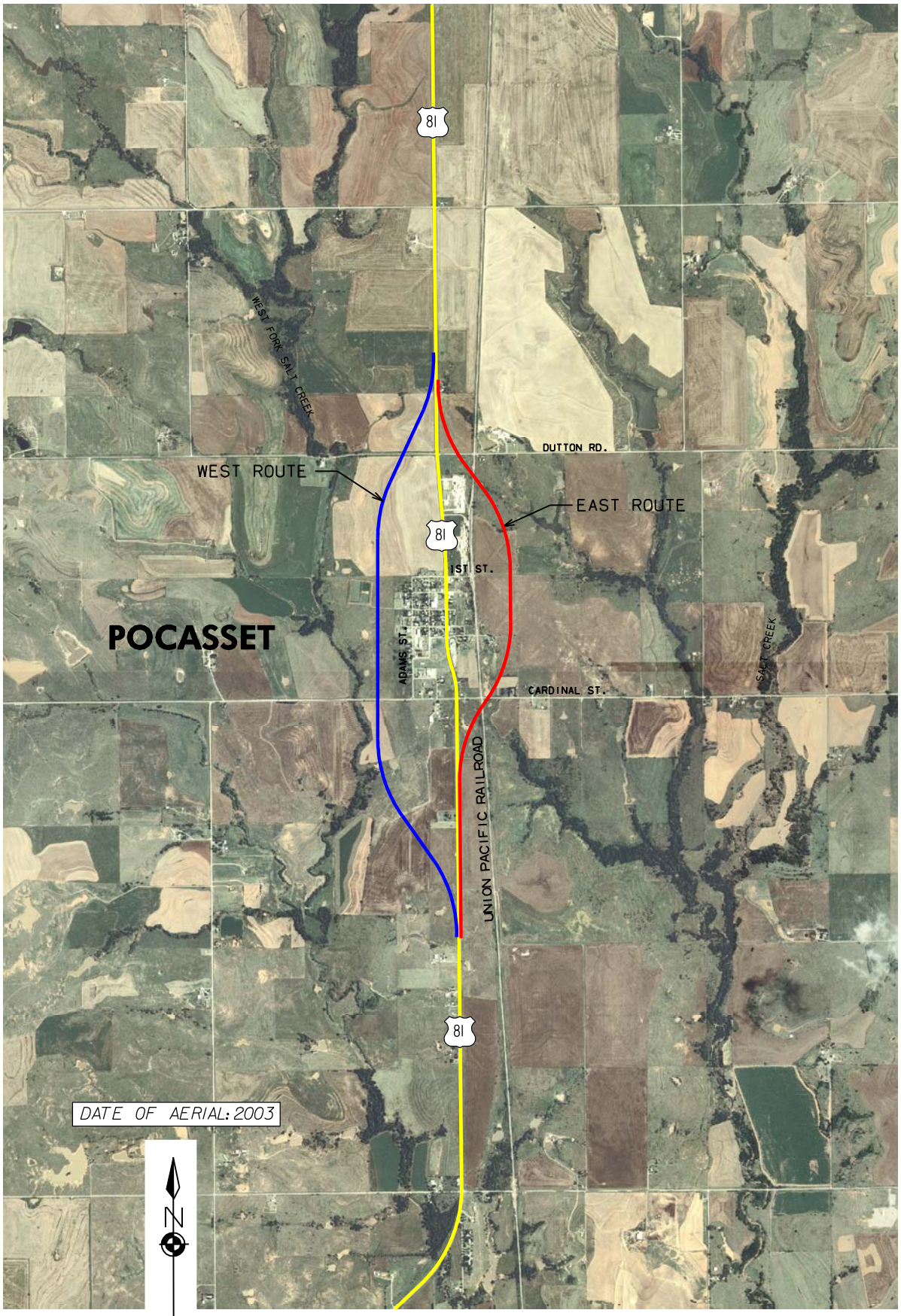
Figure 4-4.dgn



POCASSET BYPASS ALIGNMENTS

FIGURE 4–5

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CHICKASHA WEST BYPASS ALIGNMENT

FIGURE 4-6

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Figure 4-6.dgn

interchanges with I-44, and some method of payment for the “lost” tolls associated with bypass traffic’s use of I-44. Figure 4-7 depicts the North Bypass alignment.

As indicated in Section 3.4, the O-D study results indicated that only 6% - 7% of total US 81 traffic would use a North Bypass of Chickasha. Based on this evaluation, further consideration of the North Bypass was not conducted. Therefore, the following build alternative was selected for further evaluation:

- West Bypass Alternative, which would be a West Bypass of Chickasha with proposed interchanges at US 62, Idaho Avenue, Grand Avenue, Norge Road, I-44, and US 81 south of SH 19

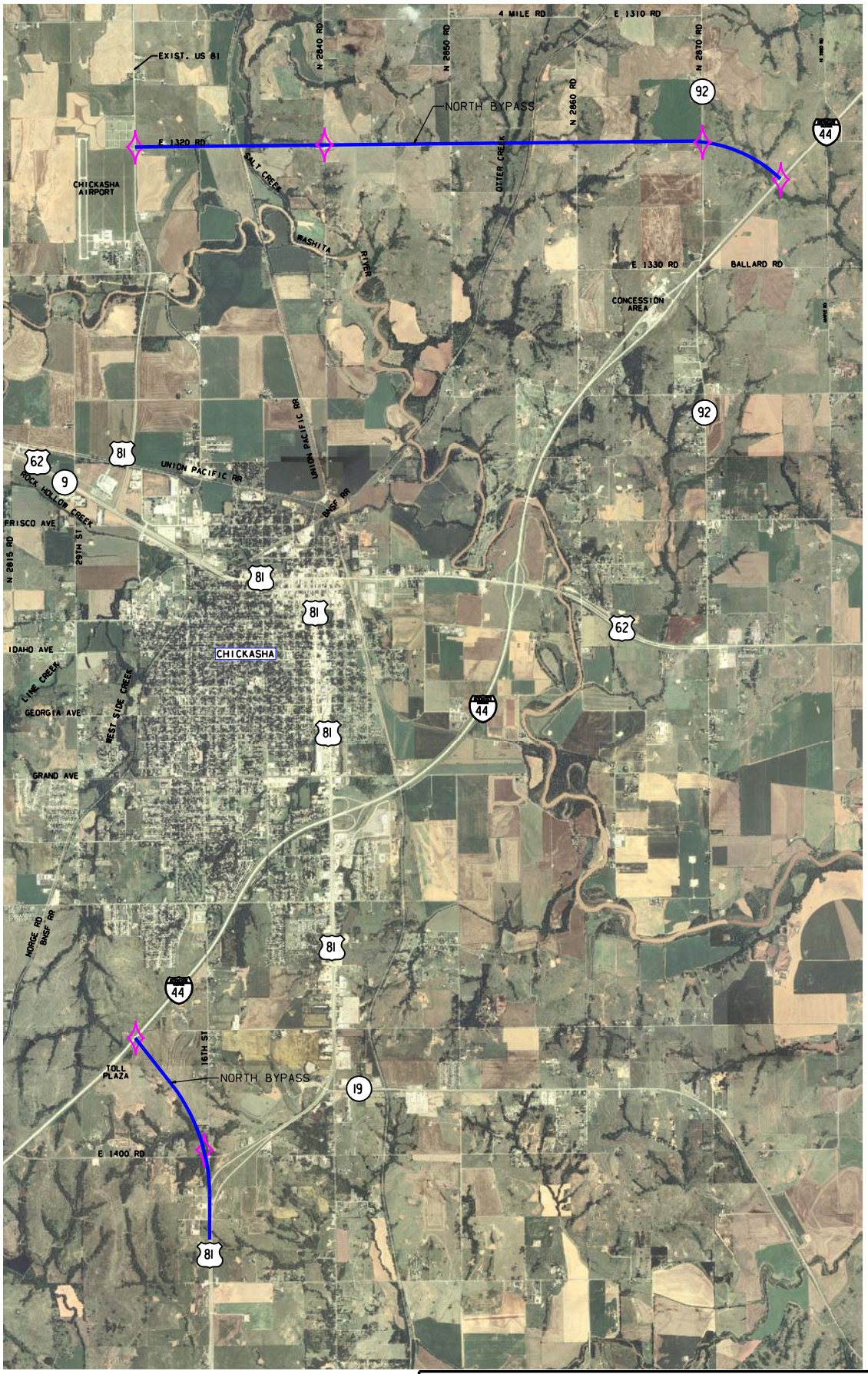
Several alignments were evaluated for a West Bypass of Chickasha. A total of six (6) potential alignments which had been identified in the previous bypass studies conducted in 1978 and 1992 were further evaluated during this Corridor Study. Two (2) additional alignments were considered further west of the previous alignments, due to the degree of development which had occurred on the west side of Chickasha since the previous studies. Therefore, a total of eight (8) potential alignments for the West Bypass were evaluated.

