Appendix A:

Technical Support Memorandum: West Plains Transportation & Arterial Network Study

MORRISON MAIERLE, INC.

memo

TO: Bill Grimes, AICP
Studio Cascade

FROM: Bill White

DATE: June 26, 2013

JOB NO.: 5199.010

RE: Technical Support Memo: West Plains Transportation & Arterial Network Study

CC: Louis Meuler, City of Spokane Development Services

☐ **Urgent** ☒ **For Review** ☒ **Please Comment** ☒ **Please Reply** ☐ **For Your Use**

This memorandum summarizes the traffic forecasts, capacity analysis, and improvement recommendation process used to support the West Plains Transportation Study and Arterial Plan project, as being led by Studio Cascade on behalf of the Planning Department for the City of Spokane. The memorandum provides a summary of the following for the Study:

1. Arterial classification approach and guidelines.
2. Existing and forecasts traffic volumes for the study area.
3. The Capacity analysis used for the study and highlighted deficiencies.
4. Previously recommended/considered improvement options.
5. Provides a summary of recommended capacity improvements.
6. Summarizes planning level cost estimates for improvements.
7. Highlights conclusions from the traffic analysis.

Please review and contact our office with questions and/or comments.

1. ARTERIAL CLASSIFICATION

The functional classification or class hierarchy of arterials is a method commonly used by Federal, state, and local agencies as a way of organizing roadways into service categories. These service categories are often distinguished by the purpose of a roadway, within the context of the overall arterial network, in moving traffic throughout a community. Arterial are classified into designations that typically range from wider roadways that support higher trip lengths, traffic volumes, and travel speeds to more narrow roadways that serve the specific purpose of connecting traffic into and/or providing access to developments, as characterized by shorter trip lengths, traffic volumes, and travel speeds. The end result of the functional classification planning process for a community is often referred to as an *arterial road plan*, which is then used to help guide the design and right-of-way dedication process as roadways are developed/extended to serve community need.

Until year 2012, most of the West Plains was located in, with roadways maintained by, Spokane County. These roadways had more of a rural character as they were intended principally to provide access to agricultural land and light density residential neighborhoods, with a handful of homes located on every five to ten acres and generating very few vehicle trips. As such, the majority of West Plains roadways had been developed, and primary still exist as, two lane facilities with narrowly paved shoulders because supporting high traffic volumes was <u>not</u> a priority at the time. In addition, the movement of pedestrians and bicycles, with the accommodation of school bus and public transit

activities, using designated facilities, was not needed as such activities could safely occur within the paved limits of these low volume rural roads.

However as of 2012, a significant portion of the West Plains was incorporated into the Cities of Spokane and Airway Heights with these agencies looking to promote development opportunities within their new boundaries. There is also capacity for commercial, light industrial, and higher density residential development within the Urban Growth Area of the County. The West Plains has been identified as a primary region for such growth, specifically within about a mile of the I-90 corridor. As such, the emergent need will be to develop or improve roadways to a cross-sectional (i.e. number and width of lanes) and structural (i.e. base course and pavement thickness) capacity necessary to accommodate higher traffic volumes. In addition, the designated facilities needed to safely accommodate pedestrian and bicycle movements, and to accommodate school bus and transit activities, will materialize with the increase of population and traffic density.

Thus, officials with the City of Spokane, in partnership with City of Airway Heights and Spokane County officials as stakeholders, have moved to develop an arterial road plan for the West Plains. This plan has been developed through a process that addresses the anticipated access and mobility needs of the region, as driven based initially on a review of zoning/land use potentials, in collaboration with the ideas offered by citizens through a public outreach and stakeholder involvement process, and as finally guided through the "best practice" guidelines and principals available for roadway planning actions. Documents researched in the process include guidelines such as the *Urban Street Geometric Design Handbook* (ITE, 2008) *A Policy on the Geometric Design of Highways and Streets* (AASHTO, 6th Edition, 2011), and the *Access Management Manual* (ITE, 2003). Also, documentation such as the *City of Spokane Comprehensive Plan* (Spokane, 2000) was used to help guide character discussions.

There are several various rural, urban, suburban functional classification descriptions that can be utilized when developing an arterial plan. The functional classifications that make the most sense in planning roadway networks for suburban and urban environments, in consistency with the *City of Spokane Comprehensive Plan*, include those of principal, minor, and collector arterials. The *City of Spokane Comprehensive Plan*, from here on referred to as Spokane Comp Plan, and *A Policy on the Geometric Design of Highways and Streets*, from here on referred to as AASHTO Greenbook, are described in the following paragraphs.

Per the City of Spokane Comprehensive Plan

Principal Arterial. *A principal arterial permits relatively unimpeded traffic flow between major areas of the city at moderately high speeds. The arterial is typically divided and has limited or controlled access to fronting properties. Intersections are typically at-grade and channelized with pedestrian accommodations. Intersecting streets are stop-controlled. Parking lanes are typically prohibited, but pullouts are available at key locations.*

Minor Arterial. *A minor arterial collects and distributes traffic between higher classified arterials and major traffic generators. Major generators would include areas such as community business centers, shopping centers, and areas with multiple residential developments. Minor arterials are designed for moderate speeds. Major intersections are typically signalized. Stop signs are used on street approaches to minor arterials. Bicycle lanes and parking lanes may be located on minor arterials. Minor arterials are restricted to two-lanes within neighborhood centers.*

Commercial/Industrial Collector Arterial. *Commercial/Industrial collector arterials collect and distribute traffic between higher classification streets, business centers, and commercial centers. These arterials are designed for moderate speeds. Traffic control should be used to facilitate the collection and distribution of traffic to higher classified arterials, yet discourage the cut-through of traffic between arterials. Parking lanes and bicycle lanes are acceptable. Stop signs are used on the street approaches to commercial/industrial collector streets.*

Residential Collector Arterial. *Residential collector arterials collect and distribute traffic between higher classification streets and residential access streets and directly to traffic destinations. Arterials are design for low to moderate speeds. Traffic control should be used to promote safety and discourage cut-through traffic between neighborhoods. Parking lanes and bicycle lanes are acceptable. Stop sings are used on street approaches to residential collector streets.*

Per A Policy on Geometric Design of Highways and Streets (AASHTO Greenbook)

Urban Principal Arterial. *The urban principal arterial system serves the major centers of activity of urbanized areas, the highest traffic volume corridors, and the longest trip desires. This system carries a high proportion of the total urban area travel even though it constitutes a relatively small percentage of the total roadway network. The system should be integrated both internally and between major rural connections.*

The urban principal arterial system carries most of the trips entering and leaving the urban area, as well as most of the through movements bypassing the central city. In addition, significant intra-area travel, such as between central business districts and outlying residential areas, between major inner-city communities, and between major suburban centers, is served by this class of facility. Frequently, the urban principal arterial system carries important intra-urban as well as intercity bus routes. Finally, in urbanized areas, this system provides continuity for all rural arterials that intercept the urban boundary.

Because of the nature of the travel served by the principal arterial system, almost all fully and partially controlled access facilities are usually part of this functional class. However, this system is not restricted to controlled-access routes. To preserve the identification of controlled-access facilities, the principal arterial system should be stratified as follows: (1) interstate, (2) other freeways, and (3) other principal arterials (with partial or no control of access).

The spacing of urban principal arterials is closely related to the trip-end density characteristics of particular portions of the urban areas. Although no firm spacing rule applies in all or even in most circumstances, the spacing between principal arterials (in larger urban areas) may vary from less than 1 mile in the highly developed central business areas to 5 miles in the sparsely developed urban fringes.

For freeways and expressways, service to abutting land is subordinate to travel service to major traffic movements. For facilities within the subclass of other principal arterials in urban areas, mobility is often balanced against the need to provide direct access as well as the need to accommodate pedestrians, bicyclists, and transit users.

Urban Minor Arterial. *The urban minor arterial street system interconnects with and augments the urban principal arterial system. It accommodates trips of moderate length at a somewhat lower level of travel mobility than principal arterials do. This system distributes travels to geographic areas smaller than those identified with the higher system.*

The urban minor arterial streets system includes al arterials not classified as principal. This system places more emphasis on land access than the higher system does and offers lower traffic mobility. Such a facility may carry local bus routes and provides intercommunity continuity but ideally does not penetrate identifiable neighborhoods.

The spacing of urban minor arterial streets may vary from 0.1 to 0.5 miles in the central business district to 2 to 3 miles in the suburban fringes but is normally not more than 1 mile in fully developed areas.

Urban Collector Street. *The urban collector street system provides both land access services and traffic circulation within residential neighborhoods and commercial and industrial areas. It differs from the urban arterial system in that facilities on the collector system may penetrate residential neighborhoods, distributing trips from the arterials through the area to their ultimate destinations. Conversely, the urban collector street also collects traffic from local streets in residential neighborhoods and channels it into the arterial system. In the central business district, and in other areas of similar development and traffic density, the urban collector system may include the entire street grid. The urban collector street system may also carry local bus routes.*

Highways were not addressed in this network planning effort, as they already exist within the West Plains. Highways are the utmost functional classification of arterials, intended as a class of roadway that primarily reflects traffic movement between communities and is primarily planned, controlled, and maintained by state agencies. With this project, Interstate 90, State Route 2, State Route 902, and State Route 904 are highways controlled by the Washington State Department of

Transportation (WSDOT). This study reflects arterial access to/from, as well as proposes congestion relief measures, for these highways as they are critical to mobility. However, local agencies have no jurisdiction over planning highway networks and are therefore were not a focus of network planning discussions; including discussion regarding the Geiger, Medical Lake, and Cheney Interchanges along I-90.

Local streets are a fundamental component of a street system, providing direct access to neighborhoods and/or individual properties. But they typically do not serve the mobility needs of a community and normally have minimal traffic volumes. In many cases, the arrangement of local streets is dictated by the character of a specific development project, as determined by a project proponent, and are not prescribed by an agency. Thus, they were not included in this master planning process as they: 1) present a level of detail too intricate to document for an arterial network especially in context to the fact that they 2) represent a functional part of the roadway system that has little to do with the collection or distribution of traffic for al community.

Planning Guidance

As indicated, the arterial network planning process was dictated initially by the need to promote mobility through and to regional land uses, with ideas provided through a public/stakeholder input, and as tempered by industry guidelines. Arterial planning guidance was adapted from material provided within *Urban Street Geometric Design Handbook* (ITE, 2008) and the AASHTO Greenbook, touching on topics such as:

- Number of lanes
- Operating speed
- Roadway spacing
- Driveway spacing
- Sidewalk Provided
- Sidewalk Buffer
- Bike Lane
- Parking Lanes

Table 1 provides a summary of the general guidance used in roadway planning within the West Plain, as provided from a transportation perspective. The guidance on how this relates to land use and public involvement is provided in the primary Plan.

Table 1. Arterial Planning Guidelines

	Principal Arterial	Minor Arterial	Collector Arterial
Number of Lanes	2 - 7 lanes	2 – 5 lanes	2 – 4 lanes
Operating Speed	25 to 45 mph	25 to 45 mph	20 to 40 mph
Arterial/Intersection Spacing	≥ 1 mile	0.5 – 1 miles	0.25 – 0.5 miles
Driveway Spacing - Left Turn Allowance - Right-In and Right-Out Only	 2640 feet 1,320 feet	 660 feet 330 feet	 330 feet Varies
Sidewalks	Yes	Yes	Yes
Sidewalk Buffer	Yes	Yes	Yes
Bike Lanes	Yes	Yes	Yes
Parking Lanes	No	No	Yes

The arterial network within the West Plains is intended to serve residential neighborhoods and commercial businesses, primarily including light industrial and manufacturing uses along I-90 and Hayford Road, and retail and service uses along SR 2. The character of these roadways should therefore reflect that of promoting access to homes, industry, and business. To that end, roadway sections that include a two-way left-turn lane (TWLTL) are encouraged to assure safe circulation and access between properties and roadways. Even if traffic volumes may not warrant the physical capacity of a third, fifth, or seventh lane, the TWLTL reduces the number of conflicts which improves traffic operations and safety.

Pedestrians are underserved in the West Plain. The demand for pedestrian facilities is expected to increase as the density of urban uses increases. As such, the majority of roadways should be developed to provide safe accommodation for pedestrians and, as appropriate, bike lanes. Sidewalks or paved pathways separated from traffic lanes with a grassy buffer is the style of accommodation the State and local agencies have adopted.. Dedicated bike lanes are recommended especially along collector roadways were recreation and non-motorized commute activity is likely considering the nature adjoining uses. The West Plains is also a busy area for school activities and is a well-established destination center for Spokane Transit Authority. As such, accommodation should be made along arterials for safe access for transit riders.

2. Traffic Volumes and Forecasts

The capacity analysis for this study was based on a review of year 2020, 2040, and 2070 average daily traffic (ADT) forecasts. In coordination with local staff, ADT volumes and forecasts were determined to be the most appropriate metric for capacity analysis, as opposed to peak hour volumes, because the overall mobility of the West Plains is being evaluated and planned for at a high level. It must be established that traffic volumes and forecasts can be accommodated overall, through the arterial network, and then peak hourly analysis can be performed in the future to further define and refine the projects/improvements, as recommended later by this technical study.

Year 2040 was the natural interim analysis year for the traffic study, as this is the horizon year utilized by local and State agencies. Year 2020 was evaluated so select improvement recommendations could be identified and prioritized on local *transportation improvement plans* for the region, which typically are six-year programs. The evaluation of both these horizon years is consistent with local practices.

Finally, a long-range analysis year that reflects a more developed or mature land use condition was desired within the West Plains. Initially, a "full build" scenario that reflected the maximization and entire occupancy of land uses was considered. However, preliminary examinations indicate there is a very high availability of vacant lands within the West Plains, and this full build scenario would reflect a housing and employment absorption rate that would nearly surpass the growth of all of Spokane County within the last 50 years. This was therefore considered excessive and beyond the scope of this present study. As such, year 2070 was selected as the long-range horizon year to assure that the arterial network, and whatever improvements proposed by this document, would have the design capability and capacity to account for traffic well beyond the year 2040 forecast horizon year.

