Appendix F.
Technical Memorandum #2: Context and Site Analysis

CTUIR TSP

TECHNICAL MEMORANDUM #2: CONTEXT AND SITE ANALYSIS

Date: June 30, 2022 Project #: 23021.046

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Project: Confederated Tribes of Umatilla Indian Reservation Transportation System Plan Update

Subject: Tech Memo #2: Context and Site Analysis

TABLE OF CONTENTS

INTRODUCTION

This memorandum summarizes information related to existing and future (no-build) transportation system conditions within the Umatilla Indian Reservation (UIR). The information provided in this memorandum will serve as the foundation for identifying existing and projected future gaps and deficiencies in the transportation system, which will then serve as the basis for developing and evaluating transportation system alternatives and identifying improvement projects for the Confederated Tribes of Umatilla Indian Reservation (CTUIR) Transportation System Plan (TSP) update.

The study area for the CTUIR TSP update encompasses all lands within the boundaries of the UIR, including several roads on off-reservation Trust lands. The primary focus of the planning effort will be on areas within the UIR. Figure 1 shows the Umatilla Reservation and CTUIR off reservation trust and fee lands. Figure 2 illustrates the study area for the CTUIR TSP update. *Attachment A* contains the existing land use assessment.

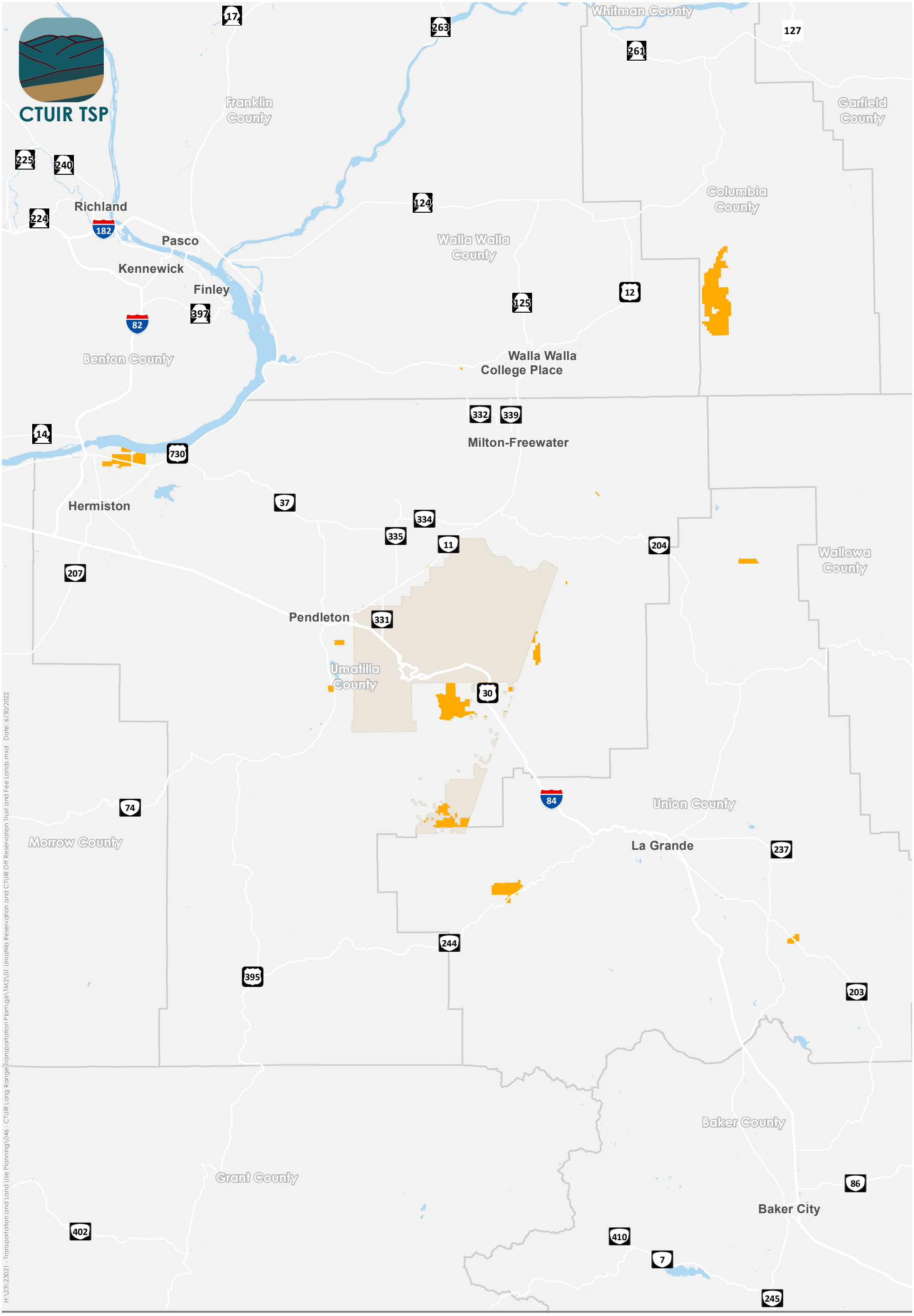


Figure 1

Umatilla Indian Reservation and CTUIR Off Reservation Trust and Fee Lands
Umatilla Indian Reservation

CTUIR TSP

See Inset Map

Umatilla Indian Reservation Boundary
Mission Hub
July Grounds Hub
Gateway Hub
Pendleton UGB

0 3 Miles

Figure 2

Study Area
Umatilla Indian Reservation

H:\23\2302 - Transportation and Land Use Planning\046 - CTUIR Long Range Transportation Plan\gis\TM2\02 Study Area.mxd Date: 6/8/2022

ROADWAY SYSTEM

Roadway System Inventory

The roadway system within the UIR boundary serves most trips across all travel modes. In addition to people driving, people walking, biking, riding the bus, and using other forms of transportation use the roadway system to travel to and from essential destinations and neighboring communities. This section describes the existing roadway system.

The roadway system within the UIR boundary was inventoried based on Geographic Information System (GIS) data obtained from CTUIR and the Oregon Department of Transportation (ODOT), as well as a review of recent aerial imagery. The inventory was supplemented by information provided in the 2001 CTUIR TSP and by information provided by CTUIR and ODOT.

JURISDICTION AND FUNCTIONAL CLASSIFICAITON

The roadway network is owned and operated by multiple entities, consisting of CTUIR, ODOT, Umatilla County, and the Bureau of Indian Affairs (BIA). Each jurisdiction is responsible for determining the functional classification of the streets, defining major design and multimodal features, and approving construction and access permits. Coordination is required among the jurisdictions to ensure that the streets are planned, operated, maintained, and improved to safely meet public needs. Figure 3 illustrates the jurisdiction and functional classification of streets within the UIR boundary.

CTUIR Roads

CTUIR owns and maintains most roads that serve tribal affiliated facilities and housing. These roadways include Short Mile Road, Easy Street, Cedar Street, Aspen Way (and other local spur streets serving the adjacent residential area), Timíne Way, Wildhorse Boulevard, Kusi Road, Coyote Road, Spilya Road, Tokti Road, and Arrowhead Road. CTUIR also owns and maintains Mission Road west of OR 331 to the western UIR border.

ODOT Facilities

Within the study area, ODOT owns and maintains Interstate 84 (I-84) and OR 331. I-84 is classified by the Oregon Highway Plan as an Interstate Highway, on the National Highway System and National Network, a Freight Route, and a Reduction Review Route. OR 331 (Umatilla Mission Highway) is classified by the Oregon Highway Plan as a District Highway, a Freight Route, and a Reduction Review Route.

Umatilla County Facilities

Umatilla County owns and maintains regionally significant roadways within the study area. Mission Road (County Road #900) is the primary east-west roadway, connecting the Mission area to the city of Pendleton to the west. Classified as a Major Collector, Mission Road consists of two travel lanes with a posted speed limit of 40 mph. Other County roads are classified as Minor Collectors, including Emigrant Road, Cayuse Road, and Kirkpatrick Road.

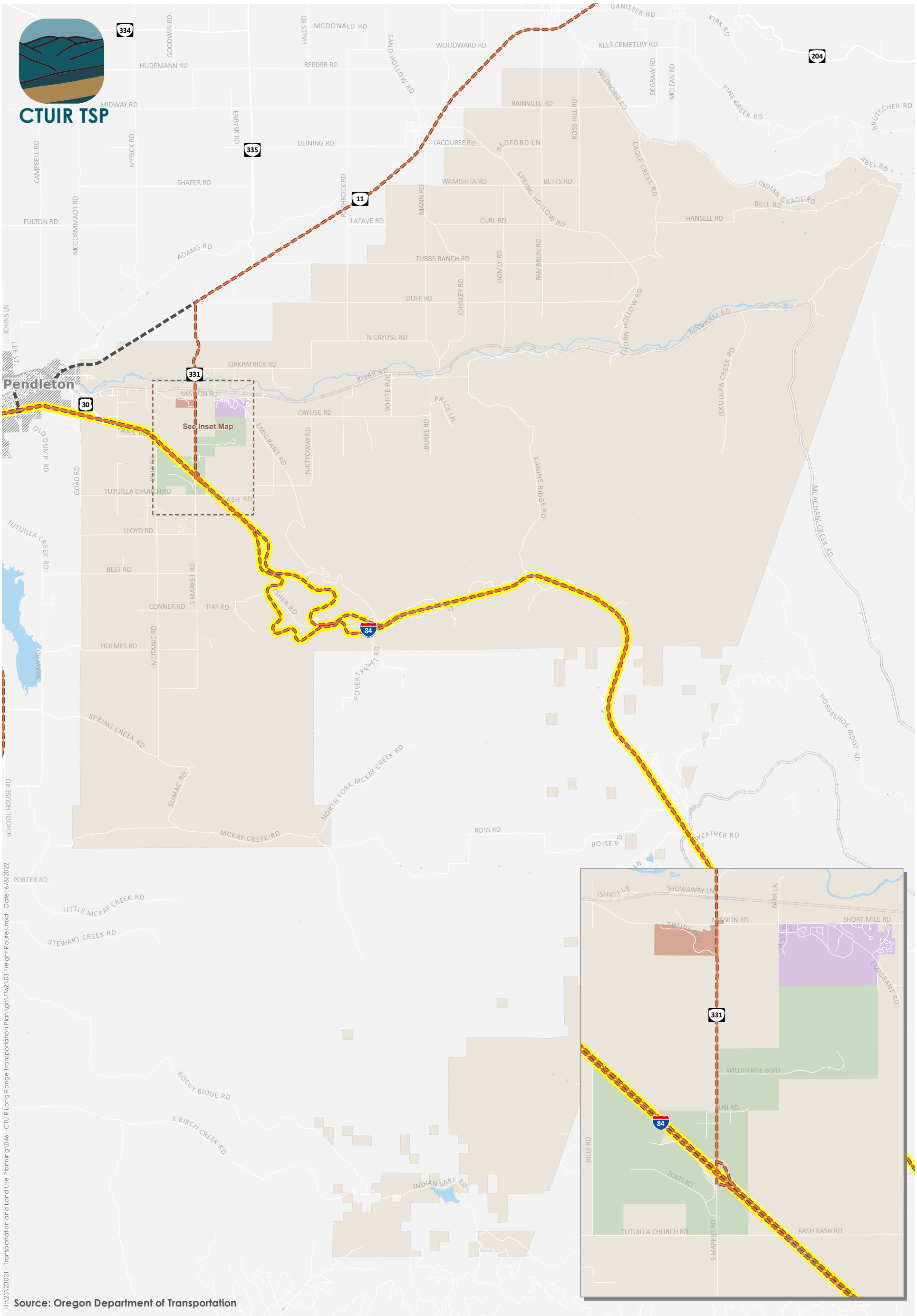
BIA Roads

Within the study area, the BIA owns and maintains several local roadways that primarily serve BIA tribal agency offices and affiliated housing. These paved roads include "A" Street, "B" Street, Alder Drive, Cayuse Loop, Confederated Way, Cottonwood Lane, Umatilla Loop Road, Walla Walla Court, Whirlwind Drive, and Willow Drive.

Paved and Unpaved Public Use Roads

Based on the 2001 TSP, all remaining roadways within the study area are considered to be “Public Use” roads. According to the TSP, these paved and unpaved roads may or may not have a dedicated right-of-way and are not claimed or maintained by any government entity.

CTUIR TSP



Source: Oregon Department of Transportation

- Oregon Highway Plan Freight Routes
- Reduction Review Routes
- National Highway Freight Routes
- Umatilla Indian Reservation Boundary
- Mission Hub
- July Grounds Hub
- Gateway Hub
- Pendleton UGB

0 3 Miles

Figure 3

Freight Routes
Umatilla Indian Reservation

H:\23\23021 - Transportation and Land Use Planning\046 - CTUIR Long Range Transportation Plan\gis\TM2\03 Freight Routes.mxd Date: 6/8/2022

FREIGHT ROUTES

Single-unit trucks and semi-truck and trailer combination vehicles deliver goods to and from various businesses within the UIR boundary.

Freight Routes

The OHP identifies all Interstate Highways and certain Statewide, Regional, and District Highways as freight routes. These routes are intended to facilitate efficient and reliable interstate, intrastate, and regional truck movement through a designated freight route system. As shown in Figure 4, OR 331 is designated by ODOT as a Freight Route and primarily accommodates the movement of freight between I-84 to the south and OR 11, which provides access to Washington, to the north.

There are no Tribal designated freight routes in the UIR; however, Mission Road is also used for local freight-related movements. There are no known freight restrictions on any roadways within the UIR. However, the Mission Community Master Plan (MCMP) noted that trucks will attempt to utilize Mission Road's connection to Old Emigrant Hill Road during periods of inclement weather when I-84 is shut down. This road is narrow and steep and cannot accommodate all truck types, especially during times of inclement weather.

National Highway System

The National Highway System (NHS) is a network of highways, including Interstate Highways, that serve strategic economic, defense, and transportation facilities, such as airports, ports, rail or truck terminals, railway stations, and pipeline terminals. I-84 is designated as an NHS route within the UIR boundary.

Intersection Operations Analysis

The study intersections for the CTUIR TSP update were determined based on direction provided by ODOT and CTUIR staff. There are 13 study intersections located along tribal, County, and ODOT facilities, all of which are unsignalized. Figure 2 illustrates the location of the study intersections. Figure 5 illustrates the current lane configurations and traffic control devices at the study intersections. The *Analysis Methodology and Assumptions Memorandum* outlines the procedures used to conduct the intersection operations analysis. The analysis results include level-of-service (LOS), delay (del), and volume-to-capacity (v/c) ratios at all intersections, regardless of jurisdiction. The LOS, del, and v/c ratios are reported for the critical movement (CM) at unsignalized intersections in accordance with the methodologies outlined in ODOT's Analysis Procedures Manual (APM).

EXISTING OPERATIONS

The *Analysis Methodology and Assumptions Memorandum* includes information related to the turning movement counts, peak hour development, and seasonal adjustment factors used to develop traffic volumes for the traffic operations analysis. Per the memorandum, a system-wide peak hour of 3:30 to 4:30 PM was selected as a basis for the analysis. The traffic volumes were also balanced as appropriate. Figure 6 summarizes the traffic volumes developed at the study intersections for the traffic operations analysis.

The traffic operations analysis identifies how the study intersections operate under existing traffic conditions during the weekday PM peak hour. The weekday PM peak hour was selected as a basis for the analysis given that it generally represents the most critical time period throughout the day.

Table 1 summarizes the results of the intersection operations analysis and compares the results to the applicable mobility standards and targets which were presented in the *Analysis Methodology and Assumptions Memorandum*.

CTUIR TSP

Pendleton

See Inset Map

Umatilla Indian Reservation Boundary
Mission Hub
July Grounds Hub
Gateway Hub
Pendleton UGB

State Functional Class
- Highway
- Major Arterials
- Major Collectors
- Minor Collectors
- Local Roads

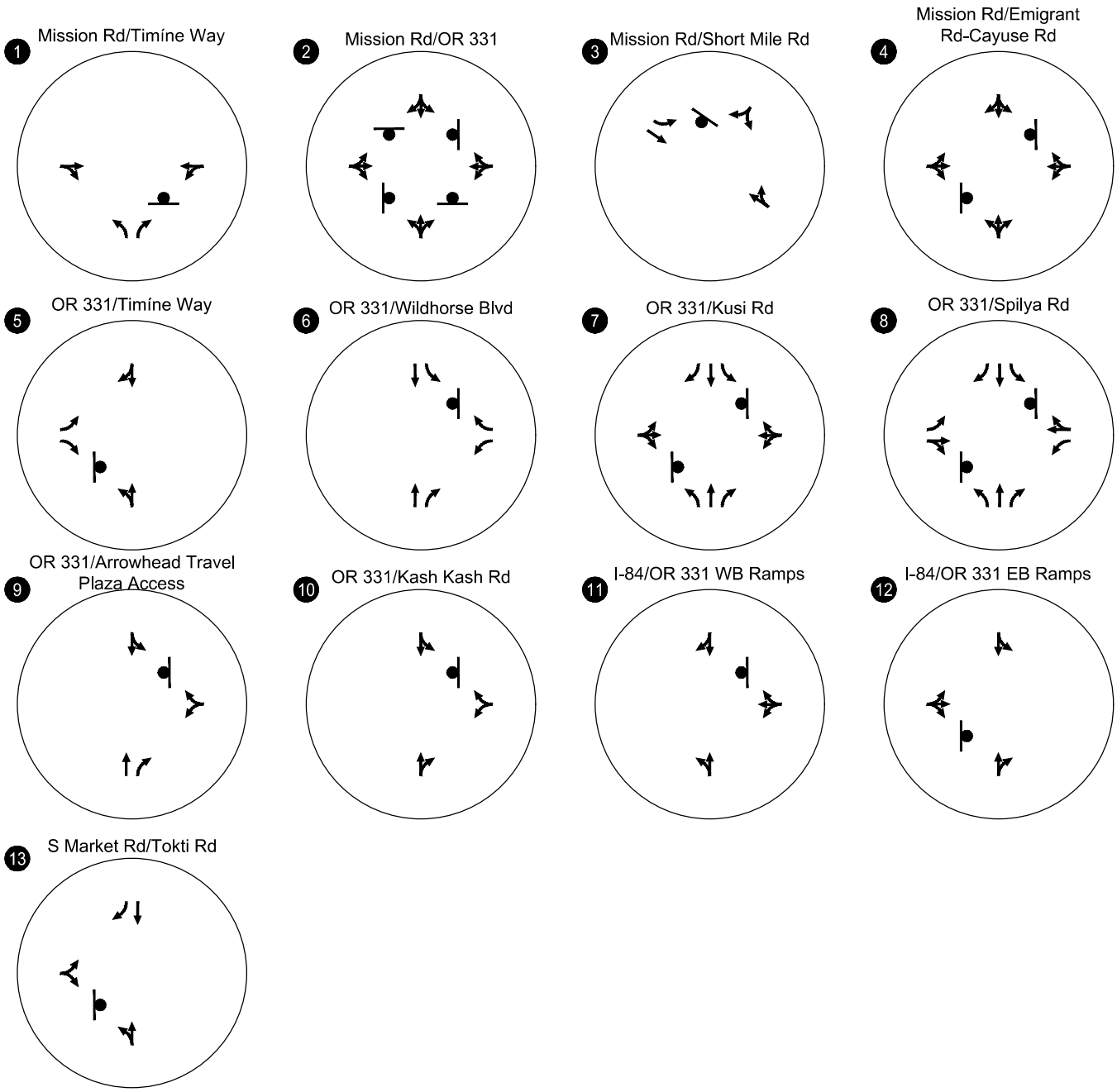
County Functional Class
- Minor Arterials
- Major Collectors
- Local Roads

- Bureau of Indian Affairs Roads
- Tribal Roads
- US Forest Service Roads
- Private Roads

0 3 Miles

Figure 4

Roadway Jurisdiction and Existing Functional Classification
Umatilla Indian Reservation



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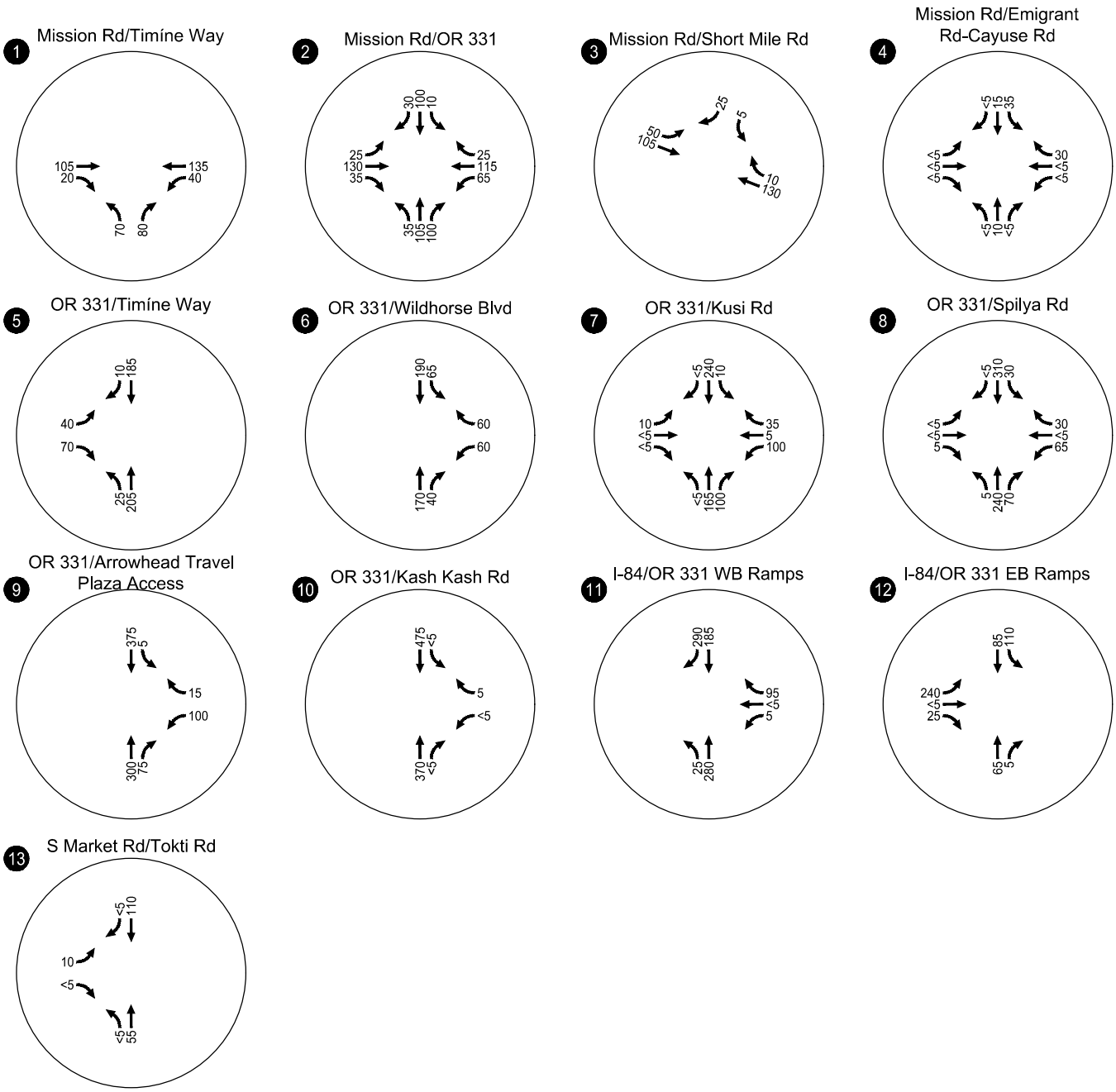
Existing Lane Configurations & Traffic Control Devices
Umatilla Indian Reservation

Figure 5



2021 Existing Traffic Volumes
Weekday PM Peak Hour
Umatilla Indian Reservation

Figure
6

Table 1: Existing Intersection Operations, Weekday PM Peak Hour

Map ID	Intersection	Control Type[1]	Mobility Standard/ Target	Intersection Operations			
				CM[3]	LOS	Del	v/c
1	Mission Road/Timíne Way	TWSC	LOS E[2]	NBL	B	12.6	0.16
2	Mission Road/OR 331	AWSC	0.75	NB	B	12.9	0.45
3	Mission Road/Short Mile Road	TWSC	LOS E[2]	SB	A	9.5	0.04
4	Mission Road/Emigrant Road-Cayuse Road	TWSC	LOS E[2]	EB	A	9.6	0.00
5	OR 331/Timíne Way	TWSC	0.75	EBL	B	14.9	0.13
6	OR 331/Wildhorse Boulevard	TWSC	0.75	WBL	B	12.6	0.12
7	OR 331/Kusi Road	TWSC	0.75	WB	B	14.4	0.30
8	OR 331/Spilya Road	TWSC	0.75	WBL	D	28.8	0.36
9	OR 331/Arrowhead Travel Plaza Access	TWSC	0.75	WB	C	18.3	0.32
10	OR 331/Kash Kash Road	TWSC	0.75	WB	B	12.4	0.01
11	I-84/OR 331 Interchange WB Ramps	TWSC	0.70	WB	B	11.7	0.16
12	I-84/OR 331 Interchange EB Ramps	TWSC	0.70	EB	C	19.6	0.55
13	S Market Road/Tokti Road	TWSC	LOS E[2]	EB	B	10.1	0.03

1) AWSC = All-way stop control; TWSC = Two-way stop control
2) If v/c is less than or equal to 1.0, LOS is based on the average control delay for the critical movement. An LOS E target for TWSC intersections is associated with a maximum control delay of 50 seconds per vehicle.
3) EB = Eastbound; WB = Westbound; NB = Northbound; SB = Southbound; L = Left-turn

As shown in Table 1, all study intersections currently operate acceptably during the weekday PM peak hour. *Attachment B* includes the intersection operations analysis worksheets.