4.3 Future Traffic Analysis, Build Alternatives

4.3.1 Future Traffic Demand

4.3.1.1 Northern Section

Table 4-6 presents the existing (2004) and future (2030) average daily traffic volumes for the Northern Section three build alternatives. This data is also depicted in Figures 4-1 and 4-8. Alternative 1 (existing alignment) and Alternative 2 (realignment south of Minco) are assumed to have induced traffic with ADT higher than the No-Build Alternative. Alternative 3 (bypasses) will result in traffic diversions and induced traffic with an ADT higher than Alternatives 1 and 2. Bypasses would result in considerable reduction of the ADT and truck traffic along the existing US 81 corridor through Pocasset, Minco and Union City with most of the external through vehicular traffic and truck traffic diverted to the bypass.



LEGEND :

POSSIBLE INTERCHANGES

0 1000' 2000' 3000'

DATE OF AERIAL: 2003

CHICKASHA NORTH BYPASS ALIGNMENT

FIGURE 4-7

OKLAHOMA DEPARTMENT OF TRANSPORTATION

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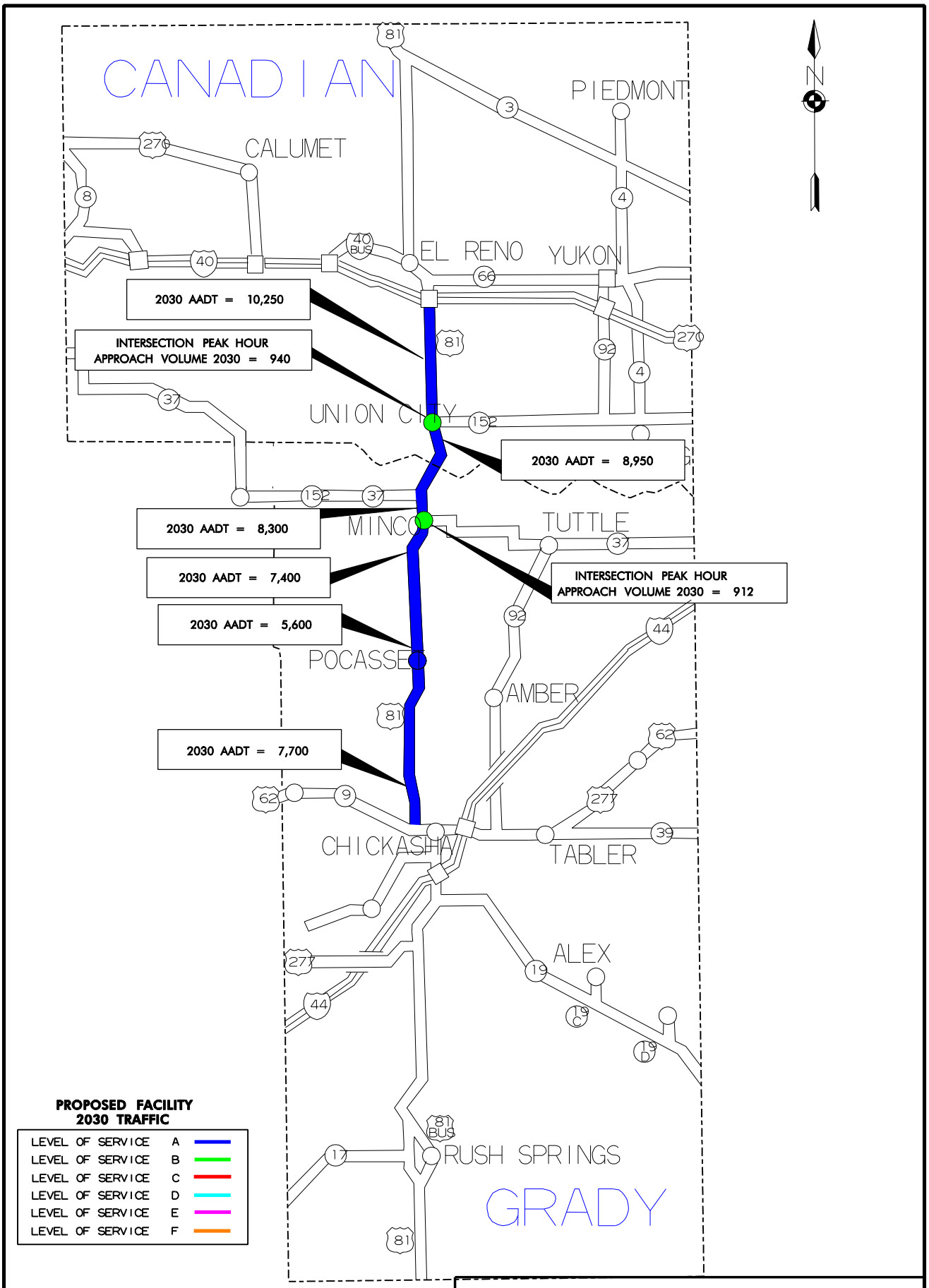
Figure 4-7.dgn



NORTHERN SECTION - PROPOSED FACILITY ANALYZED AS FOUR-LANE HWY.

PROPOSED FACILITY (4-LANE), 2030 TRAFFIC VOLUMES AND LOS

FIGURE 4-8

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Figure 4-8.dgn

Table 4-6: Projected Average Daily Traffic Volumes, US 81 Corridor, Northern Section, Alternatives 1, 2, and 3

Ref No.	US 81 Segment	Existing Traffic Volume (2004)	Projected Traffic Volume (2030)		
			Alternative 1	Alternative 2	Alternative 3
1	US 81, North of Chickasha	4,100	7,700	7,700	8,050
2	US 81 at Pocasset	3,500	5,600	5,600	5,850
3	US 81, South of Minco	4,600	7,400	7,400	7,750
4	US 81, North of Minco	5,100	8,300	8,300	8,650
5	US 81, South of Union City	5,600	8,950	8,950	9,400
6	US 81, North of Union City	5,900	10,250	10,250	10,750

Note: Alternatives are defined in Section 4.2.1

Figure 4-8 presents the future (2030) design hour traffic volumes for Alternative 1.