Traffic Counts

ADT counts were assembled for the study area through WSDOT, Spokane County, the City of Spokane, and Airway Heights. In addition, 11 ADT/tube counts were performed by the consultant team to assure information was available for all current or future roadways deemed important to mobility within the study area. All traffic counts used in the study were performed within the last three years. A summary of current ADT volumes are shown on attached Figure 1, with the roadways surveyed summarized as follows:

- Brooks Road
- Dover Road
- Rambo Road
- Craig Road
- Garfield Road
- Hayford Road
- Flint Road
- Thomas Mallen Road
- Spotted Road
- Grove Road
- Assembly Road
- Deno Road/Trails Road
- Sprague Avenue
- 12th Avenue
- 21st Avenue
- Sunset Frontage
- State Route 2 (SR 2)
- McFarlane Road
- Thorpe Road
- Electric Road
- Geiger Boulevard
- Medical Lake Highway (SR 902)
- Four Lake/Medical Lake Road
- Westbow Road
- Hallet Road
- Melville Road
- Cheney-Spokane Highway (SR 904)
- Aero Road

Traffic Forecast

Traffic forecasts were developed based on growth rates established from a review of the forecast regional travel demand model maintained by the Spokane Regional Transportation Council (SRTC), which is the federally mandated metropolitan planning organization for the Spokane County area. Year 2040 employment and housing projections are provided by local agencies to the SRTC, with this information distributed into categories that reflect the various types of travel associated with residential, commercial, light industrial, and institutional land uses. Land use trips are generated, as based upon equations developed through a review of similar land uses located throughout our region and the nation, and then these trips are assigned to over 10,000 transportation analysis zones (TAZs) that represent distinct districts of the greater Spokane regional community. Figure 2 shows the future residential and employment allocations that were incorporated into the year 2040 forecast travel demand model for the West Plains area, as allocated by TAZs.

A simulated transportation network that represents highways, principal and minor arterials, collector streets, and access connections to primary event centers is established, and then trips are assigned between TAZs and to external destinations (such as Highways leading to/from the region) to simulate land-use associated travel. These land use/TAZ trip assignments are combined with "base" forecasts, which represent travel through the region, to generate forecast year 2040 traffic projections for the simulated roadway network. This process is also performed based on existing count and land use information so a basis of comparison and calibration can be established to measure/gauge forecast travel changes.

Thus, the arterial network prepared for the forecast travel demand model, from here on referred to simply as travel model, was isolated for review within the West Plains. The majority of study roadways, as mentioned above, where reflected in the travel model. As such, existing and year 2040 travel model iterations were compared to develop annual and total growth rates for the majority of study roadways. The total growth rate was applied to ADT counts to develop year 2040 forecasts, and annual growth rates were applied to develop year 2020 and year 2070 forecasts.

Growth rates were not available for some locations as the travel model did lack some roadway links. To remedy this, growth rates were reviewed for various screen lines used to compare overall east-west and north-south traffic growths. A screen line is an imaginary boundary that extends through an area, traversing parallel roadways, and then used as a means for gauging the collective movement

of traffic within a region. For instance, a north-south screen line was reviewed for east-west traffic located east of Hayford Road, crossing the primary study roadways of Deno Road, Sprague Avenue, 12th Avenue, 21st Avenue, State Route 2, McFarlane Road, and Medical Lake Highway (SR 902). The individual counts for these roadways are 1,760, 1,235, 495, 190, 26,000, 1,580, and 6,400 ADT, respectively, but the entire screen line volume is 37,760 ADT. This means there are nearly 38,000 daily vehicles performing east –west progression within the area, and this is an important measure when planning overall lane capacities for a north-south arterial network such as the West Plains.

Growth rates were established for the majority of roadways through the travel model. From these rates, average total and annual growth rate could be surmised between arterials along the screen line, and then these rates could be used to predict growth for the few missing ADT count locations.

Attached Figure 3 shows the screen lines used for the study area. Table 2 below shows the resulting traffic growth progression for these screen lines. Finally, Figure 4 through Figure 6 shows specific ADT forecasts for study roadways for year 2020, year 2040, and year 2070, respectively.

Table 2. Screen Line Traffic Volume and Forecast Comparison

	Existing Counts/ADT	Forecast Year 2020		Forecast Year 2040		Forecast Year 2070	
		ADT	% Grow	ADT	% Grow	ADT	% Grow
Screen Line 1	13,055	15,015	15.0	22,940	75.7	33,860	159.4
Screen Line 2	24,295	26,035	7.2	32,640	34.4	42,865	72.3
Screen Line 3	16,105	18,315	13.7	26,775	66.3	38,565	139.5
Screen Line 4	11,510	12,990	12.8	18,950	64.6	27,170	136.1
Screen Line 5	5,895	6,930	17.6	11,015	86.9	16,675	182.9
Screen Line 6	10,220	11,075	8.4	14,035	37.3	18,250	78.6
Screen Line 7	16,000	17,515	9.5	22,695	41.8	30,090	88.1
Screen Line 8	8,990	9,965	10.9	13,980	55.5	19,490	116.8
Screen Line 9	16,125	17,105	6.1	20,255	25.6	24,815	53.9
Screen Line 10	37,660	40,710	8.1	53,610	42.4	71,240	89.2
Screen Line 11	3,330	3,845	15.5	5,795	74.0	8,520	155.8
Screen Line 12	39,700	42,750	7.7	53,630	35.1	69,020	73.9
Screen Line 13	5,370	6,390	19.0	10,735	99.9	16,665	210.3
Screen Line 14	57,945	62,350	7.6	77,685	34.1	99,495	71.7
Screen Line 15	22,300	23,600	5.8	27,860	24.9	34,005	52.5
Screen Line 16	20,595	22,570	9.6	29,565	43.6	39,480	91.7

3. Capacity Analysis

As indicated, the capacity analysis was based on a review of year 2020, 2040, and 2070 ADT forecasts. ADT volumes and forecasts are appropriate for capacity analysis in network planning because the overall/regional mobility of the West Plains is being evaluated and planned for at a high level. This means the capacity of east-south and north-west roadways must have the overall capacity needed to accommodate traffic moving through the region, using the proposed arterial network. Additional analyses based on peak hourly traffic volumes and forecasts can then be pursued to further define and refine the projects/improvement recommended by this technical study.

Arterial capacity was gauged based upon the level-of-service (LOS) methodologies of the *Highway Capacity Manual (*Transportation Research Board, 2010). The *Highway Capacity Manual* (HCM) is a nationally recognized and locally accepted method of measuring traffic flow and congestion for roadways and intersections. Criteria range from LOS A, indicating free-flow conditions with minimal vehicle delays, to LOS F, indicating congestion with significant vehicle delays.

Level of service C (LOS C) is an operational threshold typically used by various agencies for urban/suburban arterials and roadway segments. Thus, volume thresholds that represent a LOS C or better condition, as established for two primary classes of roadway, was developed for comparison with forecast ADT volumes. These capacity thresholds were determined using ARTPLAN; which is a software program developed through collaboration between the Florida Department of Transportation and University of Florida Transportation Research Center. The software program adapts the methodologies of the HCM, but allows for ADT thresholds to be derived from the peak hourly comparisons typical of many capacity and operational traffic studies.

ADT LOS C capacity thresholds were developed for two classes of roadways. The distinction between these classes is based primarily on the difference of free flow speed, signal spacing, and traffic density, as represented with the peak hour factor (PHF). The Class 1 arterial has a posted speed of 40 miles per hour or greater, with the potential for signalized cross streets located every half-mile and a PHF of 0.95 or greater. The Class 2 arterial has a posted speed of 35 mi/h or less with the potential for signalized cross streets on a 0.25 mile basis, and a PHF of 0.92 or less.

There were several assumptions beyond speed, spacing, and the PHF that went into developing capacity thresholds as a function of the through lanes. A summary of design factors include:

- **K Factor.** The ratio of peak hour to average daily traffic volumes.
- **Speed.** The posted speed limit or noted operating speed of an arterial.
- **Signal Spacing.** Distance assumed between signalized intersections along arterial.
- **Arrival Type.** Describes the quality of progression between signalized intersections; ranging from 1 (worst) to 6 (best). 3 is the typical setting appropriate for actuated signals along a corridor within an uncoordinated system.
- **Peak Hour Factor.** The ratio of hourly volume to the peak 15 minute flow rate within the hour times four. This is established as a means of quantifying the density of traffic flow.
- **Percent Heavy Vehicles.** The percentage of trucks to total traffic.
- **Directional Distribution.** The percentage of traffic traveling in the predominant direction versus total roadway volumes.
- **Average Turn Volume.** Typical percent of left or right turning traffic versus total approach volumes at an intersections or driveways.
- **Exclusive Turn Lanes.** Typical location of a right or left turn lanes/tapers at intersections or driveways.
- **Average Green Time.** Typical percent green time designated to the through or left turn movement, of total intersection cycle time.
- **Maximum Signal Cycle Time.** The total time for a signal to complete the sequence of signal phases/indications for all traffic movements.
- **Area Type.** Denotes the type of region within which corridor or intersection is located. This project is designated "transitioning" from rural to urban environment.

The capacity thresholds to maintain the LOS C standard, as a function of the design criteria versus various roadway cross sections (i.e. number of lanes), is shown for Class 1 and Class 2 arterials on Figure 7 shown on the following page.

Arterial Class	Class I	Class II	
K Factor	10%	10%	Ratio of ADT/PM Peak Hour Traffic
Speed Limit	40 <	< 35	Posted Speed, Free Flow is Plus Five
Signal Spacing	0.5 mi	0.25 mi	Spacing Between Major Signalized Intersections
Arrival Type	3	3	Actuated Signals, No Coordination
Peak Hour Factor	0.95	0.92	Reflective of Volume Densities
Percent Heavy Vehilces	5%	5%	Total Percent Truck Traffic from Total Volumes
Directional Distribution	60%/40%	60%/40%	Primary Versus Secondary Travel Direction (Expressed In %)
Average Turn Vol (Of Total Approach)	15%	15%	% Left and Right Turn from Through Movements
Exlusive Left Turn Lanes	Yes	Yes	Left Turn Lane Assumed at Intersections
Exlusive Right Turn Lanes	Yes	No	Right Turn Lane Assumed at Intersections
Avg % Thru Green Time (Major Rd)	40%	40%	% Phase Time Designated to Through Signal Phase for Major Street
Avg % Left Turn Green Time (Major Rd)	15%	15%	% Phase Time Designated to Left Signal Phase for Major Street
Typical Maximum Signal Cycle Setting	120 sec	90 sec	Maximum Signal Phase Up to Time in Seconds
Area Type	Transition	Transition	Transitioning Rural to Urban (Population over 5,000)
	ADT Threshold		
Road Section to Maintain LOS C for	Class I	Class II	
Two Lane Road	12400	8200	
Three Lane Road	13600	9000	10% Increase for TWLTL
Four Lane Road	25600	19200	
Five Lane Road	28200	21100	10% Increase for TWLTL
Six Lane Road	39400	30600	
Seven Lane Road	43300	33700	10% Increase for TWLTL

Table developed using ARTPLAN 2012 (Florida DOT, 2011)
Arterial LOS based on methods of HCM 2010

Figure 7. ADT Thresholds and Design Factors for ARTPLAN 2012 Capacity Analysis

Again, the end result of this ARTPLAN analysis process was developing ADT thresholds for measuring a LOS C condition for the purpose of network capacity planning. Traffic forecasts that were less than thresholds for various roadway sections were considered to operate at LOS C or better, and therefore no additional capacity is required. Forecasts that exceeded thresholds highlighted the need for capacity, either in terms of roadway widening or through the provision of arterial network enhancements. A summary of volume thresholds are again highlighted on Table 3.

Table 3. West Plains Arterial Volume Thresholds – Maintain LOS C or Better for Roadway Sections

Number of Lanes	Class I ADT Threshold	Class II ADT Threshold
2 Lane Roadway	12,400	8,200
3 Lane Roadway	13,600	9,000
4 Lane Roadway	25,600	19,200
5 Lane Roadway	28,200	21,100
6 Lane Roadway	39,400	30,600
7 Lane Roadway	43,300	33,700
Developed using ARTPLAN 2012 (Florida DOT, 2011)		

Existing and Future Capacity Review

Existing and forecast year 2020, 2040, and 2070 traffic volumes were compared with volume thresholds to determine where capacity issues will evolve in the future. A summary of capacity issues, defined as "exceptions', is shown on Table 4. Areas with expected capacity issues are identified on a screen line basis, which can be compared with Figure 3 to better confirm location.

Table 4. Screen Line Capacity Review
(Summary with LOS C exceptions noted)

	Existing	Year 2020	Year 2040	Year 2070
Screen Line 1	No Exceptions	No Exceptions	1 Exception ** Hayford - S of Trails*	1 Exception ** Hayford - S of Trails*
Screen Line 2	No Exceptions	No Exceptions	No Exceptions	No Exceptions
Screen Line 3	No Exceptions	No Exceptions	No Exceptions	1 Exception ** Brooks - S of SR 2*
Screen Line 4	No Exceptions	No Exceptions	No Exceptions	1 Exception ** Craig - N of SR 902*
Screen Line 5	No Exceptions	No Exceptions	No Exceptions	No Exceptions
Screen Line 6	No Exceptions	No Exceptions	No Exceptions	1 Exception ** SR 2 - W of Brooks*
Screen Line 7	No Exceptions	No Exceptions	No Exceptions	1 Exception ** SR 2 - W of Dover*
Screen Line 8	No Exceptions	No Exceptions	No Exceptions	No Exceptions
Screen Line 9	No Exceptions	No Exceptions	No Exceptions	No Exceptions
Screen Line 10	No Exceptions	No Exceptions	1 Exception ** SR 2 - W of Hayford*	2 Exceptions ** SR 2 - W of Hayford* ** McFarlane - W of Hayford*
Screen Line 11	No Exceptions	No Exceptions	No Exceptions	No Exceptions
Screen Line 12	No Exceptions	1 Exception ** SR 2 - E of Flint*	2 Exceptions ** SR 2 - E of Flint* ** Trails - E of Flint*	2 Exceptions ** SR 2 - E of Flint* ** Trails - E of Flint*
Screen Line 13	No Exceptions	No Exceptions	No Exceptions	No Exceptions
Screen Line 14	1 Exception - SR 2 – E of SIA Ramps	1 Exception ** SR 2 - E of SIA Ramps*	3 Exceptions ** SR 2 - E of SIA Ramp* ** Trails - @ Government* ** Geiger – E of Grove*	3 Exceptions ** SR 2 - E of SIA Ramp* ** Trails - @ Government* ** Geiger - E of Grove*
Screen Line 15	No Exceptions	No Exceptions	1 Exception ** Grove Road @ I-90*	1 Exception ** Grove Road N of I-90*
Screen Line 16	No Exceptions	No Exceptions	No Exceptions	1 Exception ** Grove Road S of I-90*

There are a number of capacity issues/exceptions that evolve with the increase of traffic. Summary discussions of these issues are discussed in the following paragraphs.