Seasonal Challenges

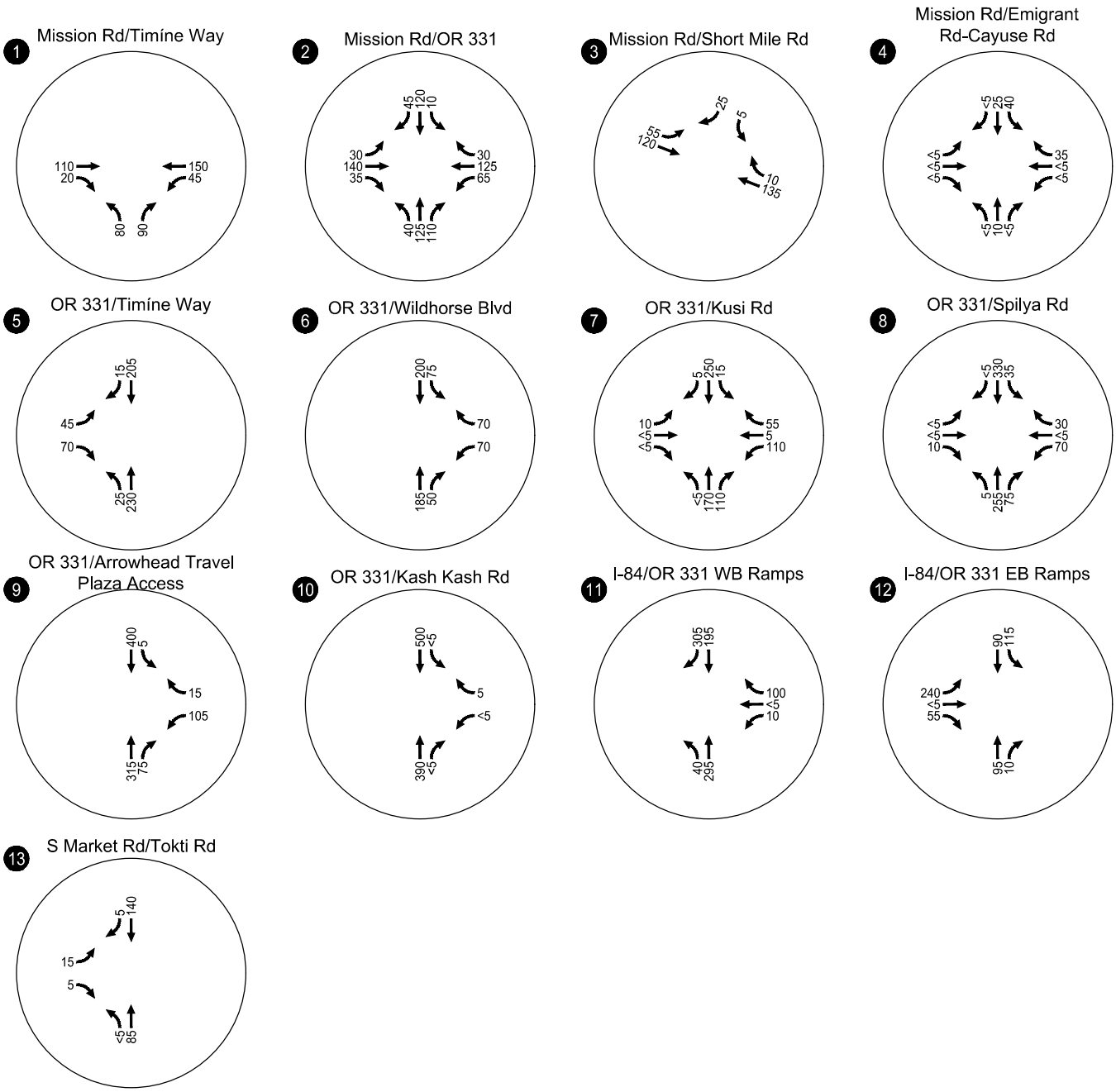
According to CTUIR staff and public feedback, the local roadway system on the UIR experiences challenges when I-84 is closed. These include vehicles parking on freeway ramp shoulders and people trying to use local roads to go around closures and getting stuck in the snow or damaging muddy roads. Cayuse Road, Old Emigrant Road, and 56th Street have been identified as the most attempted alternate routes. ODOT's 2024-2027 Statewide Transportation Improvement Program includes the I-84 Exit 216 Snow Zone/Truck Parking project, which is intended to help address some of these closure-related concerns.

FUTURE NO-BUILD OPERATIONS

The project team used ODOT's Pendleton travel demand model and existing counts to develop future year 2040 traffic volume forecasts. The travel demand model provides base year 2015 and forecast year 2040 traffic volume projections that reflect anticipated land use changes and planned transportation improvements within the study area. The forecast traffic volumes were developed by applying the post-processing methodology presented in the National Cooperative Highway Research Program (NCHRP) Report 765 Highway Traffic Data for Urbanized Area Project Planning and Design, in conjunction with engineering judgment and knowledge of the study area. *Attachment C* contains the travel demand model data provided by ODOT.

Figure 7 illustrates the year 2040 forecast traffic volumes at the study intersections during the weekday PM peak hour. Table 2 summarizes the results of the future traffic operations analysis at the study intersections under year 2040 traffic conditions.

As shown in Table 2, all study intersections are forecast to operate within their applicable mobility standards and targets during the weekday PM peak hour. *Attachment B* includes the intersection operations analysis worksheets.



2040 No Build Traffic Volumes
Weekday PM Peak Hour
Umatilla Indian Reservation

Figure
7

Although the operations analysis presented here did not highlight intersection capacity deficiencies based on the volumes provided, previous projects have established needs at several of the study intersections. The MCMP identified the long-term need to construct a single-lane roundabout or signal at the Mission Road/OR 331 intersection once volumes grow to meet warrants. Similarly, the Wildhorse Resort & Casino Expansion Traffic Impact Study identified the long-term need to either construct a single-lane roundabout or construct separate turn lanes for the OR 331/I-84 eastbound ramp terminal to mitigate queuing on the I-84 eastbound ramp. The OR 331 Access Management Implementation Strategy and Circulation Plan discusses the need for consolidating and/or closing accesses on OR 331 between Wildhorse Boulevard and I-84 with queuing and safety in mind, particularly due to the highway-oriented uses in that section of OR 331These alternatives will be moved forward through the TSP update process.

Table 2: Future No-Build Intersection Operations, Weekday PM Peak Hour

Map ID	Intersection	Control Type[1]	Mobility Standard/ Target	Intersection Operations			
				CM[3]	LOS	Del	v/c
1	Mission Road/Timíne Way	TWSC	LOS E[2]	NBL	B	13.6	0.20
2	Mission Road/OR 331	AWSC	0.75	NB	C	16.0	0.56
3	Mission Road/Short Mile Road	TWSC	LOS E[2]	SB	A	9.6	0.04
4	Mission Road/Emigrant Road-Cayuse Road	TWSC	LOS E[2]	EB	A	9.8	0.00
5	OR 331/Timíne Way	TWSC	0.75	EBL	C	16.6	0.18
6	OR 331/Wildhorse Boulevard	TWSC	0.75	WBL	B	13.3	0.15
7	OR 331/Kusi Road	TWSC	0.75	WB	B	15.4	0.36
8	OR 331/Spilya Road	TWSC	0.75	WBL	D	33.0	0.41
9	OR 331/Arrowhead Travel Plaza Access	TWSC	0.75	WB	C	19.9	0.35
10	OR 331/Kash Kash Road	TWSC	0.75	WB	B	12.7	0.01
11	I-84/OR 331 Interchange WB Ramps	TWSC	0.70	WB	B	12.2	0.19
12	I-84/OR 331 Interchange EB Ramps	TWSC	0.70	EB	C	23.2	0.64
13	S Market Road/Tokti Road	TWSC	LOS E[2]	EB	B	10.9	0.05

1) AWSC = All-way stop control; TWSC = Two-way stop control
2) If v/c is less than or equal to 1.0, LOS is based on the average control delay for the critical movement. An LOS E for TWSC intersections is associated with a maximum control delay less than or equal to 50 seconds per vehicle.
3) EB = Eastbound; WB = Westbound; NB = Northbound; SB = Southbound; L = Left-turn

Motor Vehicle Safety Analysis

Crash records were obtained from ODOT for the five-year period from January 1, 2016 through December 31, 2020 for the overall study area. Figure 8 illustrates the location, severity, and type of crashes that occurred within the study area over the five-year period. Based on the data, a total of 392 crashes occurred within the UIR, of which six resulted in a fatality, 12 resulted in suspected serious injuries, 135 resulted in suspected moderate or minor injuries, and 239 resulted in property-damage-only. Most (256) of the crashes within the UIR occurred on I-84, including three of the crashes resulting in fatalities and four of the crashes resulting in suspected serious injuries. There were 136 crashes reported within the UIR boundary outside I-84, including three fatal crashes and eight suspected serious injury crashes. The following summarizes the results of the intersection and segment crash analysis based on the five years of crash data.

CTUIR TSP

Source: Oregon Department of Transportation

- Fatal or Serious Injury
- Fatal or Serious Injury (Bike Related)
- Fatal or Serious Injury (Ped Related)
- Moderate and Minor Injury
- PDO

- Umatilla Indian Reservation Boundary
- Mission Hub
- July Grounds Hub
- Gateway Hub
- Pendleton UGB

0 3 Miles

Figure 8

Reported Crashes 2016 - 2020
Umatilla Indian Reservation

INTERSECTION CRASH ANALYSIS

The intersection crash analysis evaluates intersection crash rates, including critical crash rates. According to the data, 24 of the 136 non-I-84 reported crashes occurred at the study intersections. Table 3 summarizes the collision type and crash severity for all reported crashes at the study intersections.

Table 3: Intersection Crash History (January 1, 2016 through December 31, 2020)

Map ID	Intersection	Collision Type					Crash Severity			Total
		Angle	Turn	Rear-end	Ped/Bike	Other	Fatal and Serious Injury	Non-Serious Injury	PDO	
1	Mission Road/Timíne Way	0	0	1	0	0	0	1	0	1
2	Mission Road/OR 331	1	3	0	0	0	0	1	3	4
3	Mission Road/Short Mile Road	0	0	0	0	0	0	0	0	0
4	Mission Road/Emigrant Road-Cayuse Road	0	0	0	0	0	0	0	0	0
5	OR 331/Timíne Way	0	0	1	0	0	0	1	0	1
6	OR 331/Wildhorse Boulevard	0	0	0	0	1	0	0	1	1
7	OR 331/Kusi Road	0	2	0	0	1	0	3	0	3
8	OR 331/Spilya Road	0	3	1	0	0	0	2	2	4
9	OR 331/Arrowhead Travel Plaza Access	0	3	0	0	0	0	2	1	3
10	OR 331/Kash Kash Road	0	0	0	0	0	0	0	0	0
11	I-84/OR 331 Interchange WB Ramps	1	0	1	0	1	0	1	2	3
12	I-84/OR 331 Interchange EB Ramps	0	1	3	0	0	0	0	4	4
13	S Market Road/Tokti Road	0	0	0	0	0	0	0	0	0

Other: All other collision types, such as fixed-object, head-on, and parking maneuver

PDO: Property Damage Only

Intersection crash rates were developed for the study intersections based on the total number of crashes reported at the intersections over the five-year period and the total entering volume, or million entering vehicles (MEV). Intersection crash rates were compared to 90th percentile crash rates developed by ODOT and documented in Table 4-1 of the ODOT APM. Table 4 summarizes the total number of crashes reported at the study intersections over the five-year period, the intersection crash rates, and the corresponding 90th percentile crash rates as identified in the APM.

Table 4: Intersection Crash Rates versus ODOT 90th Percentile Rates versus Critical Crash Rates

Map ID	Intersection	Total Crashes	Intersection Crash Rate	90th Percentile Rate	Exceed 90th Percentile Rate?	Critical Crash Rate	Exceed Critical Crash Rate?
1	Mission Road/Timíne Way	1	0.12	0.48	No	0.41	No
2	Mission Road/OR 331	4	0.29	1.08	No	N/A	N/A
3	Mission Road/Short Mile Road	0	0.00	0.48	No	0.47	No
4	Mission Road/Emigrant Road-Cayuse Road	0	0.00	0.48	No	0.88	No
5	OR 331/Timíne Way	1	0.10	0.48	No	0.38	No
6	OR 331/Wildhorse Boulevard	1	0.09	0.48	No	0.37	No
7	OR 331/Kusi Road	3	0.25	1.08	No	N/A	N/A
8	OR 331/Spilya Road	4	0.29	1.08	No	N/A	N/A
9	OR 331/Arrowhead Travel Plaza Access	3	0.19	0.48	No	0.32	No
10	OR 331/Kash Kash Road	0	0.00	0.48	No	0.32	No
11	I-84/OR 331 Interchange WB Ramps	3	0.19	0.48	No	0.32	No
12	I-84/OR 331 Interchange EB Ramps	4	0.42	0.48	No	0.38	**Yes**
13	S Market Road/Tokti Road	0	0.00	0.48	No	0.62	No

None of the study intersections exceeds the corresponding 90th percentile crash rate. *Attachment D* contains the intersection crash rate analysis worksheet.

For the study intersections with sufficient reference populations, critical crash rates were developed based on the total number of crashes reported at the intersections over the five-year period, intersection type, and the total entering volume or average annual daily traffic (AADT). This method is only applicable where at least 5-10 intersections are available with similar characteristics (i.e. traffic control and legs/approaches). Otherwise, the critical crash rate defaults to the 90th percentile crash rates outlined above. Critical crash rates were calculated for the study intersections using ODOT's Critical Crash Rate Calculator tool and are summarized in Table 4. As shown, the I-84/OR 331 Interchange Eastbound Ramps intersection currently exceeds the corresponding critical crash rate. At this location, there were four crashes, which is less than one crash per year. Three of the four crashes were rear-end and occurred on the ramp. Based on the Wildhorse Resort & Casino Expansion Traffic Impact Study, this interchange experiences queuing that may create conditions that increase the risk for rear-end crashes. The fourth crash involved one vehicle turning left from the ramp and one vehicle traveling southbound. All four crashes resulted in PDO *Attachment D* contains the critical crash rate analysis worksheet.

SEGMENT CRASH ANALYSIS

This section evaluates crashes along study area roadways, excluding crashes at study intersections, by comparing their overall crash rates in Table II of the 2019 statewide Crash Rate Book. Table II lists crash rates for mainline State highways for the past five years, by federally defined urban and rural areas and functional classification.

Segment crash rates were developed for study area roadways and roadway segments based on the total number of crashes reported along the segments over the five-year period, along with the segments lengths and traffic volumes. The total number of crashes along the segments and the segment lengths were obtained from GIS data. Traffic volume data was estimated for the segments based on the traffic counts collected at the study

intersections. Per ODOT's direction, several local road segments with similar characteristics were combined (Kusi Road, Spilya Road, and Kash Kash Road) to minimize exaggerated crash rates due to short roadway lengths. Table 5 summarizes the segment crash rates for each study segment and compares them to ODOT's state highway system crash rates.

Table 5: Segment Crash Rates versus ODOT State Highway System Crash Rates

Roadway	To	From	Number of Crashes	Segment Length (mile)	Segment Crash Rate	State Highway Crash Rate	Exceed State Highway Rate?
OR 331	Northern UIR boundary	Mission Road	5	1.48	0.64	1.22	No
OR 331	Mission Road	Timíne Way	2	0.24	1.05	1.22	No
OR 331	Timíne Way	Wildhorse Boulevard	4	0.97	0.47	1.22	No
OR 331	Wildhorse Boulevard	Kusi Road	1	0.31	0.39	1.22	No
OR 331	Kusi Road	Spilya Road	0	0.10	0.00	1.22	No
OR 331	Spilya Road	Arrowhead Travel Plaza Access	0	0.11	0.00	1.22	No
OR 331	Arrowhead Travel Plaza Access	I-84 WB Ramps	0	0.20	0.00	1.22	No
OR 331	I-84 WB Ramps	I-84 EB Ramps	2	0.17	1.27	1.22	**Yes**
Market Road	I-84 EB Ramps	Best Road	2	0.42	N/A	N/A	N/A
Mission Road	western UIR boundary	Mustanger Lane	10	2.11	0.79	1.45	No
Mission Road	Mustanger Lane	Timíne Way	0	0.59	0.00	1.45	No
Mission Road	Timíne Way	OR 331	1	0.46	0.32	1.45	No
Mission Road	OR 331	Cayuse Road	7	1.64	0.53	1.45	No
Emmigrant Road	Cayuse Road	St. Andrews Road	1	2.08	0.88	2.81	No
Timíne Way	Mission Road	OR 331	1	0.64	0.41	2.81	No
Short Mile Road	Mission Road	roadway eastern end	1	0.97	N/A	N/A	N/A
Cayuse Road	Mission Road	Burke Road	2	4.68	0.33	1.45	No
Wildhorse Boulevard	OR 331	roadway eastern end	0	1.38	0.00	2.81	No
Combined Kusi Road, Spilya Road, and Kash Kash Road	roadway western end	roadway eastern end	4	0.87	0.55	2.81	No
Tokti Road	roadway western end	OR 331	0	0.85	0.00	2.81	No

Locations with N/A results did not have enough reference population sites to conduct the analysis per ODOT's APM.

As shown in Table 5, the segment of OR 331 between the two I-84 ramp terminals currently exceeds the crash rates for similar facilities throughout the state. The segment is assigned only two crashes, but the low average daily traffic volume and short length results in a crash rate higher than the critical crash rate for similar facilities.

Two crashes occurred on this OR 331 segment in the last five years. One crash was located south of the I-84 westbound ramp terminal and included a pedestrian, resulting in a severe injury. The second crash was located

north of the I-84 eastbound ramp terminal and was a head-on crash that resulted in PDO. *Attachment D* contains the segment crash analysis worksheet.

FATAL CRASH REVIEW

Six fatal crashes were reported between 2016 and 2020 within the UIR boundary. The crashes occurred along roadway segments ranging from I-84 to local roads. A high-level summary of each crash is provided below.

- Sunday April 3, 2016 at 1AM on I-84 east of the merge with Highway 30
  - Head-on collision
  - Clear and dry in darkness with no streetlights
  - Wrong way driving on one-way roadway
  - Alcohol involved
- Tuesday April 19, 2016 at 3PM eastbound on I-84 east of OR 331 interchange
  - Fixed-object collision with guardrail, traveling eastbound
  - Clear and dry day during daylight
  - Improper driving
- September 24, 2016 at 8PM on Mission Road west of Cedar Street
  - Fixed-object collision into cut slope or ditch embankment, traveling westbound
  - Clear and dry in darkness with no streetlights
  - Improper driving
  - Alcohol involved
- Wednesday 12, 2016 at 5PM on River Road west of White Road
  - Angle collision with railway train flagged (description notes train hit vehicle), vehicle traveling southbound
  - Clear and dry during daylight
  - Disregarded other traffic control device and failed to yield right-of-way
- Saturday March 3, 2018 at 6PM westbound on I-84 west of Emigrant Road interchange
  - Rear-end collision, traveling westbound
  - Clear but icy in darkness with no streetlights
  - Speed was too fast for conditions (but not exceeding speed limit) and following too closely
- Friday June 8, 2018 at 7AM on OR 331 north of Wildhorse Boulevard
  - Bicycle-involved collision, marked as a rear-end type crash traveling southbound
  - Clear and dry during daylight
  - Driving left of center on two-way road
  - Drugs involved

Three of the fatal crashes occurred on I-84. Alcohol and drugs were also involved in three of the crashes. Three crashes occurred at night and only one involved icy road surface conditions. Two crashes involved a single vehicle, one involved a bicyclist, and one involved a train.

SAFETY PRIORITY INDEX SYSTEM

The Safety Priority Index System (SPIS) was developed by ODOT to identify sites along state and local roads that may warrant further investigation. The SPIS compares the total number of crashes reported on roadway facilities and generates a list of sites (intersections and roadway segments) with calculated SPIS scores. The scores are based on crash frequency, crash rate, and crash severity. SPIS sites with scores in the top five percent are investigated by ODOT staff and reported to the Federal Highway Administration (FHWA). Per the most recent

SPIS list (2019), there are two groups of sites within the UIR boundary in the top 15 percent. These sites are located along Goad Road near the intersection with Tutuilla Church Road, where one fixed-object suspected serious injury crash occurred, and on I-84 at approximately milepoint 223.7, where two fixed-object PDO crashes occurred.

Blueprint for Urban Design Review

The project team reviewed ODOT's Blueprint for Urban Design (BUD) to determine the contexts for OR 331 within the UIR boundary. Due to varying characteristics, OR 331 was broken into two segments. The defining attributes and context selected are described below.

OR 331 FROM NORTHERN UIR BOUNDARY TO WILDHORSE BOULEVARD

OR 331 north of Wildhorse Boulevard is sparsely developed. Land uses that are present are mixed, included residential, commercial, and institutional. Off-street parking is provided, mostly in front of the buildings it serves. Block sizes range greatly.

Recommended BUD Land Use Context: Rural Community

OR 331 FROM WILDHORSE BOULEVARD TO I-84 EASTBOUND RAMPS

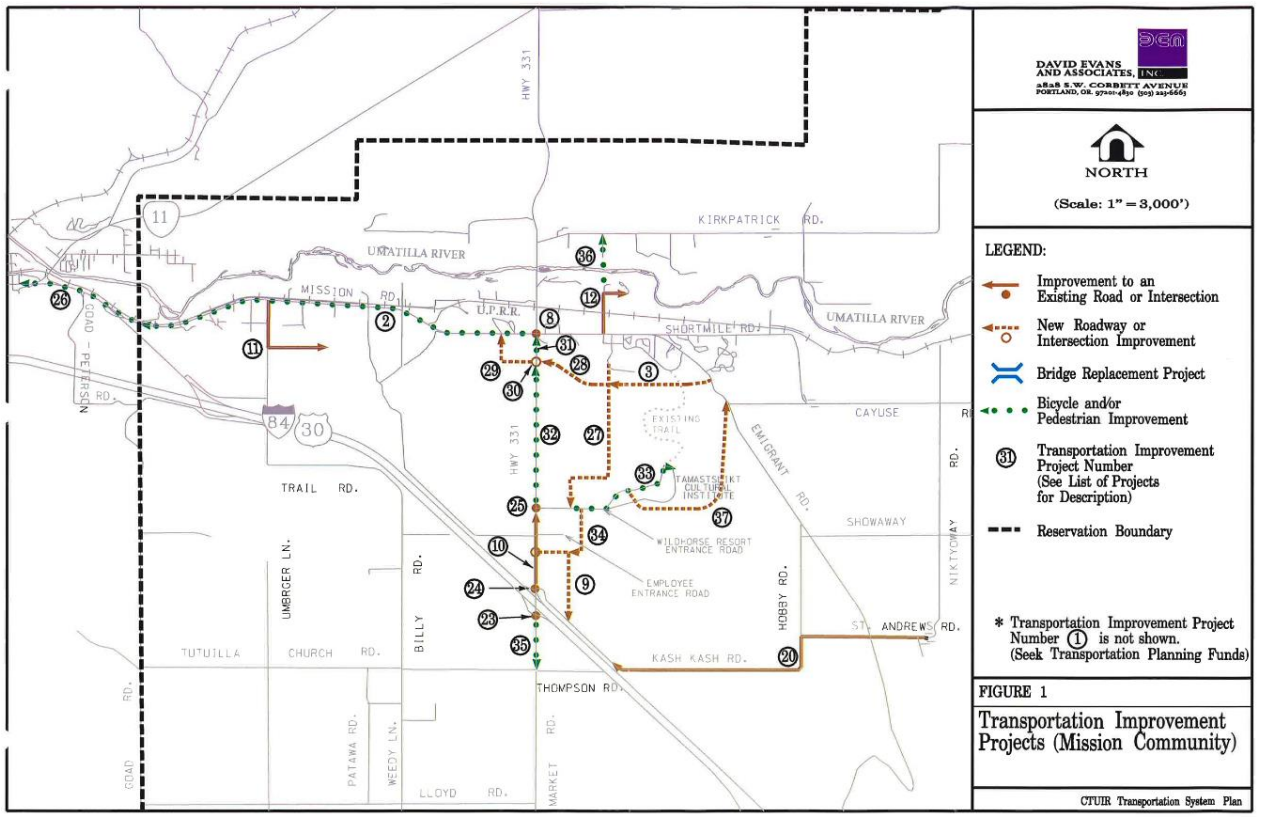
OR 331 south of Wildhorse Boulevard has a mix of commercial and auto-oriented development. Large off-street parking lots are provided, mostly in front of the buildings they serve. Block sizes are generally large, although there are some smaller block sizes where there is greater roadway connectivity. It is a relatively small concentration of development surrounded by lesser developed area.

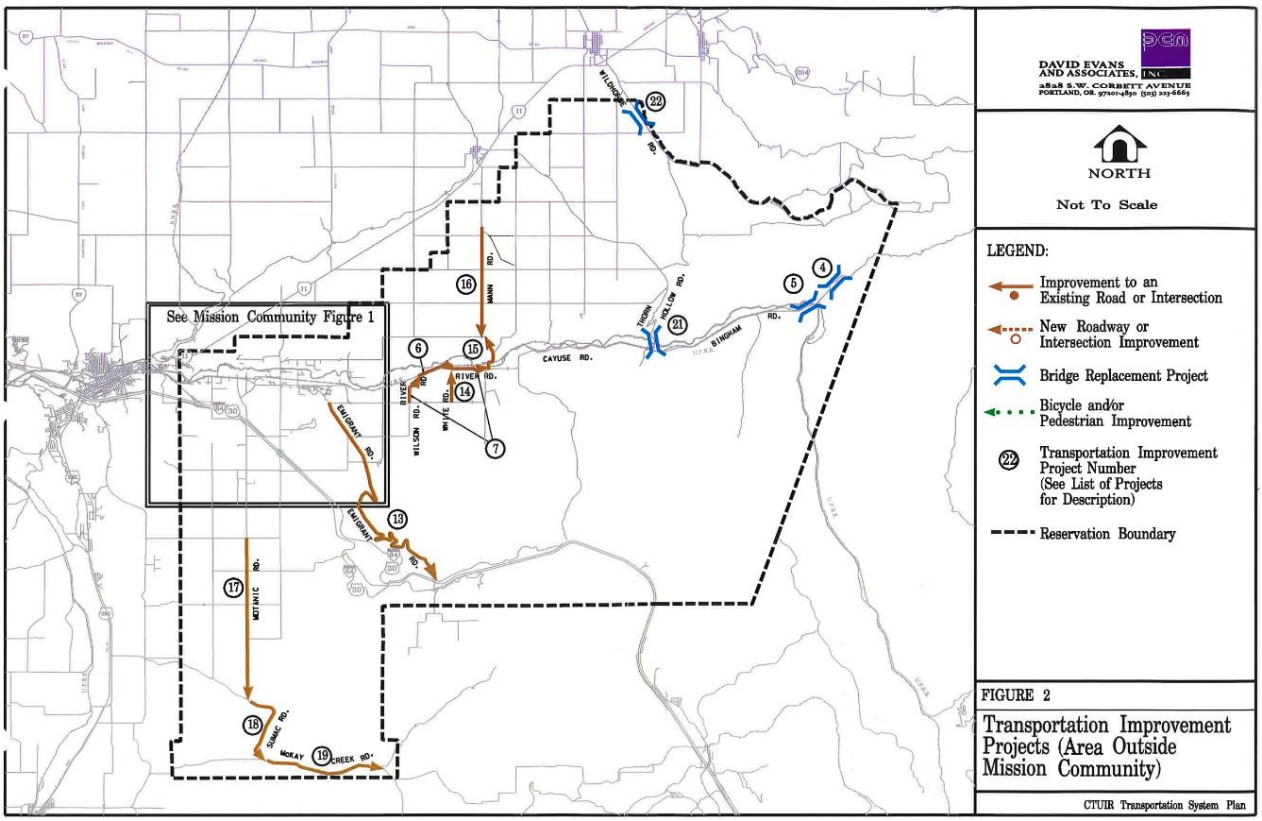
Recommended BUD Land Use Context: Rural Community

Roadway System Planned Projects and Previous Feedback

Attachment E contains a list of planned projects and previous feedback provided via the 2001 CTUIR TSP, MCMP, OR 331 Access Management Implementation Strategy and Circulation Plan, and Umatilla County TSP. Most of the previously planned roadway system projects were provided in the 2001 CTUIR TSP. Figure 9 shows the project map from the 2001 CTUIR TSP.

