

## Technical Memorandum

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**Date:** September 24, 2009

**To:** Jan Ollivier, Project Manager, Kittitas County

**From:** Jennifer Barnes, PE

**cc:** Lisa Parks, Alliance Consulting Group, Inc.; Fred Huber, Mayor, City of Kittitas

**Subject:** Kittitas County GMA Compliance, City of Kittitas Transportation Assessment

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### Introduction

The purpose of this memorandum is to provide Kittitas County (County) an analysis of transportation facilities needed to support growth under two different alternatives in the Urban Growth Area (UGA) boundaries for the City of Kittitas (City) through 2025.

This analysis has been done in accordance with Section 36.70A.070 of the Washington State Growth Management Act (GMA). GMA requires that transportation elements include the following:

- Inventory of existing city-owned capital facilities, showing the approximate location and identifying the approximate capacities of those facilities;
- Forecast of future needs (for the next six years minimum);
- The proposed locations and capacities of expanded or new capital facilities;
- A six-year plan that also identifies potential revenue sources needed to fund the timely construction of the capital facilities, including specific identification of funding programs or sources of public money for such purposes; and
- Coordination among the Land Use Element, Capital Facilities Plan Element, and Financial Planning Element of the Comprehensive Plan to provide consistency with one another.

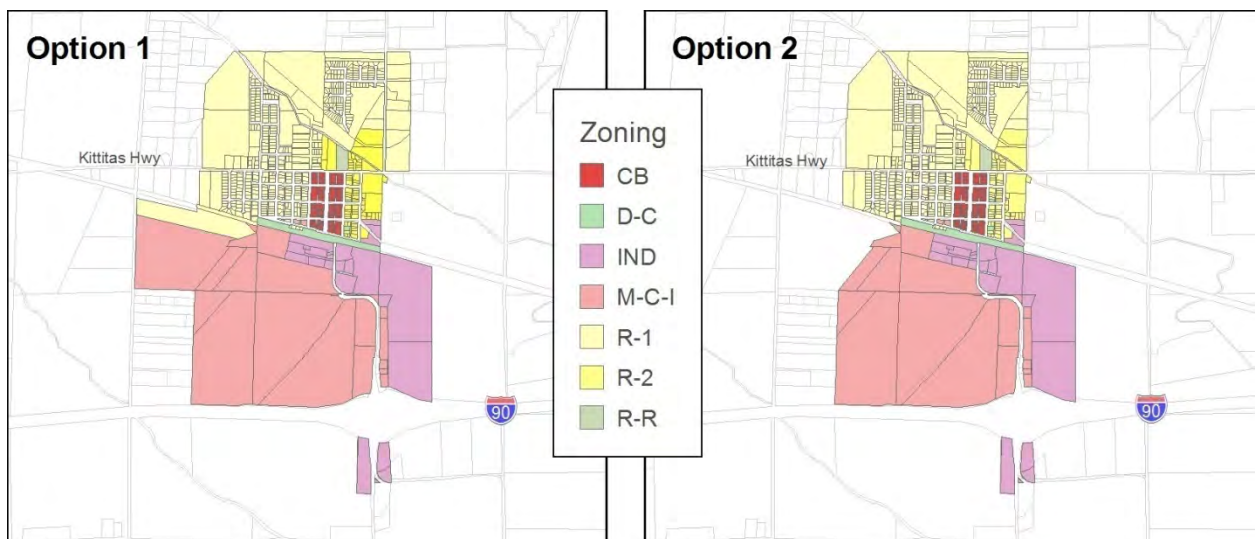
Analysis provided in this memorandum may be used by the County to augment the City's capital facilities plan to address compliance issues raised about the County Comprehensive Plan, and to adopt the capital facilities assessment into the County Comprehensive Plan. However, it would be appropriate for the City to consider incorporating the County's updated transportation assessment

(after the County has finalized the City UGA size and allocations) into its own transportation and capital facilities elements, as part of its next Comprehensive Plan update.

## Future Land Use Options

The analysis evaluates capital facility needs under two different study options based on the residential and employment options outlined in the City of Kittitas Land Capacity Analysis Evaluation memorandum (ICF Jones and Stokes 2009). Figure 1 shows the UGA parcels under each option.