State Route 2

Existing — Traffic volumes exceed capacity thresholds on SR 2 east of the Spokane International Airport (SIA) on/off ramps. This section of the highway has higher speeds and is divided with no street or driveway connectivity. As such, elevated capacity beyond the ranges specified for a Class I arterial is available, and this exception is not of immediate concern. However, the forecast for SR 2 near Hayford Road, where the roadway has a five lane section and is not divided, is 28,200 ADT which is near thresholds for a class I roadway. Historical traffic studies and field observations indicate congestion occurs at intersections as well. Thus, SR 2 congestion relief is expected to be a high priority moving into the immediate future.

Year 2020 Traffic forecasts are nearly 5 percent over thresholds on SR 2 east of Hayford Road, indicating oversaturated conditions and a priority for congestion relief; especially as field observations and the intersection studies confirm need, as previously discussed.

Year 2040 Traffic volumes are 15 percent over thresholds within the City of Airway Heights, and over 20 percent over thresholds within the vicinity of Hayford Road.

Year 2070 Traffic volumes exceed thresholds throughout the study area ranging from west of Fairchild Air Force base to east of Spotted Road. The greatest congestion is expected to occur within the City of Airway Heights to Spotted Road, with volumes ranging in excess of 40 to 45 percent above thresholds for a Class I roadway.

Brooks Road

Year 2070 Traffic volumes are nearly 20 percent higher than Class II thresholds south of SR 2 by year 2020; however, no exceptions are noted prior to year 2070.

Craig Road

Year 2070 Volumes are just under thresholds in year 2040. Traffic volumes are over 40 percent higher than Class II thresholds south of SR 2 by year 2070. Craig Road may likely evolve as a secondary means to travel south from SR 2 to I-90 in the future. The roadway would need to be improved in areas to act as a bypass, even though forecasts fall below practical capacity thresholds on over the road on paper.

Hayford Road

Ex & Yr 2020 There are no volumes exceeding Class I thresholds through the existing and 2020 study years. With that said, Hayford Road is a primary north south arterial within the region, with a roadway section that is below current City standard. In addition, zoning designations along the roadway will allow for the development of several driveway access points between SR 2 and McFarlane Road. As such, the roadway should be improved to standard section as soon as feasibly possible.

Year 2040 Traffic volumes are over 30 percent beyond thresholds north of Quest Casino as Hayford Road transitions into Trails Road.

Year 2070 Traffic volumes are 90 percent over thresholds north of Quest Casino as Hayford Road transitions into Dino Road. Volumes are still below thresholds along Hayford Road south of SR 2; although again the evolution of several access points along the roadway may warrant a wider roadway section to assure safe turning operations.

Grove Road

Year 2070 Traffic volumes are over 10 percent higher than Class II thresholds directly north of the I-90 Geiger Interchange by year 2040. The volumes are 40 percent higher than thresholds to the north and 5 percent higher to the south of the interchange by year 2070. In addition, field observations confirm that the ramp junctions between Grove Road and the I-90 ramps, and at the Geiger/Grove/Flightline Boulevard intersection located 150 feet north of the westbound ramp terminal, are approaching capacity limits. Given dwindling capacity conditions and the potential for development growth within the area, WSDOT is seeking funds to improve the I-90/Geiger Interchange and the I-90/Medical Lake Interchange. Although the operating conditions of intersections and ramp junction are beyond the broader scope of this network analysis, the experience of the consultant team and field observations corroborates WSDOT conclusions and proposals.

Trails Road

Year 2040	Traffic volumes exceed thresholds by nearly 20 percent on this Class I arterial where Trails Road initiates from and is aligned east of Hayford Road.
Year 2070	Traffic volumes are over 60 percent beyond thresholds as the arterial continues east from Hayford Road to Government Way.

McFarlane Road

Year 2040	Traffic volumes nearly exceed Class II thresholds by 2020, exceeding thresholds by nearly 90 percent by 2070. The need for improving this road will be driven principally by the rate of industrial development within Airway Heights and the County, as this road does not provide much service to through traffic.

Geiger Blvd

Year 2020	Traffic volumes are just under Class II thresholds by 2020 east of Grove Road/Flightline Boulevard. By year 2070, volumes are 60 percent over volume thresholds. However, the need for improving this road is linked to the rate of industrial development expected in Spokane over the next several years. Thus, growth should be monitored in the area and if projects are not occurring, then traffic will not increase at projected rates and widening may not be needed.

Cheney Highway/SR 904

Existing	The Cheney Highway is just outside of the project study area, but there was a high level of interest in this roadway as noted through the public involvement processes. The current count on the arterial is 16,000 ADT which already exceed Class I thresholds by nearly 30 percent south of the I-90 Interchange.
Year 2020	Traffic volumes will reach 17,650 ADT by year 2020, which exceeds volume thresholds for a Class I arterial by over 40 percent.
Yr 2040 & 70	At 23,400 ADT, traffic volumes are 90 percent over thresholds on by year 2040 and nearly 90 percent of thresholds by year 2070 with a projected ADT of 35,650.

4. BACKGROUND IMPROVEMENTS

Two significant studies have been reviewed for areas of the West Plains including the *West Plains – Spokane International Airport Transportation Study* (SRTC, 2011) and the *US 2 Route Development Plan* (WSDOT, 2009). These studies outline several improvement projects that, as described in Improvement Recommendation, were confirmed or adapted for the study area. A summary of these improvements are discussed on the following pages.

SRTC Proposed Improvements

Northwest Collector - New two lane rural minor arterial with eight foot shoulders from Nine Mile Dam to Trails Road, and then to I-90 via Hayford Road. Hayford Road would be improved to four lanes from Trails Road to I-90.

21st Avenue Arterial - Three-lane urban minor arterial along the 21st Avenue alignment from the Airport interchange to US 2. The roadway would support multimodal transportation with bike lanes, sidewalks on either side and transit opportunities.

Widen US 2 - Widen US 2 from five lanes to 7 lanes from Airport Interchange to Hayford Road. WDOT has the right-of-way to achieve this improvement.

Widen Trails Road - Widen to four lanes on Tails Road from Hayford Road to Government Way.

Widen Hayford Road - Widen to four or five lanes on Hayford Road from Trails Road to I-90 at the Medical Lake I/C. Also improve with wide shoulders and/or bike lanes. The project could include realignment around the 3rd planned SIA runway impact area.

Electric-Thorpe Connection - Provide a bridge connection over I-90 between Electric Avenue and Thorpe Avenue. Reduce congestion on Geiger and Medical Lake Interchanges.

6th and 12th Alignment - Develop a two or three lane minor arterial within the alignment of 6th and 12th Avenue alignment between Russell Road and Rambo Road.

Geiger Interchange Improvements - Create space between Flightline Boulevard/Geiger Boulevard intersection and the north I/C ramp to allow for queuing vehicles between intersections.

Sprague Spur - Develop a new urban collector roadway as a continuation of Sprague Avenue between Hayford Road and the Airport Road interchange.

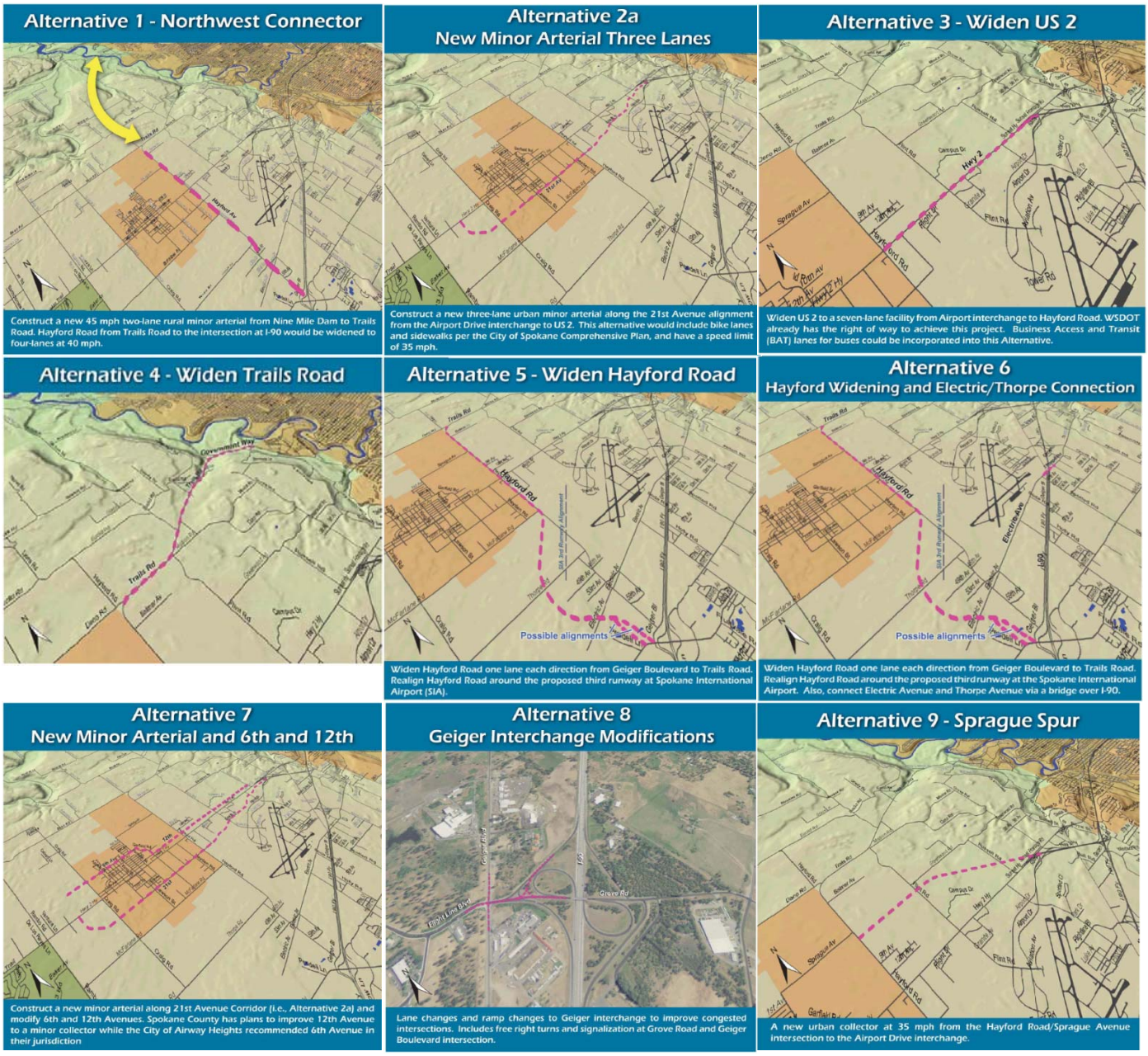


Figure 8. SRTC Improvement Summaries (Source: West-Plains SIA Transportation Study, 2011)

US 2 Route Development Plan Proposed Improvements

Sprague Avenue Spur - Dedicated 2 lane roadway from Hayford Road/Sprague Avenue intersection to the Airport I/C.

18th/21st Avenues Alternatives Route - An existing corridor widened to move traffic between Rambo Road and Airport I/C south of US 2.

Sprague Avenue Corridor Alternative. Develop a new arterial that begins at US 2 near Lincoln County line and connects to existing Sprague Road. The alignment turns southeast below NQ Casino and terminates at airport I/C.

6th Avenue Corridor. Improve to lane facility from Rambo Road/US 2 intersection and connects north to 6th Avenue at Craig, extending to Spotted Road and US 2.

Deno Corridor Alternative Route. New 2 lane alternative begins at US 2 at Lincoln County line and extends to the existing Deno Rd/Hayford Road, then south terminating at Airport I/C.

South Airport Corridor. A new 2 lane alignment beginning at the Rambo Rd/US 2 intersection then south to end at the medical Lake I/C.

South Fairchild Corridor Alternative Route. A new 2-Lane alignment beginning at Coulee-Hits Rd/US 2 and runs below Fairchild AFB to terminate on SR 902 west of Craig Road.

Airway Heights Couplet. This one-way 2-lane couplet south of US 2 begins just east of Rambo Road, and ends east of Hayford Road.

US 2 Widening. This widens US 2 to seven lanes from Fairchild AFB to Sunset Road.

US 2 Widening. This widens US 2 to five lanes from Reardon to Fairchild AFB.

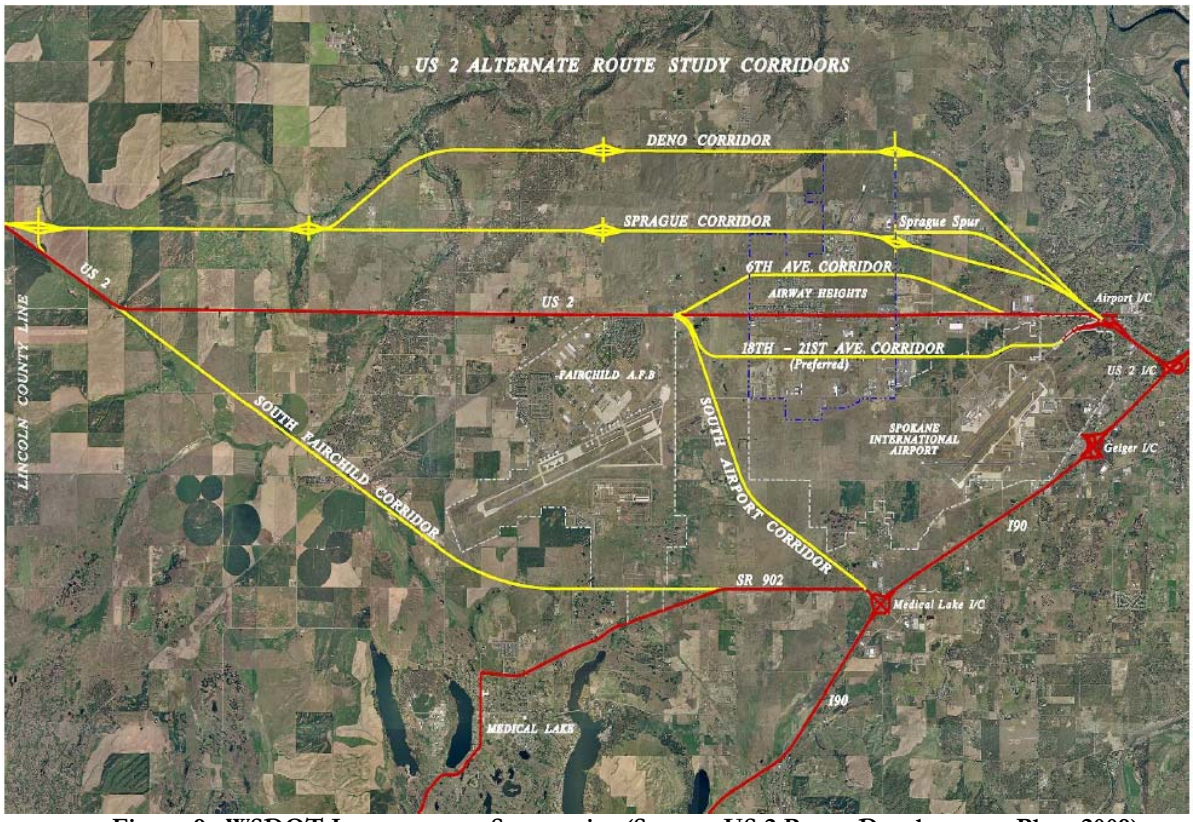


Figure 9. WSDOT Improvement Summaries (Source: US 2 Route Development Plan, 2009)

5. IMPROVEMENT RECOMMENDATIONS

The arterial network for this project was developed as a function of the public and stakeholder involvements process, and as a result of the "best" practice community planning analyses. This complete network, as shown on Figure 10, promotes mobility and levels of capacity commiserate of

a fully developed land use and transportation system within the West Plains. However, full development is not anticipated for some time even after the ultimate horizon years used in this study, as the West Plains represents a significant land area likely take dozens of years to develop.