Figure 9: 2001 CTUIR TSP Project Map





TRANSIT SYSTEM

The transit system within the UIR was inventoried based on information from CTUIR staff and their website, as well as a review of recent aerial imagery.

Transit Service and Facilities

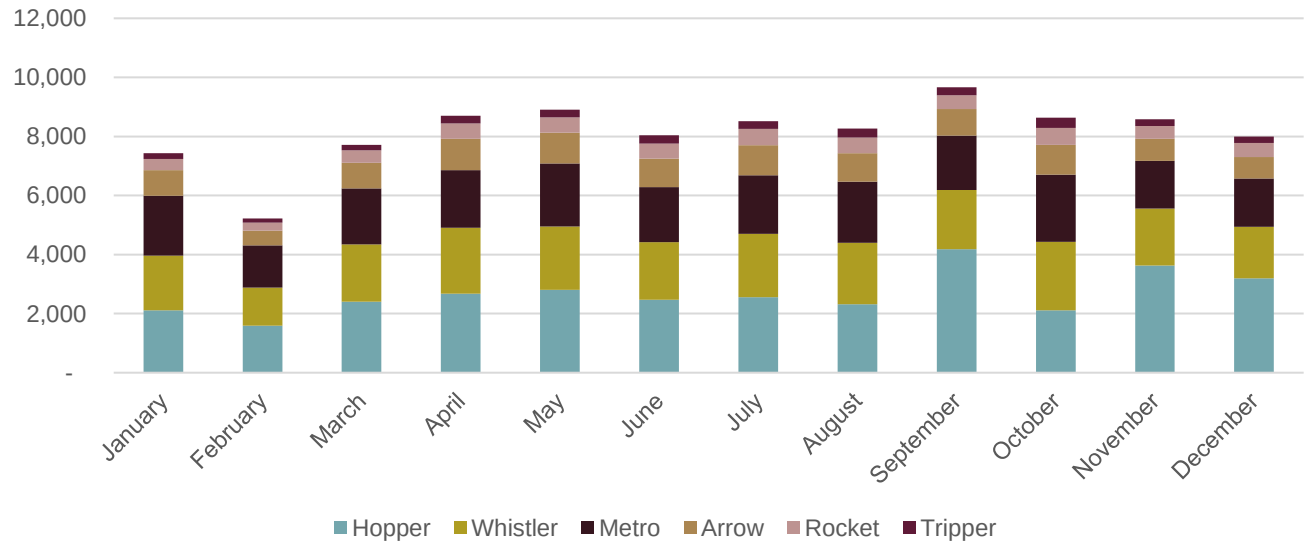
CTUIR operates Kayak Public Transit (Kayak) which serves northeastern Oregon via fixed route local and commuter service and paratransit[1]. CTUIR began public transportation services after observing people walking the distance between Pendleton and Mission. Over time, service has grown from one van to a fleet of cutaway vehicles operating seven year-round fixed routes. In 2014, CTUIR rebranded service as Kayak Public Transit to help people understand that service is open to the public, not just tribal members.

Table 6 and Figure 11 summarize the Kayak routes serving the UIR as of January 2022. CTUIR provides updated Kayak service information and schedules at the beginning of each calendar year. Because of service changes and traveler pattern changes due to COVID-19 during 2020 and 2021, the ridership for 2019 is shown for each route. In addition, Figure 10 provides a monthly overview of ridership during 2019 for the routes serving the UIR area. As shown, the highest monthly ridership during 2019 was approximately 9,670 rides in September. The lowest monthly ridership was approximately 5,225 rides in February.

Table 6: Kayak Services with Stops within the Umatilla Indian Reservation

Route Name	Type of Service	Days of Operation	Span of Service	2019 Annual Ridership
Hopper	Commuter	Monday - Saturday	4:55 a.m. – 7:02 p.m.	32,035
Whistler	Commuter	Monday - Saturday	4:39 a.m. – 7:12 p.m.	23,652
Metro	Local	Monday - Friday	5:00 a.m. – 8:43 p.m.	22,719
Arrow	Commuter	Monday - Friday	5:05 a.m. – 7:10 p.m.	10,668
Rocket	Commuter	Monday - Friday	6:07 a.m. – 6:30 p.m.	5,642
Tripper	Local	Monday-Friday	7:20 a.m. – 4:20 p.m.	2,950

Figure 10: 2019 Ridership for Kayak Routes Serving the Umatilla Indian Reservation



[1] Local fixed-route transit service is required by Federal Law to have complementary origin-to-destination service along a ¾ mile buffer of the fixed-route to serve those with certified temporary or permanent disabilities.

CTUIR TSP

Pendleton

See Inset Map

Hopper
Arrow
Metro
Rocket
Tripper
Whistler

Kayak Bus Stops
Umatilla Indian Reservation Boundary
Mission Hub
July Grounds Hub
Gateway Hub
Pendleton UGB

0 3 Miles

Figure 11

Existing Transit Routes and Stops
Umatilla Indian Reservation

H:\23\23021 - Transportation and Land Use Planning\046 - CTUIR Long Range Transportation Plan\gis\TM2\11 Existing Transit Facilities and Services.mxd Date: 6/27/2022

BUS STOPS SERVING UMATILLA INDIAN RESERVATION

As of January 2022, there are 18 Kayak bus stops located within the UIR boundary and shown in Figure 11. Eight of the stops have shelters available for waiting riders and seven have sidewalks immediately adjacent to the stop. No bus stops within the UIR boundary have designated bicycle facilities (e.g., bike lanes or multi-use paths) immediately adjacent.

OTHER SERVICES

Outside of the UIR boundary, Kayak also provides the Hermiston Area Regional Transit (HART) fixed route. This service operates within Hermiston on weekdays from approximately 7 a.m. to 7 p.m. with five daily trips. In addition to Kayak, there are other agencies and operators that serve the UIR or adjacent areas. CTUIR maintains a list of these operators on their website at https://ctuir.org/departments/tribal-planning-office/kayak-public-transit/other-transportation-agencies/.

Transit Qualitative Multimodal Assessment

A transit qualitative multimodal assessment was conducted in accordance with the methodology described in ODOT's APM. Transit factors that are considered are frequency and on-time reliability, schedule speed/travel times, transit stop amenities, and connecting pedestrian/bicycle network. This methodology applies a rating system of: excellent, good, fair, and poor. Table 7 outlines the methodology used for conducting a transit qualitative multimodal assessment within the UIR. Due to the rural nature of the service in the study area, the frequency and on-time reliability methodology was adjusted to review number of daily round trips. This methodology has been used in other Oregon TSPs, such as the Independence TSP.

Table 7: Transit Qualitative Multimodal Assessment Methodology – For Rural Service

Category	Excellent	Good	Fair	Poor
Frequency and on-time reliability	12 daily round trips	8-10 daily round trips	5-7 daily round trips	4 or fewer daily round trips
Schedule speed/ travel times	<20% slower than driving	20% to 40% slower than driving	40% to 60% slower than driving	>60% slower than driving
Transit stop amenities	Shelter	Bench	Sign with waiting area	No waiting area and/or no sign
Connecting pedestrian/ bike network	BLTS and PLTS 2 or better and crossing	BLTS and PLTS 2 or better with no crossing	BLTS or PLTS >2 and no crossing	BLTS and PLTS >2 and no crossing

FREQUENCY

Frequency is how many times an hour a user has access to transit service, assuming that service is provided within acceptable walking distance and at the times the user wishes to travel. Frequency helps determine the convenience of transit service to riders and is one component of overall transit trip time (helping to determine the wait time at a stop). Table 8 provides the assessment for Kayak services within the UIR boundary.

Table 8: Transit Qualitative Multimodal Assessment - Frequency

Route Name	Daily Trips	Assessment
Hopper	4 weekday trips, 2 Saturday trips	Poor
Whistler	4 weekday trips, 2 Saturday trips	Poor
Metro	6 weekday trips	Fair
Arrow	3 weekday trips	Poor
Rocket	3 weekday trips	Poor
Tripper	3 weekday trips	Poor

Due to the rural nature of the area and long service routes supporting the region, Kayak's routes operate just a few trips day. The commuter service routes only operate at peak commute times and are not intended to provide convenient service throughout the day.

SCHEDULE SPEED/TRAVEL TIMES

Schedule speed and travel time refer to the time it takes to complete a transit route in full. The bus travel time includes wait time between an outbound trip and inbound trip, as well as diversions off the most direct motor vehicle routes to reach all bus stops. Table 9 provides the assessment for Kayak services within the UIR boundary.

Table 9: Transit Qualitative Multimodal Assessment – Schedule Speed/Travel Times

Route Name	Maximum Number of Roundtrip Stops	Bus Scheduled Roundtrip Travel Time (Hours:Minutes)	Vehicle Travel Time (Hours:Minutes)*	Assessment
Hopper	37	3:40	2:15	Poor
Whistler	33	3:00	2:10	Good
Metro	47	2:10	1:10	Poor
Arrow	22	2:40	2:10	Good
Rocket	16	1:35	1:30	Excellent
Tripper	22	1:20	1:10	Excellent

* Google Maps was used to estimate the vehicle travel time to reach major stops along the routes.

TRANSIT STOP AMENITIES

Amenities at transit stops, such as bus benches and bus shelters, enhance a transit route and make it more user-friendly. Steps that can make taking the bus as comfortable and accommodating as possible may help encourage ridership. Table 10 provides the assessment for Kayak services within the UIR boundary. Bus stop amenities in the area include shelters and signage.

Table 10: Transit Qualitative Multimodal Assessment – Transit Stop Amenities

Route Name	Condition	Assessment
Hopper	5 of 7 stops have shelters; 2 have signage	Good
Whistler	4 of 5 stops have shelters; 1 has signage	Good
Metro	7 of 13 stops have shelters; 1 has signage; 4 stops have no amenities	Fair
Arrow	4 of 5 stops have shelters; 1 has signage	Good
Rocket	5 of 8 stops have shelters, 2 have signage; 1 stop has no amenities	Good
Tripper	5 of 10 stops have shelters; 1 has signage; 4 stops have no amenities	Fair

CONNECTING PEDESTRIAN/BICYCLE NETWORK

Table 11 provides the assessment for Kayak services within the UIR boundary. There are no designated bicycle facilities adjacent to the bus stops within the UIR boundary, therefore the assessment focused on whether sidewalk was present immediately adjacent to the route bus stops within the UIR.

Table 11: Transit Qualitative Multimodal Assessment – Connecting Pedestrian/Bicycle Network

Route Name	Condition	Assessment
Hopper	Sidewalk adjacent to 5 of 7 stops; no adjacent dedicated bicycle facility	Fair
Whistler	Sidewalk adjacent to 4 of 5 stops; no adjacent dedicated bicycle facility	Fair
Metro	Sidewalk adjacent to 6 of 13 stops; no adjacent dedicated bicycle facility	Poor
Arrow	Sidewalk adjacent to 4 of 5 stops; no adjacent dedicated bicycle facility	Fair
Rocket	Sidewalk adjacent to 5 of 8 stops; no adjacent dedicated bicycle facility	Poor
Tripper	Sidewalk adjacent to 5 of 10 stops; no adjacent dedicated bicycle facility	Poor

Transit System Planned Projects and Previous Feedback

Attachment E contains a list of planned projects and previous feedback provided via the 2001 CTUIR TSP, MCMP, OR 331 Access Management Implementation Strategy and Circulation Plan, and Umatilla County TSP. CTUIR staff also noted the following transit system goals and potential project types to consider moving forward:

- Transit system goals:
  - Increase system capacity
  - Ensure safety for all users
  - Protect livability and ensure equity and access
  - Begin environment-electric vehicle service for the Mission Metro and campus shuttle routes
  - Establish a regional outlook and future focus Regional Transit Authority (RTA)
- Potential project types:
  - Traffic signals on OR 331 to provide safe crossing opportunities for transit riders and to better enable transit vehicles to turn onto OR 331
  - Crosswalks and mid-block crossings near stops for connectivity to pedestrian and bicycle facilities or key destinations
  - Capital improvements including Kayak Transit Center expansion to include public restrooms for passengers at the Kayak Hub
  - Increase number of bus shelters and bus stop signs

PEDESTRIAN SYSTEM

The following section describes the pedestrian system in the UIR boundary. It includes a system inventory, pedestrian level of traffic stress analysis, and a systemic safety risk analysis. It also summarizes previously planned projects.

Inventory

The pedestrian system within the UIR was inventoried based on GIS data from the MCMP, as well as a review of recent aerial imagery. The inventory was supplemented by information provided in the 2001 CTUIR TSP and by information provided by the CTUIR.

The pedestrian system consists of sidewalks and multi-use paths, as well as marked and/or signed pedestrian crossings. These facilities are primarily provided within the Mission, July Grounds, and Gateway hubs near OR 331 and Mission Road. Figure 12 illustrates the pedestrian network within the UIR.

CTUIR TSP

Pendleton

See Inset Map

Mid-block crossing
Crosses uncontrolled intersection leg
Crosses controlled intersection leg
Sidewalk
Multi-Use Path
Umatilla Indian Reservation Boundary
Mission Hub
July Grounds Hub
Gateway Hub
Pendleton UGB

0 3 Miles

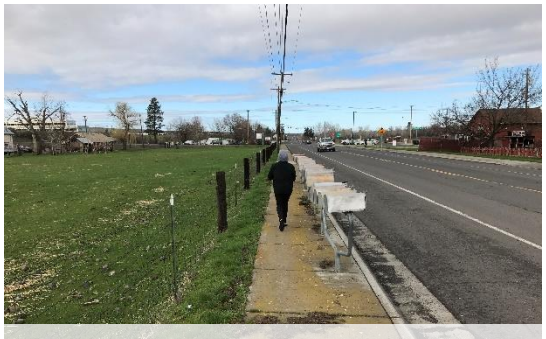
Figure 12

Existing Pedestrian Network
Umatilla Indian Reservation

H:\23\23021 - Transportation and Land Use Planning\046 - CTUIR Long Range Transportation Plan\gis\TM2\12 Existing Pedestrian Facilities.mxd Date: 6/8/2022

SIDEWALKS

Sidewalks are primarily provided within the July Grounds hub, on side streets off OR 331 south of the Wildhorse Resort & Casino, and along portions of Mission Road. Sidewalks within the UIR boundary are approximately 4-6 feet wide, although obstructions may be located within the sidewalk width. One example from a MCMP field review includes a series of mailbox obstructions. These obstructions occur periodically along the south side of Mission Road, reducing the effective width of the sidewalk and presenting barriers for the passage of wheelchairs.



Mission Road Sidewalk Obstructions
Source: Mission Community Master Plan

MULTI-USE PATHS

Multi-use paths are used by people walking, biking, and rolling. They can create connections within, or between, communities, as well as provide recreational opportunities for residents and visitors. The following multi-use paths are located within the UIR boundary:

- A paved five-foot wide multi-use path network linking the residential areas between Cayuse Road and Short Mile Road.
- The paved nine-foot wide Tamastslikt Trail linking the Tamastslikt Cultural Institute to the July Grounds.
- The paved eight-foot wide Timíne Way multi-use path on the north side of the roadway.

PEDESTRIAN CROSSINGS

Based on a review of aerial imagery, there are approximately 13 marked crossings within the UIR boundary. Figure 12 shows the locations of these crossings, including five marked mid-block crossings. A field review will be conducted at these locations in May 2022.

Marked Crossings on Timíne Way
Source: Google Earth

Marked Mid-block Crossing on Cayuse Road
Source: Google Earth

Pedestrian Level of Traffic Stress

Pedestrian level of traffic stress (PLTS) is a perception-based analysis methodology that is used to evaluate the adequacy of streets to accommodate pedestrians in urban and rural environments. As applied by ODOT, this methodology classifies four levels of traffic stress that a pedestrian can experience on the street, ranging from PLTS 1 (little traffic stress) to PLTS 4 (high traffic stress). A street or street segment that is rated PLTS 1 generally has low traffic volumes and travel speeds and has a sidewalk that is separated from vehicle traffic. These segments are generally suitable for all pedestrians, including children. A street or street segment that is rated PLTS 4 generally has high traffic volumes and travel speeds and is perceived as unsafe by most adults. Segments rated PLTS 4 also include those with no sidewalks or other pedestrian facilities. Per the APM, PLTS 2 is considered a reasonable target for streets due to its acceptability with most pedestrians.

The PLTS score is determined based on four criteria, including sidewalk condition, physical buffer type, total buffering width, and general land use. All four criteria are scored from 1 to 4 and the highest score determines the overall score for the road segment.

Figure 13 illustrates the results of the PLTS analysis for the roadways scoped for this analysis by CTUIR and ODOT. Some segments shown as PLTS 3 or 4 may have shorter segments with lower PLTS scores.

Several of the analyzed streets have segments that are rated PLTS 3 and PLTS 4. Most segments rated PLTS 4 have no sidewalks or other pedestrian facilities, such as along OR 331 and Short Mile Road. For these segments to be rated PLTS 2, sidewalks with appropriate sidewalk and buffer widths would need to be installed along the full length of the gap. Other common characteristics related to the PLTS 3 and PLTS 4 ratings are described below:

- A few segments rated PLTS 3 or 4 have curb-tight sidewalks on roadways with speeds of 30 mph or higher, such as the sidewalks on Mission Road just east of OR 331. For these segments to be rated PLTS 2, the speeds would need to be reduced to 25 mph or a buffer would need to be installed between the sidewalk and vehicle travel lane.
- Other segments rated PLTS 3 have narrow sidewalks of 4 feet, including the sidewalks on Cedar Street. For these segments to be rated PLTS 2, the sidewalks would need to be widened to at least five feet wide.
- Other segments are be located adjacent to auto-oriented land uses, such as those near Arrowhead Travel Plaza. Per the APM, these segments are automatically rated PLTS 3 or 4 given the auto-oriented nature of these land uses. For these segments, the priority is filling gaps. Alternatives for these segments will be analyzed without respect to the land-use criteria to understand the effects of the proposed solutions.

Pedestrian Systemic Safety Risk Analysis

As part of the Oregon Pedestrian and Bicycle Safety Implementation Plan, ODOT implemented the NCHRP Research Report 893 methodology in 2020. This methodology uses risk factors to complete a systemic safety analysis aimed at identifying high risk locations for pedestrian and bicycle crashes along the state highway system. Systemic safety, opposed to the traditional review of crash history, allows practitioners to proactively identify high risk sites for potential safety improvements based on risk factors that often correlate to locations with low frequency but high injury crashes. For ODOT's statewide systemic safety analysis completed in 2020, the pedestrian risk factors used within rural areas included:

- Principal Arterial[2]
- Number of Lanes (>=Four Lanes)[3]
- Posted Speed (>=35mph)[4]
- Other Zoning[5]
- Proximity to Schools (one mile)
- Proximity to Transit Stops (1/4 mile)

Within the UIR boundary, only one ODOT roadway segment was identified as in the highest-risk 20% of all State Highways: OR 331 north of Mission Road.

[2] The only roadway segment within the UIR boundary that is classified as a principal arterial is the portion of OR 11 approaching Pendleton in the northeast corner of the study area.
[3] The only roadway segment within the UIR boundary that has four or more lanes is OR 331 from north of Kusi Road to South of Spilya Road.
[4] Posted speed values were used for study segments where posted speed was already collected for LTS analysis or where the posted speed GIS data was available. For segments where speed data was unavailable, CTUIR's GIS data for "road type" was used as a proxy for speed. Segments listed as a federal/state route or as a public paved/hard-surface road were assumed to have a posted speed of 35 MPH or greater.
[5] "Other" zoning includes all zoning classifications within the Oregon Spatial Data Library (OSDL) with the exception of residential, commercial, industrial, mixed-use, and farm-use zoning. Examples of "Other" zoning including forest/federal lands, coastline, parks, range, and public health. Based on OSDL 2017 zoning data, most of the study area is categorized as "other" zoning, except the areas to the south that are not connected to the primary boundary.

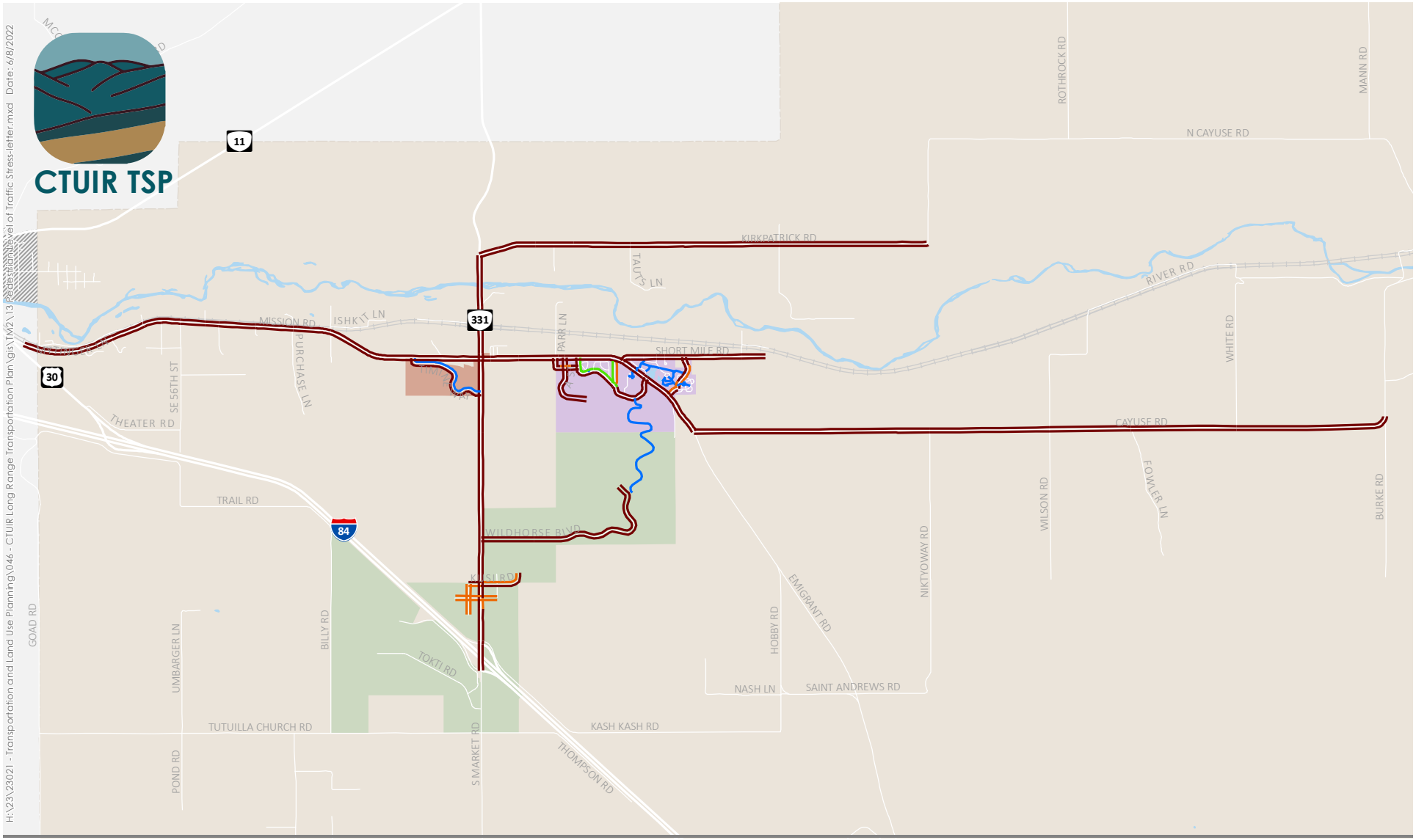


Figure 13

Pedestrian Level of Traffic Stress
Umatilla Indian Reservation

In addition to reviewing ODOT's 2020 analysis, the project team completed the same analysis on all roadways within the UIR boundary. Figure 14 illustrates the results of the pedestrian risk analysis. The top 20% of analyzed locations for the TSP study area shown in red.

One of the high-risk segments includes OR 331 near the I-84 interchange. The one reported crash involving a pedestrian within the UIR boundary from 2016 to 2020 was located on this segment, and it resulted in a serious injury.

Because most of the roadways in the UIR are non-principal arterials with less than four lanes in "other" zoning, the main risk differentiators for this assessment are if the roadway segment has a **posted speed equal to or over 35 MPH, is within one mile from the Nixyaawii Community School, and/or is within ¼ mile to a transit stop**. This results in streets within the more urban portions of the Mission area showing up as higher risk due to their proximity to pedestrian activity generators (e.g., the school, transit stops).

Outside of the short segment of OR 331 with four/five lanes, the highest scoring segments within the UIR boundary include OR 331, Mission Road, and Kirkpatrick Road within 1-mile of the Nixyaawii Community School, where all three of these factors are present. Other high-risk segments are primarily located on OR 331 or within the Mission and July Grounds Hub areas, where two of three of these factors are present in varying combinations. For example, A Street is located within one mile from the Nixyaawii Community School and is within ¼ mile to a transit stop, yielding a higher risk value even through the posted speed is less than 35 MPH.