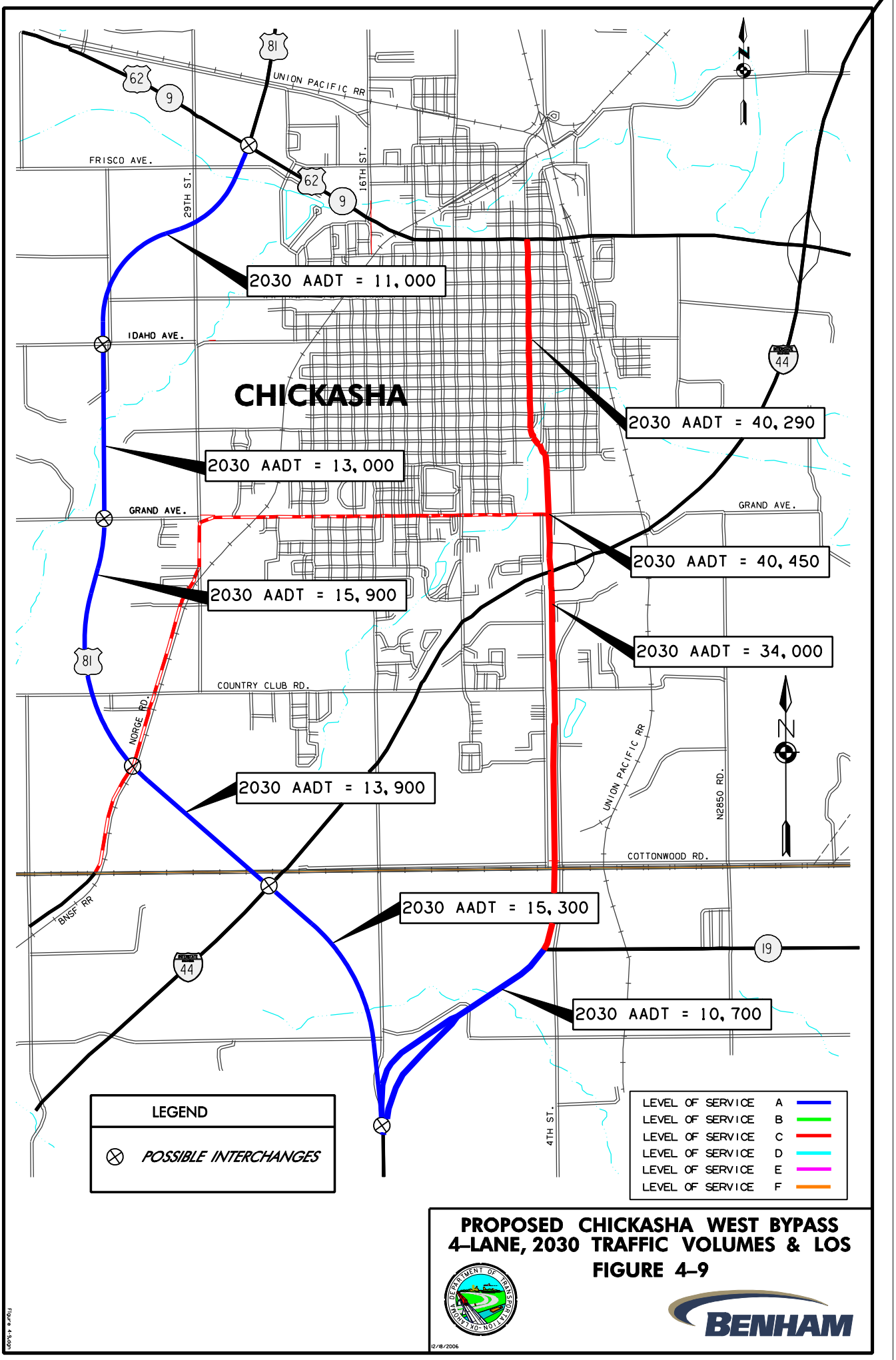
4.3.1.2 Chickasha Section

The impact of the West Bypass Alternative on the existing US 81 in the future design year (2030) was studied to identify the reduction in average daily traffic (ADT) and level of service (LOS). Traffic volumes and capacity at the existing intersections that are proposed to be future bypass interchanges were also studied. Table 4-7 presents the Existing (2004) and future (2030) ADT along the US 81 study corridor, major intersecting highways and impacted intersections for the West Bypass Alternative in the Chickasha Section. The data was developed in coordination with ODOT Planning & Research Division and information obtained from various sources including ODOT Planning & Research Division, City of Chickasha Urban Counts, ODOT 1992 Feasibility Study and the field study. Appendix F contains more detailed information regarding the traffic volume development.

Table 4-7: Projected Average Daily Traffic Volumes, US 81 Corridor, Chickasha Section, West Bypass Alternative

Ref No.	Arterial Description	Existing Traffic Volume (2004)	Projected Traffic Volume (2030) West Bypass Alternative
1	US 62/SH 9, West of US 81	8,300	15,700
2	US 81, North of US 62/SH 9	4,300	12,100
3	US 62/US 277/SH 9, East of I-44	9,200	21,200
4	US 81/4th Street, South of US 62/SH 9	20,350	40,290
5	Existing 29th Street/ Proposed US 81 Bypass at Idaho	4,500	11,000
6	US 81 at Grand Avenue	28,000	40,450
7	Existing 29th Street/ Proposed US 81 Bypass at Grand Ave.	4,650	13,000
8	US 81, South of I-44	27,300	34,000
9	Proposed US 81 Bypass at I-44	-	13,900
10	Existing Norge Road at Country Club Road & Proposed US 81 Bypass at Norge Road	3,150	15,900
11	US 81, North of SH 19	16,550	29,000
12	SH 19, East of US 81	5,500	9,400
13	US 81, South of SH 19	8,900	10,700

Figures 4-1 and 4-9 present the existing (2004) and future (2030) design hour traffic volumes for the West Bypass Alternative at all the existing intersections that are future proposed interchange locations. Appendix F contains more detailed information regarding the traffic volume development.



PROPOSED CHICKASHA WEST BYPASS 4-LANE, 2030 TRAFFIC VOLUMES & LOS

FIGURE 4-9

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4.3.2 Future Roadway Capacity Analysis

Capacity and LOS analyses were performed for the US 81 study corridor in both the Northern and Chickasha Sections for the various build alternatives to determine the roadway capacity for future 2030 traffic demand. Methodologies in the Highway Capacity Manual 2000 (HCM 2000) for rural two-lane and rural and urban multi-lane highways were used for this analysis.

4.3.2.1 Northern Section

The future 2030 traffic demand for the build alternatives as outlined in Table 4-6 was used to determine the future roadway capacity and LOS. Traffic data required for the analysis include peak hour factor, K factor, directional distribution, percent of heavy and recreation vehicles and topography. The peak hour factor (PHF) is an adjustment to fix the variation of flow during the peak hour. A PHF ranging from 0.66-0.90 was observed from the site studies for the Northern Section study corridor. The proportion of total daily traffic that occurs in the peak hour is defined by the K-factor. The K-factors for Union City and Minco were identified by comparing the peak hour turning movement counts and average daily traffic information from the Northern Section count locations. The Highway Capacity Manual (HCM 2000) recommends default values of 0.095 and 0.100 for rural developed and rural undeveloped regions. A default value of 0.100 was used for deriving the peak hour volumes for Pocasset from the ADT. The heavy vehicle factors used for the various Northern Section alternatives are shown in Table 4-8. Directional distribution identifies the traffic characteristic when volume may be greater in one direction than in the other. Although HCM recommends a default value of 60/40 for rural highways, the actual directional splits derived from Northern Section traffic data were used (i.e., ranging from 55/45 to 70/30). Terrain type is used in the capacity analysis in lieu of a specific grade and HCM classifies it as level, rolling and mountainous. Rolling terrain was used in the capacity analysis for the Northern Section of the study corridor. Rolling terrain is a combination of horizontal and vertical alignments causing heavy vehicles to reduce their speed substantially below that of passenger cars but not to operate at crawl speeds for a significant amount of time.

Table 4-8: Future 2030 Capacity and LOS Analysis, US 81 Corridor, Northern Section, Alternatives 1, 2, and 3

No	Arterial Description	2030 ADT	% Trucks	K	Design Hour Volume (veh/h)*	LOS
1	US 81, North of Chickasha	7,700	24	0.1	462	A
2	US 81 at Pocasset	5,600	24	0.1	336	A
3	US 81, South of Minco	7,400	13	0.1	407	A
4	US 81, North of Minco	8,300	13	0.1	456	A
5	US 81, South of Union City	8,950	15	0.1	447	A
6	US 81, North of Union City	10,250	15	0.1	512	A

*: Design Hour Volume for Alternative 3 is 5% greater, due to induced traffic.