As such, an assessment of improvement needs to maintain adequate traffic mobility was prepared for year 2020 and year 2040 for the study area based on the respective traffic forecasts discussed previously. These horizon years were selected for review as recommendations can be incorporated into short and long range transportation improvement plans for the region, and the forecasts for short and mid-term out years can be considered reasonably accurate given the forecasting methodologies employed in comparison with historical growth trends. The year 2070 analysis was used as a means for helping for establishing ultimate build-out needs for recommended improvements, but improvements were not developed on the merit of 2070 conditions. This is because there are no means for programing long-term/50 year improvement projects and because such long range forecasts would require calibration and reanalysis again in the future to assure improvement make sense in context to more recent land use and traffic patterns within the region.

A summary of improvements is provided in the following paragraphs. These improvements are also shown on Figure 11 to support discussions.

Note the recommended improvements increase the overall mobility of the arterial network, and do not necessary reflect the improvements needed to assure the adequate operation and safety of roadway segments or intersections. These "spot" and more select improvements are usually of reduced scale and cost compared with the network improvements recommended by this report.

State Route 2

As indicated, forecast traffic volumes will surpass capacity thresholds by 6,000 ADT through year 2040 and by 13,000 ADT through year 2070 east of Hayford Road. Traffic volumes will exceed capacity thresholds by 3,000 ADT west to and beyond Brooks Road by year 2070.

There were two approaches considered for improving east-west capacity within the SR 2 corridor area. The first is to widen the roadway to seven lanes. The second approach includes the development/promotion of parallel roadway routes to attract local trips off the highway.

Right-of-way is largely available along the already established SR 2 corridor and the arterial can be widened to provide immediate capacity. For a Class II arterial, widening increases the practical capacity of the highway by 15,000 which are sufficient to address traffic increases through year 2070. However, the issues associated with this approach can be considerable. First, widening may impact many businesses located along the Highway, requiring the relocation of parking, utility and drainage easements, and even buildings as many businesses especially in Airway Heights are built near or encroaching upon right-of-way. Second, pedestrian and bicycle safety would be compromised as pedestrians are forced to cross a wider highway section negotiating high traffic volumes and high free flow speeds. Finally, the mobility and safety of traffic can decrease along arterials that serve to both move traffic and promote community and property access do to the conflicts associated with turning traffic at intersections and driveways.

Classic local examples of these impacts are demonstrated on arterials such as Division Street in Spokane and Sullivan Road in Spokane Valley with traffic volumes near and even surpassing 40,000 ADT. Both of these arterials are comprised of seven lane cross sections with arterial and collector streets intersecting every ¼ to ½ miles, on average; also allowing driveway access to commercial businesses. Pedestrian movements are promoted at marked crosswalks at signals, and the arterials serve to move traffic between areas of the community. The result is corridors where traffic

mobility is compromised due to high traffic volumes and because of frequent conflicts from intersections and driveways, resulting in decreased safety for all road users. In addition, the "character" presented along these roadways are rather bleak to the community, as these are rivers of pavement and automobiles separating the community.

Alternatively, the provision of parallel route alternatives provides congestion relief by separating local traffic and shorter (business-to-business) trip ends from through trips along the highway. Also, these roadways provide opportunities to promote business access, pedestrian/bike facilities, and community character. Principally the WSDOT and SRTC recommendations to promote the 6th12th Avenue and 18th/21st Avenue roadway alignments would increase east-west traffic capacity by over 16,000 vehicles and the roadways could:

1) Reduce the impact to businesses and properties along SR 2 as no roadway widening would be needed of the highway,
2) Provide street access to the community and driveway access to businesses ,
3) Provide pedestrian and bicycle routes with reduced crossing widths and lessor roadway volumes to navigate,
4) Allows for roads to be developed with character and style more appealing to the community.

Recommendation

Given the range of anticipated drawbacks, the widening of SR 2 is not a preferred recommendation (although right-of-way for potential widening should be reserved for some potential long range need). The preferred recommendation for SR 2 congestion relief is to construct parallel roadways along SR 2 within the alignments already explored by WSDOT and the SRTC. North-south roadway extensions would be developed to assure adequate access to/from these roadways. Chiefly, the recommendations for these roadways include:

- Construct the 6th/12th Avenue arterial initiating on SR 2 at Fairview Height's Road, improving this roadway 0. 5 miles north to the 6th Avenue alignment. The arterial would continue in the 6th Avenue alignment 1.75 miles to Garfield Road, follow Garfield Road ¼ mile south to the 12th Avenue alignment, and then follow the W. 12th Avenue alignment east 2.75 miles to the Spotted Road alignment. The final leg would follow Spotted Road ¼ mile south to tie back into SR 2. The total length of the roadway is approximately 5.50 miles.

  This roadway would provide access principally to residential neighborhoods and to move commuting traffic between SR 2 and Hayford Road, supporting major traffic generators such as Fairchild Air Force Base, Crosspointe Plaza, Airway Business Center, the proposed Spokane Tribe Casino, and existing Quest Casino. As such, a three lane section should be developed to accommodate traffic and turning traffic. A roadway extension in line with Hayden Road pushing north to the 6th/12th alignment should be considered in Airway Heights to assure ½ mile access between SR 2 and the new arterial. New/improved roadway connections at Deer Heights Road, Whitman-Campus Drive, Flint Road, and Spotted Road would assure ½ mile spacing to the roadway east of Hayford Road. Improved intersections, likely requiring designated turn lanes, signalization, and/or roundabout to assure safety, would ultimately (and as warranted) be anticipated at SR 2 with Craig Road, Deer Heights Road, Flint Road, Campus Drive (note Flint Road will be improved with a traffic signal summer of 2013 and this would fall off the list of needed intersections), and between 6th/12th Avenue with Hayford Road.
- Construct the 18th/21st Avenue arterial initiating east of Fairchild Air Force Base, either intersecting with Rambo Road or departing directly/south from SR 2, continuing the roadway south ½ mile to the 21st Avenue alignment. The arterial would follow the 21st Avenue alignment for approximately 3.5 miles, then push south 900 feet over 0.5 miles to align with Granite Avenue in the Northwest Technology Park. After 1/4 mile within the

Granite Avenue alignment, the arterial would push 400 feet north over 0.75 miles to align with Tech Park Drive, following the roadway for approximately ¼ mile. At this point the roadway would divert north an additional 900 feet over ¼ miles to tie back into SR 2 near the Sunset Frontage Road intersection. The total length of the roadway is approximately 5.75 within the alignment described.

Given the nature of properties located south of SR 2, this would predominantly be a commercial arterial consisting of a three lane cross section to promote driveway access and turning truck traffic; although right-of-way for five lanes should be reserved for future widening needs. The extension of Deer Heights Road and Campus Drive would have to be constructed from SR 2 to the new roadway alignment to adequately provide for community/property access on a ½ mile basis east of Hayford Road. Roadway connectors within Airway Heights are currently available on a ½ mile basis or better, so no further connections are recommended. Major intersections, likely requiring designated turn lanes, signalization, and/or roundabout to assure safety, would ultimately (and as warranted) be anticipated at Craig Road, Deer Heights Road, Campus Drive, and Flint Road (again Flint Road will be addressed summer 2013), and between 18th/21st Avenue with Hayford Road and Flint Road.

Staging/Phasing Recommendations

Phase 1. Traffic volumes surpass capacity thresholds by year 2020 east of Hayford Road, with high traffic volumes and dominant movements occurring between Hayford Road to the north and SR 2 to the east (as noted through both ADT and turn movement counts). Thus, the first logical link is to promote the three lane 6th/12th Avenue connection between north Hayford Road and east SR 2 at Spotted Road. A ½ mile section of the roadway has already been developed directly east of Hayford Road and a short 0.1 mile section has already been developed east of Flint Road. This leaves approximately 1.4 miles to be developed along the 12th Avenue alignment and a ¼ mile section of Spotted Road south to finish the new arterial connection, for a total new two lane roadway section of 1.65 miles. The ¼ mile two lane extensions/improvements of Deer Heights Road, Flint Road (improved section), and Whitman-Campus Drive would enhance north-south connectivity between 12th Avenue and SR 2, with improved intersections needed at Deer Heights Road/SR 2, Flint Road/SR 2 (already programmed), Whitman-Campus Drive/SR 2, and Hayford Road and the 6th/12th Avenue alignment. Sidewalks or paved pathways are recommended to promote pedestrian/bike activity along the roadway. It is recommended that Phase 1 be programmed for construction by year 2020.

Phase 2. Traffic volumes will continue to increase on SR 2 east of Hayford Road, with need and emphasis on providing access to commercial properties located south of the highway. As such, the next phase recommendation includes the development of a three lane 18th/21st connection between Hayford Road pushing east to tie into SR 2 near Sunset Frontage Road. There is a short ¼ mile section of Tech Park Drive with paved width sufficient for a three lane section. Thus, 2.25 miles of roadway would be needed to provide this arterial alignment. A 0.15 mile extension of Deer Heights Road and a 0.25 mile extension of an additional roadway (likely the Campus Drive alignment) would be developed to enhance north-south connectivity between 18th/21st Avenue and SR 2. Improved intersections would be needed at Deer Heights Road/SR 2, Flint Road/SR 2 (already programmed), the new alignment (assume Whitman-Campus Drive/SR 2), 18th/21st Avenue/Flint Road, and 18th/21st Avenue/Flint Road to assure safe highway access. Sidewalks or paved pathways are recommended to promote pedestrian activity along the roadways, and this roadway would be a good candidate for bike lanes. If funding permits, it would be ideal to program Phase 2 for year 2020. However, a review of progressive annual traffic growth suggests the connection should be constructed prior to year 2025. Again the principal roadway alignment should be developed to a right-of-way of five lanes, even though three lanes are only recommended in the near future.

Phase 3. A review of progressive traffic volumes suggests the need to link north Hayford Road and east SR 2 by year 2025; thus, the next SR 2 congestion relief recommended includes the development of 6th/12th Avenue to provide this link/route. The roadway alignment is partially improved to a 40 foot pavement width with swales, buffers and sidewalks. Thus, this roadway section should be matched, requiring a new roadway 0.5 miles along Fairview Heights Road and then 0.85 miles east along the 6th Avenue alignment to nearly Aspen Street. 6th Avenue is improved with two lanes, swales, and sidewalks for 0.15 miles to Ziegler Street, at which point widening and the construction of sidewalks is required 0.75 miles (minus some sidewalk section) to Garfield Road. Widening and sidewalks would be needed along nearly most of a 0.25 mile section of Garfield Road to the W. 12th Avenue alignment (Not to be confused with a second 12th Avenue alignment further south). Partial widening and sidewalk would be needed along a 0.2 mile section, and then a full roadway section would be needed the remaining 0.5 miles along the W. 12th Avenue alignment to tie in with Hayford Road. A new roadway extension in-line with Hayden Road should be considered between the W. 12th Street alignment and SR 2, though the Hayden Road/SR 2 intersection should remain unsignalized. Major intersection improvements would be considered at Craig Road/SR 2 and W. 12th Avenue/Hayford Road. Sidewalks or paved pathways are recommended and again this project should be constructed prior to year 2025.

Phase 4. The final phase of the SR 2 congestion relief includes the development of 18th/21st Avenue south of SR 2 and west of Hayford Road. A new three lane roadway connection, with a five lane right-of-way, would be developed from SR 2 south 0.5 miles to the 21st Avenue alignment. New roadway would be developed along the alignment 1.15 miles to Lunstrom Street. Widening would occur the remaining 1.5 miles along 21st Avenue to Hayden Road. The entire alignment would require sidewalk or paved pathways, with bike lanes included along the roadway. No roadway extensions are necessary, but major intersections would be needed at the SR 2 connector, SR 2/Craig Road, and at Hayford Road/18th/21st Avenue. This is the least critical link that would not be needed until year 2040 or even beyond.

Craig Road

Improvements are not warranted along Craig Road by year 2040, as volumes are below thresholds. However, Craig Road has been strongly supported by agencies and the public as a secondary north-south connection within the West Plains as it extends between SR 2 and SR 902, and continues to I-90 and SR 904 (and Cheney) via Medical Lake-Four Lakes Road. This route could be improved to more adequately support commute activities. Thus, this north-south connector has been recommended as a low priority project improvement to enhance circulation in the west plains.

Recommendation and Phasing

Improve Craig Road to better promote north-south traffic circulation. The Craig Road alignment is generally established between SR 2 and Medical Lake-Four Lakes Road with a 32 foot shoulder to shoulder paved surface. Some resurfacing and minor widening may be needed to provide greater vehicle capacity; however traffic volumes would not warrant such improvements until beyond year 2040 (outside of normal pavement maintenance). The exception includes some realignment that would be required prior to year 2040 at Thorpe Road to make the arterial continuous. Thus, either north and/or south of Thorpe Road, encompassing about a 0.5 mile "s" curve, construct new roadway to provide continuous motion through the Thorpe Road area, creating a four-way intersection between the two arterials.