Pedestrian System Planned Projects and Previous Feedback

Attachment E contains a list of planned projects and previous feedback provided via the 2001 CTUIR TSP, MCMP, Safe Routes to School Plan, and CTUIR Capital Improvement Plan. Most of the previously planned pedestrian system projects were provided in the MCMP.

As alternatives and projects are reviewed from these documents and/or developed to address the pedestrian system gaps and deficiencies, *Attachment F: Active Transportation and Transit Toolbox* will be used as a resource.

BICYCLE SYSTEM

The following section describes the bicycle system in the UIR boundary. It includes a system inventory, bicycle level of traffic stress analysis, and a systemic safety risk analysis. It also summarizes previously planned projects.

Inventory

The bicycle system within the UIR was inventoried based on GIS data from the MCMP, as well as a review of recent aerial imagery. The inventory was supplemented by information provided in the 2001 CTUIR TSP and by information provided by the CTUIR.

The bicycle system within the UIR boundary consists of on-street bike lanes, shoulder bikeways, and unmarked shared roadways, as well as off-street multi-use paths and bicycle parking. The only marked bike lanes are on Mission Road, connecting the Mission and July Grounds hubs with residential, school, and commercial uses. Figure 15 illustrates the bicycle system within the UIR.

Bicyclist on Mission Road Using the Wide Shoulder Lane
Source: Mission Community Master Plan

CTUIR TSP

Risk Factor Score

- 0.00 (bottom 20%)
- 0.01 - 1.45
- 1.46 - 1.63
- 1.64 - 3.08
- 3.09 - 5.81 (top 20%)

- Umatilla Indian Reservation Boundary
- Mission Hub
- July Grounds Hub
- Gateway Hub
- Pendleton UGB

0 3 Miles

Figure 14

Pedestrian Risk Factor Screening
Umatilla Indian Reservation

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CTUIR TSP

Bike Lane
Multi-Use Path
Wide Shoulder
Umatilla Indian Reservation Boundary
Mission Hub
July Grounds Hub
Gateway Hub
Pendleton UGB

0 3 Miles

Figure 15

Existing Bicycle Network
Umatilla Indian Reservation

H:\23\23021 - Transportation and Land Use Planning\046 - CTUIR Long Range Transportation Plan\gis\TM2\15 Existing Bicycle Facilities.mxd Date: 6/8/2022

BIKE LANES

Mission Road between SE 56th Street and OR 331 has a striped bicycle lane on both sides of the roadway representing the only formal bicycle-only facility within the UIR boundary.

SHOULDER BIKEWAYS

On Mission Road between OR 331 and Parr Lane, bicyclists may utilize an unmarked wide shoulder on both sides of the street, with a width varying between 7.5 to 10 feet.

SHARED ROADWAYS

Aside from multi-use paths and facilities described above, bicycle riders must either ride in the street with motor vehicle traffic or on the sidewalk, if present, with pedestrians.

MULTI-USE PATHS

As further described in the Pedestrian System section, there are three multi-use paths within the UIR boundary, including links between residential area between Cayuse Road and Short Mile Road, the Tamastslikt Trail, and the Timíne Way multi-use path on the north side of the roadway.

BICYCLE PARKING

Bicycle parking is limited and generally concentrated to local businesses and the school.

Bicycle Level of Traffic Stress

Similar to PLTS, Bicycle level of traffic stress (BLTS) is a perception-based analysis methodology that is used to evaluate the adequacy of streets to accommodate bicyclists in urban and rural environments. As applied by ODOT, this methodology classifies four levels of traffic stress that a cyclist can experience on the street, ranging from BLTS 1 (little traffic stress) to BLTS 4 (high traffic stress). A street or street segment that is rated BLTS 1 generally has low traffic volumes and travel speeds and is suitable for all cyclists, including children. A street or street segment that is rated BLTS 4 generally has high traffic volumes and travel speeds and is perceived as unsafe by most adults. Per the APM, BLTS 2 is considered a reasonable target for streets due to its acceptability with most cyclists.

The BLTS score is determined based on the speed of the street, the number of travel lanes per direction, the presence and width of an on-street bike lane and/or adjacent parking lane, and several other factors.

Figure 16 illustrates the results of the BLTS analysis for the roadways scoped for this analysis by CTUIR and ODOT. Some segments shown as BLTS 3 or 4 may have shorter segments with lower BLTS scores.

Several of the analyzed streets have segments that are rated BLTS 3 and BLTS 4. Most segments rated BLTS 3 or 4 do not have bike lanes or wide shoulders. For these segments to be rated BLTS 2, bike lanes with appropriate width and/or buffers would need to be installed. Mission Road has striped bike lanes, but is still rated as BLTS 3 or 4, depending on the location. This is because the bike lanes/shoulders west of OR 331 are not sufficient to provide a comfortable riding experience for most people given the posted speed of 40 mph. For these segments to be rated BLTS 2, the posted speed would need to be reduced and/or the bike lane/shoulders would need to be widened, potentially with a physical buffer installed.

Most segments evaluated as shared roadways that were rated BLTS 2 could still benefit from signage and/or striping to remind motorists to share the road. The signing and striping can also provide important wayfinding for cyclists to inform them of the preferred bicycle routes.

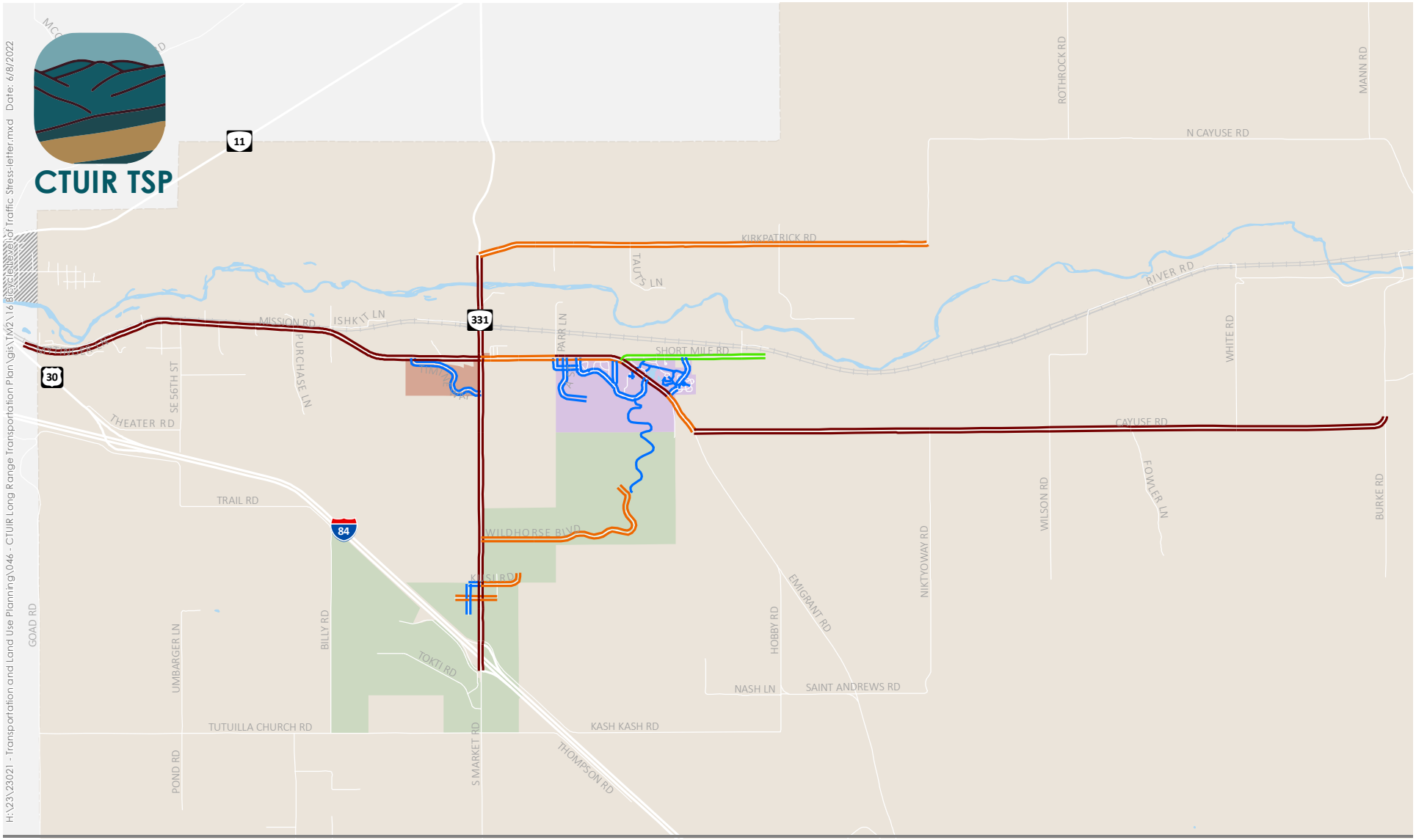


Figure 16

Bicycle Level of Traffic Stress
Umatilla Indian Reservation

Bicycle Systemic Safety Risk Analysis

Similar to the pedestrian risk factor screening, ODOT completed a statewide systemic safety analysis for bicycle risk factors in 2020. The risk factors used as part of the bicycle analysis for rural areas included:

- Principal Arterial
- Posted Speed (>=35mph)
- Proximity to Schools (one mile)
- Proximity to Transit Stops (1/4 mile)
- High Population over the Age of 64[6]

Within the UIR boundary, no ODOT roadway segments were identified as in the top 20% statewide.

The project team completed a bicycle risk factor screening analysis on all roadways within the UIR boundary using the same methodology as the ODOT screening. Figure 17 illustrates the results of the bicycle risk analysis conducted, including the top 20% locations for the TSP study area shown in red

One of the high-risk segments includes OR 331 north of Wildhorse Boulevard. The one reported crash involving a bicyclist within the UIR boundary from 2016 to 2020 was located on this segment. It resulted in a fatality.

Because the entire study area meets the high population over the age of 64 risk factor and most roadways within the UIR boundary are not classified as principal arterials, the main differentiators risk for this assessment are if the roadway segment has a **posted speed equal to or over 35 MPH, is within one mile from the Nixyaawii Community School, and/or is within ¼ mile to a transit stop**. Similar to the pedestrian risk factor screening, this results in roads located near activity generators in the Mission area scoring in the higher tiers. The highest scoring segments within the UIR boundary include OR 331, Mission Road, and Kirkpatrick Road within one-mile of the Nixyaawii Community School, where all three of these factors are present. Other high-risk segments are primarily located within the Mission Hub and July Grounds Hub areas, where two of three of these factors are present in varying combinations. For example, Timíne Way is located within one mile from the Nixyaawii Community School and is within ¼ mile to a transit stop, yielding a higher risk value even through the posted speed is less than 35 MPH.

Bicycle System Planned Projects and Previous Feedback

Attachment E contains a list of planned projects and previous feedback provided via the 2001 CTUIR TSP, MCMP, Safe Routes to School Plan, and CTUIR Capital Improvement Plan.

As alternatives and projects are reviewed from these documents and/or developed to address the bicycle system gaps and deficiencies, *Attachment F: Active Transportation and Transit Toolbox* will be used as a resource.

RAIL SYSTEM

The rail system within the UIR boundary was inventoried based on GIS data obtained from ODOT, as well as a review of recent aerial imagery. The inventory was supplemented by information provided in the 2001 CTUIR TSP.

Rail Facilities

There is one rail line within the UIR boundary, connecting Pendleton and La Grande. The line runs east and west, parallel to Mission Road, Short Mile Road, Cayuse Road, and Bingham Roads before turning south along Meacham Creek Road and into the Blue Mountains. Union Pacific is the owner of the rail line, which has an ODOT rail line designation of 2A. The line's primary purpose is for freight movement.

[6] The entire UIR boundary meets the high population over 64 threshold of 16.8%, with only three census blocks covering the study area.

CTUIR TSP

See Inset Map

Risk Factor Score

- 1.00 (bottom 20%)
- 1.01 - 2.00
- 2.01 - 2.03
- 2.04 - 2.09
- 2.10 - 4.12 (top 20%)

- Umatilla Indian Reservation Boundary
- Mission Hub
- July Grounds Hub
- Gateway Hub
- Pendleton UGB

0 3 Miles

Figure 17

Bicycle Risk Factor Screening
Umatilla Indian Reservation

H:\23\23021 - Transportation and Land Use Planning\046 - CTUIR Long Range Transportation Plan\gis\TM2\17 Bicycle Risk Factor Screening.mxd Date: 6/30/2022

Rail Crossings

Based on GIS data from ODOT, there are 29 rail crossings within the UIR, which are summarized in Table 12.

Table 12: Rail Crossings with the Umatilla Indian Reservation Boundary

Location Name	ODOT Crossing Number	Type	Crossing Surface Material
Nr Pendleton – Mission Frontage Road	2A-218.43	Mainline at Grade	Concrete
Nr Pendleton – Private Road	2A-218.66-P	Private	Concrete
Nr Pendleton – Private Road	2A-219.12-P	Private	Concrete
Nr Pendleton – Private Road	2A-219.45-P	Private	Concrete
Mission – Private Road	2A-219.71-P	Private	Concrete
Mission – Davis Lane	2A-219.90	Mainline at Grade	Paved
Mission – Umatilla-Mission Hwy	2A-221.00	Mainline at Grade	Paved
Mission – Parr Lane	2A-221.50	Mainline at Grade	Gravel
Mission – Private Road	2A-222.25-P	Private	Concrete
Mission – Private Road	2A-222.75-P	Private	Concrete
Minthorn – Niktyoway Road	2A-224.10	Mainline at Grade	Gravel
Minthorn – Old River Road #918	2A-225.20	Mainline at Grade	Gravel
Minthorn – Private Road	2A-225.60-P	Private	Concrete
Minthorn – Private Road	2A-225.88-P	Private	Concrete
Minthorn – Old River Road #927	2A-226.20	Mainline at Grade	Gravel
Cayuse – Private Road	2A-226.68-P	Private	Concrete
Cayuse – Cayuse-Adams Road 925	2A-227.30	Mainline at Grade	Combination
Cayuse – Private Road	2A-229.34-P	Private	Concrete
Thorn Hollow – Thorn Hollow Road	2A-231.10	Mainline at Grade	Paved
Thorn Hollow – Private Road	2A-232.04-P	Private	Concrete
Thorn Hollow – Bingham Road	2A-232.40	Mainline at Grade	Paved
Thorn Hollow – Private Road	2A-233.44-P	Private	Concrete
Thorn Hollow – Private Road	2A-233.85-P	Private	Concrete
Thorn Hollow – Private Road	2A-234.36-P	Private	Concrete
Gibbon – Private Road	2A-234.92-P	Private	Concrete
Gibbon – Private Road	2A-235.53-P	Private	Concrete
Gibbon – Private Road	2A-236.27-P	Private	Concrete
Gibbon – Bingham Road	2A-236.60-C	Spur	Paved
Gibbon – Bingham Road	2A-237.30	Mainline at Grade	Paved

ATTACHMENTS

A. Land Use Assessment Memo (APG)
B. Traffic Operations Worksheets
C. Travel Demand Model Data
D. Crash Analysis Worksheets
E. Planned Projects and Previous Feedback
F. Active Transportation and Transit Toolbox

A. LAND USE ASSESSMENT MEMO (APG)

CTUIR TSP

TECHNICAL MEMORANDUM #2: DRAFT CONTEXT AND SITE ANALYSIS

Date: April 20, 2022 Project #: 23021.005

To: Confederated Tribes of the Umatilla Indian Reservation (CTUIR)

From: MIG | APG

Project: CTUIR Transportation System Plan

Subject: Land Use Context and Site Analyses

TABLE OF CONTENTS

INTRODUCTION

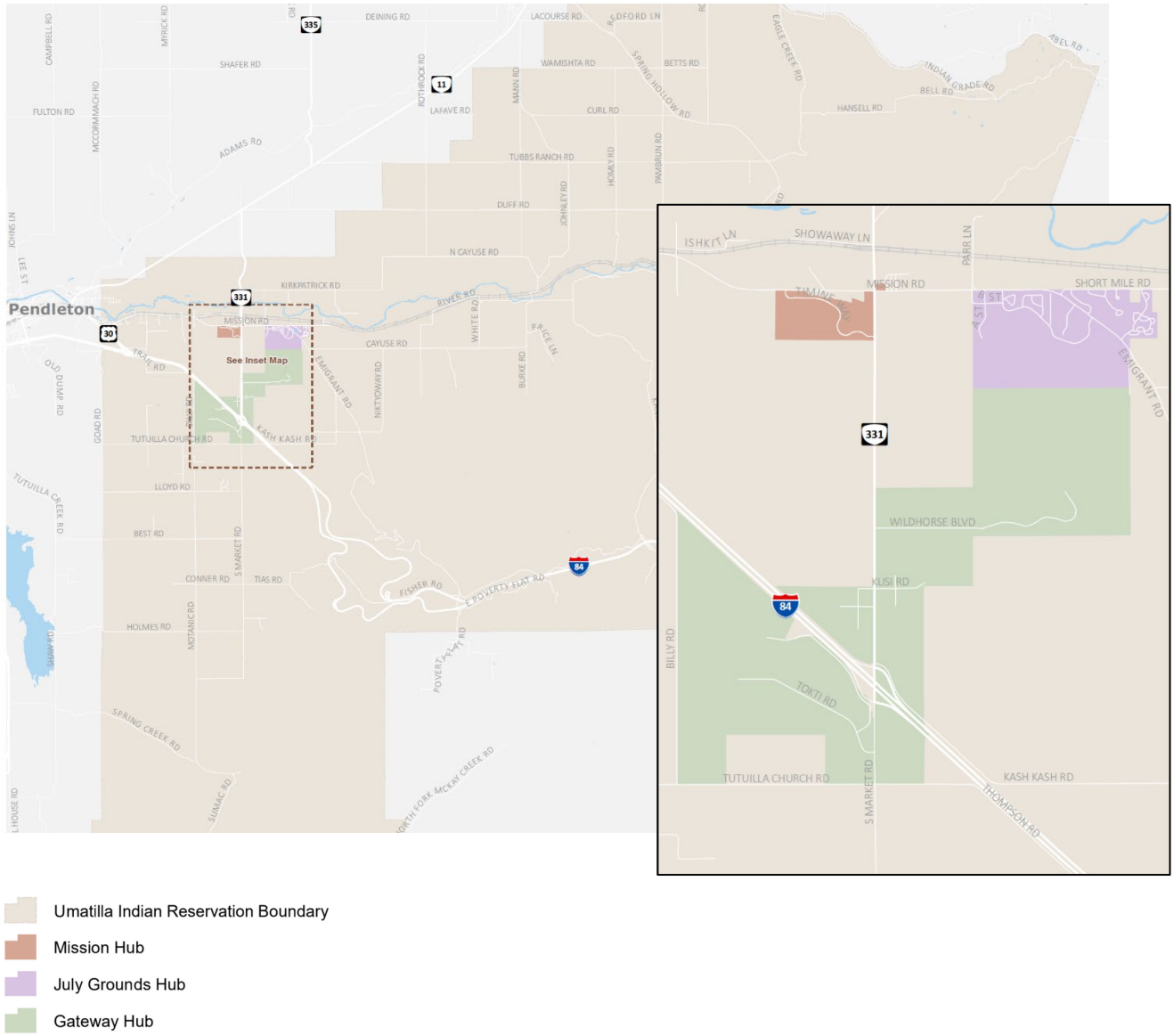
The purpose of this memorandum is to document existing conditions, opportunities, and constraints to planning for quality development and active transportation within the study area. This memorandum is part of the 2022 CTUIR TSP update, which aims to foster cultural connectedness, deliver community-focused healthy lifestyle solutions, and prioritize safety for all modes of travel on the Umatilla Indian Reservation (Reservation).

This memorandum focuses on issues of land use, development, and property ownership in order to inform the update of transportation projects and policies. The memorandum also reviews and recommends regulatory best practices to implement the TSP update project objectives.

STUDY AREA OVERVIEW

The study area for this analysis is the Umatilla Indian Reservation Boundary, shown on Figure 1. The Reservation is located along the Umatilla River east of the City of Pendleton in Umatilla County and encompasses about 172,000 acres (about 273 square miles). The Reservation lies east of Pendleton and is primarily north of Interstate 84 (I-84) and south of OR Highway 11. A map of the study area is shown in Figure 1.

Figure 1. Study Area Map



CTUIR has over 3,100 tribal members; nearly half live on or near the Reservation. The Reservation is also home to another 300 American Indians who are members of other tribes, and approximately 1,500 non-Indians also live on the Reservation.

The majority of government activity, commerce, and residential developments on the Reservation are located in the vicinity of South Market Road (OR 331) and Mission Road. This area is organized into several "Community Hubs," as shown on the inset map above and described below.

- **Gateway**. This area includes the Wildhorse Resort and Casino, Tamastslikt Cultural Institute, and Coyote Business Park. It is the primary entrance onto the Reservation from I-84.
- **Mission**. The Mission area is the center for tribal governance and includes Nixyáawii Governance Center, Community School, the Yellowhawk Tribal Health Center, and transit hub for Kayak Public Transit. The Mission Area includes some residencies, including a small apartment complex and platted subdivision for single family homes.

- **July Grounds**. This area located north of the Gateway Area, includes the site of the former Nixyáawii Community School, Bureau of Indian Affairs office, Wetland Community Park, the Mission Longhouse, Mission Assembly of God Church and many of CTUIR's residences.

POLICY CONTEXT

Governance and Land Ownership

CTUIR is governed by a Constitution and Bylaws adopted in 1949. The Constitution and Bylaws establishes membership criteria and operating procedures for the General Council, Board of Trustees, and Tribal Court meetings, and positions. The Governing body is the nine-member Board of Trustees, elected every two years by the General Council (tribal members ages 18 and older).

Land ownership on the Reservation complicates the development process and may have implications for how TSP projects are implemented. Table 1 describes the types of ownership and Figure 3 and Figure 4 show land ownership for the reservation as a whole and the Community Hubs located in the vicinity of I-84. As shown on these figures, the Community Hubs consist entirely of Tribal Trust and Tribal Fee lands.

Table 1. Land Ownership/Status Types

Type	Description
Fee Lands	Lands on which taxes are paid and in the County/State's jurisdiction. CTUIR and Umatilla County have an MOU that allows for the CTUIR to administer zoning on fee lands within the Reservation boundaries.
Allotment	Trust lands are held by the US government for the perpetual use of an individual (Allotee) or tribal government (CTUIR); so while the Federal Government owns it, CTUIR owns the rights to it.
Tribal Trust	Tribal Trust Lands are the trust lands that are owned by the CTUIR. This can be either in whole or in part. Those that are listed as Tribal Trust on the maps are those that are owned in whole by the CTUIR, but in reality many of the allotment lands also have at least a portion of the properties owned by the Tribes because of right-of-first-refusal on portions where there is not a qualified descendant through probate; through individuals selling portions to the Tribe of their own volition; or through the Cobell Land Buy Back Program.
Tribal Fee Lands	These are fee lands that are owned by the Tribe. Generally they are lands that have not yet been transferred into Trust. The Fee-to-Trust transfer is a long process that requires that the property not have any outstanding debts or liens; all rights-of-way, easements, and access agreements need to be finalized and cleaned up, and all must be resurveyed at a level of accuracy that exceeds most general surveys. Also, local jurisdictions are notified and have a response time to contest or negotiate the Fee-to-Trust transfers because it impacts their tax base. For lands of considerable value and lands that receive municipal or emergency services paid by tax dollars, an annual payment in lieu of taxes is often made.