Figure 1. UGA Parcels and Zoning for Two City of Kittitas Land Use Options



Source: Kittitas County 2009; ICF Jones and Stokes 2009; BERK 2009

Option 1 reflects the high end of the range of future population and employment. Under this option, the Kittitas UGA boundaries defined in the City Comprehensive Plan would be maintained and additional population allocated to the UGA from other parts of the County. The City would have capacity for a 2025 population of 2,250 (~448 residences), and employment of 1,512 new jobs. Future employment is assumed to occur in the form of three new large format retail stores and additional commercial and industrial employment.

Option 2 reflects the lower end of the range of future population and employment. Under this option, the Kittitas UGA boundaries would be adjusted to reduce the overall UGA size, the future land use mix would be adjusted, and a lower population reallocated that would be reflected in Option 1. The City would have capacity for a 2025 population of 2,056 (~370 residences), and

employment of 885 new jobs. Future employment is assumed to occur in the form of two new large format retail stores and additional commercial and industrial employment.

## Transportation Assessment

The transportation assessment for potential UGA expansion of the City of Kittitas consists of the following elements:

- Transportation Inventory
- Level of Service
- Transportation Needs

These are presented in the following sections.

### Transportation Inventory

Table 1 summarizes key roads located in and adjacent to the Kittitas UGA, along with their Average Daily Traffic (ADT).

**Table 1. Inventory of Roads in the Vicinity of Kittitas**

Road	Location	Federal Functional Classification	Average Daily Traffic
Vantage Highway	West of No. 81 Road	Major Collector	2,896
Fairview Road	North of Kittitas Highway	Local Road	1,163
Kittitas Highway	East of Fairview Road	Major Collector	2,879
No. 81 Road	North of Clerf Road	Major Collector	1,212
Clerf Road	East of No. 81 Road	Local Road	803
Main Street <sup>1</sup>	North of 1st Avenue	Major Collector	2,000
Parke Creek Road	West of Hemingston Road	Minor Collector	365
Hemingston Road	South of Parke Creek Road	Local Road	399
Badger Pocket Road	East of Cleman Road	Minor Collector	503
Tjossem Road	West of Cleman Road	Major Collector	602
Cleman Road	South of Tjossem Road	Major Collector	1,004

1. Source of Main Street ADT is Wind Ridge Power environmental report (2003). All other ADT value based on Kittitas County counts collected in 2008 and 2009.

In general, roads are two lanes (one lane in each direction), with functional classifications of Local Road, Minor Collector, or Major Collector. For planning purposes, this analysis assumes that typical capacity is 600 vehicles/lane/hour for local roads; 800 vehicles/lane/hour for minor collectors; and 1,000 vehicles/lane/hour for major collectors. This is a conservative average estimate, based upon typical capacity values presented in the Highway Capacity Manual (Transportation Research Board 2000).

## Level of Service

The County uses Highway Capacity Manual methods to calculate level of service (LOS) of its roadways. LOS is the primary measurement used to determine the operating quality of a roadway segment or intersection. The quality of traffic conditions is graded into one of six LOS designations: A, B, C, D, E, or F. Table 2 presents typical characteristics of the different LOS designations, as well as typical volume to capacity ratio (V/C) for each designation. V/C represents the volume of traffic on a road divided by the vehicle carrying capacity of the road. As the table shows, LOS A and B represent the fewest traffic slow-downs, and LOS C and D represent intermediate traffic operations. LOS E indicates that traffic levels are at or approaching congested conditions; and LOS F a high level of congestion and unstable traffic flow. (Transportation Research Board 2000)

Existing LOS is based upon traffic counts. Future LOS is assessed by projecting future travel demand that will result from planned land use. Concurrency requirements under GMA indicate that facilities and services necessary to support development shall be adequate to serve existing and planned future land use without decreasing current LOS below locally established minimum standards. The County has established a standard of LOS C in rural areas, and LOS D in urban areas. Any road with LOS that exceeds these standards would be considered deficient, and out of compliance with the County's concurrency management system.

LOS standards for transportation facilities are provided in the transportation element of the City Comprehensive Plan (Policy T1.6). The City's adopted standard of LOS C for roads is consistent with the County's LOS standard for roads in rural areas.