Table 4-8 summarizes the results of the capacity and LOS analysis for the Northern Section segments under Alternatives 1, 2, and 3. As indicated in Figure 4-8, all the Northern Section roadway segments operate at acceptable LOS A under the future 2030 traffic demands.

4.3.2.2 Chickasha Section

The future 2030 traffic demand for the West Bypass Alternative as outlined in Table 4-7 was used to determine the future roadway capacity and LOS. Traffic data required for the analysis include peak hour factor, K factor, directional distribution, percent of heavy and recreation vehicles and topography. The peak hour factor (PHF) is an adjustment to fix the variation of flow during the peak hour. A PHF ranging from 0.73-0.93 was observed from the site studies for the Chickasha Section study corridor. The proportion of total daily traffic that occurs in the peak hour is defined by the K-factor. The K-factor for Chickasha was identified by comparing the peak hour counts from the license plate survey and average daily traffic information from the Chickasha Section count locations. The Highway Capacity Manual (HCM 2000) recommends default values of 0.091 and 0.093 for urbanized and urban regions. A default value of 0.092 was used at locations where field data was not available. The heavy vehicle factor used for the West Bypass

Alternative is shown in Table 4-9. Directional distribution identifies the traffic characteristic when volume may be greater in one direction than in the other. Although HCM recommends a default value of 60/40 for urban highways, the directional splits derived from the Chickasha Section traffic data were used (i.e., ranging from 55/45 to 60/40). Terrain type is used in the capacity analysis in lieu of a specific grade and HCM classifies it as level, rolling and mountainous. Rolling terrain was used in the capacity analysis for the Chickasha Section of the study corridor. Rolling terrain is a combination of horizontal and vertical alignments causing heavy vehicles to reduce their speed substantially below that of passenger cars but not to operate at crawl speeds for a significant amount of time.

The West Bypass Alternative involves a bypass west of Chickasha with proposed interchanges at US 62/US 277, Idaho Avenue, Grand Avenue, Norge Road, I-44/H.E. Bailey Turnpike and SH 19. The City of Chickasha's comprehensive master plan proposes future construction to make Idaho Avenue continuous. The design hour volumes at the intersections of US 81 and US 62, 29th Street & Future Idaho Avenue, 29th Street & Grand Avenue, Norge Road and Country Club Road, US 81 and I-44 ramps, and US 81 and SH 19 were used to make future projections at the proposed bypass interchanges. Figures 4-1 and 4-9 show the existing intersection and future interchange projected design hour volumes.

Roadway capacity and LOS analysis were performed for the proposed bypass facility segments between the interchanges. A 20% heavy vehicle factor was used for trucks using the proposed bypass facility. Table 4-9 summarizes the results of the LOS analysis for the West Bypass Alternative.

Table 4-9: Future 2030 Capacity and LOS Analysis, US 81 Corridor, Chickasha Section, West Bypass Alternative

No	Arterial Description	2030 Design Hour Volume	% Trucks	Density (pc/mi/ln)		LOS	
				NB	SB	NB	SB
1	US 81 Bypass b/w US 62 and Idaho Interchanges	11,000	20	8.0	6.5	A	A
2	US 81 Bypass b/w Idaho and Grand Interchanges	13,000	20	9.4	7.7	A	A
3	US 81 Bypass b/w Grand and Norge Road Interchanges	15,900	20	11.6	9.4	B	A
4	US 81 Bypass b/w Norge Road and I-44 Interchanges	13,900	20	10.1	8.2	A	A
5	US 81 Bypass b/w I-44 and SH 19 Interchanges	15,300	20	11.1	9.1	A	A

Table 4-9 indicates that the proposed bypass facility west of downtown Chickasha operates at acceptable LOS A for future 2030 traffic demand, thus enabling the external through traffic along US 81 to operate at higher capacity.

One benefit of the West Bypass Alternative should be an improved LOS along existing US 81 in downtown Chickasha. For that reason, the impact of the proposed bypass on the existing US 81 was studied for capacity and LOS using the daily traffic volumes shown in Table 4-7. A 5% heavy vehicle factor was assumed for trucks that would use the existing US 81 after the proposed bypass facility is built.

Table 4-10 indicates that construction of the West Bypass Alternative will improve the LOS of US 81 on 4th Street to south of I-44 from D to C, and south of I-44 to north of SH 19 from C to B. Figure 4-9 depicts the LOS along existing US 81 after construction of the West Bypass Alternative.

Table 4-10: Future 2030 Capacity and LOS Analysis, US 81 Corridor, Chickasha Section, Existing US 81 after Construction of West Bypass Alternative

No	Arterial Description	2030 Design Hour Volume After Improvement	% Trucks	Density (pc/mi/ln)		LOS	
				NB	SB	NB	SB
1	US 81/4th Street, South of US 62/SH 9	40,290	5	19.2	22.7	C	C
2	US 81, South of Grand Avenue	40,450	5	19.3	22.7	C	C
3	US 81, South of I-44	34,000	5	16.2	19.1	B	C
4	US 81, North of SH 19	29,000	5	13.9	16.2	B	B
5	US 81, South of SH 19	10,700	5	5.2	5.9	A	A

4.3.3 Intersection Warrant Analysis

A summary of intersection capacity analyses was performed for the future 2030 traffic conditions for the Northern Section as shown in Table 4-11. The analyzed intersections include US 81 and SH 37 in Minco and US 81 and SH 152 in Union City. Signalized intersections are noted with an [S] and unsignalized with an [N]. Capacity analyses for this Study were performed using Synchro 6, Traffic Signal Coordination Software.

Table 4-11: Future 2030 Intersection LOS Summary, US 81 Corridor, Northern Section

Intersection and Direction of Approach	Calculated LOS (AM/PM)
US 81 and SH 37 – [N]	
Eastbound	B/B
Westbound	B/B
Northbound	B/B
Southbound	B/B
US 81 and SH 152 – [N]	
Eastbound	A/B
Westbound	A/B
Northbound	A/B
Southbound	A/B

Note: [N] = Non-Signalized Intersection

As shown in Table 4-11, the intersection of US 81 with SH 37 is operating at an overall LOS B for the future 2030 AM and PM peak hours, and the intersection of US 81 and SH 152 is operating at an overall LOS A and B for the future 2030 AM and PM peak hours.

Traffic along SH 37 in Minco and SH 152 in Union City experiences delay during the 2030 AM and PM peak hours. The intersections were checked for signal warrant justification based on entering peak hour volumes and approach delays.

4.3.4 Intersection Warrant Studies

In order to signalize an intersection, a needs analysis called a signal warrant study must be performed. This study is an engineering analysis of traffic conditions, pedestrian characteristics, and physical characteristics of a location. Eight (8) warrants have been established in detail in the Federal Highway Administration's Manual on Uniform Traffic Control Devices (MUTCD). These warrants are:

- Warrant 1, Eight-Hour Vehicular Volume
- Warrant 2, Four-Hour Vehicular Volume
- Warrant 3, Peak Hour
- Warrant 4, Pedestrian Volume
- Warrant 5, School Crossing
- Warrant 6, Coordinated Signal System
- Warrant 7, Crash Experience
- Warrant 8, Roadway Network

The intersections of US 81 and SH 37 and US 81 and SH 152 were checked for traffic signal justification against the MUTCD warrants for future 2030 traffic demand. Results of the analysis are outlined in Table 4-12 and details of the warrants and analyses are included in Appendix G.

4.3.4.1 US 81 and SH 37E, Downtown Minco

As indicated by Table 4-12, the intersection of US 81 and SH 37 in Minco failed to meet the requirements of the eight (8) MUTCD signal warrants. Hence signalization of the intersection is not recommended. Table 4-11 indicates that the unsignalized intersection is operating at acceptable LOS B in the future 2030 traffic conditions.