Figure 2. Land Ownership – CTUIR (Portion)

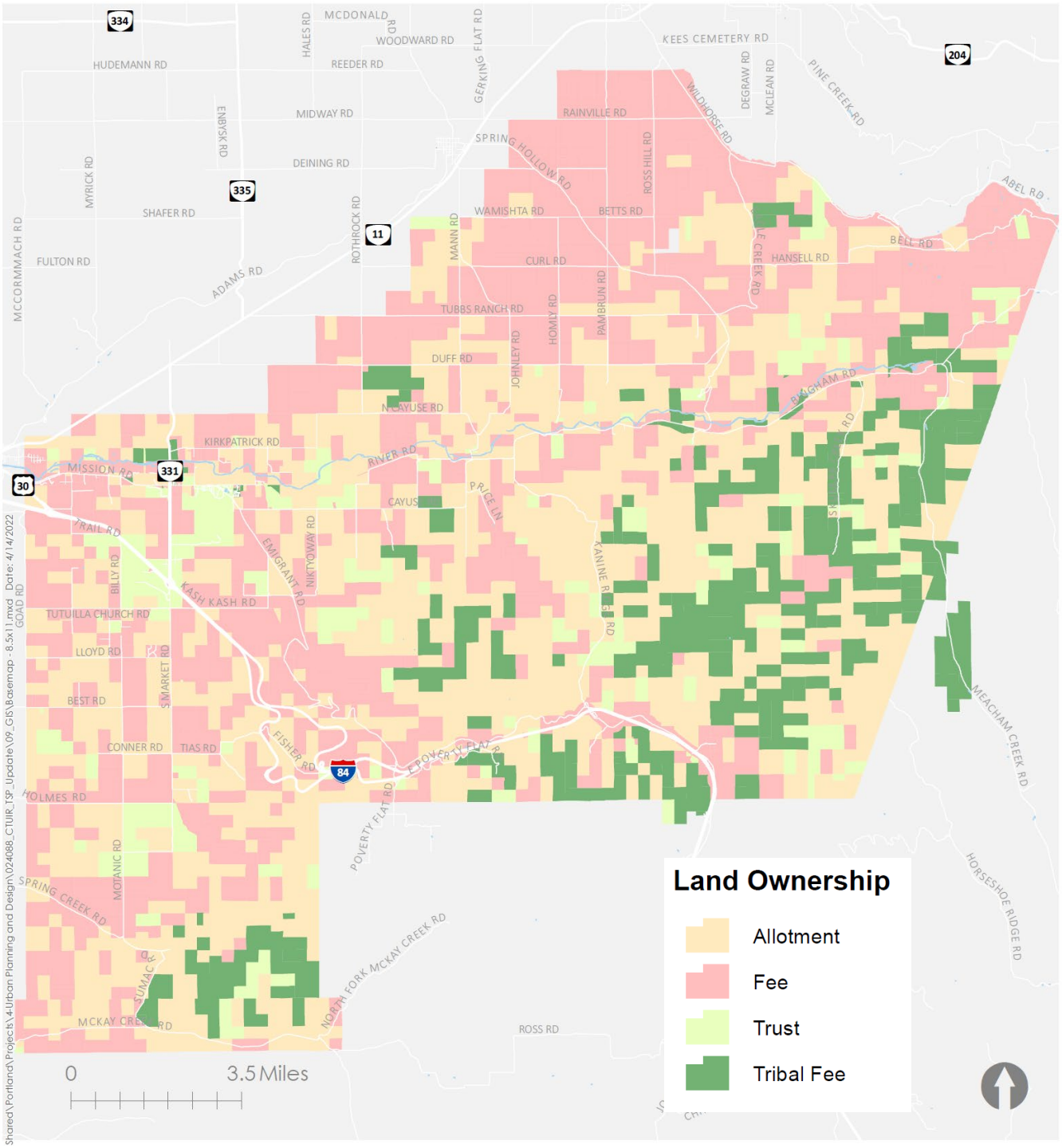
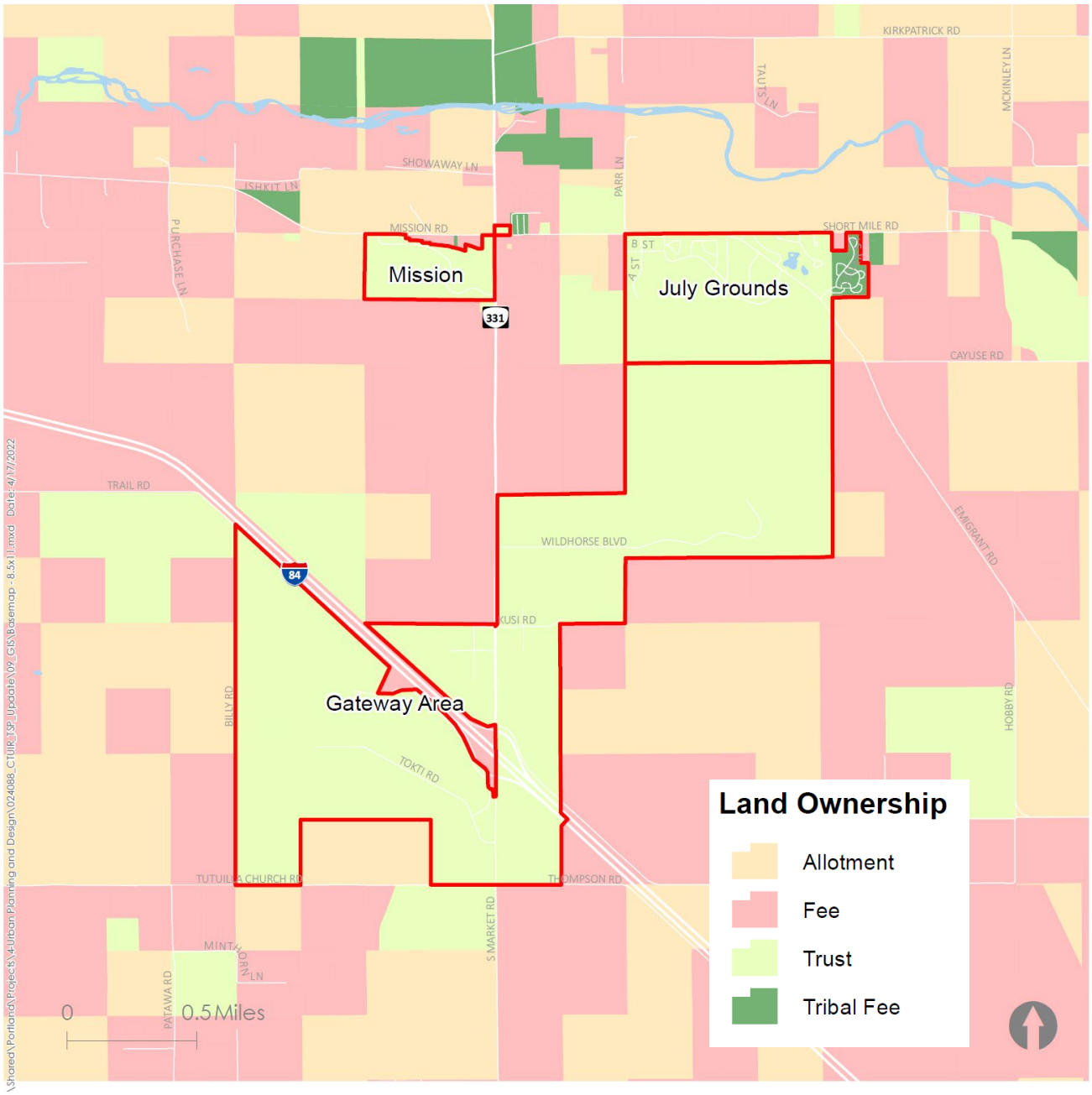


Figure 3. Land Ownership – Community Hubs



Zoning Designations

Land within CTUIR has one of several base zoning designations. Overlay zones include a floodplain zone and public use overlay that apply in specific areas. Zones are described briefly in this section and shown in Figure 5.

RESIDENTIAL ZONES

- **Community Residential (CR-1)** – *The CR-1 zone is intended to promote areas for community suburban residential development that connect to community water and sewer services where those services are available consistent with the policies of the Mission Community Plan. This zone is intended to create residential neighborhoods for public and private housing.*

- **Rural Residential (R-1)** – *The R-1 zone is intended to promote areas for medium density suburban residential development in close proximity to necessary public utilities (water, sewer, electricity, natural gas, telephone, etc.).*

- **General Rural (R-2)** – *The R-2 zone is intended as a transition zone from agricultural uses to rural residential uses or small farms. These lands contain many developed and undeveloped lots of record of varying acreages and uses with inadequate flood plain management and lack of planned efficient utility systems.*

EMPLOYMENT ZONES

- **Commercial Development (C-D) –** *The C-D zone is designed to promote individual and Tribal Enterprise Development to diversify and improve the Reservation economy. This zone is established to promote efficient and appropriate locations for commercial and related service activities.*

- **Industrial Development (I-D)** - *The I-D zone is intended to provide areas for industrial development compatible with the economic resource base of the Umatilla Indian Reservation and the economic needs and wants of the people of the reservation. This zone designation is appropriate for areas in close proximity to major transportation facilities and necessary utilities, while preserving or enhancing the air, water and land resources of the area.*

AGRICULTURAL ZONES

- **Exclusive Farm Use (AG-1**) - *The AG-1 zone is designed to maintain the agricultural economy of the Umatilla Indian Reservation. The purpose of this zone is to preserve and maintain agricultural lands for farm use. These lands are viewed as largely undeveloped, limited and irreplaceable, agricultural soils.*
- **Farm Pasture (AG-2)** - *The AG-2 zone is designed to maintain the agricultural land base taking into consideration special management practices due to steeper sloped, shallower soils and special wildlife and fish habitats. Foods, herbs and medicines traditional to the Confederated Tribes are also found in this region making it necessary for the Land Protection Planning Commission or the Board of Trustees to place further restrictions from time to time.*
- **Small Farm (AG-3)** - *The AG-3 zone is designed to maintain the agricultural lands and open space of the Reservation and yet accommodate high intensity agriculture of such as the product of fruit crops, vegetable crops, greenhouses, hay crops and certain types of animal husbandry excluding feed lots and hog farms, in areas with adequate soils and efficient irrigation systems. This zone is also designed to allow tribal members and other persons to more economically become involved in agriculture on a small scale to reduce the cost of living and/or provide additional income.*
- **Agri-Business (AG-4)** - *The AG-4 zone is designed to provide areas for certain types of agriculturally oriented businesses and services which may not otherwise need to locate in more intensive commercial or industrial areas. It may be appropriate for storage, handling or processing of agricultural products, or provide area for agriculturally oriented businesses which require larger areas.*

FOREST ZONES

- **Restricted Indian Forest (F-2)** - *The F-2 zone is designated to the Tribal trust lands of the Johnson Creek Restoration Area which were added to the Umatilla Indian Reservation by the Johnson Creek Restoration Act of 1939. Lands within this zone are undeveloped and culturally significant. Generally, these lands are utilized and managed for range, timber and other tribal interests.*
- **Big Game Grazing Forest (G-1)** - *The G-1 zone is designated to provide critical range for big game populations. The purpose of this zone is to preserve and maintain habitat for big game and other wildlife. Lands within this zone are largely undeveloped and located at the higher elevations of the Reservation. Generally, these lands are utilized and managed for outdoor recreation, range and timber with very limited development.*

RESOURCE ZONES

- **Surface Mine (SM)** - *The SM zone is designated for surface mining sites, an area that includes all or any part of the process of mining minerals by the removal of overburden and extraction of natural mineral deposits thereby exposed by any method by which more than 50 cubic yards of minerals are extracted.*

PUBLIC USE ZONES

- **Public Use Zone (P-1)** - *The purpose of the P-1 zone is to set aside land for educational, recreational, homesites, subsidization for the benefit of the Tribe, or tribal religious organizations or an agency of Federal, State or local governments.*
- **Public Facilities Zone (P-2)** - *The P-2 zone provides lands for use by governmental and other non-profit organizations that provide services which are inherently intensive or unusual uses not normally associated with other zones.*

OVERLAY ZONES

- **Public Use (P-1-O) Overlay** - *The purpose of the P-1 Overlay Zone is to support and protect the integrity of the Tamastslikt Cultural Institute of the Umatilla Indian Reservation, and within the context of supporting the Institute, to set aside land for education, recreation, subsidization for the benefit of the Tribe, tribal religious organizations or an agency of Federal, State or local governments.*
- **Flood Hazard Overlay (F-H-O)** - *The purpose of the Flood Hazard Overlay Zone is to promote and protect the public health, safety and general welfare, to protect soils, water quality, and quantity, to maintain and improve fish and wildlife habitat and minimize public and private flood losses due to floods by provisions designed to: restrict and prohibit dangerous and uses vulnerable to floods in an effort to reduce the damage of flooding.*

Table 2. Summary of Zoning Designations

Zone	Description	Acres	Percentage of Study Area
Ag-1	Exclusive Farm Use	53,723	37.9%
Ag-3	Small Farm	1,171	0.8%
Ag-4	Agri-Business	47	0.0%
C-D	Commercial Development	315	0.2%
CR-1	Community Residential	52	0.0%
F-2	Restricted Indian Forest	14,202	10.0%
G-1	Big Game Grazing Forest	69,353	48.9%
I-D	Industrial Development	560	0.4%
P-1	Public Use	246	0.2%
P-2	Public Facilities Zone	25	0.0%
R-1	Rural Residential	285	0.2%
R-2	General Rural	1,057	0.7%
SM	Surface Mine	200	0.1%
	Overlays		
FP	Floodplain	320	n/a
P-1-O	Public Use Overlay	576	0.4%

Figure 4. CTUIR Zoning

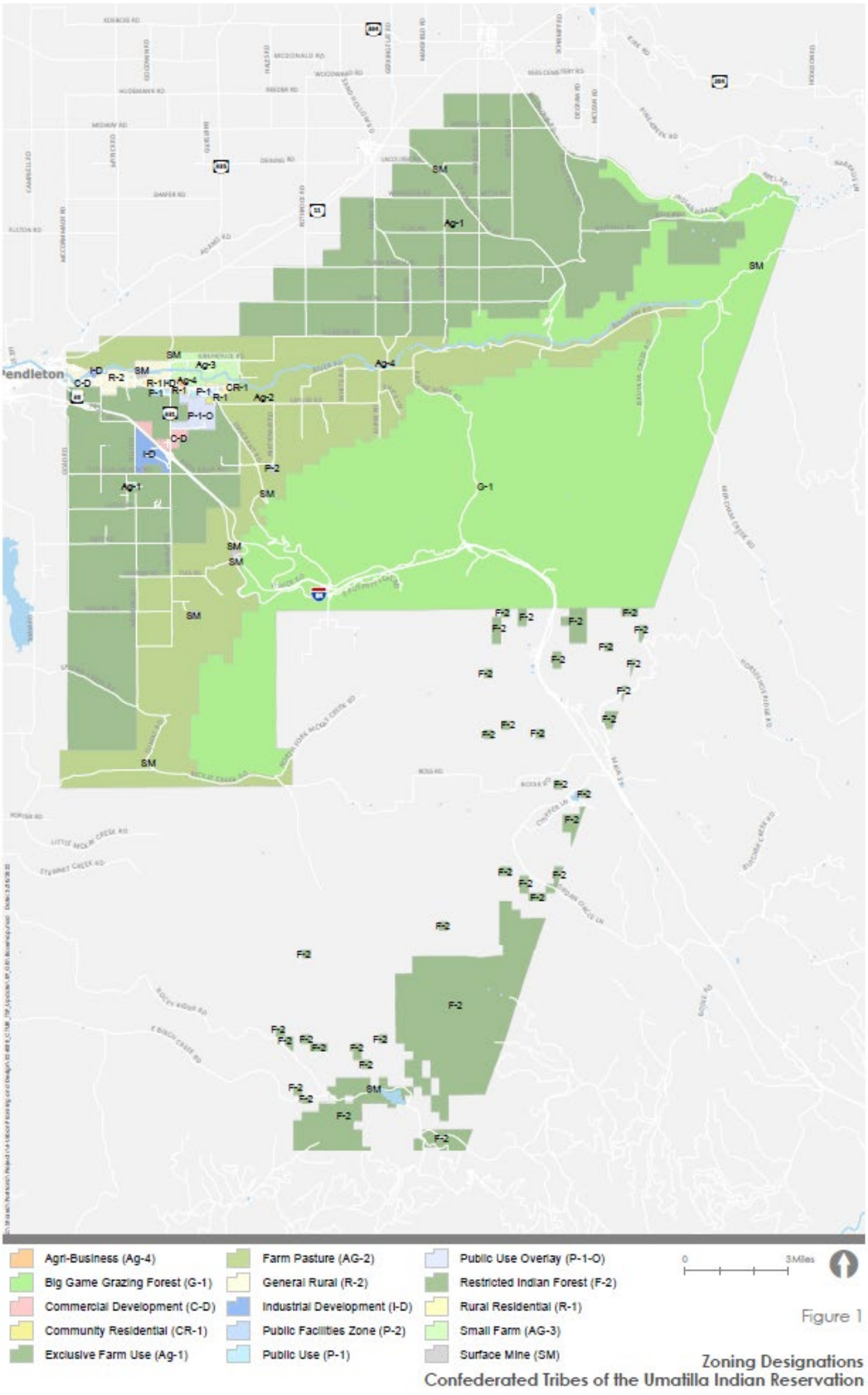
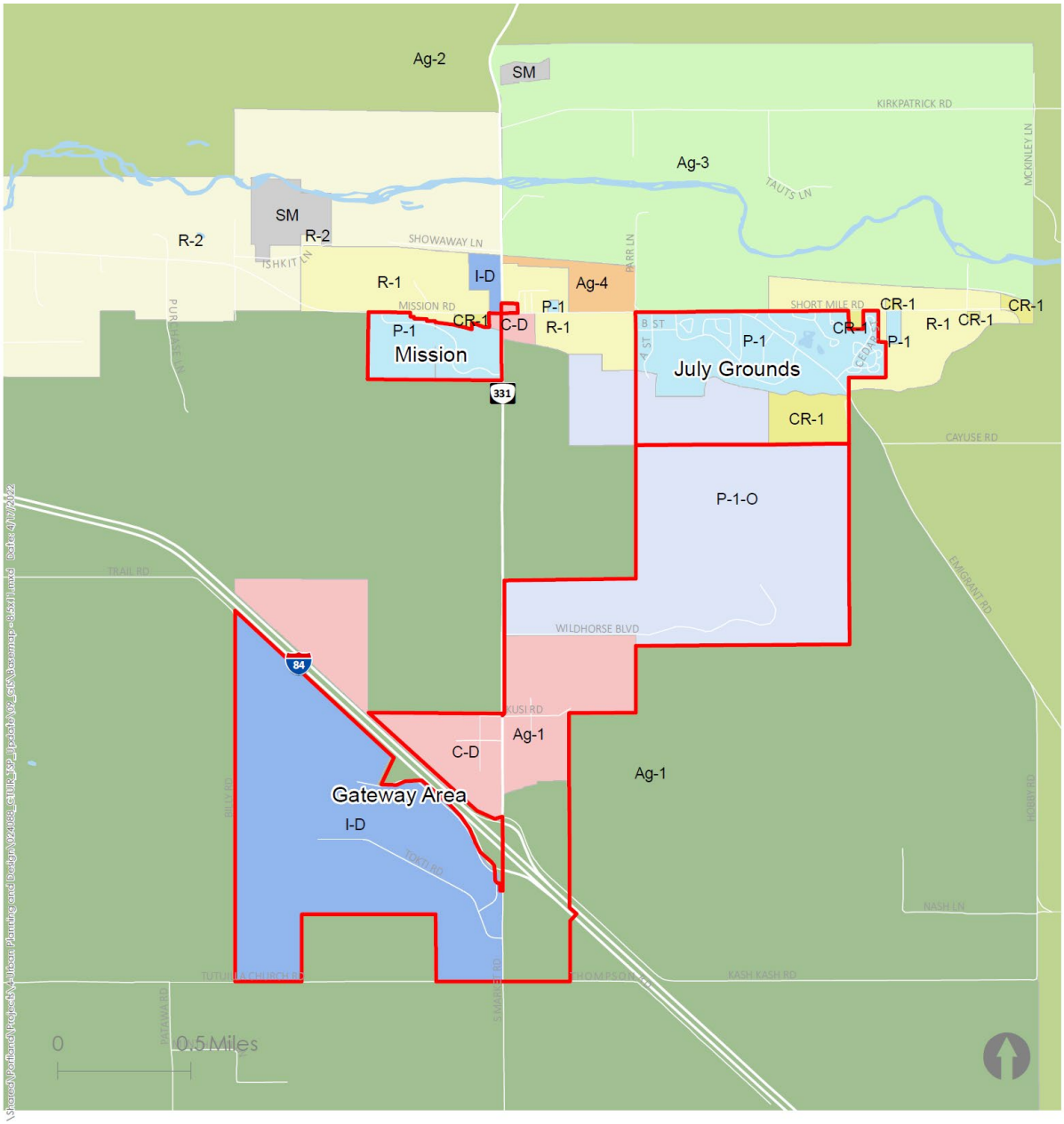


Figure 5. Zoning – Community Hubs



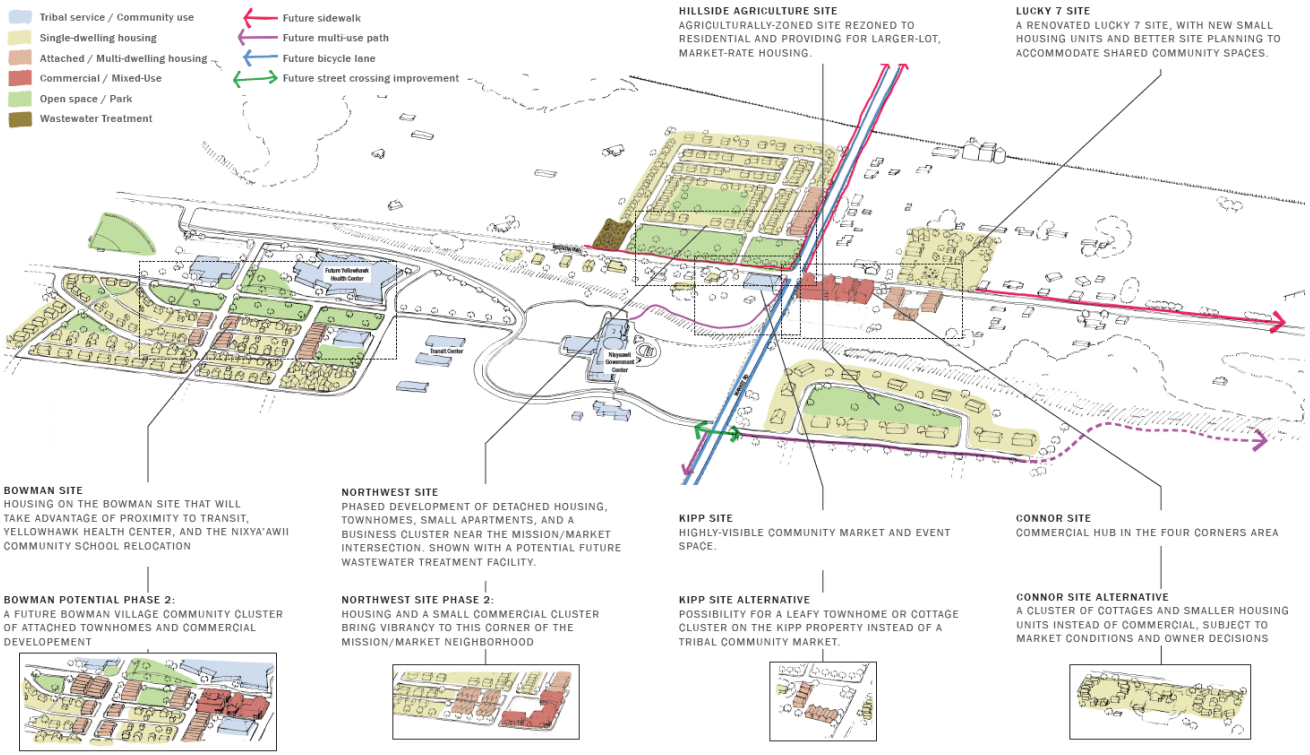
- Agri-Business (Ag-4)
- Big Game Grazing Forest (G-1)
- Commercial Development (C-D)
- Community Residential (CR-1)
- Exclusive Farm Use (Ag-1)
- Farm Pasture (AG-2)
- General Rural (R-2)
- Industrial Development (I-D)
- Public Facilities Zone (P-2)
- Public Use (P-1)
- Public Use Overlay (P-1-O)
- Restricted Indian Forest (F-2)
- Rural Residential (R-1)
- Small Farm (AG-3)
- Surface Mine (SM)

RECENT PLANNING EFFORTS

CTUIR and neighboring jurisdictions have undertaken several planning efforts in recent years that are relevant to this TSP update. These plans are described below.

Mission Community Master Plan (2018)

Figure 6. Key Elements of the Mission Community Master Plan



The Mission Community Master Plan (MCMP) is a plan to coordinate development at the heart of the Mission Community. The plan includes specific land use and transportation recommendations, as well as an implementation plan, intended to create a vibrant, engaged, and multi-modal community that fosters cultural and environmental connectedness, economic vitality, health, and well-being. During the plan's 20-year horizon there is an estimated a need for 349 dwelling units on the reservation.

The MCMP study area focused on the Central Business District and Governance Activity Center at the key intersection of Highway 331 and Mission Road, also referred to as the "Four Corners" area, shown in Figure 8.

The MCMP includes policy recommendations to improve transportation standards and design guidelines, as well as a specific transportation improvement project list. The transportation projects list includes intersection improvements at OR 331 and Mission Road, pedestrian and bicycle improvements (e.g., construction of sidewalks, bike lanes and enhanced crossings), several multi-use pathways, and transit improvements. The complete list and index maps are included in Appendix A.

Key MCMP recommendations include updates to the CTUIR Land Development Code and transportation standards to be incorporated into the TSP, as follows.

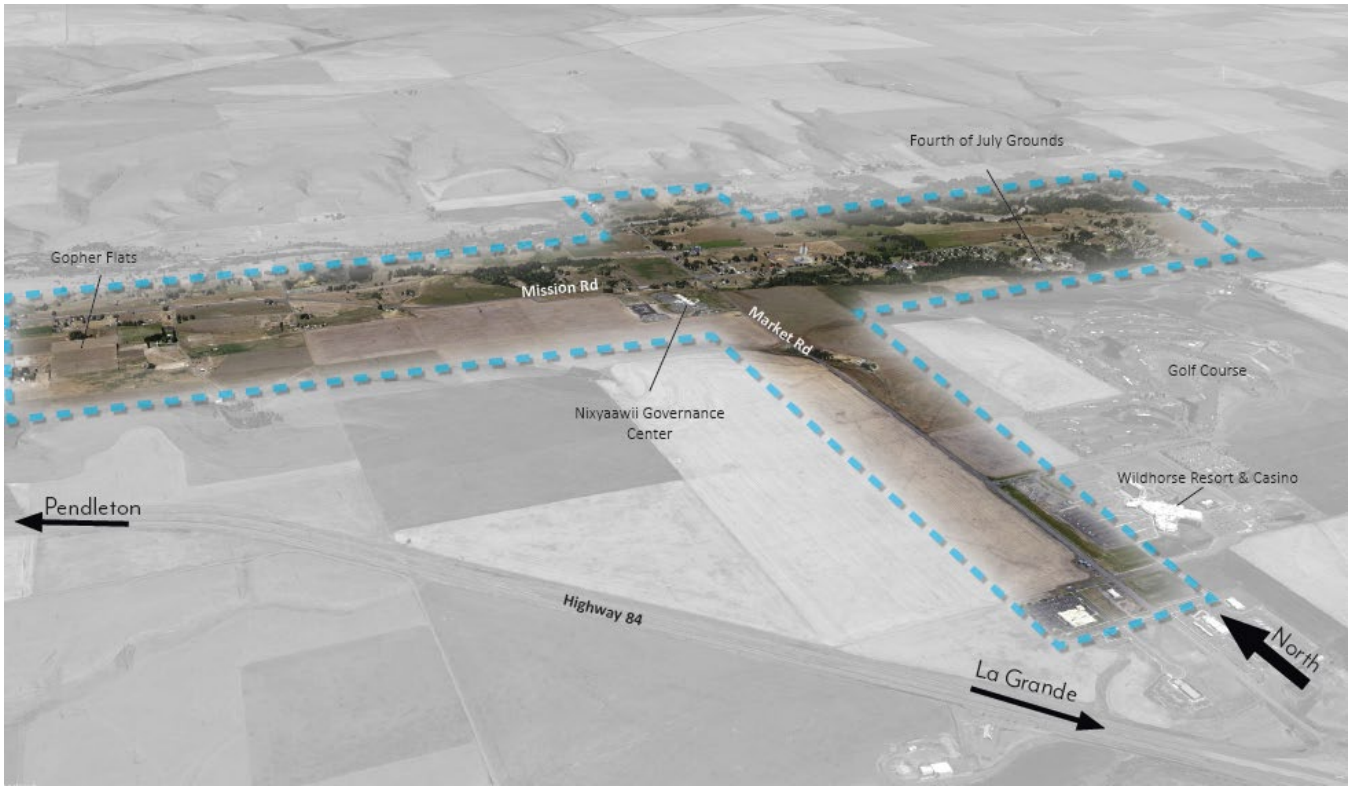
- ***Land Use Regulations.*** Recommended Land Development Code amendments include:
  - *New CR-2 zone*. The MCMP proposed a new zoning district to enable the uses and features envisions for the Central Business District and Governance Activity Center. Rezoning land to CR-2

provides opportunity to create the mixed-use, housing, and commercial developments envisioned by the Master Plan.