To estimate the existing LOS on the study area roads, the following assumptions were applied, based upon typical transportation planning guidelines:

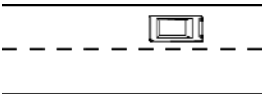
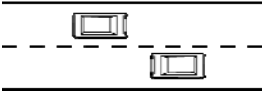
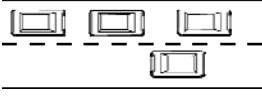
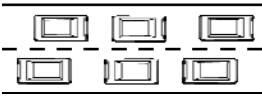
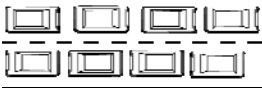
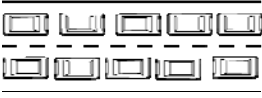
- Peak hour traffic volume is 10% of the ADT
- Peak direction traffic volume is 60% of the peak hour traffic volume

V/C for a road is calculated by dividing the peak direction of traffic volume per lane by the capacity per lane. Based upon these guidelines, the maximum V/C for each classification of road (based upon the ADT volumes presented in Table 1) is as follows:

- Major Collector:  $V = 2,896 * 0.10 * 0.60 = 174$ ;  $V/C = 174 / 1,000 = 0.17$
- Minor Collector:  $V = 503 * 0.10 * 0.60 = 30$ ;  $V/C = 30 / 800 = 0.04$
- Local Road:  $V = 1,163 * 0.10 * 0.60 = 70$ ;  $V/C = 70 / 600 = 0.12$

These maximum V/C values are well within the typical V/C range for LOS A, as shown in Table 2. Thus, it is concluded that all roads within the Kittitas vicinity are currently operating at LOS A.

**Table 2. Roadway LOS Characteristics**

Level of Service	Characteristic Traffic Flow
<p>A</p> 	<p>Free flow – Describes a condition of free flow with low volumes and high speeds. Freedom to select desired speeds and to maneuver within the traffic stream is extremely high. Stopped delay at intersections is minimal.</p> <p><b>Typical V/C: ≤0.60</b></p>
<p>B</p> 	<p>Stable flow – Represents reasonable unimpeded traffic flow operations at average travel speeds. The ability to maneuver within the traffic stream is only slightly restricted and stopped delays are not bothersome. Drivers are not generally subjected to appreciable tensions.</p> <p><b>Typical V/C: 0.61 – 0.70</b></p>
<p>C</p> 	<p>Stable flow – In the range of stable flow, but speeds and maneuverability are more closely controlled by the higher volumes. The selection of speed is now significantly affected by interactions with others in the traffic stream, and maneuvering within the traffic stream required substantial vigilance on the part of the user. The general level of comfort and convenience declines noticeably at this level.</p> <p><b>Typical V/C: 0.71 – 0.80</b></p>
<p>D</p> 	<p>Stable flow – Represents high-density, but stable flow. Speed and freedom to maneuver are severely restricted, and the driver or pedestrian experiences a generally poor level of comfort and convenience- Small increases in traffic flow will generally cause operational problems at this level.</p> <p><b>Typical V/C: 0.81 – 0.90</b></p>
<p>E</p> 	<p>Unstable flow – Represents operating conditions at or near the maximum capacity level. Freedom to maneuver within the traffic stream is extremely difficult, and it is generally accomplished by forcing a vehicle or pedestrian to "give way" to accommodate such maneuvers. Comfort and convenience levels are extremely poor, and driver or pedestrian frustration is generally high. Operations at this level are usually unstable, because small increases in flow or minor disturbances within the traffic stream will cause breakdowns.</p> <p><b>Typical V/C: 0.91 – 1.00</b></p>
<p>F</p> 	<p>Forced flow – Describes forced or breakdown flow, where volumes are above theoretical capacity. This condition exists wherever the amount of traffic approaching a point exceeds the amount that can traverse the point. Queues form behind such locations, and operations within the queue are characterized by stop-and-go waves that are extremely unstable. Vehicles may progress at reasonable speeds for several hundred feet or more, then be required to stop in a cyclical fashion.</p> <p><b>Typical V/C: &gt;1.00</b></p>

Source: Transportation Research Board 2000

## Transportation Needs

Following is an assessment of the potential effect of traffic conditions that could result from land use Options 1 and 2, and transportation issues that would need to be addressed.

### *2025 Baseline LOS*

Table 3 summarizes projected baseline conditions on the study area roads, without additional development defined under Options 1 and 2. This reflects increases in traffic volumes that could be expected to result from regional growth. The table shows that with projected regional growth, all roads in the Kittitas area are projected to continue to operate at LOS A through 2025.