4.3.4.2 US 81 and SH 152E, Union City

Table 4-12 indicates that the intersection of US 81 and SH 152 in Union City meets the requirements of MUTCD signal warrants 1, 2 and 3 for the future 2030 traffic demand. Signal warrant analysis also revealed no traffic signal justification until the year 2029. Signalization is recommended for the future design year 2030 to reduce the delay experienced by the minor street traffic and improve the overall intersection capacity. However, since the signalization is not required until after 2029, this improvement has not been recommended in this report and the associated cost is not included.

Table 4-12: Justification of Northern Section Intersection Signalization Using MUTCD Warrants

MUTCD Warrants	US 81 and SH 37, Minco	US 81 and SH 152, Union City
1 - Eight-Hour Vehicular Volume	NOT MET	MET
2 - Four-Hour Vehicular Volume	NOT MET	MET
3 - Peak Hour	NOT MET	MET
4 - Pedestrian Volume	NOT MET	NOT MET
5 - School Crossing	NOT MET	NOT MET
6 - Coordinated Signal System	N/A	N/A
7 - Crash Experience	NOT MET	NOT MET
8 - Roadway Network	NOT MET	NOT MET

4.4 Selection of Recommended Alternative

4.4.1 Northern Section, Rural Areas

4.4.1.1 Construction Costs

The construction cost associated with adding two additional lanes to the east or to the west of the existing lanes was considered to be approximately the same.

4.4.1.2 Environmental Analysis

Expansion to the west side of the existing facility through the rural areas could potentially impact two cemeteries, a church, municipal water well, and a residence eligible for the National Register of Historic Places (NRHP). The Union Pacific Railroad located immediately west of the existing facility north of Minco and south of Union City is another constraint to expansion to the west. Expansion to the east side would result in fewer environmental impacts, with the most substantial impact being one residence eligible for the NRHP. Noise sensitive receptors along the rural areas of the Northern Section are widely scattered; therefore, noise mitigation is not likely to be reasonable or feasible.

4.4.1.3 Recommended Improvement

Addition of a median and two additional lanes to the east side of the existing lanes, with reconstruction of the existing lanes, is the recommended improvement in rural areas. Along those stretches of the US 81 corridor between cities, the roadway will be improved to a divided 4-lane roadway with paved shoulders. The 4-lane facility will consist of two sets of two 12-foot traffic lanes, with 10-foot outside and 4-foot inside shoulders, and a median of varying width. Drainage from the roadway will be carried away by open ditches located in the median and beyond the outside shoulders. Typically, a minimum of 250’ of ROW is required to construct this section, depending upon adjacent terrain, design requirements, utilities, and other factors.

4.4.2 Northern Section, Through Cities

4.4.2.1 Construction Costs and LOS Comparison

The construction costs and LOS for Alternative 3 (bypasses) were compared to the costs and LOS associated with Alternatives 1 (existing) and 2 (realignment south of Minco). LOS would be improved to LOS A by any of Alternatives 1, 2, or 3. The estimated construction costs for either Alternative 1 or 2 were approximately 35% less than for Alternative 3. Further comparison of Alternatives 1 and 2 indicated that Alternative 1 would be less expensive than Alternative 2 and would still provide a high level of service.

4.4.2.2 Environmental Analysis

The majority of public input received supported Alternative 1 over either Alternative 2 or 3. Alternative 1 is not anticipated to have any substantial environmental impacts. The increased traffic anticipated through the cities along the improved facility is not anticipated to have any noise impacts.

4.4.2.3 Recommended Improvement

Any of the three Build Alternatives would provide a LOS of A. Alternative 1 (existing) would cost less to construct than Alternative 2 (realignment south of Minco) or Alternative 3 (bypasses), and Alternative 1 received greater public support than Alternatives 2 and 3. There were no substantial environmental impacts associated with any of the Build Alternatives. Based upon these factors, Alternative 1 was selected as the recommended improvement of US 81 through Pocasset, Minco, and Union City.

Based upon consideration of the criteria for a 5-lane facility through Union City, Minco, and Pocasset, a 5-lane undivided facility was not recommended. Appendix H contains a summary of the 4-lane versus 5-lane evaluation. The typical 4-lane facility would consist of an undivided 4-lane roadway with paved shoulders, with the lanes being 12-feet wide. A drainage system with curb inlets would also be required through the downtown areas. The curbed section would require at least 120’ of ROW to allow for placement of utilities and other appurtenances behind the curb.

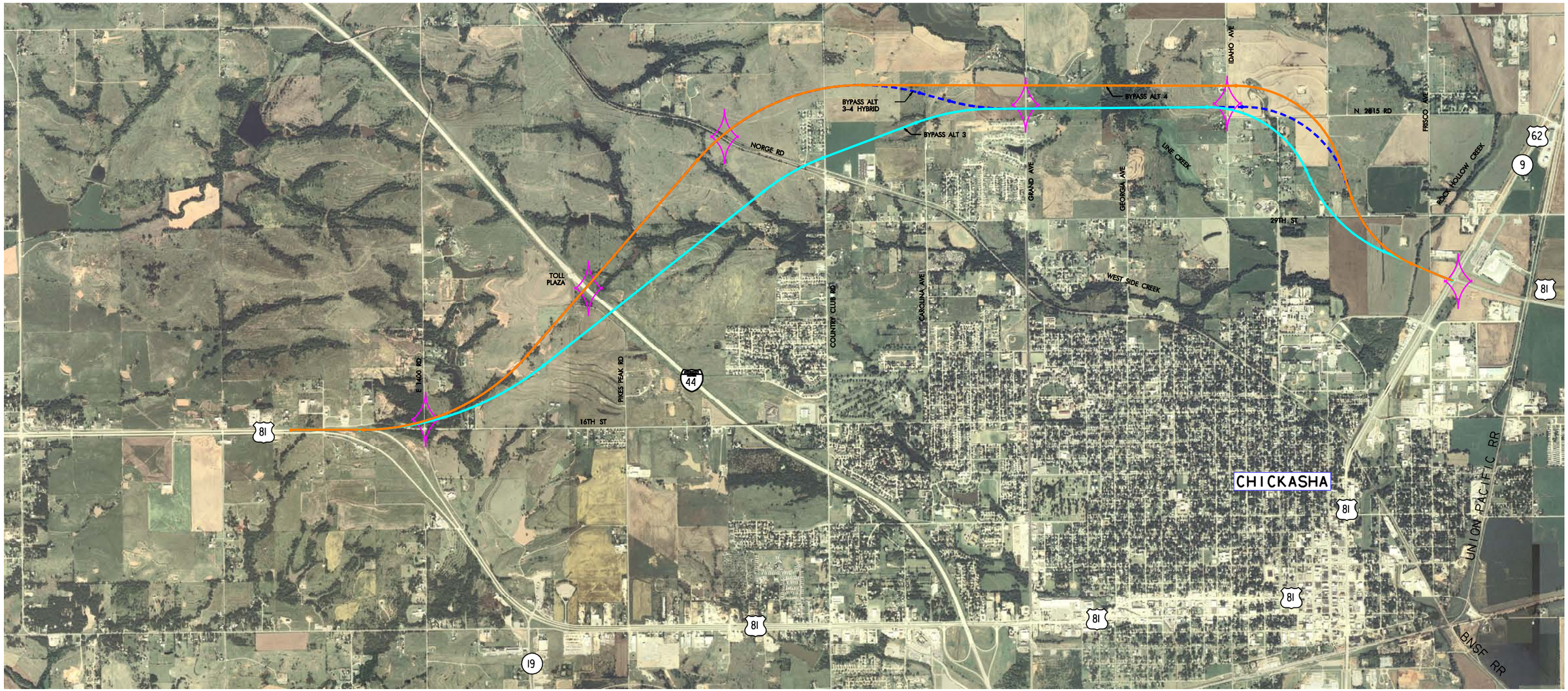
Through Union City, the recommended improvement alternate is to widen the existing 2-lane facility to a 4-lane facility, and add curb and gutter where needed. It is anticipated that the existing ROW may be adequate to allow a 4-lane facility, and that minimal ROW may be needed in areas to add the curb and gutter. For that portion of US 81 through Union City that is currently 4-lane, the recommended improvement will be to mill and overlay the existing facility. It is anticipated that little or no additional ROW will be needed to implement these improvements.