- *Design Guidelines.* The MCMP shows examples of specific building designs and configurations that address adjacency considerations and typical user needs across a variety of land uses and development typologies that are true to the vision for the Mission Community.

- ***Transportation Standards*.** Standards related to specific transportation facilities to be incorporated into the TSP include:
  - MCMP Figure 12. OR 331 + Multi Use Path Cross-Section
  - MCMP Figure 13. Multi-Use Pathway Cross-Section
  - MCMP Figure 14. Umatilla River Multi-Use Trail and Equestrian Trail Cross-Section
  - MCMP Figure 16. Mission Road Cross-Section
  - MCMP Figure 17. Potential Signalized Intersection Widening Improvements
  - MCMP Figure 18. Potential Roundabout Intersection Improvements
  - MCMP Figure 19. Standard Residential Street Cross-Section
  - MCMP Figure 20. Minor Residential Street Cross-Section

Figure 7. Mission Community Master Plan Study Area

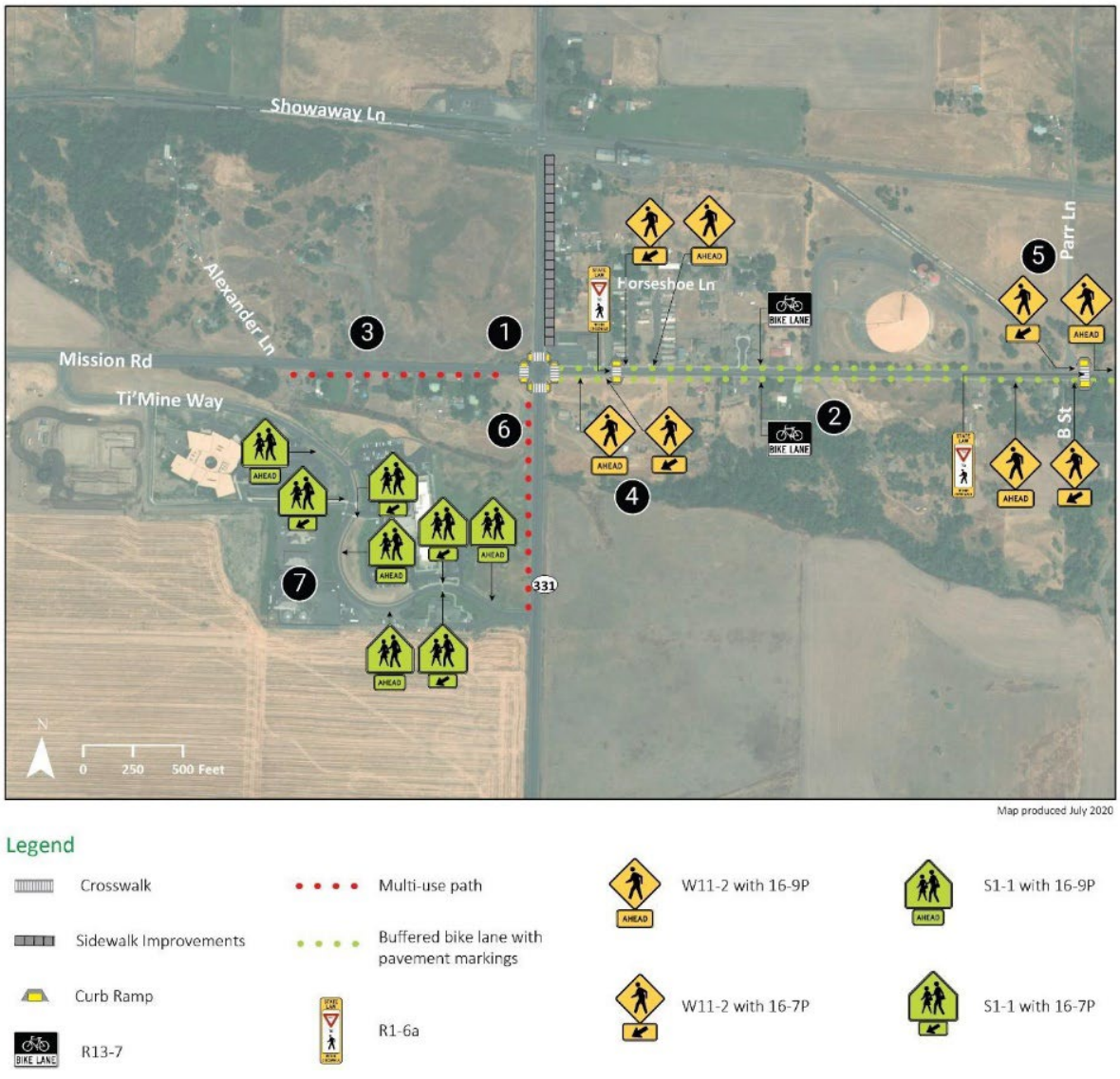


CTUIR Safe Routes to School Plan (2020)

The CTUIR Safe Routes to School Plan lays the foundation for coordination between the Nixyáawi Community School, CTUIR government, Charter School Board, Yellowhawk Tribal Health, Pendleton School District, Umatilla County, ODOT Region 5, and the broader community. The overarching goal is to reduce barriers for students walking and biking to school. This plan addresses access to Nixyáawii Community School, the only school located within the CTUIR boundary.

The process of developing the plan included outreach to the community and an existing conditions assessment, and resulted in a list of recommended improvements including installation of curb ramps, high visibility crosswalks, new sidewalks, pedestrian signs, and a bike lane. The complete list and location of improvements are shown in Figure 9.

Figure 8. STRS Improvement Recommendations List and Map



Nixyaawii Community School
SRTS Improvement Recommendations

SafeRoutes
Oregon Safe Routes To School

1. Mission Road and Hwy 331: Install perpendicular curb ramps on all four corners of the intersection. Install 2' wide high visibility white thermoplastic continental crosswalk markings across each leg of the intersection. Upgrade the stormwater system and review pedestrian lighting needs at the intersection, as necessary.

2. Parking along Mission Road: Install bike lane symbol pavement markings and stripe a buffer within the existing bike lanes east of the Four Corners intersection about 2,100 feet along the north side of the road and about 4,200 feet along the south side of the road. Install accompanying bike lane signs.

3. Mission Road and Hwy 331: Review the community's desire to construct a multi-use path along the south side of the road as had been indicated in previous planning documents. Consider enhanced crossings across Mission Rd, such as at Alexander Ln and Ti'mine Way, based on anticipated crossing demand.

4. Mission Road and Horseshoe Lane: Install perpendicular curb ramps on each side of Mission Rd. Install 2' wide high visibility white thermoplastic continental crosswalk markings with associated warning signage across Mission Rd (R1-6a, W11-2 with 16-7P and W11-2 with 16-9P).

5. Mission Road and B St: Install 2' wide high visibility white thermoplastic continental crosswalk markings with perpendicular curb ramps and associated warning signage, across Mission Rd, on the east leg of the Parr Ln/B St and Mission Rd intersection (R1-6a, W11-2 with 16-7P and W11-2 with 16-9P).

6. Hwy 331: Install 6' sidewalks along the east side of Hwy 331 north of the existing sidewalk at the Four Corners intersection extending to Showaway Ln. Install a 12' multi-use path along the west side of Hwy 331 south of the Four Corners intersection extending to Ti'Mine Way.

7. Ti'Mine Way: Install bidirectional Pedestrian Crossing signs (S1-1 with W16-7P, S1-1 with W16-9P) in advance of the crosswalks on Ti'Mine Way.

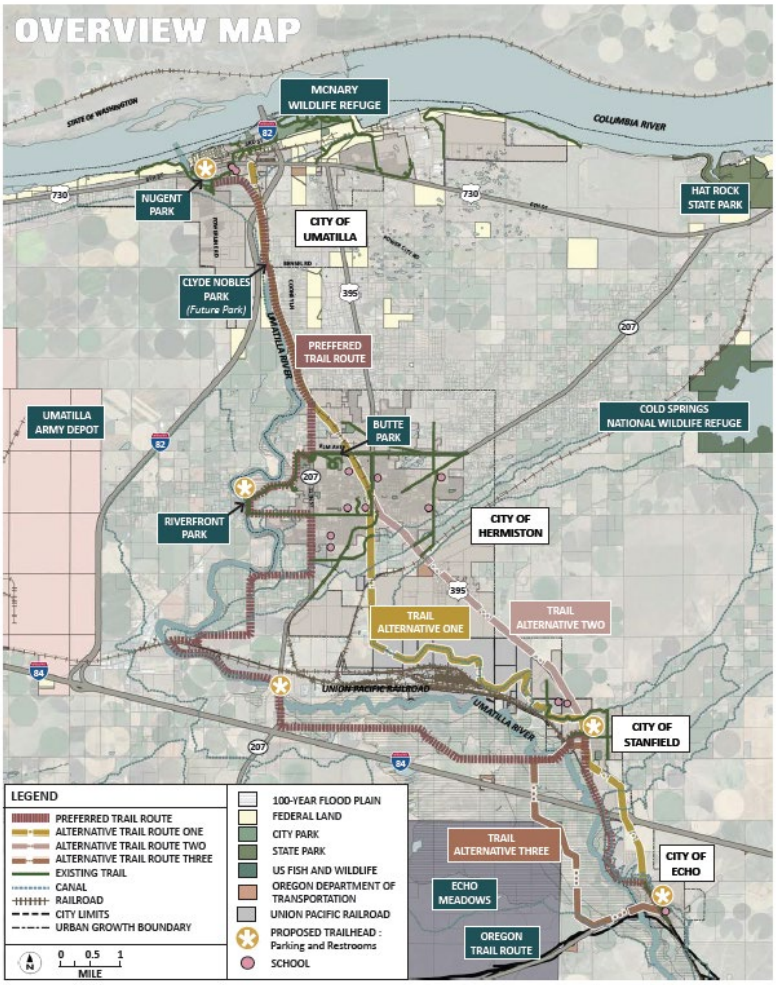
Mission Road between Confederated Way and Cedar Street: Install 6'sidewalks along the south side of Mission Rd / Cayuse Rd between the western intersection of Confederated Way and Cedar St (not pictured in map extent).
Install 6' sidewalks along the north side of Cayuse Rd between Short Mile Rd and Cedar St, as project budget allows (not pictured in map extent).
Upgrade the two existing marked crosswalks to ADA standards within the segment of roadway, and review additional marked crossing locations if installing only south side sidewalks (not pictured in map extent).

Umatilla County Trail Plan Concept Plan (2021)

The Umatilla County Trail Plan Concept Plan develops a vision and plan for a multi-modal trail that interconnects the cities of Umatilla, Hermiston, Stanfield and Echo. The plan depicts conceptual trail locations and designs from Umatilla to Echo, as shown in Figure 10.

The eastern edge of the trail concept terminates at Echo High School, located on US 395. Echo is located approximately 30 miles west of the CTUIR reservation.If the trail eventually extends into the Reservation, CTUIR can chose to follow the trail design recommendations if desired.

Figure 9. Umatilla County Trail Conceptual Plan

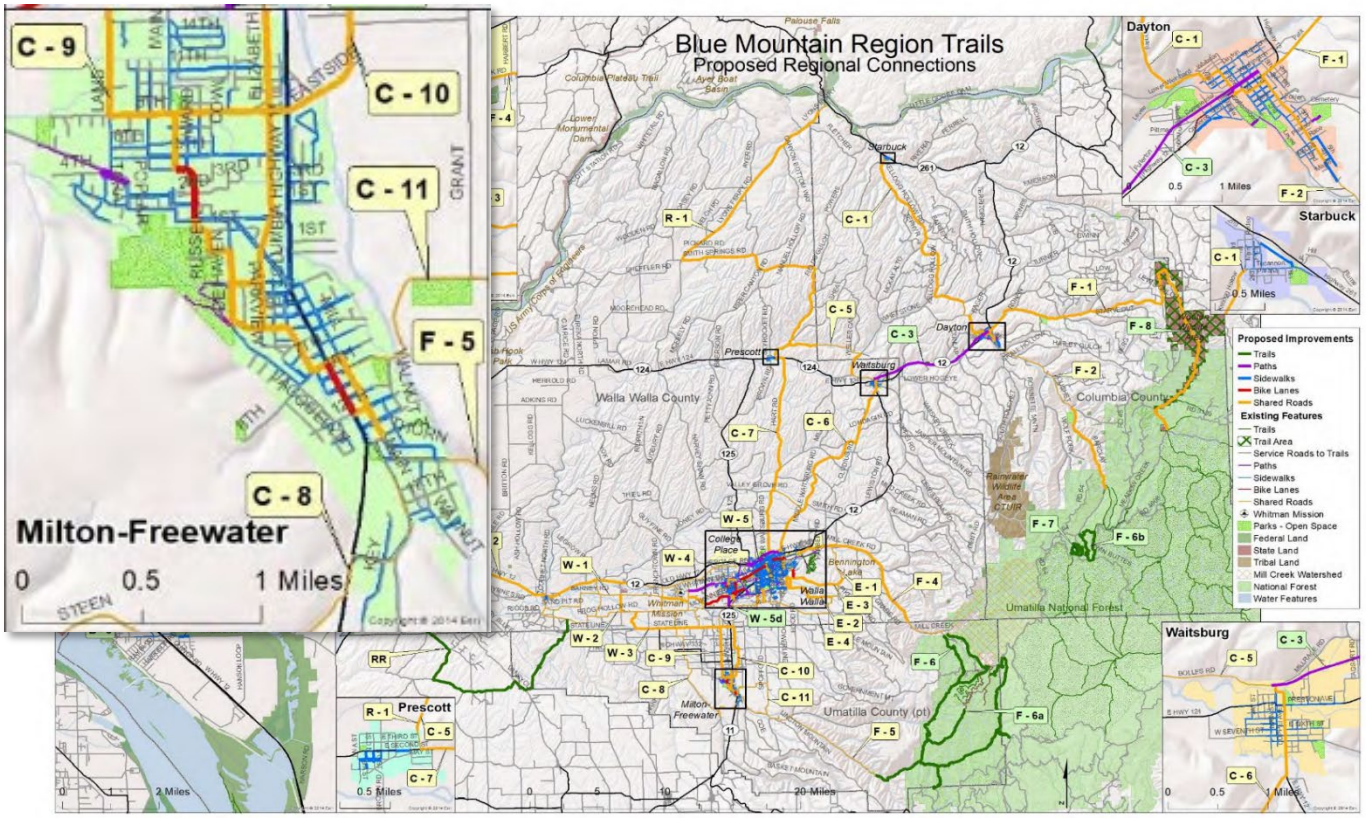


Blue Mountain Regional Plan (2018)

The vision for the Blue Mountain Regional Plan was to develop a community-driven and locally-supported regionwide network of bicycle and pedestrian routes and non-motorized trails. The objective of this network is to provide outdoor recreation opportunities, mobility options, and connectivity within the Blue Mountain Region that benefit health, mobility, quality of life and livability, and economic development and tourism. The Regional Plan was developed with a large group of partners, including CTUIR.

CTUIR's involvement in the plan was focused on the Rainwater Wildlife Area, which is owned and operated by CTUIR and at the time did not have an updated management plan. Located in Columbia County WA, the Rainwater Wildlife Area is outside of the TSP project area. However, connections to this area from the Reservation may be considered as part of the TSP update.

Table 3. Blue Mountain Region Trails – Proposed Connections



Walla Walla MPO 2045 Plan

The Walla Walla Valley Metropolitan and Sub-Regional Transportation Planning Organizations are responsible for transportation planning in Walla Walla Valley MPO – a region that includes the Walla Walla - College Place - Milton-Freewater urbanized area and more rural portions of Umatilla and Walla Walla counties. The 2045 Plan ensures federal, state, and local investments into pedestrian, bicycle, public transit, roadway, and freight transportation will enhance the movement of all people and goods efficiently and safely. The CTUIR Reservation is not located within the Walla Walla MPO. However, Kayak Public Transit, operated by CTUIR, provides service within the boundary of the MPO. To the extent applicable, the CTUIR TSP should be consistent with the transit recommendations in the 2045 Plan including Transportation Demand Management policies for collective marketing, trip planning, and other coordination between jurisdictions and transit agencies.

DEVELOPMENT ISSUES AND OPPORTUNITIES

This section outlines development issues and opportunities based on demographic trends; recent, ongoing, and future development; and focus areas visions, and how those opportunities can align with the TSP goals of accommodating quality development and active transportation.

Demographic Trends and Housing Need

Census data from 2010 to 2020 shows marginal population growth on the Reservation (see Table 4) and a steady increase in the number and proportion of American Indian and Alaskan Native individuals. Current estimates are significantly lower than the 20-year population forecasts found in the 2001 CTUIR TSP (shown in Table 5).

Table 4. Historic Population Data (Source: ACS 5-year Community Survey Data, CTUIR Tribal Area Geography)

	2010	*Margin of Error*	**2015**	*Margin of Error*	**2020**	*Margin of Error*
Total Population (Table S0101)	2,748	*301*	2,842	*209*	2,818	*326*
Population over 65 (Table S0101)	14.5%	*2.7%*	16.7%	*2.7%*	20.3%	*3.1%*
American Indian and Alaska Native Population /Percentage of Population (Table B02001)	917 / 33%	*219*	1,068 / 38%	*153*	1,144 / 40%	*179*
White Alone Population / Percentage of Population (Table B02001)	1,520 / 55%	*202*	1,352 / 48%	*115*	1,284 / 45%	*171*
Labor Force Participation Rate of Population 16+ (Table S2301)	65.4%	*4.1%*	57.3%	*3.4%*	56.6%	*4.9%*

Table 5. 2001 CTUIR TSP Future Population Projection and Housing Needs (TSP Table 5-1)

FUTURE POPULATION PROJECTION AND HOUSING NEEDS

	Year 2000	Year 2020	20-Year Increase
Population- All Indians in the Area	3,044	4,125	1,081
Additional Dwelling Units	-	347	347
(Scattered Sites)	-	*(160)*	*(160)*
(Mission Community)	-	*(187)*	*(187)*

The MCMP estimated a need for 349 dwelling units on the reservation within the 20-year planning horizon, broken down into 151 ownership units (both Single Family Detached and Mobile Home units) and 198 rental units of various housing types. See Table 6 for additional detail.

Table 6. Projected 20-Year Need for New Housing Units (CMCP Figure 3.7)

OWNERSHIP HOUSING										
	Multi-Family									
Price Range	Single Family Detached	Single Family Attached	2-unit	3- or 4-plex	5+ Units MFR	Mobile home	Boat, RV, other temp	Total Units	% of Units	Cummulative %
Totals:	114	0	0	0	0	36	0	**151**	**% All Units:**	43.3%
Percentage:	75.6%	0.3%	0.0%	0.0%	0.0%	24.1%	0.0%	100.0%		

RENTAL HOUSING										
	Multi-Family									
Price Range	Single Family Detached	Single Family Attached	2-unit	3- or 4-plex	5+ Units MFR	Mobile home	Boat, RV, other temp	Total Units	% of Units	Cummulative %
Totals:	84	9	48	7	28	22	0	**198**	**% All Units:**	56.7%
Percentage:	42.5%	4.5%	24.1%	3.7%	14.2%	11.0%	0.0%	100.0%		

TOTAL HOUSING UNITS									
	Multi-Family								
	Single Family Detached	Single Family Attached*	2-unit	3- or 4-plex	5+ Units MFR	Mobile home	Boat, RV, other temp	Total Units	% of Units
Totals:	198	9	48	7	28	58	0	**349**	**100%**
Percentage:	56.8%	2.7%	13.7%	2.1%	8.0%	16.7%	0.0%	100.0%	

Sources: CTUIR, Census, Johnson Economics

* Uses Census definition, including townhomes/rowhouses and duplexes attached side-by-side, seperately metered.

CTUIR has enacted several programs to incentivize tribal members to live and/or work on the Reservation itself. Programs include housing assistance, land leasing, educational assistance programs, childcare, elder services, travel arrangements, and health services at Yellowhawk Health Center. The success of these programs could add to the growth forecast for CTUIR. As of 2017, CTUIR owned and/or managed 238 housing units.

Buildable Land Inventory and Opportunity Sites

The 2018 MCMP included an analysis of land within the plan's study area, shown in Figure 11 and Figure 12. As discussed previously, this area contains the vast majority of land on the Reservation that is designated for uses other than agriculture, forest, or other open space.

This analysis led to identification of several "key opportunity sites" potentially suitable for new development at the heart of the Mission Area, shown in Figure 14 and discussed in the following section of this memorandum.

Figure 10. MCMP Residential BLI

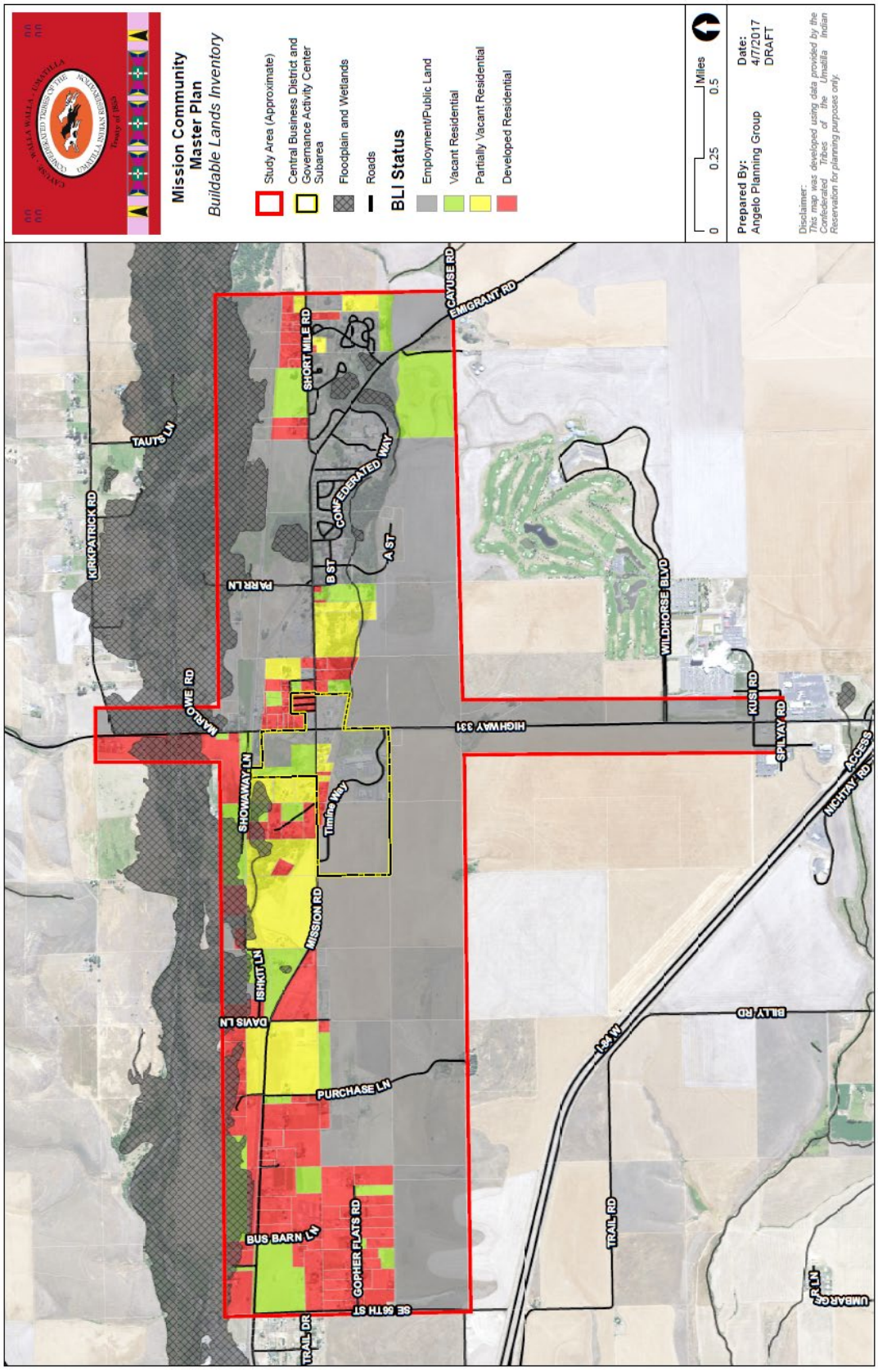
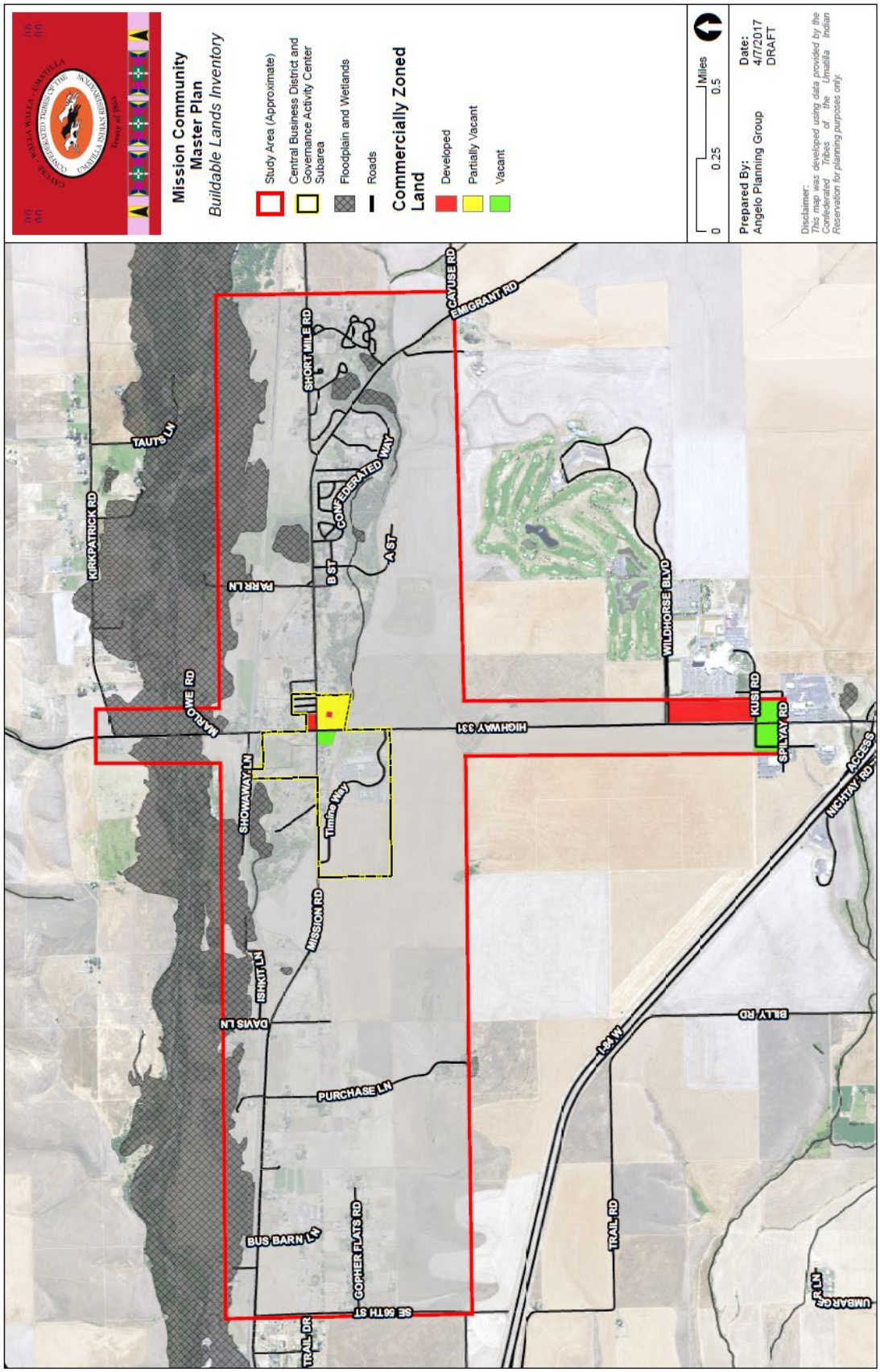


Figure 11. MCMP Commercial BLI



Community Hubs

The key opportunities for development on the Reservation lie within the Community Hubs, identified in Figure 2. Existing conditions and opportunities for each of these areas are described below.