**Table 3. 2025 Baseline LOS on Kittitas Roads**

Road	Location	Federal Functional Classification	Existing (2009) ADT	Projected 2025 Baseline ADT <sup>1</sup>	Estimated 2025 Baseline V/C <sup>2</sup> (LOS <sup>3</sup> )
Vantage Highway	West of No. 81 Road	Major Collector	2,896	3,396	0.20 (LOS A)
Fairview Road	North of Kittitas Highway	Local Road	1,163	1,364	0.14 (LOS A)
Kittitas Highway	East of Fairview Road	Major Collector	2,879	3,376	0.20 (LOS A)
No. 81 Road	North of Clerf Road	Major Collector	1,212	1,421	0.09 (LOS A)
Clerf Road	East of No. 81 Road	Local Road	803	942	0.09 (LOS A)
Main Street <sup>1</sup>	North of 1st Avenue	Major Collector	2,000	2,345	0.14 (LOS A)
Parke Creek Road	West of Hemingston Road	Minor Collector	365	428	0.03 (LOS A)
Hemingston Road	South of Parke Creek Road	Local Road	399	468	0.05 (LOS A)
Badger Pocket Road	East of Cleman Road	Minor Collector	503	590	0.04 (LOS A)
Tjossem Road	West of Cleman Road	Major Collector	602	706	0.04 (LOS A)
Cleman Road	South of Tjossem Road	Major Collector	1,004	1,177	0.07 (LOS A)

1. Based upon a conservative estimate of average 1% traffic growth per year, between 2009 and 2025.
2.  $V/C = (ADT * 0.10 * 0.60) / \text{capacity}$ ; Capacity assumed 1,000 veh/lane/hour for major collectors, 800 veh/lane/hour for minor collectors, and 600 veh/lane/hour for local roads.
3. Based upon typical ranges summarized in Table 2.

### *Traffic Generated by Land Use Options*

Traffic generated by new development under Options 1 and 2 was estimated based upon typical values in the Trip Generation Manual. (Institute of Transportation Engineers 2003) For each option, all future residential development is expected to be single family housing, and future jobs were assumed to be 50% retail and 50% industrial. Table 4 summarizes typical trip generation rates for land uses that have been identified under the options.

**Table 4. Typical Trip Generation Rates**

Land Use	ITE Code	Average Daily Trip Generation
Single Family Residential	210	9.57 trips per dwelling unit
Retail (based upon Free Standing Discount Store)	815	28.84 trips per employee
General Light Industrial	110	3.02 trips per employee

Source: Institute of Transportation Engineers 2003.

Table 5 summarizes the estimated total new trips generated under each of the options. The table shows that between 1,700 and 2,900 total peak hour trips are projected to result from build-out of residential and commercial development under UGA land use Options 1 and 2. It is expected that total traffic generated by new development would distribute throughout the roadway network, so no one roadway would be expected to accommodate the total number of trips.

**Table 5. Trip Generation Estimate for Land Use Options 1 and 2**

Land Use	Trip Generation Rate (trips/unit/day)	Option 1		Option 2	
		Units	Trips	Units	Trips
Single Family Residential	9.57 trips/dwelling unit	448	4,287	370	3,541
Retail	28.84 trips/employee	756	21,803	443	12,776
Industrial	3.02 trips/employee	756	2,283	442	1,335
<b>Estimated Daily Traffic</b>			<b>28,374</b>	<b>17,652</b>	
<b>Estimated Peak Hour<sup>1</sup></b>			<b>2,837</b>	<b>1,765</b>	

1. Source: Institute of Transportation Engineers 2003

2. Assumed as 10% of total daily traffic

### *Future LOS under Build-out of Options 1 and 2*

Table 6 summarizes the approximate number of additional peak hour trips that could be accommodated by the individual roads, so that they still maintain LOS C or better, based upon the volume projections and capacity assumptions presented above. The table shows that depending on how the additional traffic distributes onto the roadway network, additional capacity may be needed some roads under future build-out conditions. However, the estimates presented in this memorandum are based upon very conservative assumptions, and actual conditions could vary, depending on the following:

- Traffic increases due to regional growth could occur at a lower rate than what was assumed in this analysis, in which case more road capacity would be available to accommodate traffic generated by new development in Kittitas.

- The actual mix of retail and industrial development would affect the total number of trips generated. As shown in Table 4, industrial development typically generates much less traffic than retail development. In addition, different types of retail generate different levels of traffic. The assumption of Free Standing Retail represents a conservative (high end) estimate of potential retail trips.
- Capacity estimates for local and collector roads presented in this memorandum are planning level, and purposely conservative. Actual capacities for individual roads could be higher than what is presented in this memorandum.