The current configuration of the Craig Road/SR 902 intersection is likely to be sufficient; although some realignment and development of auxiliary lanes would be necessitated at Craig Road/Medical Lake-Four Lakes Road to support turning vehicles. The remainder of the route along Medical Lake-Four Lakes Road, with a paved 32 foot width, should be sufficient as well through year 2040. Given

high projected traffic volumes along SR 904, however, intersection improvements that include a signal or roundabout should be considered to improve traffic safety. Given remote location, pedestrian facilities are not necessarily needed although wide shoulders do provide for additional vehicle capacity and biking activities. The attempt to develop projects by year 2040 is recommended with the priority/phasing of improvements, in order to promote traffic safety, are as follows:

1. Priority 1 – SR 904/Medical Lake-Four Lakes Road Intersection Improvements
2. Priority 2 – Craig Road/Medical Lake-Four Lakes Road Turn Lanes
3. Priority 3 – Craig Road/Thorpe Road Realignment

Hayford Road

Hayford Road is the critical north-south arterial within the West Plains, providing community access and supporting commuter traffic. Volume analyses suggest the need for roadway widening improvements to accommodate traffic north of Quest Casino tying into Trails Road by year 2040 only. With that said a review of field conditions indicates that an improved roadway section could better provide property access and improve capacity along south Hayford Road south of SR 2 into I-90. As roadway conditions are currently deficient, from the perspective of both roadway width and pavement condition, this is considered to be a priority improvement for the West Plains, recommended for development by year 2020.

Recommendation and Phasing

The five lane section of Hayford Road north of SR 2 transitions back into two lanes starting about 900 feet north of Quest Casino. An analysis progressive, annual traffic gains indicates a widened roadway section would be needed by year 2030. Thus, the widening of Hayford Road to Trails Road is recommended, with the four to five lane roadway section provided to accommodate traffic volumes through both year 2040 and ultimately 2070.

The five lane section of Hayford Road starts transition back to two lanes approximately 375 feet south of the SR 2. To provide improved property access, a three lane section is recommended from the current five lane transition extending 0.95 miles south to McFarlane Road, which is the end of the joint boundary between the Cities of Airway Heights and Spokane. An improved two lane section is recommended the remaining 2.35 miles south to Geiger Boulevard, and then the short 0.2 miles west to SR 902. Intersection improvements should be developed along Hayford Road at the new 21st Avenue alignment and McFarlane Road to safely support turning traffic movements. The priority/phasing of improvements, in order to promote traffic safety and access, are as follows:

1. Priority 1 – Three Lane Hayford Road, SR 2 to McFarlane Road completed by year 2020.
2. Priority 2 – Two Lane Hayford Road from SR 2 to SR 902 with completion by year 2020.
3. Priority 3 – Four Lane Hayford Road, Quest to Trails Road with completion by year 2030.

Grove Road ***(w/Recommendation)***

Grove Road will experience capacity issues north and then south of the I-90 interchange by year 2040 and 2070, respectively. As indicated, field visit have confirmed congestion issues have developed within the interchange area during peak hours, and there are high levels of development programmed around the interchange. As such, WSDOT has petitioned Washington legislators to fund interchange improvements within the State Transportation Improvement Program over the next six years. They will continue pursuing funds until interchange improvements are addressed. Improvements will likely include widening the bridge deck, improving ramp junctions/intersections with lanes and signalization (or roundabouts), and improving the roadway up to and including intersection improvements of the Flight Boulevard/Geiger Boulevard/Grove Road intersection. This project is recognized as a regional priority with goals of construction by year 2020, and has

been highlighted by this report although funding will follow State routes and not that of the local programs tracts. As a note, this funding package includes improvement of the I-90/Medical Lake Interchange, with widening of bridge deck, improved, intersections, realignment of Hayford Road, and improvement of the SR 902/Hayford Road intersection.

There is a 0.25 mile section of the roadway that falls outside WSDOT jurisdiction aligned south of the Interchange to Thorpe Road. The volume exception here is moderate, and based on year 2070 projections, thus no significant roadway widening is recommended. However, the roadway has a sub-standard cross section that could be improved to a wider two-lane standard to provide the full benefit of capacity for a Class II arterial. The logical performance of this improvement would occur with WSDOT plans, assumably sometime before year 2020 as funding is acquired. Some improvement to the Thorpe Road/Grove Road intersection, including the provision of turn lanes, would be of benefit to accommodate peak hourly turn movements (recommended this is determined based on new counts performed prior to widening). This project has not been highlighted specifically as it is minor improvement, and dependent upon WSDOT.

Trails Road *(w/Recommendation and Phasing)*

Trails Road supports high levels of traffic traveling between the West Plains and north Spokane, with traffic volumes expected to pass capacity thresholds by year 2040. An analysis indicates a four to five lane arterial would be needed to address traffic volumes through year 2040 and year 2070. The widened roadway section should be developed from Hayford Road to Fort George Wright Drive in Spokane (outside of the study area). This consists of approximately 4.5 miles of roadway to be improved; though the section addressed by this study includes 1.75 miles from Hayford Road to the BNSF rail and bridge crossing of the roadway, and is therefore assumed within the West Plains impact area. An analysis of progressive, annual traffic gains indicates a widened roadway section would be needed by year 2030. Given remote location and rural designation, pedestrian facilities are not necessarily needed although wide shoulders can be developed to provide for additional vehicle capacity and biking activities.

Geiger Blvd

Traffic volumes are shown to surpass thresholds by year 2040 along the 1.75 mile section of Geiger Boulevard between Grove Road/Flightline Boulevard and Sunset Highway. The volumes on this roadway are anticipated to be largely development driven, as only moderate levels of commuter traffic use this roadway as SR 2 and I-90 provide for most east-west commuter trips within this area. This development is anticipated to initiate to the southwest and work its way northwest.

Volume demands indicate the need for a three lane roadway by year 2040, peaking towards a four or five lane roadway by year 2070. This is a location where the differential between three and four to five lanes is less intuitive as this is not a likely commuter route. As such, it is recommended that traffic conditions and volumes be reviewed before the design and implementation of this project to determine trends and predict what cross section may ultimately be needed. For the purpose of this report, a three lane section was estimated in cost projections, but reserving right-of-way for five lanes is recommended.

The review of forecast indicates roadway improvements are not needed until between year 2035 and year 2040. Given that development is anticipated to progress from the southeast and move out to northeast, the project can be developed in two stages between these years initiating with a 0.85 mile section from Grove Road to Lawton Road, and then the remaining 0.9 miles from Lawton Road to Sunset Boulevard.

Cheney Highway/SR 904

As indicated, the Cheney Highway/SR 904 is aligned outside of the West Plains study/impact area for the most part, but there were questions from the public regarding this highway in project open house meetings. Thus, forecast volumes were reviewed in order to develop recommendations. At the I-90 Interchange, this Highway extends 1.45 miles as a three arterial to W. Meadow Lake Lane, then extending 2.45 miles as a two lane roadway to just beyond Paradise Road, where the arterial widens back to five lanes for the remaining 0.25 miles into Cheney. The speed limit along the Highway is 55 mph, with limited access and turn pockets located at most major intersections. Given these conditions, the practical capacity of the highway likely exceeds the thresholds identified by this report for a Class I arterial.

Traffic volumes are expected to increase to 17,650 by year 2020, 23,400 by year 2040, and 35,650 by year 2070. The horizon years examined by this report, and the widening of the Highway and/or alternative routes into the community, should be reviewed very soon as the safety of road users may become compromised with increased congestion. There are many options on the table to improve the highway itself, including widening several lanes or completing more moderate widening with full access restrictions. As such, it is recommended that WSDOT and local agencies coordinate a route development plan to better refine travel forecasts and determine the improvement measures needed to assure SR 904 capacity. The timing of this plan should be a priority given the rate of currently projected growth and high traffic volumes already utilize the corridor.

6. Cost Estimation

Planning level cost estimates were developed to help the City and stakeholder agencies plan capital projects for the region. Estimates were developed based on the best quantity and material data available at the time, with quantity information developed from Google GIS maps and local agency street cross section information (number and width of lanes, sidewalks, buffers, and swales. Material data, including typical structural sections (i.e. material thickness), with material costs was developed based on information provided by City of Spokane Engineers.

Four principal cross sections were used, as based on cross sections shown in the Spokane Comp Plan. These cross sections are shown on Figure 12. A description of cross sections is as follows:

- **Spokane Three Lane.** This section includes a paved 48 foot curb-to-curb roadway with three travel lanes and bike lanes, and has 1.5 foot curbs, 10 foot swales, and 5 foot sidewalks. The total right-of-way width is 81 feet.
- **Spokane Five Lane.** This section includes a paved 63 foot curb-to-curb roadway with five travel lanes, 1.5 foot curbs, 10 foot swales, and 5 foot sidewalks. The total right-of-way width is 96 feet.
- **Spokane Interim Three.** This is developed as a three lane section with buffers and sidewalks set to the five lane section. It includes a 48 foot curb-to-curb roadway with three travel lanes and shoulders or bike lanes. Beveled pavement can be used for drainage, with no curbs recommended. The buffers would be 19 feet, with swale sections located on the outer half bordered by five foot sidewalks, with a resultant 96 foot right-of-way.
- **AWH/County Section.** The City of Airway Heights and Spokane County appear to have developed a section for 6th/12th that should be matched west of Hayford Road (for both the alignment and north-south roadways). This includes a 40 foot paved roadway section with 1.5 curbs, 10 foot swales, and 5 foot sidewalks for a total right-of-way of 73 feet.

In the cases of widening, the base roadway section between outer lane-stripes was preserved (24 foot paved) with widening occurring outside of side cuts. Finally, a 15 foot paved section including a 12 foot lane with a 3 foot shoulder was assumed for turn pockets.

Numerous assumptions were used in the estimation of transportation improvement costs, as it regards material and implementation costs and factors. These assumptions were based on City direction or engineering judgment, with a summary as follows:

- **Mobilization.** Assumed for large projects at 4% total construction cost.
- **Clearing & Grubbing.** ROW determined in acres, with 15 hours assumed per acre with $100 assumed per hour factored by 1.2 for materials and as a contingency.
- **Excavation and Prep.** Assumed at $20 per cubic yard, including time and haul.
- **Roadway Prep.** Assumed at $3 per square yard.
- **Base Course:** A thickness of 7 inches was assumed for *minor arterials* and 9 inches for *principal arterials*, with a cost of $35 assumed per cubic yard.
- **Pavement:** A cost of $25 per square yard was assumed for *minor arterials* with 5 inch thick pavement, and $35 per square yard for *principal arterials* with 7 inch pavement thickness.
- **Herbicide.** Application assumed at $0.5 per square yard.
- **Curb & Gutter.** Concrete curb and gutter assumed at $23 per linear foot.
- **Curb Inlets.** Assumed at $50 per square yard.
- **Sidewalk Base Course.** Assume 4 inch section with assumed cost of $45 per cubic yard.
- **Concrete Sidewalk.** Assumed at $45 per square yard.
- **208 Drain Swale.** Area assumed at 20 percent of roadway surface area, with $10 assumed per square yard.
- **Topsoil for Swales.** Match swale area and assumed at $15 per square yard.
- **Hydroseed Swale.** Match swale area and assumed at $3 per square yard.
- **Geotextile Drain Fabric.** Assumed 50 percent swale area at $10 per square yard.
- **Swale Drain Pad.** Assumed at $60 per square yard.
- **Drywells.** Two assumed per $500 feet at a cost of $3,800 per drywell.
- **Pavement Cut.** Assumed at $1.00 per linear foot.
- **Signs and Markings.** Assumed at $1.5 per linear foot factored at 1.2 to address signage and contingency.
- **Traffic Control.** Minimal expected as mostly new roadways. Assumed small lump sums.
- **Scope Contingency (On Materials).** Assumed at 20 percent.
- **Construction Contingency.** Assumed at 10 percent.
- **Geotechnical Engineering.** Assumed at 5 percent of total construction.
- **Surveying.** Assumed at 2 percent of total construction.
- **Design and Bid Documents.** Assumed at 15 percent of total construction.
- **Admin, Legal, and Permits.** Assumed at 1 percent of total construction.
- **Construction Management.** Assumed at 15 percent of total construction.
- **Arterial Signal or Intersection.** Assumed at $450,000.
- **Highway Signal or Intersection Improvement.** Assumed at $800,000.
- **Inflation.** Annual inflation for future costs assumed at 3 percent per year.

A summary of base assumptions for the roadway improvements are as follows:

- **SR 2 Congestion Relief Phase 1 - Three Lane 6th/12th Alignment East.** Includes the development of a *minor arterial* for 8,750 feet with the Spokane Three Lane section.
- **SR 2 Congestion Relief Phase 1 - Deer Heights, Campus, and Flint Road.** Includes the development of *minor arterials* for 3,960 feet (3 roads) of Spokane Three Lane.
- **Hayford Road Priority 1. Three Lanes (SR 2 to McFarlane).** Spokane Interim Three Lane for a length of 5,000 feet of *principal arterial*. This is a widening project, assuming a 24 foot section of pavement will remain.
- **Hayford Road Priority 2. Two Lanes (McFarlane to SR 902).** Add 6 foot shoulders and prep 60 foot right-of-way for 13,500 feet.
- **SR 2 Congestion Relief Phase 2 - Three Lane Interim 18th/21st Alignment East.** Includes a *minor arterial* for 11,880 feet with Spokane Interim Three Lane section.
- **SR 2 Congestion Relief Phase 2 - Deer Heights & Campus.** Includes the development of *minor arterials* for 2,120 feet (2 roads) of Spokane Three Lane.
- **SR 2 Congestion Relief Phase 3 - 6th/12th Alignment West.** Includes the development of a *minor arterial* for 16,270 feet with the AWH/County section.
- **SR 2 Congestion Relief Phase 3 - Hayden Road.** Includes the development of *minor arterials* for 1,320 feet (1 road) with the AWH/County section.
- **Hayford Road Priority 3 - Five Lanes (SR 2 to McFarlane).** Spokane Five Lane for a length of 2,970 feet of *principal arterial*. This is a widening project assuming a 24 foot section of pavement to remain.
- **Trails Road Five Lane - Hayford to BNSF.** Spokane Five Lane for a *principal arterial* length of 9,240 feet. Widening project assuming a 24 foot section of pavement to remain.
- **Geiger Boulevard Priority 1 - Geiger to Lawton.** A 4,500 foot extension of Spokane Interim Three Lane as *principal arterial*, assuming 24 feet to remain of this widening project.
- **SR 2 Congestion Relief Phase 4 - Three Lane Interim 18th/21st Alignment West.** Includes *minor arterial* for 7,950 feet with Spokane Interim Three Lane section.
- **Craig Priority 2 - Craig & Medical Lake Turn Lanes.** Add 300 feet of 15 feet roadway section (lane and shoulder) to intersection, with *minor arterial* material widths.
- **Craig Priority 3 - Realignment of Craig at Thorpe.** This is a 32 foot paved section for 2,670 feet with minor arterial material widths.
- **Geiger Boulevard Priority 2 - Lawton to Sunset.** A 4,500 foot extension of Spokane Interim Three Lane as *principal arterial*, assuming 24 feet to remain of this widening project.