GATEWAY COMMUNITY HUB

The Gateway Community Hub is the primary entrance to the Reservation from I-84. It extends to both the north and south of the interstate and includes:

- **Coyote Business Park.** The Coyote Business Park is a 170-acre master planned commercial and industrial park, owned and operated by CTUIR. The business park presents opportunities for commercial development. Currently, the park has an Arrowhead Travel Plaza, a truck repair stop, a Subway, and several other businesses. The proximity to I-84 and the Wildhorse Casino and Resort are notable benefits. On the South side of the park, there are more than 140 acres being marketed for distribution and shipping, logistics, light manufacturing and value-added agriculture. The area contains various tax exemption opportunities and is an IRS-certified Opportunity Zone.
- Coyote Business Park Development Standards and Design Guidelines establish the following objectives:
    - Encourage office and retail uses in Coyote North.
    - Encourage retail uses in Coyote East.
    - Attract diversified light manufacturing and distribution warehousing to Coyote South.
    - Plan for pedestrian and bicycle features, including wide sidewalks, landscaping, and retail buildings with display windows.
    - Keep auto circulation compatible with pedestrian, bicycle, and transit transportation.
    - Coordinate building design, signage, lighting and landscape design to provide diversity and variety in building form and type, open spaces, and site features while maintaining a sense of design continuity throughout the site.

Figure 12. Coyote Business Park Lots

(Source: https://coyotebusinesspark.com/)

- **Wildhorse Resort and Casino**. A key economic driver for CTUIR, this area contains a casino, golf course, movie theater, restaurants, RV park, bowling lanes, and conference/meeting facilities. The resort has been significantly expanded recently, with major construction completed in 2011 and 2020. Wildhorse employs over 800 individuals, according to the CTUIR website.
- **Tamástslikt Cultural Center**. The Tamástslikt Cultural Institute is located in the northeast corner of the Gateway Area at the east edge of the Wildhorse Golf Course. The Cultural Center contains a museum and education center and is the only American Indian owned and operated interpretive center on the Oregon Trail. Its permanent exhibits explore the past, present, and future of the Cayuse, Umatilla, and Walla Walla people (the Confederated Tribes) and tell the Oregon Trail story from their perspective. The Cultural Center includes spaces to rent for meetings and events. In 2018, the annual visitation totaled 28,027, including visiting school groups.

MISSION AREA

The Mission Community Hub contains many key CTUIR institutions, including the Governance Center, Yellowhawk Health, Kayak Transit Center, the Nixyáawi Community School, and the Nixyáawi Neighborhood.

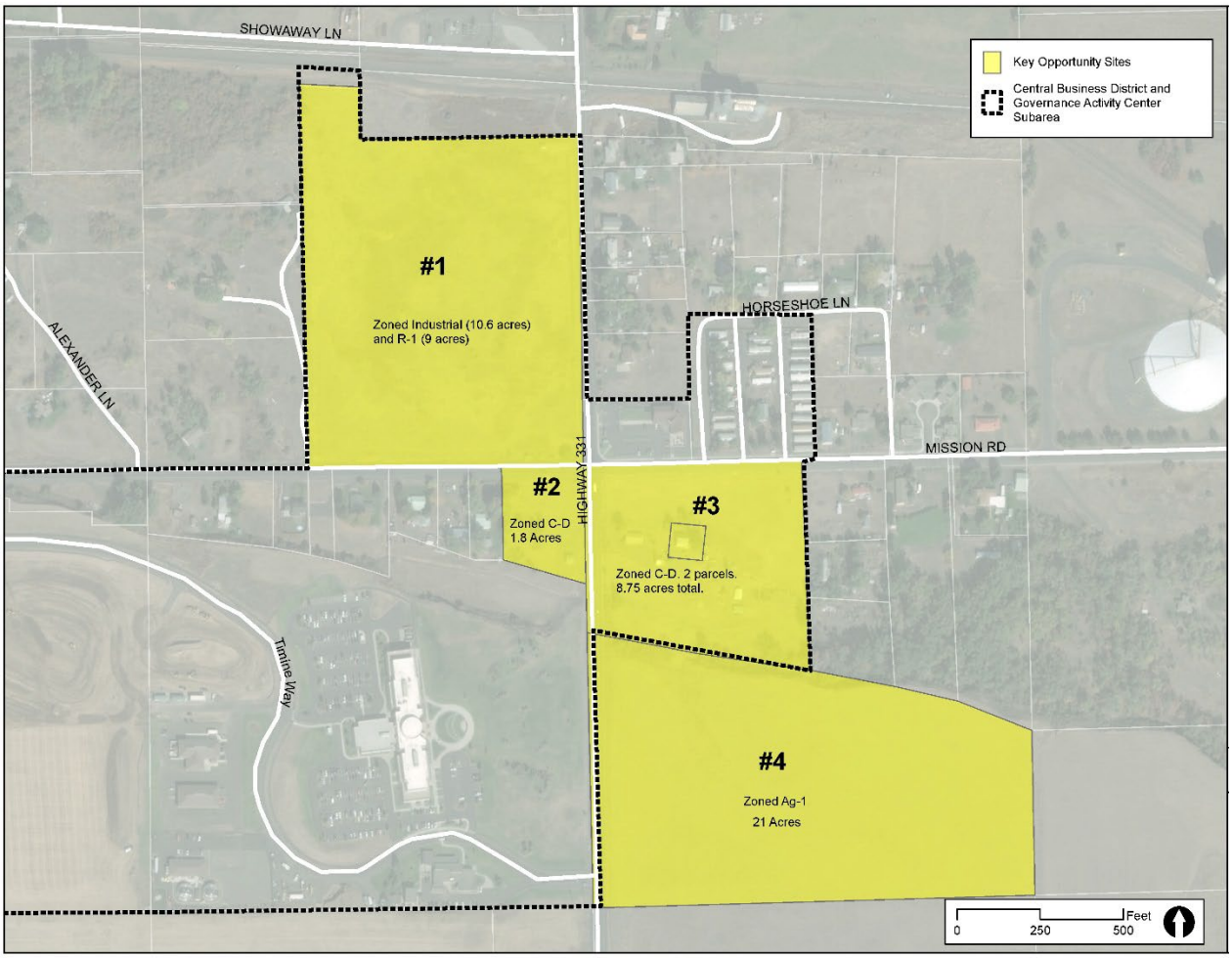
- **Nixyaawii Governance Center.** Tribal operations, including the Tribal Planning Office and Public Works, are housed in the governance center on Timine Way.
- **Yellowhawk Tribal Health Center.** Yellowhawk is a Tribally governed facility that provides outpatient primary care to CTUIR tribal members and other eligible American Indians. Services include outpatient medical, dental, mental health, alcohol / drug treatment, and aftercare programs. Yellowhawk also offers pharmacy services, medical laboratory, radiology and a DUII diversion program.
- **Kayak Transit Hub and Maintenance Shop.** A bus barn and maintenance shop have been on the site since 2014, and a new Transit Hub with benches and cooling/heating was built adjacent to the Transit Center in 2018.
- **Nixyáawii Community School**. The new school building opened in September 2019 with a 105 student capacity limit, an increase from the previous school building located in the July Grounds.[1]
- **The Nixyáawii Neighborhood/Subdivision.** The new Nixyáawii neighborhood is an opportunity for CTUIR Tribal Members to build, live, and enjoy their own homes in their own community. The 13-acre area is located southeast of the Nixyáawii Education Center and Yellowhawk Tribal Health Center. The subdivision has roughly 40 lots available to tribal members with 99-year leases. The neighborhood is planned to include:
  - A community park and walking trails
  - A safe, walkable design with close proximity to CTUIR events and services at the Nixyáawii Governance Center, Nixyáawii Community School, and the Yellowhawk Tribal Health Center
  - Easy access to Kayak Public Transit
  - Parking access through alleyways behind each lot
  - Stubbed-out utility connections
  - Access to electricity through Pacific Power and fiber optic internet
  - Space reserved for future neighborhood businesses and services
- **Other Key Sites.** The MCMP identified four key sites adjacent to the Mission Community Hub, shown in Figure 14. These sites are either partially or fully vacant and are described below.
  - Site #1: This site is a tribal allotment property held in Trust by the BIA and, as of this writing, is held in probate and is expected to be held by a local family. It is currently zoned for industrial and low-density residential uses. Any future development and zone changes would be at the behest of the property owners.
  - Site #2: This property is a tribally owned trust property. It is 1.8 acres currently zoned for commercial uses. It currently has a well house and one of the CTUIR's community water wells located on it. Some

[1] Source: https://www.eastoregonian.com/news/local/Nixyáawii-holds-first-open-house-in-new-building/article_16a6e81c-caa1-11e9-9035-7bb97a1574f5.html

previous conceptual design work for this site included uses ranging from apartments to commercial development and a skate park.

- Site #3: This is two individual parcels with the smaller, inscribed parcel containing a residence that is in trust, while the larger surrounding property is fee land owned by Tribal members. Both are zoned Commercial. Any future development or zone designation changes would be at the behest of the property owners.
- Site #4: This is a 21-acre fee property owned by non-tribal members and is zoned Ag-1. Any future residential development would require a change of zoning designation and would be initiated at the property owner's behest in partnership with CTUIR.

Figure 13. MCMP Key Opportunity Areas



JULY GROUNDS

The July Grounds were the site of several tribal buildings that have recently been relocated to the Mission area or elsewhere, including the Cay-Uma-Wa Education Center, the old Yellowhawk Tribal Health Center, the former Nixyaawii Community School, and the former Tribal Police station. It is still the site of the Community Center and Longhouse. The site has historical significance and is connected to the Tamástslikt Cultural Institute via off-street path. The broader July Grounds area contains residences for many tribal members.

LAND USE UTILIZATION MAP

The following maps combine information listed previously in this memorandum into a Land Use Utilization Map. Development and redevelopment opportunities are primarily outside of resource zones. As shown on Figure 15, the study area is predominantly rural in nature, with about 97% of its acreage in either Exclusive Farm Use, Restricted Indian Forest, or Big Game Grazing Forest designations. These areas are expected to remain undeveloped for the duration of the planning period.

Figure 16 shows the CTUIR Community Hubs. There is a significant amount of land shown as vacant or partially vacant in commercial, industrial, and residential designations. There are also several parcels in CTUIR ownership with a public zoning designation. Uses in these areas vary substantially – from major employment centers such as the Wildhorse Casino and Coyote Business Park to old and new residential subdivisions.

Several other factors will contribute to development in CTUIR:

- Infrastructure availability and costs
- Floodplain regulations, particularly after significant flooding events in recent years.
- Transportation access
- Property owner interest
- CTUIR interest in developing properties it controls

Figure 14. Land Use Utilization Map - CTUIR

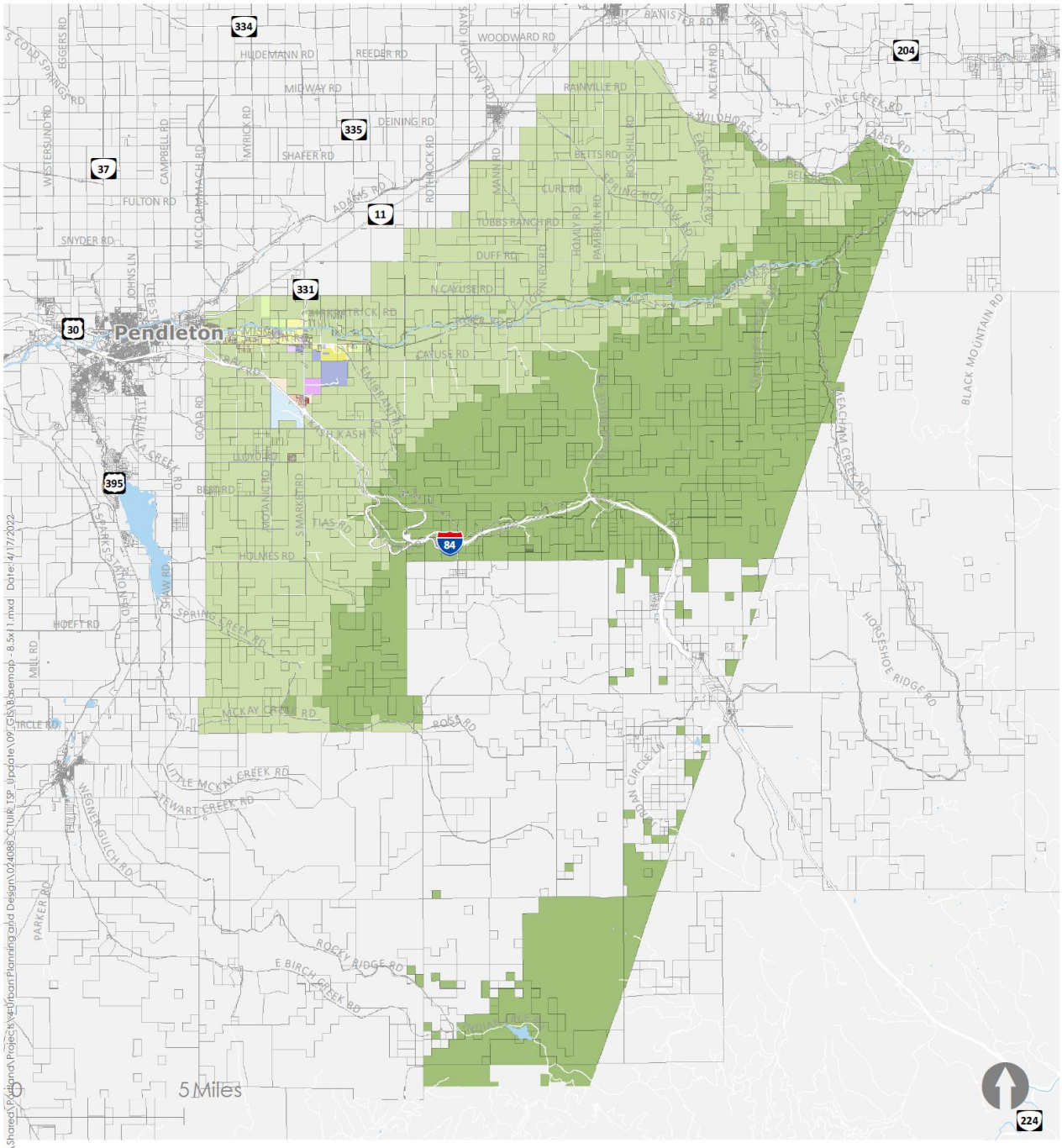
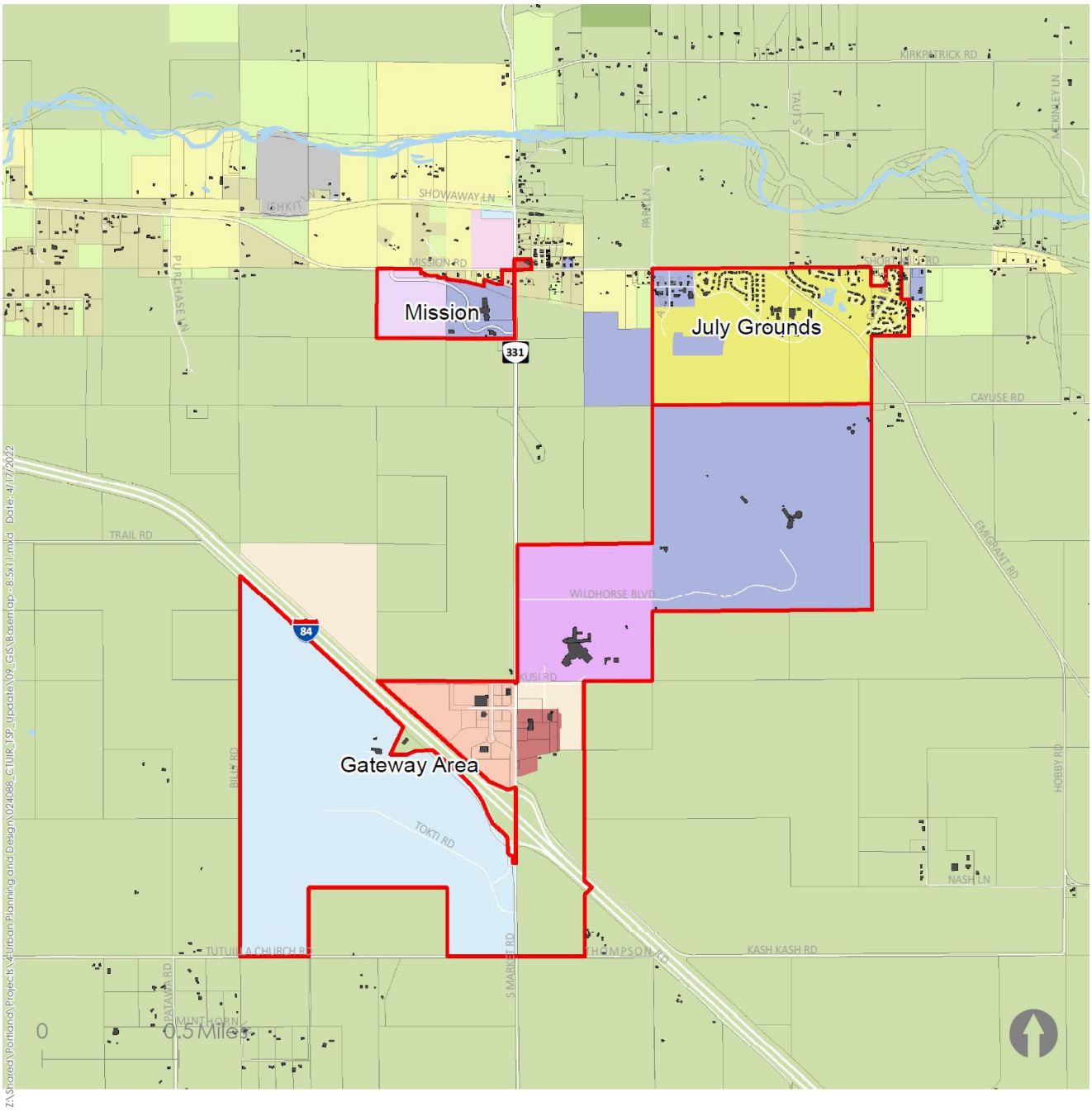


Figure 15. Land Use Utilization Map – Community Hubs



OPPORTUNITIES FOR THE CTUIR TSP

This section summarizes opportunities for the CTUIR TSP to create a transportation system that achieves CTUIR's goals. Additional community conversation will refine this list of opportunities into actionable items developed later in the TSP Update process.

Land Use and Development Code Concepts

Development on the Reservation is subject to the CTUIR Land Development Code. The following general concepts are used by communities of all sizes to implement policies that promote active transportation, create transit-supportive development, protect rural landscapes, and other community goals around health, environmental stewardship, and equity.

Bicycle and Pedestrian Connectivity

A key goal of this TSP update is to improve bicycle and pedestrian connectivity. This can be achieved by:

- Identifying key projects to create/enhance bicycle and pedestrian connections among key destinations (primarily between and within Community Hubs).
- Requiring sidewalks as part of subdivisions to improve internal and cross-site connectivity.
- On-site connectivity for larger commercial and industrial development (e.g., Coyote Business Park). This can be achieved by requiring pedestrian connections from the site entrance to other on-site locations, and requiring raised sidewalks or striping to emphasize pedestrian routes within parking lots and vehicle circulation areas.

Transit Supportive Development

In order to improve transit service and promote transit use, transit stops should host amenities for safety, comfort, and function of use, including real-time transit tracking, benches, shelters for weather protection, and lighting. Development of these features can be required through development approval on sites located along existing or planned transit routes in coordination with Kayak Public Transit. Dedication of right-of-way for bus pull-outs or turnarounds as necessary can also be required.

Street Connectivity

Having a high level of street connectivity, with multiple options for routing for all modes of travel, can support active transportation and improve overall travel times among destinations. Establishing maximum street lengths for subdivisions, discouraging or limiting cul-de-sacs, and requiring connections to neighboring sites as part of subdivision regulations are tools to implement this.

Trails

The rural nature of CTUIR provides opportunity for off-street transportation that provides residents and visitors the opportunity to get around on foot, bicycle, horseback, skateboard, and other means. Trail connections can be required of development and redevelopment in the land use code, along with design requirements for grade, lighting, and other design characteristics. Acquiring and maintaining the right of way for these connections is a key step, either through development or acquisition by CTUIR itself. This is particularly important along Umatilla River, which holds cultural significance to the Tribe.

Create Inviting and Comfortable Spaces Through Building Design

Creating spaces that are pedestrian-friendly and transit supportive can be achieved in part through the design of buildings and site planning. Provisions often include:

- Ground floor windows, regulated by a minimum amount of ground floor windows and glazing provides a more inviting façade for pedestrians.
- Maximum setback standards and requiring buildings to be set closer to the street they feel more inviting to pedestrians.

- Requiring or encouraging parking in the side or rear of buildings to reduce potential conflicts between modes and create a more attractive streetscape.

Protection of Rural Landscapes and Development Patterns

Creating tightly-knit and walkable communities in the core areas of CTUIR is a way to preserve the natural and agrarian nature of land elsewhere on the Reservation while continuing to support the Tribe's goals of housing and employing tribal members on the Reservation. The MCMP contains several recommendations to reduce regulatory barriers to developing more dense housing opportunities, including accessory dwelling units, cottage clusters, or attached housing.

Identification of Key Projects

The TSP update will identify key improvements to meet existing and future need, which will be the basis of planned capital improvements and can also be implemented through future development approval ensuring that a robust multimodal network is built incrementally over time. The projects identified in the MCMP and listed in Attachment A are a starting point for reviewing current and future transportation needs.

Attachment A

Mission Community Master Plan Transportation Projects and TSP Figures

Table 7. Mission Community Master Plan Preferred Transportation Improvement Projects

Map ID	Location	Project Description	Project Benefit/Implementation Considerations	Priority/ Time Frame	Cost[1]	Funding Source	Consistency with 2001 CTUIR TSP
Intersection Projects							
-	OR 331/ Mission Road Intersection	• Signalized the intersection • Construct separate left-turn lanes on all four intersection approaches • Construct a separate right-turn lane on the northbound approach	Would be needed to accommodate projected long-term local and regional traffic growth. Would require a more detailed engineering study to determine when signalization is warranted based on traffic volume growth over time.	Medium Priority Long-Term Time Frame	$450k	Development/ STIP	Would replace Project #8 in existing TSP.
	OR 331/ Mission Road Intersection	• Construct a single lane roundabout • Realign the northbound and southbound approaches to avoid impacts to the Mission Market	Would be needed to accommodate projected long-term local and regional traffic growth. Would require a more detailed engineering study to determine when a roundabout would be needed based on traffic volume growth over time.	Medium Priority Long-Term Time Frame	$850k	Development/ STIP	Would replace Project #8 in existing TSP.
Pedestrian Improvement Projects							
P1	Mission Road (north side from grain silo to Cedar Street)	Install six-foot sidewalks along the north side of Mission Road.	Would address an existing sidewalk gap between the residential areas north of the July Grounds, the Wetland Community Park, and the Four Corners area. Implementation could be a combination of a capital improvement project and/or required as part of future development projects along the Mission Road corridor.	High Priority Near-Term Time Frame	$450k	Tribal Capital Project / Development	This project is not currently identified as a need in the existing TSP.