Since the existing road system has substantial available capacity, even with the conservative assumptions applied in this analysis, a considerable level of additional development would be able to occur before capacity improvements would be warranted. It is not expected that additional capacity improvements would be needed within the first six years of the planning period.

However, as population and employment growth occurs, the City and County would need to monitor traffic conditions, and conduct more detailed traffic impact analysis as part of future development agreements. Transportation improvements (or impact fees to contribute toward transportation improvements) to ensure that the transportation system is adequate to support planned land use can be required as a condition of future development approval.

**Table 6. 2025 Baseline LOS on Kittitas Roads**

Road	Location	Federal Functional Classification	Estimated 2025 Baseline V/C	Approximate Additional Peak Hour Trips Accommodated While Maintaining LOS C <sup>1</sup>
Vantage Highway	West of No. 81 Road	Major Collector	0.20	1,000
Fairview Road	North of Kittitas Highway	Local Road	0.14	660
Kittitas Highway	East of Fairview Road	Major Collector	0.20	1,000
No. 81 Road	North of Clerf Road	Major Collector	0.09	1,200
Clerf Road	East of No. 81 Road	Local Road	0.09	700
Main Street <sup>1</sup>	North of 1st Avenue	Major Collector	0.14	1,100
Parke Creek Road	West of Hemingston Road	Minor Collector	0.03	1,000
Hemingston Road	South of Parke Creek Road	Local Road	0.05	750
Badger Pocket Road	East of Cleman Road	Minor Collector	0.04	1,000
Tjossem Road	West of Cleman Road	Major Collector	0.04	1,300
Cleman Road	South of Tjossem Road	Major Collector	0.07	1,200

1. Based upon maximum additional two-directional peak hour trips that would allow V/C of 0.80 or better to be maintained.

### *Access and Connectivity*

Areas within the potential UGA boundaries that are currently undeveloped, particularly in the potential commercial areas to the south the existing city, are not served by the existing roadway system. Additional roads will be needed to provide support access and circulation for development in these areas. Similar to potential capacity improvements on existing roads, new

access roads (or impact fees to contribute toward the roadway system) to ensure that the transportation system is adequate to support planned land use can be required as a condition of future development approval. The City has identified potential future roads to serve the expanded UGA in Appendix E of its Comprehensive Plan (included as Attachment 1 to this memorandum).

## Conclusion

Under existing traffic conditions, all roads within and adjacent to the potential Kittitas UGA are estimated to be operating at LOS A, which is well within the City and County standard of LOS C. These roads are also expected to accommodate additional traffic resulting from typical regional growth through 2025, and still maintain operations at LOS A. Build-out of potential new residential and commercial development under the UGA land use options could generate substantial additional traffic in the area. However, even with the conservative assumptions applied in this analysis, a considerable level of additional development would be able to occur before capacity improvements would be warranted. It is not expected that additional capacity improvements would be needed within the first six years of the planning period.

Areas within the potential UGA boundaries that are currently undeveloped, particularly in the potential commercial areas to the south the existing city, are not served by the existing roadway system. Additional roads will be needed to provide support access and circulation for development in these areas. The City has identified potential future roads to serve the expanded UGA in Appendix E of its Comprehensive Plan (included as Attachment 1 to this memorandum).

As population and employment growth occurs, the City and County would need to monitor traffic conditions, and conduct more detailed traffic impact analysis as part of future development agreements. Transportation improvements (or impact fees to contribute toward transportation improvements) to ensure that the transportation system is adequate to support planned land use can be required as a condition of future development approval.

## References

Berk and Associates. 2009. City of Kittitas Capital Facilities Needs Analysis. Prepared for Kittitas County as part of the 2009 Comprehensive Plan Compliance Project. September.

ICF Jones & Stokes. 2009. City of Kittitas Capital Land Capacity Analysis. Prepared for Kittitas County as part of the 2009 Comprehensive Plan Compliance Project. September.

Institute of Transportation Engineers (ITE). 2003. Trip Generation.

Kittitas, City of. 2007. Comprehensive Plan. Prepared by Alliance Consulting Group for the City of Kittitas.