Cross sections, material costs, and improvement assumptions were analyzed to develop planning level cost estimates for the West Plains study area. Summary calculation sheets are attached to this technical memorandum. A summary of cost estimates are provided on Figure 13 below.

Project Number	Project Name/Description	Base Year Total Project Budgets	Future Year Total Project Budgets
	Year 2020 Projects		
1	SR 2 Congestion Relief Phase 1 - Three Lane 6th/12th Alignment East (SR 2 Spotted to Hayford North)	$7,214,365	$8,729,381
2	SR 2 Congestion Relief Phase 1 - Deer Heights, Campus, Flint Rd Extensions	$3,261,286	$3,946,156
3	Hayford Road Priority 1 - Three Lanes (SR 2 to McFarlene)	$3,067,919	$3,712,182
4	Hayford Road Priority 2 - Widened Two Lanes (McFarlene to SR 902)	$4,302,191	$5,205,652
5	Highway Traffic Signal or Intersection Improvements - SR 2/Deer Heights	$800,000	$975,000
6	Highway Traffic Signal or Intersection Improvements - SR 2/Campus Road	$800,000	$975,000
7	Arterial Traffic Signal or Intersection Improvements - Hayford Road/6th/12th Intersection	$450,000	$550,000
	Total TIP Year 2020	***$19,895,761***	***$24,093,371***
	Year 2025 Projects		
8	SR 2 Congestion Relief Phase 2 - Three Lane 18th/21st Alignment East (SR 2 to Hayford South)	$8,666,502	$11,786,443
9	SR 2 Congestion Relief Phase 2 - Deer Heights & Campus	$1,760,284	$2,393,986
10	SR 2 Congestion Relief Phase 3 - 6th/12th Alignment West (Fairview Heights to Hayford North)	$12,074,544	$16,421,380
11	SR 2 Congestion Relief Phase 3 - Hayden Road Extension	$1,091,694	$1,484,704
12	Highway Traffic Signal or Intersection Improvements - SR 2/Sunset Highway Connector	$800,000	$1,100,000
13	Highway Traffic Signal or Intersection Improvements - SR 2/Fairview Heights	$800,000	$1,100,000
14	Arterial Traffic Signal or Intersection Improvements - Hayford Road/18th/21st Intersection	$450,000	$600,000
15	Arterial Traffic Signal or Intersection Improvements - 18th/21st Avenue/Flint Road	$450,000	$600,000
	Total TIP Year 2025	***$26,093,023***	***$35,486,512***
	Year 2030 Projects		
16	Hayford Road Priority 3 - Widened 5 Lanes (Quest to Trails Rd)	$2,089,741	$3,155,509
17	Trails Road Five Lane (Hayford Road to BNSF Tracks)	$8,131,888	$12,279,151
	Total TIP Year 2030	***$10,221,629***	***$15,434,660***
	Year 2035 Projects		
18	Geiger Boulevard Priority 1 - (Geiger to Lawton)	$2,774,242	$4,605,241
	Total TIP Year 2035	***$2,774,242***	***$4,605,241***
	Year 2040 Projects		
19	SR 2 Congestion Relief Phase 4 - Three Lane 8th/21st Alignment West (SR 2 to Hayford South)	$5,178,022	$9,372,220
20	Craig Rd Priority 1 - Intersection Improvements - Craig Road Route(4 Lakes Rd)/SR 904/3rd	$450,000	$825,000
21	Craig Rd Priority 2 - Craig&Medical Lake Intersection Turn Lanes	$43,056	$77,931
22	Craig Rd Priority 3 - Realignment of Craig at Thorpe	$905,591	$1,639,121
23	Geiger Boulevard Priority 2 - (Lawton to Sunset Hwy)	$2,774,242	$5,021,377
	Total TIP Year 2040	***$9,350,911***	***$16,935,649***
		Current Year	**Total Future Year**
	Total West Plains Recommended Capacity Projects Through Year 2040 - Project Budgets	**$68,335,566**	**$96,555,433**

Figure 13. WSDOT Improvement Summaries (Source: US 2 Route Development Plan, 2009)

As shown, recommended improvements have a present day total cost of just over $68,300,000. Factoring in inflation to the proposed improvement year, the future total cost by year 2040 would be over $96,000,000, assuming all projects were developed. Construction cost estimates neglect right-of-way acquisition and any environmental remediation factors. It should also be mentioned that costs should be considered conservative on the higher end, as several contingencies were assumed in analyses. However, conservative estimates are appropriate when seeking/establishing moneys for improvement projects.

7. Summary and Conclusions

This technical memorandum was developed to support the West Plains Transportation & Arterial Network study. In summary, the study provided general guidelines to support the network development process, as established through a review of land use needs and public opinion. Year 2020, 2040, and 2070 were then developed for 28 primary roadways within the West Plains, as developed from a review of the SRTC forecast travel demand model. The resulting forecasts were reasonable and show growth trends consistent with traffic increases noted throughout the region over the last 20 years.

It was quickly determined that the arterial network developed through the land use, public and stakeholder involvement, and best practice guideline process would provide a level of capacity commiserate of a West Plains region fully occupied by a mature land use and transportation condition. This is not expected to happen for even several years beyond the 2070 horizon studies by this report, given the vast availability of undeveloped areas within the West Plains. As such, the focus then because the identification of capacity improvements that would assure safe and adequate mobility within the region overall, through year 2040 with projects that had the capacity to be sufficient through year 2070. These are high-level improvements that assure the overall adequacy of the arterial network, and do not include "spot" improvements that may be needed to assure traffic operations within focused areas or at intersections.

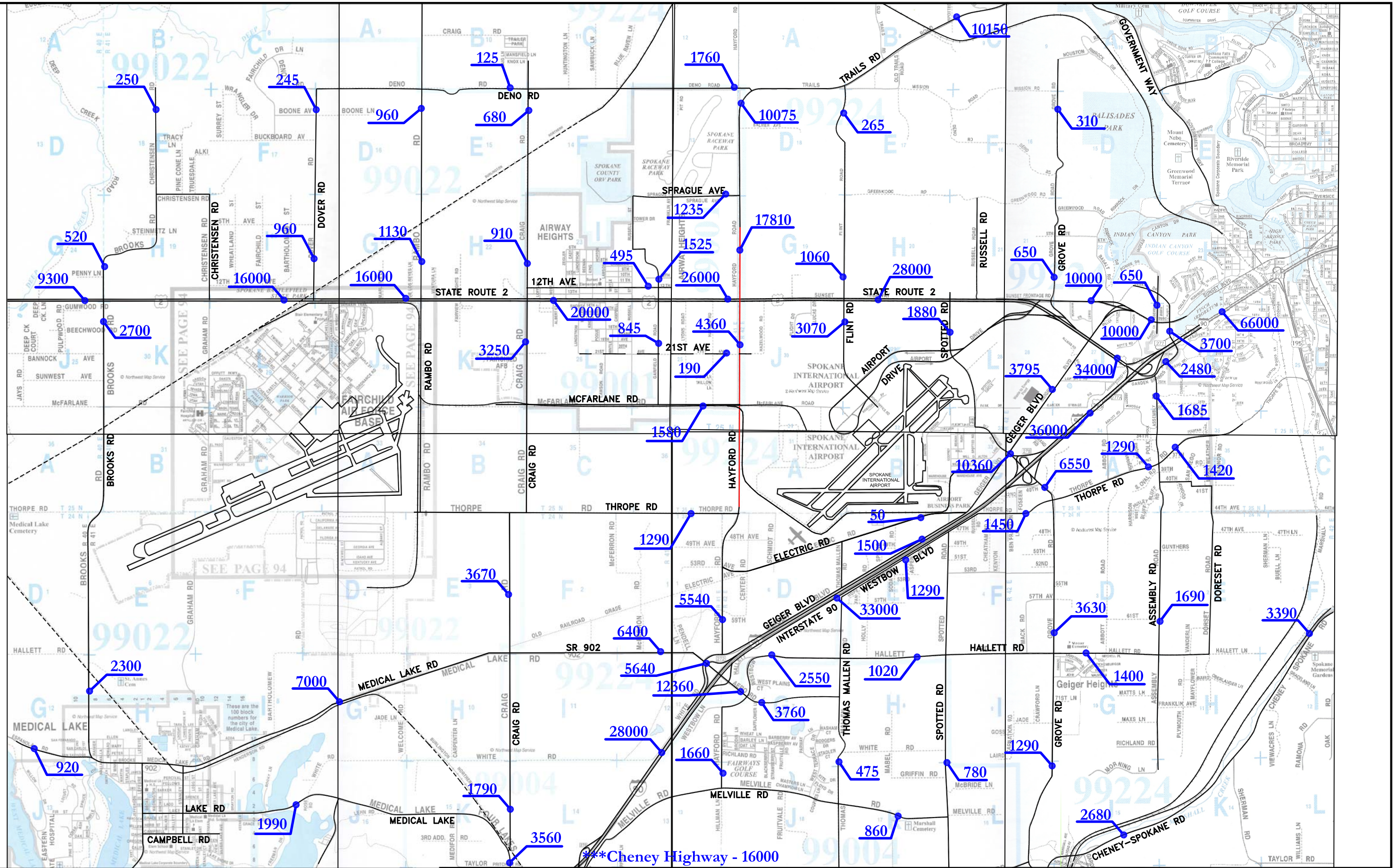
The capacity analysis was developed using ARTPLAN 2012, which is an HCM 2010 software module which reviews capacity based on ADT volumes, which were the forecasts developed for this project. The analysis confirmed several deficiencies, noted as "exceptions", where forecast ADT volumes exceed capacity thresholds for study area roadways. Improvement recommendations were developed to address these capacity deficiencies/exceptions, resulting in the following list/summary of improvements and strategies:

1. SR 2 Congestion Relief Phase 1 - Three Lane 6th/12th Alignment East
2. SR 2 Congestion Relief Phase 1 - Deer Heights, Campus, and Flint Road
3. Hayford Road Priority 1. Three Lanes (SR 2 to McFarlane)
4. Hayford Road Priority 2. Two Lanes (McFarlane to SR 902)
5. SR 2/Deer Heights Signal or Intersection Improvements
6. SR 2/Campus Road Signal or Intersection Improvements
7. Hayford Road/6th/12th Signal or Intersection Improvements
8. SR 2 Congestion Relief Phase 2 - Three Lane Interim 18th/21st Alignment East
9. SR 2 Congestion Relief Phase 2 - Deer Heights & Campus
10. SR 2 Congestion Relief Phase 3 - 6th/12th Alignment West
11. SR 2 Congestion Relief Phase 3 - Hayden Road
12. SR 2/Sunset Highway Connector Signal or Intersection Improvements
13. SR 2/Fairview Heights Signal or Intersection Improvements
14. Hayford Road/18th/21st Signal or Intersection Improvements
15. 18th/21st/Flint Road Signal or Intersection Improvements
16. Hayford Road Priority 3 - Five Lanes (SR 2 to McFarlane)
17. Trails Road Five Lane - Hayford to BNSF
18. Geiger Boulevard Priority 1 - Geiger to Lawton
19. SR 2 Congestion Relief Phase 4 - Three Lane Interim 18th/21st Alignment West
20. Craig Road Priority 1 – Craig Road Route SR 904/3rd Signal or Intersection Improvements
21. Craig Priority 2 - Craig & Medical Lake Turn Lanes
22. Craig Priority 3 - Realignment of Craig at Thorpe
23. Geiger Boulevard Priority 2 - Lawton to Sunset
24. Cheney Highway/SR 904 Route Development Plan

These recommended improvements have a present day total project cost of just over $68,300,000, with a cost of over $96,000,000 being noted through year 2040 if factoring in inflation and, assuming all projects were developed in the recommended horizon year. Construction cost estimates neglect right-of-way acquisition and any environmental remediation factors.

In support of the primary study, this technical information can be used to help support future studies and also provide a means for acquiring project funds in the future. As a final recommendation, it is recommended that these projects be further reviewed based on peak hour conditions so they can be further refined as the area continues to develop in the future

.



MORRISON MAIERLE, INC.
An Employee-Owned Company
Engineers
Surveyors
Scientists
Planners
1 Engineering Place
Helena MT 59602
Phone: (406) 442-3050
Fax: (406) 442-7862

DRAWN BY: _____
CHK'D. BY: _____
APPR. BY: _____
DATE: _____

C:\Users\bwhite\Documents\MMI Projects\5199010 - West Plains Trans\Graphics\WestPlainsTransStudyGraphics.dwg Plotted by bill white on Jun 26/2013

WEST PLAINS TRANSPORTATION AND ARTERIAL NETWORK STUDY

WEST PLAINS WASHINGTON

AVERAGE DAILY TRAFFIC MAP, CURRENT VOLUMES

PROJECT NO. 5199010

FIGURE NUMBER FIG. 1

West Plains TAZ Boundaries & Projected Growth

2/2013

Legend

- TAZ - Growth 2010-2040
- SIA Ownership
- Urban Growth Area
- Municipal Boundaries
- Arterial
- Streets
- Existing Railroad

0 0.5 1 2 Miles

THIS IS NOT A LEGAL DOCUMENT: The information shown on this map is compiled from various sources and is subject to constant revision. Information shown on this map should not be used to determine the location of facilities in relationship to property lines, section lines, streets, etc.