Through Minco, the recommended improvement is to mill and overlay the existing 4-lane facility. Little or no additional ROW will be needed for this improvement. Local business and civic leaders in Minco suggested a new alignment for SH 37. The concept was to eliminate the existing US 81 curve south of Minco and to re-align SH 37 east of Minco to intersect US 81 south of its existing intersection. This concept might be considered by ODOT at a later time, but is outside the scope of this Corridor Study.

Through Pocasset, the recommended improvement is to widen the existing 2-lane facility to a 4-lane facility, and add curb and gutter where needed. It is anticipated that the existing ROW may be adequate to allow a 4-lane facility, and that minimal ROW may be needed in areas to add the curb and gutter.

4.4.3 Chickasha Section

As discussed previously, the West Bypass Alternative is preferred, due to the unacceptable deterioration of service experienced in the Chickasha Section under the No-Build Alternative. Of eight (8) potential alignments initially considered, six (6) alignments were eliminated as infeasible. Therefore, two (2) potential alignments remained for evaluation. These bypass alignments were referred to as West Bypass Alternate 3 and West Bypass Alternate 4, and are illustrated in Figure 4-10.



LEGEND :

◇ POSSIBLE INTERCHANGES

N

1000' 0 1000'

DATE OF AERIAL: 2003

CHICKASHA WEST BYPASS ALTERNATES

FIGURE 4-10

OKLAHOMA DEPARTMENT OF TRANSPORTATION

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12/22/2006

Figure 4-10.dgn

4.4.3.1 Environmental Analysis

Review of the environmental constraints maps indicated a number of known environmental constraints in the vicinity of West Bypass Alternates 3 and 4. These included a City of Chickasha water tower, a rest home, oil and gas production sites, several residential additions, a small manufacturing facility, an electrical substation, and churches. Input from local stakeholders revealed additional constraints in the vicinity of West Bypass Alternates 3 and 4, including current construction of a new church and a 100-acre parcel currently being platted for residential development. It was determined from further evaluation and public comment that features of West Bypass Alternates 3 and 4 could be combined to avoid the environmental constraints, and the resulting recommended alignment was referred to as the West Bypass 3-4 Hybrid Alternate. By avoiding densely-populated residential areas and sensitive areas such as churches, the only noise sensitive receptors along the West Bypass are widely scattered. Therefore, noise mitigation is not likely to be reasonable or feasible.

4.4.3.2 Recommended Improvement

The recommended improvement for the Chickasha Section is construction of a 4-lane, divided bypass west of Chickasha via an alignment referred to as the West Bypass 3-4 Hybrid Alternate. The final alignment of the recommended West Bypass will be determined during the National Environmental Policy Act (NEPA) process to follow.

4.5 Project Segment Identification, Costs, and Prioritization

4.5.1 Programmed Projects along US 81 Corridor

Improvement of the segment of US 81 north of Union City and construction of a new 2-lane bridge just east of the existing Canadian River Bridge north of Minco are currently in ODOT's eight-year construction program.

4.5.2 Northern Section

The Northern Section of the Corridor Study is approximately 26 miles long. As an aid to future programming of the recommended improvements, the Northern Section was divided into 12 construction segments. The goal was to identify a series of segments with individual maximum construction costs of approximately $10 million. Details of the

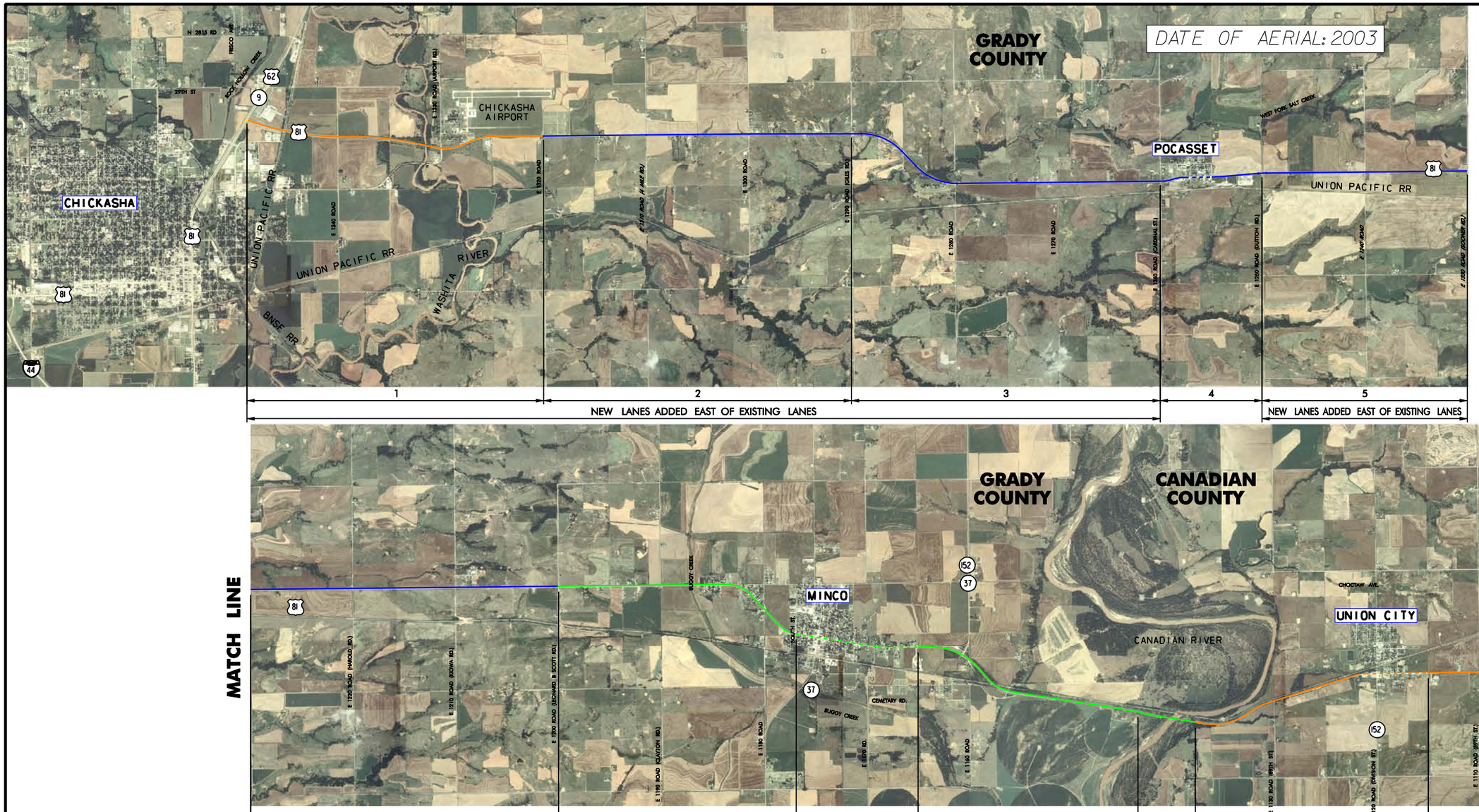
estimated construction costs for the 12 segments are provided in the following section of text. The 12 segments, from south to north, are described briefly in the following table and illustrated in Figure 4-11.

Table 4-13: Construction Segment Summary, US 81 Corridor, Northern Section

Segment	Approximate Extents	Length (miles)
1	US 62 to E 1320 Road	2.94
2	E 1320 Road to E 1290 Road	3.00
3	E 1290 Road to E 1260 Road	3.17
4	Pocasset (E 1260 Road to E 1250 Road)	1.00
5	E 1250 Road to E 1230 Road	2.00
6	E 1230 Road to E 1200 Road	3.00
7	E 1200 Road to South Street in Minco	2.50
8	Minco (South Street to 1.2 miles north)	1.20
9	0.45 miles south of SH 37 West to Canadian River	2.30
10	Canadian River	0.57
11	Canadian River to 0.50 miles north of SH 152 East	2.36
12	0.50 miles north of SH 152 East to E 1090 Road	2.50
	Total Length	26.54

Construction costs for each of the construction segments were estimated using bid tabulations from recent ODOT construction projects to estimate the earthwork, drainage, surfacing, and bridge costs for each segment. The detailed construction cost estimates are included in Appendix I. Engineering costs for each of the construction segments were estimated by assuming that preliminary engineering would be equal to 5% of the construction costs, and that construction engineering would be equal to 8% of the construction costs.