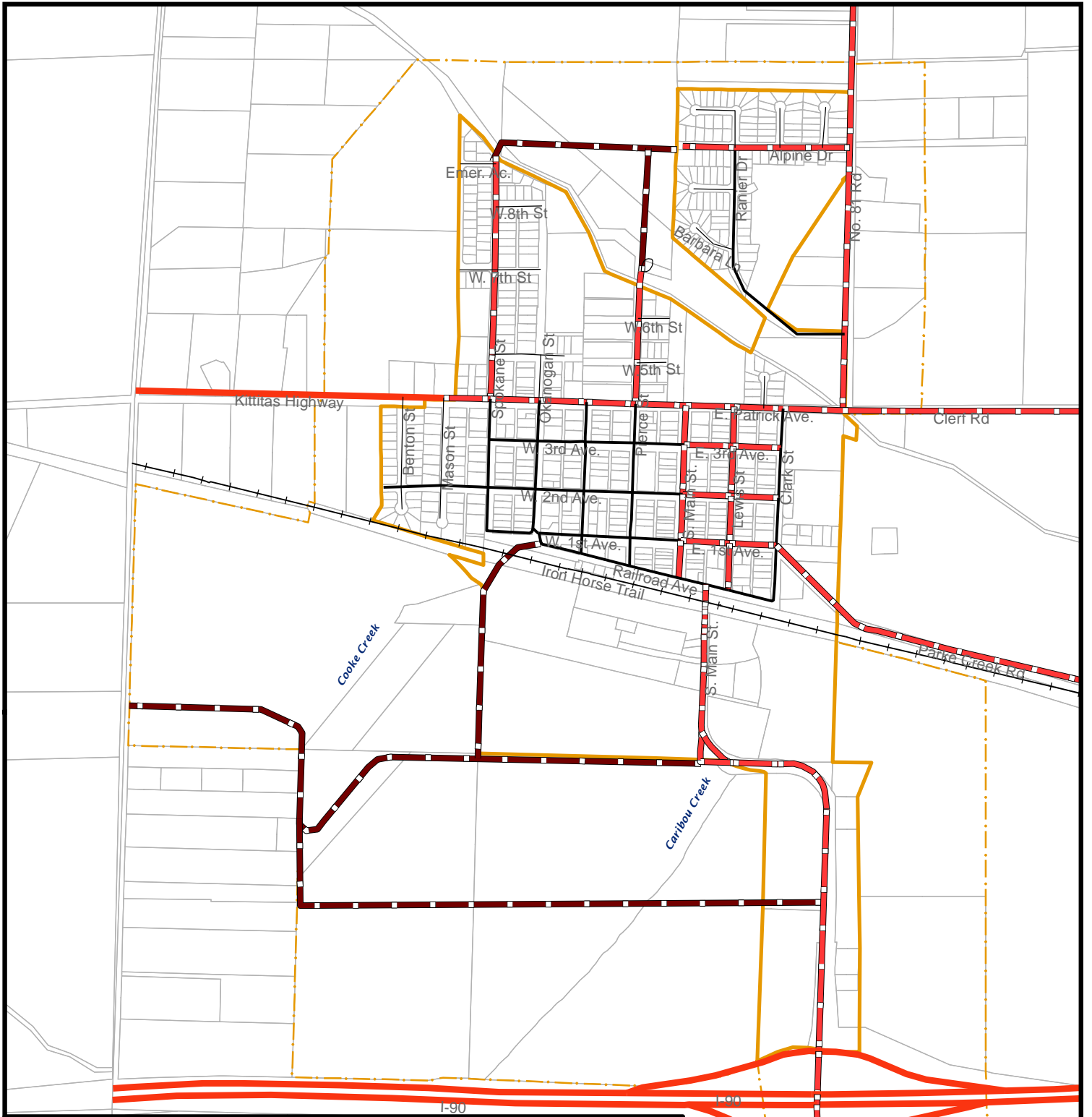
Transportation Research Board. 2000. Highway Capacity Manual. Special Report 209.

## Attachment 1

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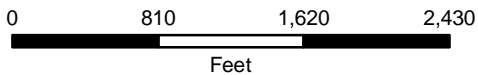
City of Kittitas Future Planned Roads  
(from Appendix E of City Comprehensive Plan)





### Future Roads Corridors Kittitas, Washington

- City\_limits
- Highway
- Collector
- Old RR
- 2006UGA
- Arterial
- Local Access
- Proposed Arterial



**Disclaimer:**  
This map is intended for general information only. Data is subject to change. It is not meant as an accurate measurement. Contact the City of Kittitas for more information. March 13, 2007