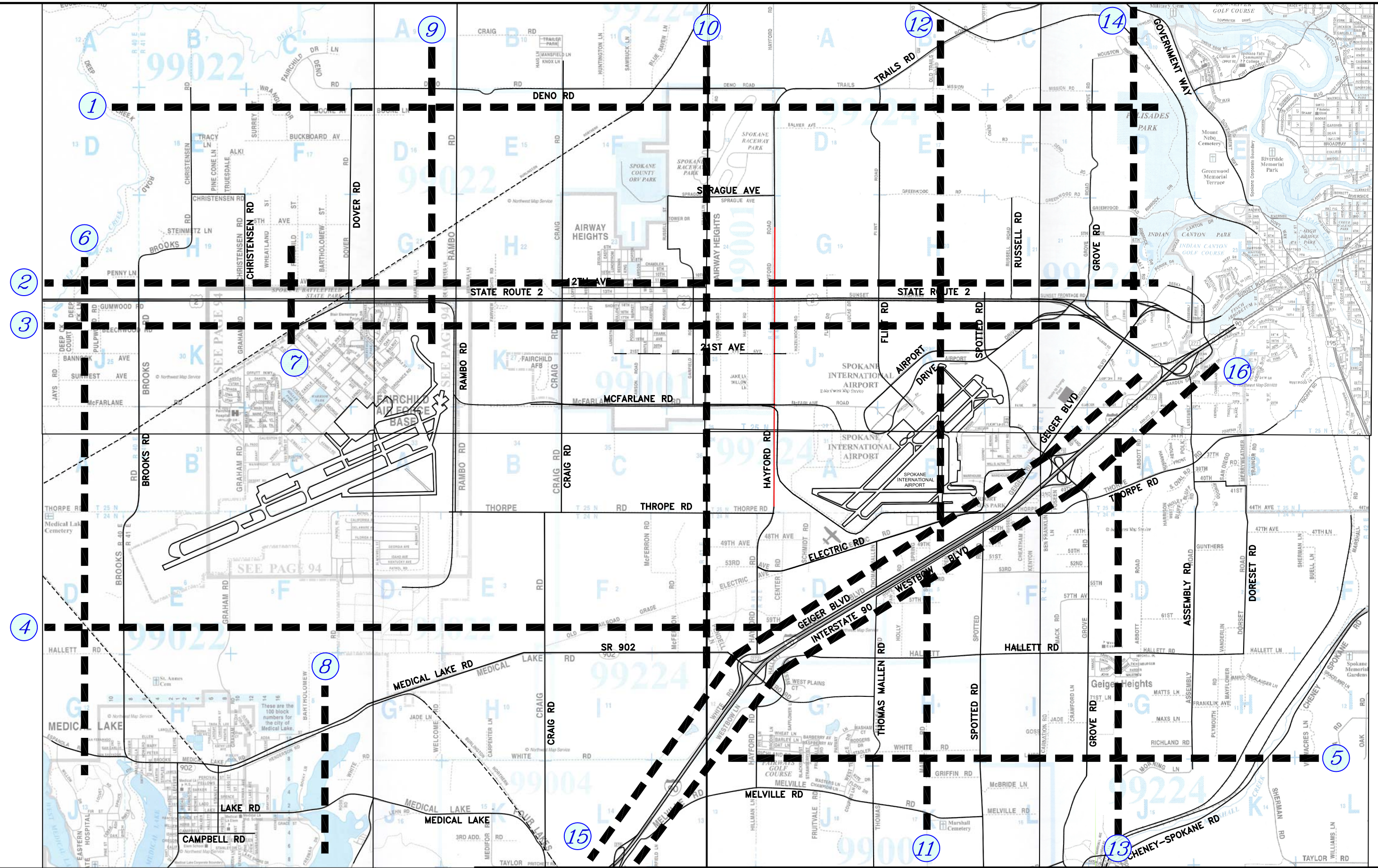
Fairchild Air Force Base

TAZ 544 EMP^ 165 SF^ 277 MF^ 0
TAZ 545 EMP^ 20 SF^ 110 MF^ 0
TAZ 546 EMP^ 9 SF^ 95 MF^ 0
TAZ 547 EMP^ 111 SF^ 261 MF^ 0
TAZ 548 EMP^ 174 SF^ 77 MF^ 13
TAZ 549 EMP^ 0 SF^ 0 MF^ 0
TAZ 550 EMP^ 562 SF^ 0 MF^ 650
TAZ 551 EMP^ 608 SF^ 14 MF^ 0
TAZ 552 EMP^ 703 SF^ 189 MF^ 50
TAZ 553 EMP^ 542 SF^ 18 MF^ 0
TAZ 554 EMP^ 3 SF^ 338 MF^ 0
TAZ 555 EMP^ 169 SF^ 292 MF^ 55
TAZ 556 EMP^ 836 SF^ 105 MF^ 0
TAZ 557 EMP^ 91 SF^ 653 MF^ 0
TAZ 558 EMP^ 309 SF^ 310 MF^ 64
TAZ 559 EMP^ 840 SF^ 97 MF^ 0
TAZ 560 EMP^ 81 SF^ 69 MF^ 0
TAZ 577 EMP^ 8 SF^ 488 MF^ 0
TAZ 579 EMP^ 9 SF^ 435 MF^ 0
TAZ 581 EMP^ 5 SF^ 154 MF^ 0
TAZ 584 EMP^ 2 SF^ 788 MF^ 647
TAZ 585 EMP^ 0 SF^ 847 MF^ 0
TAZ 597 EMP^ 66 SF^ 142 MF^ 0
TAZ 602 EMP^ 21 SF^ 97 MF^ 0
TAZ 603 EMP^ 616 SF^ 98 MF^ 0
TAZ 459 EMP^ 353 SF^ 1018 MF^ 209
TAZ 460 EMP^ 2107 SF^ 14 MF^ 0
TAZ 461 EMP^ 645 SF^ 0 MF^ 0
TAZ 462 EMP^ 1084 SF^ 0 MF^ 279
TAZ 463 EMP^ 1402 SF^ 6 MF^ 0
TAZ 464 EMP^ 840 SF^ 0 MF^ 0
TAZ 193 EMP^ 4 SF^ 7 MF^ 0
TAZ 197 EMP^ 3 SF^ 134 MF^ 0
TAZ 198 EMP^ 58 SF^ 1515 MF^ 28

Euclid Rd, Wood Rd, Rambo Rd, Deno Rd, Trails Rd, Northwest Blvd, Garland Ave, Driscoll Blvd, Ash St, Maple St, Monroe St, Pearl St, Buckeye Ave, Ruby Pl, Empire Ave, Indiana Ave, Mission Ave, Trent Ave, Sprague Ave, 3rd Ave, Main Ave, Sunset Blvd, Geiger Sunset Blvd Hwy, Greenwood Rd, Government Way, Fort George Wright Dr, Grove Rd, Hayford Rd, Craig Rd, Thorpe Rd, Geiger Blvd, Brooks Rd, Espanola Rd, Medical Lake-Four Lakes Rd, Fancher Rd, Cheney-Spokane Rd, Sherman Rd, Cedar Rd, Inland Empire Way, Bernard St, Grand Blvd, 29th Ave, 37th Ave, 10th Ave, High Dr

MORRISON MAIERLE, INC. *An Employee-Owned Company*	*Engineers Surveyors Scientists Planners*	1 Engineering Place Helena MT 59602 Phone: (406) 442-3050 Fax: (406) 442-7862	DRAWN BY: CHK'D. BY: APPR. BY: DATE:
WEST PLAINS TRANSPORTATION AND ARTERIAL NETWORK STUDY — WEST PLAINS WASHINGTON			PROJECT NO. 5199010
SRTC EMPLOYMENT AND HOUSING ALLOCATION FOR WEST PLAINS (SOURCE: CITY OF SPOKANE PLANNING DEPARTMENT)			FIGURE NUMBER FIG. 2

C:\Users\bwhite\Documents\MMI Projects\5199010 - West Plains Trans\Graphics\WestPlainsTransStudyGraphics.dwg Plotted by bill white on Jun 26/2013

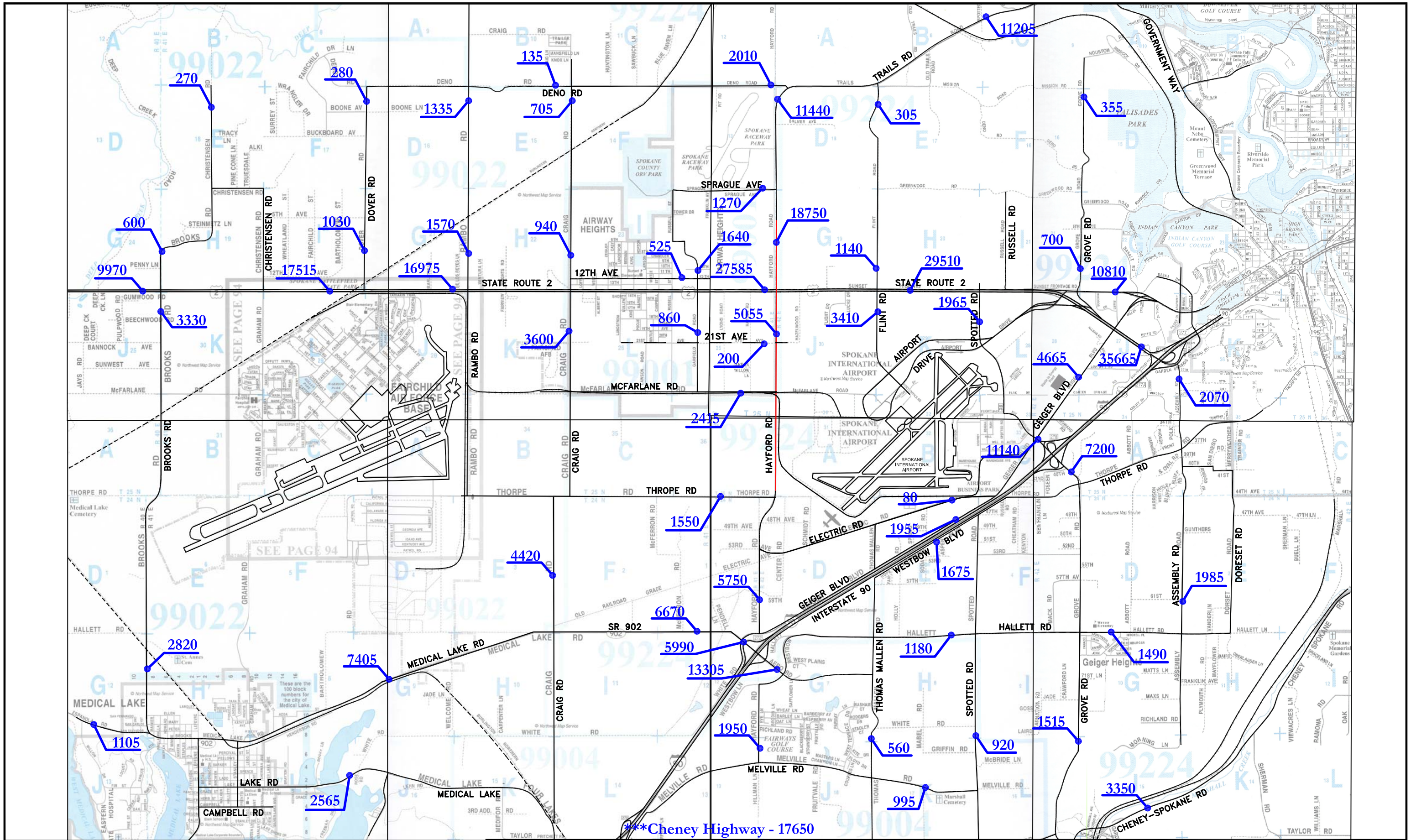


MORRISON MAIERLE, INC. *An Employee-Owned Company*	*Engineers* *Surveyors* *Scientists* *Planners*	1 Engineering Place Helena MT 59602 Phone: (406) 442-3050 Fax: (406) 442-7862	DRAWN BY: CHK'D. BY: APPR. BY: DATE:	WEST PLAINS TRANSPORTATION AND ARTERIAL NETWORK STUDY WEST PLAINS WASHINGTON ADT ANALYSIS SCREENLINES

C:\Users\bwhite\Documents\MMI Projects\5199010 - West Plains Trans\Graphics\WestPlainsTransStudyGraphics.dwg Plotted by bill white on Jun 26/2013

PROJECT NO. 5199010

FIGURE NUMBER FIG. 3



MORRISON MAIERLE, INC.
An Employee-Owned Company
Engineers
Surveyors
Scientists
Planners
1 Engineering Place
Helena MT 59602
Phone: (406) 442-3050
Fax: (406) 442-7862

DRAWN BY: _____
CHK'D. BY: _____
APPR. BY: _____
DATE: _____

C:\Users\bwhite\Documents\MMI Projects\5199010 - West Plains Trans\Graphics\WestPlainsTransStudyGraphics.dwg Plotted by bill white on Jun 26/2013

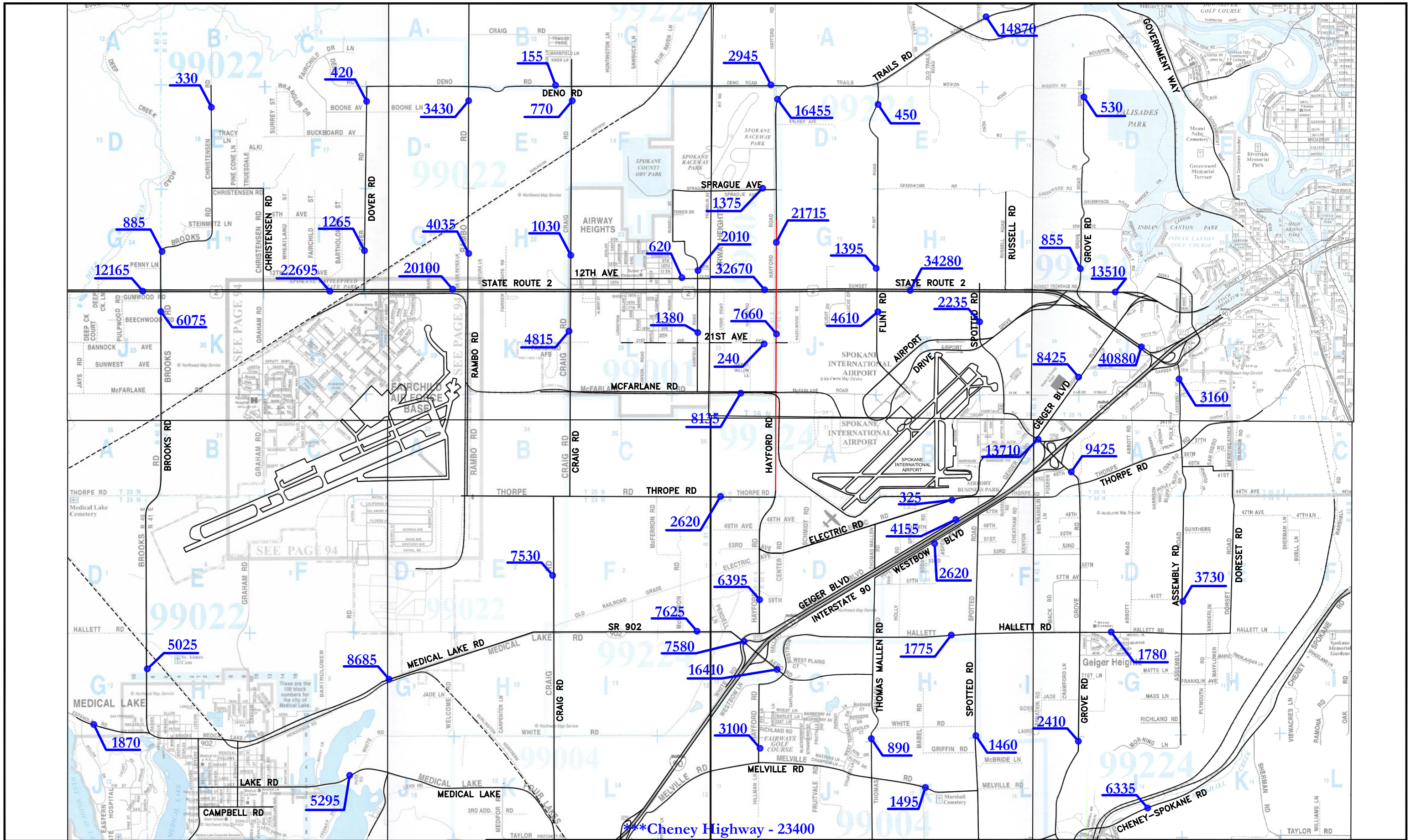
WEST PLAINS TRANSPORTATION AND ARTERIAL NETWORK STUDY

WEST PLAINS WASHINGTON

YEAR 2020 FORECASTS AVERAGE DAILY TRAFFIC MAP

PROJECT NO. 5199010

FIGURE NUMBER FIG. 4



MORRISON MAIERLE, INC.
An Employee-Owned Company
Engineers
Surveyors
Scientists
Planners
1 Engineering Place
Helena MT 59602
Phone: (406) 442-3050
Fax: (406) 442-7862