Right-of-way costs for each of the construction segments were estimated by conducting a windshield survey and reviewing real estate comparable costs. The detailed right-of-way cost estimates are included in Appendix J.



PROJECT PRIORITY MAP

Segment Identification	1	2	3	4	5	6	7	8	9	10	11	12
Project Length (miles)	2.94	3.00	3.17	1.00	2.00	3.00	2.50	1.20	2.30	0.57	2.36	2.50
Type of Improvement	AA	AA	AA	BB / CC	AA	AA	AA / BB	CC	AA / BB	AA	AA / CC	AA
Project Cost ($ Million)[1]	26.30	13.73	12.72	2.96	7.57	10.56	11.13	2.83	11.40	6.89	9.21	11.95
Priority Group	High	Low	Low	Low	Low	Low	Medium	Medium	Medium	Medium	High	High

1 Project Costs estimated are based on 2006 dollars

LEGEND

Type of Improvement
- AA — Add Median & 2 New Lanes, Reconstruct Existing Lanes
- BB — Widen from Existing 2–Lane to 4–Lane Undivided
- CC — Mill and Overlay Existing 4–Lane Undivided

- HIGH PRIORITY
- MEDIUM PRIORITY
- LOW PRIORITY
- ----- Existing 4 Lane Undivided

US 81 CORRIDOR CONST. SEGMENTS, NORTH SECTION

FIGURE 4–11

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12/22/2006

Figure 4-11.dgn

Utility costs for each of the construction segments were also estimated by identifying relocation needs through a windshield survey, and obtaining cost estimate information from ODOT and utility companies. The detailed utility cost estimates are included in Appendix K.

The total estimated costs for construction, right-of-way, and utility for each construction segment are presented in the following table. All costs have been estimated and expressed in 2006 dollars.

Table 4-14: Construction Cost Estimates for 12 Construction Segments, US 81 Corridor, Northern Section

Segment	Preliminary Engineering $	Construction $	Right-of-Way $	Utilities $	Construction Engineering $	Totals $
1	1,117,157	22,343,132	914,330	216,812	1,787,451	26,378,881
2	484,925	9,698,493	1,746,400	1,320,719	775,879	14,026,416
3	538,541	10,770,819	283,890	520,063	861,666	12,974,978
4	124,187	2,483,744	35,894	345,938	198,699	3,188,462
5	297,351	5,947,012	386,340	646,250	475,761	7,752,713
6	447,923	8,958,468	187,954	450,063	716,677	10,761,085
7	454,480	9,089,597	604,560	554,000	727,168	11,429,805
8	125,333	2,506,662	0	0	200,533	2,832,528
9	472,871	9,457,417	296,488	627,156	756,593	11,610,525
10	0	6,446,930	123,600	318,270	0	6,888,800
11	337,181	6,743,623	949,464	925,594	539,490	9,495,352
12	0	8,597,520	1,825,295	1,523,436	0	11,946,251
Totals	4,399,948	103,043,416	7,354,215	7,448,301	7,039,917	**129,285,798**

Note: All costs are expressed in 2006 dollars.

The construction costs for Segment 1 are significantly greater than any other segment due to the earthwork costs associated with the north side of the future US 81/US 62 interchange, as well as the construction costs (including earthwork) for the Union Pacific Railroad overpass bridge.

Lastly, each construction segment was assigned a construction priority of High, Medium, or Low. These priorities were determined based upon traffic volumes, as well

as input from ODOT personnel and the public. The priorities of the 12 construction segments are presented in the following table:

Table 4-15: Construction Segment Priority, US 81 Corridor, Northern Section

Segment	1	2	3	4	5	6	7	8	9	10	11	12
Priority	High	Low	Low	Low	Low	Low	Medium	Medium	Medium	Medium	High	High

4.5.3 Chickasha Section

The proposed Chickasha West Bypass was considered in two segments for cost estimating purposes. The segments, C-1 and C-2, are illustrated in Figure 4-12. The total estimated costs for construction, right-of-way, and utility for each construction segment are presented in Table 4-16. All costs have been estimated and expressed in 2006 dollars.

Table 4-16: Construction Cost Estimates for Construction Segments, US 81 Corridor, Proposed Chickasha West Bypass

Segment	Preliminary Engineering $	Construction $	Right-of-Way $	Utilities $	Construction Engineering $	Totals $
C-1	3,795,534	75,910,674	1,520,470	536,813	6,072,854	87,836,345
C-2	3,860,425	77,208,502	1,676,096	1,148,525	6,176,680	90,070,229
Totals	7,655,959	153,119,177	3,196,566	1,685,338	12,249,534	**177,906,574**

The estimated costs for right-of-way acquisition, $3.2 million, were developed by conducting a windshield survey and reviewing real estate comparable costs. The detailed right-of-way cost estimates are included in Appendix J. Estimated utility costs, $1.7 million, were developed by identifying relocation needs through a windshield survey, and obtaining cost estimate information from ODOT and utility companies. The detailed utility cost estimates are included in Appendix K. The estimated construction costs of $153.1 million were based upon the length of the proposed bypass and the number of interchanges along the controlled access alignment. Construction costs were estimated using bid tabulations from recent ODOT construction project to estimate the earthwork, drainage, surfacing, and bridge costs for each segment.

Various phases of the West Bypass construction were assigned priorities of High and Low. Due to the importance of protecting the proposed bypass corridor from future development and additional environmental constraints, right-of-way acquisition has been assigned a High priority. Utility relocation and construction have been assigned a Low priority. It is significant to note that these priorities were developed specifically for the Chickasha Section, and are not comparable to the priorities developed for the Northern Section. For example, a Northern Section segment with a Medium priority would not necessarily be considered a higher priority than a Chickasha bypass task assigned a Low priority. The Chickasha West Bypass alignment, with cost and priority information, is presented in Figure 4-12.

Figure 4-12.dgn

US 81 CORRIDOR CONST. INFO., CHICKASHA WEST BYPASS

FIGURE 4-12

Segment	Project Length (miles)	Priority: Acquire ROW	Priority: Relocate Utilities; Construction	Preliminary Engineering $	Construction $	Right–of–Way $	Utilities $	Construction Engineering $	Totals $
C–1	2.76	High	Low	3,795,534	75,910,674	1,520,470	536,813	6,072,854	87,836,345
C–2	4.09	High	Low	3,860,425	77,208,502	1,676,096	1,148,525	6,176,680	90,070,229
Totals	6.85			7,655,959	153,119,177	3,196,566	1,685,338	12,249,534	177,906,574

Note: Estimated costs are based on 2006 dollars.

LEGEND

◊ Possible Interchanges

DATE OF AERIAL: 2003

6/26/2007

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5.0 PUBLIC INVOLVEMENT

5.1 Introduction

The public involvement process for the US 81 Corridor Study included two sets of informal stakeholder meetings at Minco and Chickasha, as well as two sets of public meetings at Minco and Chickasha. Meeting minutes and copies of the public comments received are included in Appendix L. Also, a number of internal meetings were held at various times throughout the project to evaluate the Corridor Study status. The minutes of these internal meetings are included as Appendix M.

5.2 Informal Stakeholder Meetings

The first set of informal stakeholders meetings were held September 30, 2004 at the Chickasha Chamber of Commerce and the Minco City Hall. A powerpoint presentation was made to explain the purpose of the US 81 Corridor Study, and the stakeholders were encouraged to provide input, particularly on the issue of potential bypasses around the cities of Union City, Minco, Pocasset, and Chickasha.