DRAWN BY: _____
CHK'D. BY: _____
APPR. BY: _____
DATE: _____

C:\Users\bwhite\Documents\MMI Projects\5199010 - West Plains Trans\Graphics\WestPlainsTransStudyGraphics.dwg Plotted by bill white on Jun 26/2013

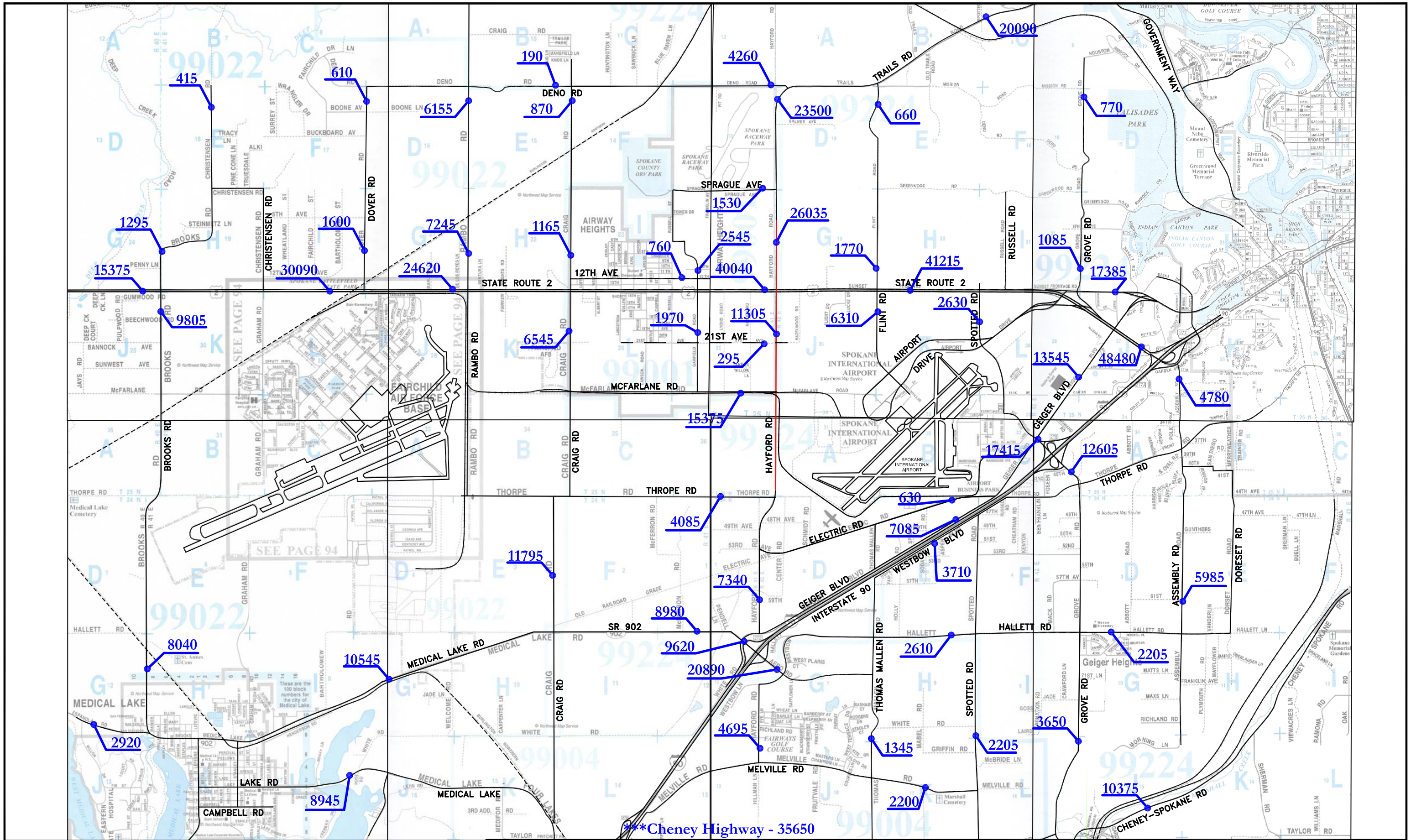
WEST PLAINS TRANSPORTATION AND ARTERIAL NETWORK STUDY

WEST PLAINS WASHINGTON

YEAR 2040 FORECASTS AVERAGE DAILY TRAFFIC MAP

PROJECT NO. 5199010

FIGURE NUMBER FIG. 5



MORRISON MAIERLE, INC.
An Employee-Owned Company

Engineers
Surveyors
Scientists
Planners

1 Engineering Place
Helena MT 59602

Phone: (406) 442-3050
Fax: (406) 442-7862

DRAWN BY: _____
CHK'D. BY: _____
APPR. BY: _____
DATE: _____

C:\Users\bwhite\Documents\MMI Projects\5199010 - West Plains Trans\Graphics\WestPlainsTransStudyGraphics.dwg Plotted by bill white on Jun 26/2013

WEST PLAINS TRANSPORTATION AND ARTERIAL NETWORK STUDY

WEST PLAINS WASHINGTON

YEAR 2040 FORECASTS AVERAGE DAILY TRAFFIC MAP

PROJECT NO. 5199010

FIGURE NUMBER
FIG. 6

West Plains Arterial Network Designations Draft Alternative

Print date: 5/14/2013

Legend

Proposed Regional Network Designations
- Urban Principle Arterial - Interstate
- Urban Principle Arterial - Freeways
- Urban Principle Arterial
- Urban Principle Arterial (Alternative Concept)
- Urban Principle Arterial - New ROW
- Urban Minor Arterial
- Urban Minor Arterial - New ROW
- Urban Collector
- Urban Collector (Alternative Concept)
- Urban Collector - New ROW
- Slip Ramp (Concept)

Airway Heights Planned Arterial Network
- State Highway
- Principal Arterial
- Minor Arterial
- Collector
- Boulevard

City of Spokane Planned Arterial Network
- Principal - State Route
- Principal
- Minor Arterial
- Neighborhood Collector

Spokane County Planned Arterial Network
- Urban Principal Arterial
- Urban Minor Arterial
- Urban Collector Arterial
- Rural Major Collector
- Rural Minor Collector
- Existing Railroad
- Municipal Boundary
- FAFB Boundary

0 1 2 Miles

Geographic Information System

N W E S

CITY OF SPOKANE

THIS IS NOT A LEGAL DOCUMENT: The information shown on this map is compiled from various sources and is subject to constant revision. Information shown on this map should not be used to determine the location of facilities in relationship to property lines, section lines, streets, etc.

MORRISON MAIERLE, INC.
An Employee-Owned Company
Engineers
Surveyors
Scientists
Planners
1 Engineering Place
Helena MT 59602
Phone: (406) 442-3050
Fax: (406) 442-7862

DRAWN BY:_____
CHK'D. BY:_____
APPR. BY:_____
DATE:_____

C:\Users\bwhite\Documents\MMI Projects\5199010 - West Plains Trans\Graphics\WestPlainsTransStudyGraphics.dwg Plotted by bill white on Jun 26/2013

WEST PLAINS TRANSPORTATION AND ARTERIAL NETWORK STUDY
WEST PLAINS WASHINGTON

WEST PLANS ARTERIAL NETWORK
(SOURCE: CITY OF SPOKANE PLANNING DEPARTMENT)

PROJECT NO. 5199010

FIGURE NUMBER
FIG. 10

DRAFT

West Plains Subarea Proposed Street Improvements

Please refer to the attached table for descriptions of each proposed improvement.

Print date: 6/25/2013

Legend

- Short-Term Projects
- Mid-Term Projects
- Long-Term Projects
- Existing Arterials
- Proposed Runway
- Existing Runways
- Runway Clear Zone
- Existing UGA
- Municipal Boundaries
- = Intersection Improvement
- = Street Improvement

0 3,300 6,600 9,900 Feet

Geographic Information System

N W E S

CITY OF SPOKANE

THIS IS NOT A LEGAL DOCUMENT: The information shown on this map is compiled from various sources and is subject to constant revision. Information shown on this map should not be used to determine the location of facilities in relationship to property lines, section lines, streets, etc.

MORRISON MAIERLE, INC.
An Employee-Owned Company

Engineers
Surveyors
Scientists
Planners

1 Engineering Place
Helena MT 59602

Phone: (406) 442-3050
Fax: (406) 442-7862

DRAWN BY:
CHK'D. BY:
APPR. BY:
DATE:

C:\Users\bwhite\Documents\MMI Projects\5199010 - West Plains Trans\Graphics\WestPlainsTransStudyGraphics.dwg Plotted by bill white on Jun 26/2013

WEST PLAINS TRANSPORTATION AND ARTERIAL NETWORK STUDY

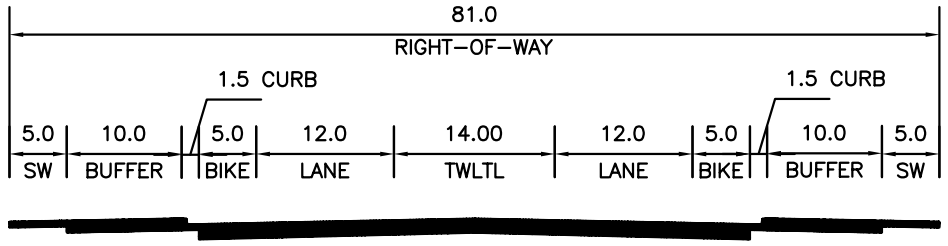
WEST PLAINS WASHINGTON

WEST PLANS PROPOSED STREET IMPROVEMENTS
(SOURCE: CITY OF SPOKANE PLANNING DEPARTMENT)

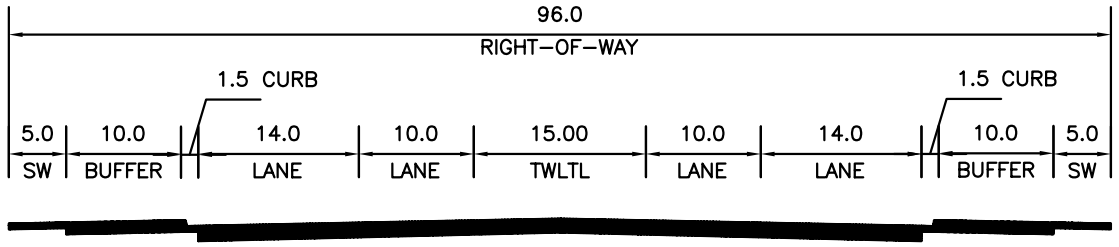
PROJECT NO. 5199010

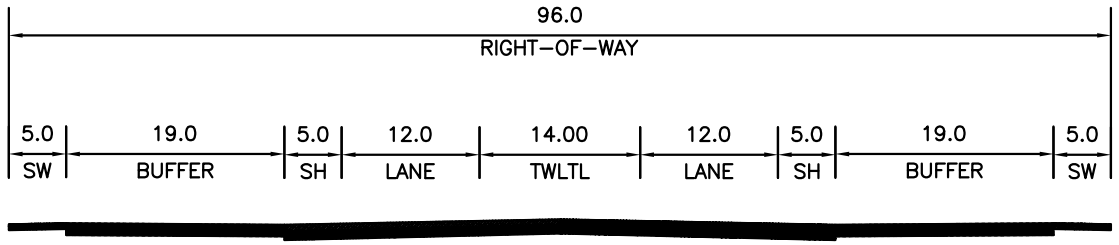
FIGURE NUMBER FIG. 11

CITY OF SPOKANE THREE LANE

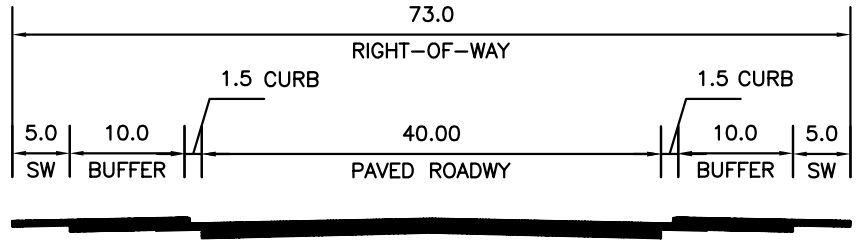


CITY OF SPOKANE FIVE LANE





AIRWAY HEIGHTS/COUNTY SECTION



CITY OF SPOKANE INRIM THREE TO FIVE LANE

MORRISON MAIERLE, INC.
An Employee-Owned Company
Engineers
Surveyors
Scientists
Planners
1 Engineering Place
Helena MT 59602
Phone: (406) 442-3050
Fax: (406) 442-7862

DRAWN BY:_____
CHK'D. BY:_____
APPR. BY:_____
DATE:_____

WEST PLAINS TRANSPORTATION AND ARTERIAL NETWORK STUDY

WEST PLAINS WASHINGTON

STREET CROSS SECTIONS USED IN COST ESTIMATION

PROJECT NO. 5199010

FIGURE NUMBER FIG. 12

C:\Users\bwhite\Documents\MMI Projects\5199010 - West Plains Trans\Graphics\WestPlainsTransStudyGraphics.dwg Plotted by bill white on Jun 26/2013