At the Chickasha stakeholder meeting, general support of a Chickasha bypass was expressed. In addition to the concept of a West Bypass which had been studied by ODOT previously, several stakeholders suggested consideration of a North Bypass.

The second set of informal stakeholder meetings were held November 1, 2005 at the Chickasha Chamber of Commerce and the Minco Senior Citizens Center. The primary purpose of these meetings was to present the results of the evaluation of the various bypass alignments. At Chickasha, the results of the traffic count and license plate survey were presented. It was explained that because these evaluations indicated that the North Bypass would be used by only 6 to 7% of the traffic traveling through Chickasha on US 81, while the West Bypass would be used by 25 to 28% of the same US 81 traffic, the North Bypass would be eliminated from further study. Several stakeholders commented verbally and in writing that of the three West Bypass alternates presented, they favored the 3-4 Hybrid alternate.

At Minco, the potential bypasses of Union City, Minco, and Pocasset were reviewed, and stakeholder input on the bypasses was requested. Opposition to the bypasses was voiced at the meeting, as well as in later written comments. Members of the Minco Planning Commission voiced their support of the alternate alignment south of Minco. This alignment was originally developed to correct the substandard curve on existing US 81, but was favored by the Minco Planning Commission in part due to the fact that it was also compatible with their wish to re-align SH 37 east of Minco to proceed west along existing Sager Road.

5.3 Public Meetings

The first set of public meetings was held on November 7, 2005 at the Minco Public School Auditorium and November 10, 2005 at the Grady County Fairgrounds Community Building in Chickasha. The purpose of these meetings was to present the following information:

- 2004 Traffic Volumes and Level of Service
- 2030 Traffic Volumes and Level of Service (both without and with improvements)
- Typical Cross Sections
- Potential Bypass Locations
- Environmental Constraints Maps

All graphical information from the meetings was also made available for subsequent review on the consultant's project website. The public was encouraged to provide comments and/or additional information relative to the Corridor Study. They were also informed that their comments would be considered in selecting the recommended improvements, which would be presented at the final set of public meetings.

Public comments received after the 2005 public meetings expressed opposition to bypasses of the small towns, and fairly equal support/opposition to the concept of a Chickasha bypass.

The second set of public meetings was held September 7, 2006 at the Grady County Fairground Community Building and September 19, 2006 at the Minco Public School

Auditorium. The purpose of these meetings was to present the final recommended improvements. Environmental constraints maps were presented, as well as the associated costs and priorities associated with the Chickasha Section West Bypass and the 12 construction segments identified in the Northern Section. The public had many questions regarding likely scheduling of the project.

Public comments received after the 2006 public meetings overwhelmingly addressed the West Bypass. More comments expressing opposition than support were received, with the greatest number (approximately 125) expressing concern over the West Bypass alignment and suggesting an alignment further to the west to avoid existing homes. A citizen who owns a significant amount of property southwest of Chickasha stated that the West Bypass 3-4 Hybrid Alternate would be very disruptive to his business operations. Another landowner pointed out that the south end of the Alternate was located in a large drainage area which would require significant dirt work. Concern was also expressed over the proposed bypass interchange at Idaho Street, as in that area Idaho Street is narrow, primarily residential, and is not continuous to the east.

Copies of all written public comments received, as well as ODOT's written responses, are included in Appendix L.

5.4 Summary

The public involvement process resulted in the definition and evaluation of a northern Chickasha bypass, and also was a factor in elimination of Union City, Minco, and Pocasset bypasses from further evaluation. Several residents expressed concern over the proposed location of the West Bypass. While this Corridor Study recommends construction of a West Bypass of Chickasha, it also recognizes that additional effort will be made during the NEPA process to identify its most advantageous and least intrusive alignment. In addition to identifying key issues and concerns voiced by the public, the Corridor Study's public involvement process has also yielded a comprehensive mailing/contact list of interested citizens, which will be used extensively during the NEPA project to follow.

6.0 SUMMARY OF RECOMMENDATIONS

The recommendations of this US 81 Corridor Study include:

- **From south of US 81/SH 19 intersection to US 81/US 62 intersection:** Construct a controlled-access 4-lane divided West Bypass

- **From US 81/US 62 intersection north to Pocasset:** Add a median and 2 new lanes east of the existing lanes; reconstruct the existing lanes; resulting in a 4-lane divided facility

- **Through Pocasset:** Widen the existing 2 lanes to 4 lanes; add curb and gutter where lacking; resulting in a 4-lane undivided facility

- **From Pocasset to Minco:** Add a median and 2 new lanes east of the existing lanes; reconstruct the existing lanes; resulting in a 4-lane divided facility

- **Minco:** Mill and overlay the existing 4 lanes; add curb and gutter where lacking; resulting in a 4-lane undivided facility

- **From Minco to Union City:** Add a median and 2 new lanes east of the existing lanes; reconstruct the existing lanes; resulting in a 4-lane divided facility

- **Union City:** Widen the existing 2 lanes to 4 lanes; mill and overlay the existing 4 lanes; add curb and gutter where lacking; resulting in a 4-lane undivided facility

- **Union City to North Corridor End:** Add a median and 2 new lanes east of the existing lanes; reconstruct the existing lanes; resulting in a 4-lane divided facility

- **Public Involvement:** To ensure adequate public involvement in selecting the most advantageous and least intrusive alignment of the Chickasha West

Bypass, the comprehensive mailing list developed during the Corridor Study should be used during the future NEPA process to facilitate public involvement.

- **Future Consideration:** Appropriate consideration should be given to the potential realignment of SH 37 east of Minco along existing Sager Road to US 81 as improvements to SH 37 east of Minco are planned.

- **Construction Segments, Northern Section:** As an aid to project programming, the Northern Section was divided into 12 construction segments. The cost estimate and priority developed for each segment is as follows:

Table 4-17: Cost Estimates and Priorities for 12 Construction Segments, US 81 Corridor, Northern Section

Segment	Approximate Extents	Total Cost (million $)	Priority
1	US 62 to E 1320 Road	26.4	High
2	E 1320 Road to E 1290 Road	14.0	Low
3	E 1290 Road to E 1260 Road	13.0	Low
4	Pocasset (E 1260 Road to E 1250 Road)	3.2	Low
5	E 1250 Road to E 1230 Road	7.8	Low
6	E 1230 Road to E 1200 Road	10.8	Low
7	E 1200 Road to South Street in Minco	11.4	Medium
8	Minco (South Street to 1.2 miles north)	2.8	Medium
9	0.45 miles south of SH 37 West to Canadian River	11.6	Medium
10	Canadian River	6.9	Medium
11	Canadian River to 0.50 miles north of SH 152 East	9.5	High
12	0.50 miles north of SH 152 East to E 1090 Road	12.0	High

Note: See Table 4-14 (page 70) for details.

- **Project Phases, Chickasha Section:** A cost estimate and priority for each phase of the Chickasha Section West Bypass was developed, as follows:

Table 4-18: Cost Estimates and Priorities, US 81 Corridor, Proposed Chickasha West Bypass

Phase	Total Cost (million $)	Priority
Right-of-Way Acquisition	10.9	High
Utility Relocation and Construction	166.9	Low

Note: See Table 4-16 (page 71) for details.

APPENDIX A
Previous Studies

APPENDIX B
Roadway Data

APPENDIX C
Sufficiency Ratings

APPENDIX D
Environmental Analysis Materials
(Under Separate Cover)

APPENDIX E
Origin-Destination Study

APPENDIX F
Interchange Traffic Volumes
With and Without Improvement

APPENDIX G
Intersection Warrant Analyses

APPENDIX H
4-Lane vs. 5-Lane Comparison/Recommendation

APPENDIX I
Construction Cost Estimate

APPENDIX J
Right-of-Way Cost Estimate

APPENDIX K
Utility Cost Estimate

APPENDIX L
Public Meeting Materials

APPENDIX M
Internal Meeting Minutes