Map ID	Location	Project Description	Project Benefit/Implementation Considerations	Priority/ Time Frame	Cost[1]	Funding Source	Consistency with 2001 CTUIR TSP
			Portions of the corridor may require right-of-way acquisition and some utility relocation. Portions of the corridor near Cedar Street may have wetland impacts. A near-term/high-priority need as it would immediately benefit pedestrian access to employment areas, retail, parks and the community school. There are no other multi-modal options.				
P2	Mission Road (south side from Confederated Way to Cedar Street)	Complete the sidewalk network along the south side of Mission Road from Confederated Way to Cedar Street. Widen existing sidewalks near the Four Corners area to six feet and address the existing mailbox obstructions located across from Lucky Seven.	Would address an existing sidewalk gap between the July Grounds and the four corners area. Implementation could be a combination of a capital improvement project and/or required as part of future development projects along the Mission Road corridor. Portions of the corridor may require right-of-way acquisition and some utility relocation. Portions of the corridor near Cedar Street may have wetland impacts. A near-term/high-priority need as it would immediately benefit pedestrian access to employment areas, retail, parks and the community school. There are no other multi-modal options.	High Priority Near-Term Time Frame	$350k	Tribal Capital Project / Development	This project is not currently identified as a need in the existing TSP.
P3	OR 331 (Mission Road to Umatilla River)	Install sidewalks along the east and west sides of OR 331.	Sidewalks would ultimately link to a multi-use pathway along the south side of the Umatilla River (see project M5). Implementation of the sidewalks would likely be driven by the development of Project M5 and/or installed as part of future redevelopment along the OR 331 corridor. Redevelopment of adjacent parcels would likely address portions of this sidewalk corridor. Portions of the corridor may require right-of-way acquisition.	Low Priority Long-Term Time Frame (tied to development of Project M5)	$300k	Development / Grant	This project is not currently identified as a need in the existing TSP.

Map ID	Location	Project Description	Project Benefit/Implementation Considerations	Priority/ Time Frame	Cost[1]	Funding Source	Consistency with 2001 CTUIR TSP
			A long-term need that would coincide with the development of project M5.				
P4	OR 331 crossing at Ti'Mine Way	Install an enhanced pedestrian crossing treatment. Treatment may include signalization (if warranted) or a grade separated undercrossing of OR 331.	Would provide a safer pedestrian crossing opportunity on a portion of Mission Road that has higher speeds and heavy truck volumes. Implementation of the crossing would be tied to future residential development on the east side of OR 331. OR 331 is a high speed and high volume state highway. Signalized crossing could be installed when warranted by a more detailed engineering study. Grade separated undercrossings are costly and impactful during construction. Long-term project needed if/when development occurs on the east side of OR 331.	Low Priority Long-Term Time Frame (tied to future residential development)	$35k - $500k	Development / STIP	This project is not currently identified as a need in the existing TSP.
P5	Mission Road crossings at July Grounds and Cedar Street	Install an enhanced pedestrian crossing such as a Rectangular Rapid Flashing Beacon.	Would facilitate pedestrian crossings of Mission Road and improve pedestrian access to tribal services and the community school on a portion of Mission Road that has higher speeds and heavy truck volumes. Implementation would be tied to a capital improvement project or Safe Routes to School improvement. Would be installed when warranted by a more detailed engineering study. Would need to be accompanied by sidewalks (see project P1 and P2). A near-term/high-priority need as it would immediately benefit pedestrian access to tribal services, parks, and the community school.	High Priority Near-Term Time Frame	$35k per location	Grant	These projects are not currently identified as a need in the existing TSP.
P6	New residential/mi	Install sidewalks along all new	Would facilitate walking to/from new development areas. Construction would	High Priority	Varies	Development	

Map ID	Location	Project Description	Project Benefit/Implementation Considerations	Priority/ Time Frame	Cost[1]	Funding Source	Consistency with 2001 CTUIR TSP
	xed-use street	residential and mixed-use streets.	occur as part of future residential and mixed-use development. No special considerations. Would be constructed as a condition of future development. Project required when development takes place.	Development Driven Time Frame			These projects are not currently identified as a need in the existing TSP.
Bicycle Improvement Projects							
B1	Mission Road (north side from grain silo to Cedar Street)	Widen Mission Road and install bicycle lanes along the north side all the way east to Cedar Street.	Would address an existing bicycle lane gap between the residential areas north of the July Grounds, the Wetland Community Park, and the Four Corners area. Implementation could be a combination of a capital improvement project and/or required as part of future development projects along the Mission Road corridor. Portions of the corridor may require right-of-way acquisition. Portions of the corridor may have wetland impacts. A near-term/high-priority need as it would immediately benefit bicycle access to employment areas, retail, parks and the community school.	High Priority Near-Term Time Frame	$600k	Tribal Capital Project / Development	• This project is not currently identified as a need in the existing TSP.
B2	Mission Road (south side from Short Mile Road to Cedar Street)	Widen Mission Road and install bicycle lanes along the south side from Short Mile Road to Cedar Street.	Would address an bicycle lane gap between Cedar Street and the July Grounds area. Implementation could be a combination of a capital improvement project and/or required as part of future development projects along the Mission Road corridor. Portions of the corridor may require right-of-way acquisition. Portions of the corridor may have wetland impacts. A near-term/high-priority need as it would immediately benefit bicycle access to	High Priority Near-Term Time Frame	$500k	Tribal Capital Project / Development	• This project is not currently identified as a need in the existing TSP.

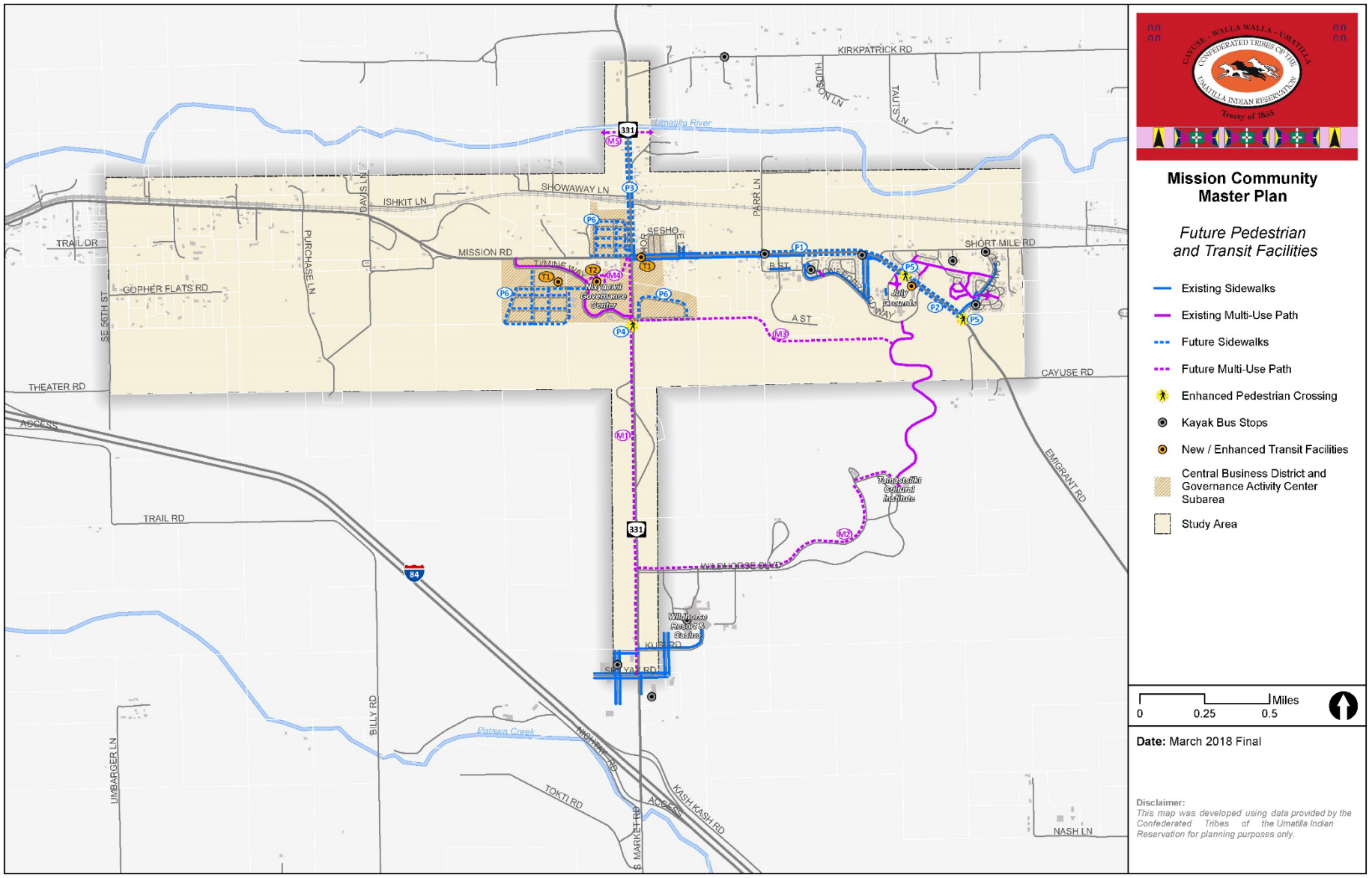
Map ID	Location	Project Description	Project Benefit/Implementation Considerations	Priority/ Time Frame	Cost[1]	Funding Source	Consistency with 2001 CTUIR TSP
			employment areas, retail, parks and the community school.				
B3	OR 331 (Mission Road to Umatilla River)	Install bicycle lanes along the east and west sides of OR 331.	Bicycle lanes would ultimately link to a multi-purpose pathway along the south side of the Umatilla River (see project M5). Implementation of the bike lanes would likely be driven by the development of Project M5 and/or installed as part of future redevelopment along the OR 331 corridor. Redevelopment of adjacent parcels would likely address portions of this corridor. Portions of the corridor may require right-of-way acquisition. A long-term need that would coincide with the development of project M5.	Low Priority Long-Term Time Frame (tied to development of Project M5)	$400k	Development / Grant	This project is not currently identified as a need in the existing TSP.
Multi-Use Pathway Improvement Projects							
M1	OR 331 (Mission Road to Kusi Road)	Construct a separated paved multi-use path along the west side of OR 331 from Mission Road to Spilya Road	Would provide a walking/biking route that would link Nixyáawii Governance Center and surrounding future residential development to the Wildhorse Resort & Casino and other adjacent employment areas. Implementation would most likely be tied to grant funding or a larger capital improvement project. Portions of the corridor have grade challenges. Would require right-of-way acquisition. Portions of the corridor have steep embankments which would pose some engineering and construction challenges. A near-term/high-priority need as it would immediately benefit bicycle and pedestrian access between the Governance Center and the employment centers to the south.	High Priority Near-Term Time Frame	$1.0M	Grant	This project is not currently identified as a need in the existing TSP.
M2	Wildhorse Boulevard (OR 331 to Tamastslikt	Construct a paved multi-use path along the north side of Wildhorse	There is currently no formal walking or biking facilities between the Wildhorse Boulevard and Tamastslikt Cultural Institute. Would link the July Grounds and adjacent residential	Medium Priority	$95k	Grant	This project is consistent with Project

Map ID	Location	Project Description	Project Benefit/Implementation Considerations	Priority/ Time Frame	Cost[1]	Funding Source	Consistency with 2001 CTUIR TSP
	Cultural Institute)	Boulevard. Could be a separated path or as an extension of the existing road surface.	areas to the various employment centers around the Wildhorse Resort and Casino. Implementation would most likely be tied to grant funding or a larger capital improvement project. Could be used by both residents and visitors to the Wildhorse Casino. A near-term need as it would immediately benefit bicycle and pedestrian access between the July Grounds and various employment centers around the Wildhorse Casino.	Near-Term Time Frame			#33 in the existing TSP and calls for an even longer extension of multi-use path to connect to OR 331.
M3	East-West Bluff Trail (OR 331 to T	Construct a new multi-use path along the top of the bluff connecting OR 331 to the Tamastslikt Trail.	This path would parallel Mission Road providing an alternate route between the July Grounds and the Nixyáawii Governance Center. Implementation would most likely be tied to grant funding or a larger capital improvement project. Alignment is on Exclusive Farm Use zoned land. Alignment would be partially located on private land, requiring right-of-way. Alignment of trail would require careful planning to avoid sacred burial grounds. A long-term need that won't be needed until development occurs east of OR 331.	Low Priority Long-Term Time Frame	$100k	Grant / Development	This project is not currently identified as a need in the existing TSP.
M4	Nixyáawii Governance Center	Construct a new multi-use path connecting the Nixyáawii Governance Center to the Four Corners area.	The path would provide a direct and formal connection between the governance center and the Four Corners area that does not require walking or biking along Mission Road or 331. Implementation would most likely be tied to a capital improvement project. This project is needed under existing conditions as there is currently no formal walking route. Portions of the alignment would need to navigate a steep grade.	High Priority Near-Term Time Frame	$45k	Tribal Capital Project	This project is not currently identified as a need in the existing TSP.

Map ID	Location	Project Description	Project Benefit/Implementation Considerations	Priority/ Time Frame	Cost[1]	Funding Source	Consistency with 2001 CTUIR TSP
			A near-term/high-priority need as it would immediately benefit bicycle and pedestrian access between the Bowman Property/Governance Center and Four Corners area.				
M5	Umatilla River Trail	Construct a new multi-use trail along the south side of the Umatilla River on in parallel but offset from the river where applicable.	This path could be extended to the west over time to ultimately connect to the City of Pendleton and the existing/planned expansion their levee trail system. Project could be designed to include a hardscape pathway for walking/bicycle and a soft-surface for equestrian use. Implementation would most likely be tied to grant funding or a larger capital improvement project. Would require right-of-way. May impact some private property. Would require consideration of areas that have the potential to be culturally or historically significant. A low priority need, but one that could provide significant regional connections.	Low Priority Long-Term Time Frame	$>500k	Grant / Tribal Capital Project	This project is not currently identified as a need in the existing TSP.
Transit Projects							
T1	Multiple Locations	Install new transit amenities including new shelters with real-time transit tracking, benches, lighting, etc.	There is a general desire to enhance all transit stops within the Mission study area. Some stops have transit shelters already. Upgrades would be limited to better lighting and transit tracking amenities. A medium priority need for lower use locations. A higher priority need for higher volume locations.	Medium Priority Near-Term Time Frame	Shelters $10,000 per location Lighting $10-$15k per location	Tribal Capital Project	These projects are not currently identified as a need in the existing TSP.
T2	Nixyáawii Governance Center	Designate some existing parking spaces within the Nixyáawii Governance Center for use as a park-	The ability to take transit to regional destinations such as Pendleton, Milton-Freewater, Hermiston, etc. can lead to financial savings for many Mission residents. The Nixyáawii Governance Center is a central location with a well-lit parking lot that	Medium Priority Long-Term Time Frame	Signage: $2 per square foot;	Tribal Capital Project	These projects are not currently identified as a

Map ID	Location	Project Description	Project Benefit/Implementation Considerations	Priority/ Time Frame	Cost[1]	Funding Source	Consistency with 2001 CTUIR TSP
		and-ride for Mission community members riding Kayak to other regional locations.	could accommodate the daily parking needs of those residents wishing to commute regionally by bus. Reduces some parking at the Nixyáawii Governance Center to be allocated specifically to park-n-ride. A central location near the majority of Mission area residents. Lot is well lit and would be a safe location for daily parking. A long-term/low priority need until more residential development takes place within the Mission area.				need in the existing TSP.
High Priority (0-5 years)					>$3.0M		
Medium Priority (6-10 years)					$1.5M		
Low Priority (10-20 years)					>$1.1M		
				Total	**>$5.6M**		

[1] Cost estimates include engineering and construction costs but do not include potential right-of-way acquisition. Therefore these estimates should be considered planning level estimates. More detailed cost estimates will be required as projects are pursued through the actual design and engineering phases.


KIRKPATRICK RD
Umatilla River
SHOWAWAY LN
ISHKIT LN
DAVIS LN
PURCHASE LN
TRAIL DR
GOPHER FLATS RD
SE 56TH ST
MISSION RD
SESHO LN
PARR LN
SHORT MILE RD
B ST
A ST
CAYUSE RD
THEATER RD
ACCESS
TRAIL RD
EMIGRANT RD
WILDHORSE BLVD
KUSH RD
BILLY RD
UMBARGER LN
Patawa Creek
TOKTI RD
KASH KASH RD
NASH LN
Nixyaawii Governance Center
July Grounds
Tamastslikt Cultural Institute
Wildhorse Resort & Casino
331
84
Mission Community Master Plan
Future Pedestrian and Transit Facilities
Existing Sidewalks
Existing Multi-Use Path
Future Sidewalks
Future Multi-Use Path
Enhanced Pedestrian Crossing
Kayak Bus Stops
New / Enhanced Transit Facilities
Central Business District and Governance Activity Center Subarea
Study Area
Miles
0
0.25
0.5
Date: March 2018 Final
Disclaimer:
This map was developed using data provided by the Confederated Tribes of the Umatilla Indian Reservation for planning purposes only.

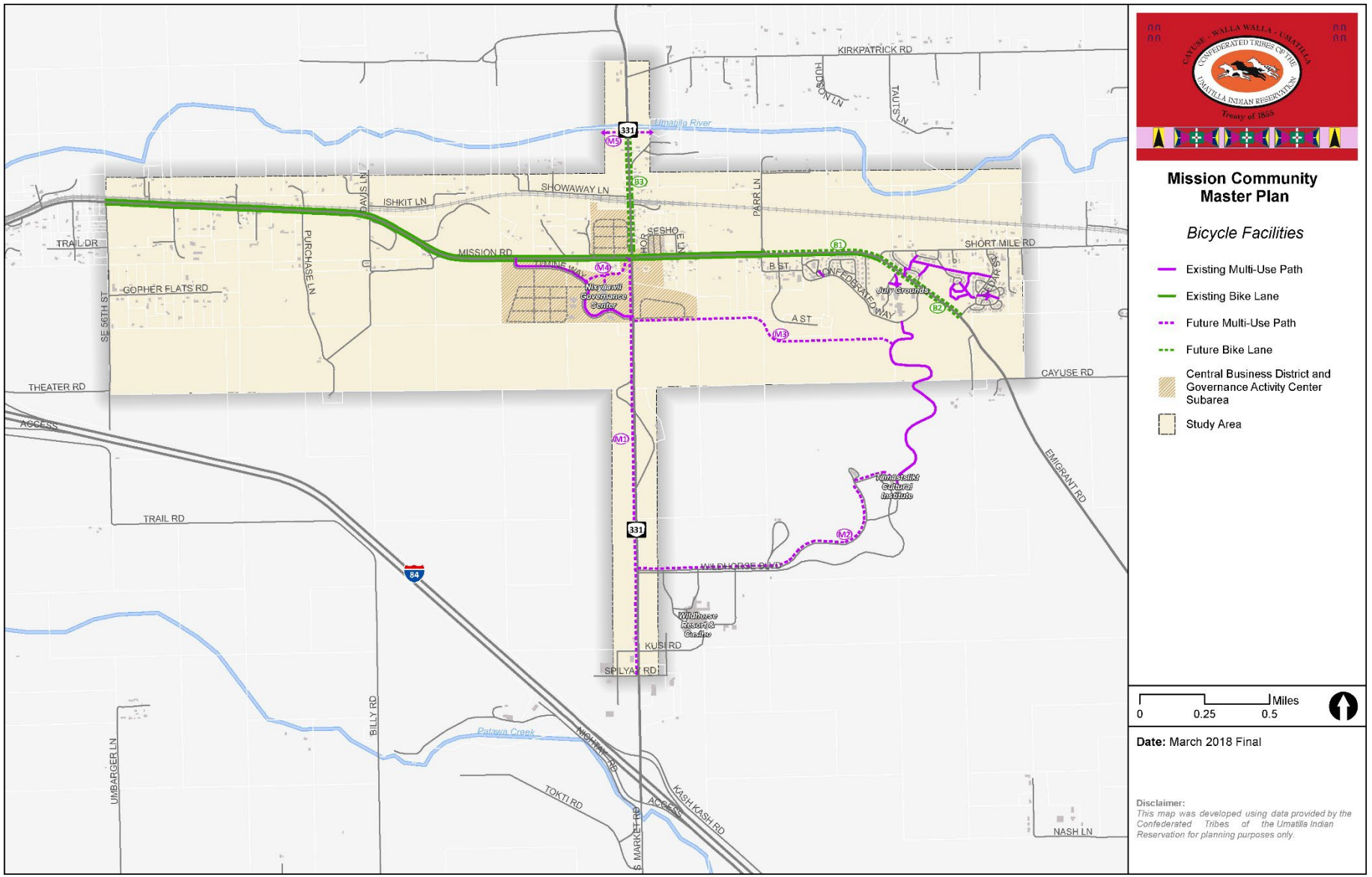

KIRKPATRICK RD
HODSON LN
TAUTS LN
Umatilla River
331
M5
SHOWAWAY LN
B3
DAVIS LN
ISHKIT LN
PARR LN
SESHO LN
TRAIL DR
PURCHASE LN
MISSION RD
SHORT MILE RD
B1
M4
Nixyaawii Governance Center
B ST
CONFEDERATED WAY
July Grounds
B2
GOPHER FLATS RD
SE 56TH ST
A ST
M3
CAYUSE RD
THEATER RD
ACCESS
M1
Tamástslikt Cultural Institute
EMIGRANT RD
TRAIL RD
331
M2
84
WILDHORSE BLVD
Wildhorse Resort & Casino
KUSH RD
SPLYAY RD
BILLY RD
Patawa Creek
UMBARGER LN
TOKTI RD
KASH KASH RD
ACCESS
S MARKET RD
NASH LN
Mission Community Master Plan
Bicycle Facilities
Existing Multi-Use Path
Existing Bike Lane
Future Multi-Use Path
Future Bike Lane
Central Business District and Governance Activity Center Subarea
Study Area
0
0.25
0.5
Miles
Date: March 2018 Final
Disclaimer:
This map was developed using data provided by the Confederated Tribes of the Umatilla Indian Reservation for planning purposes only.

Figure A.1 OR 331 + Multi Use Path Cross-Section

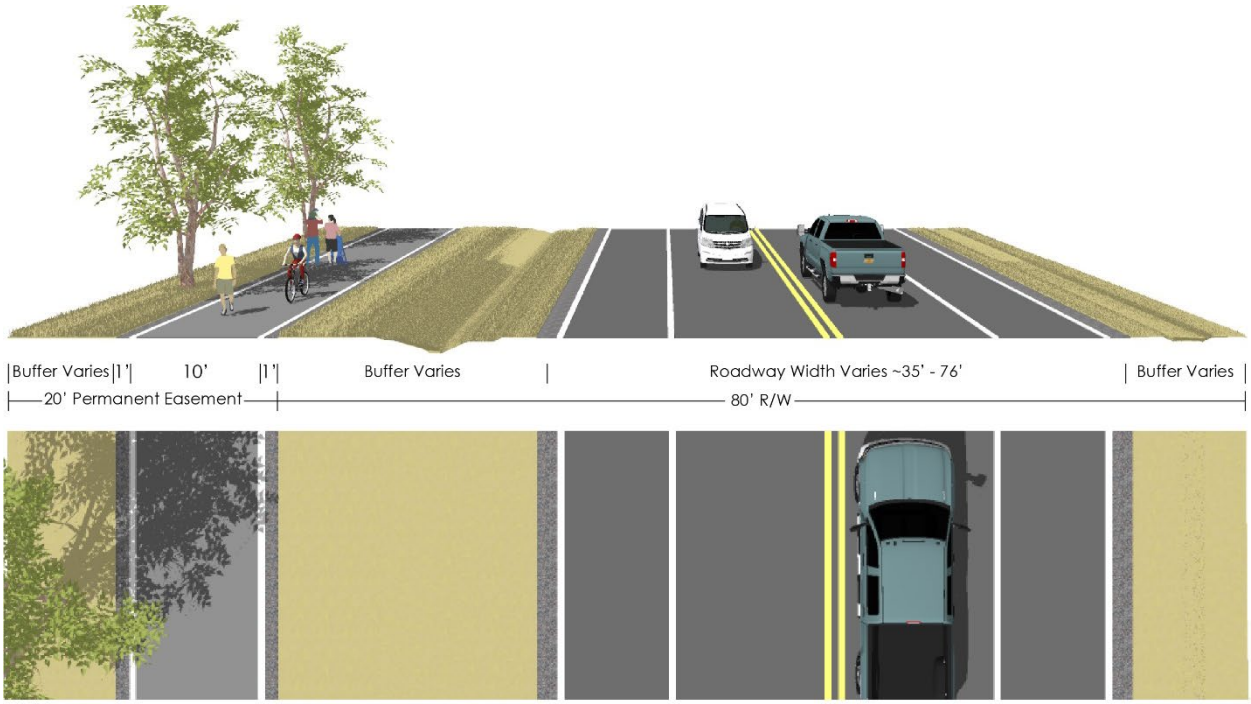


Figure A.2 Multi-Use Pathway Cross-Section

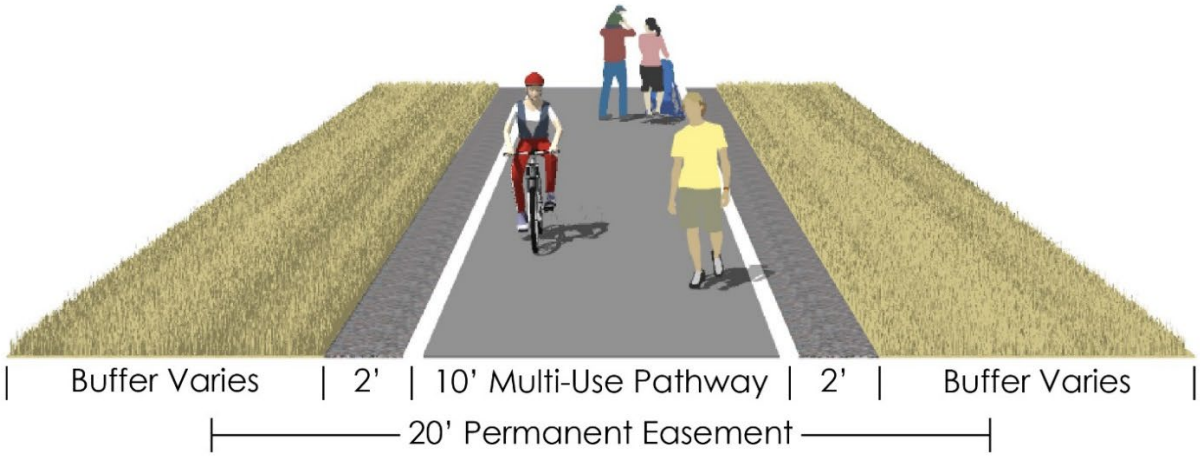


Figure A.3 Umatilla River Multi-Use Trail and Equestrian Trail Cross-Section

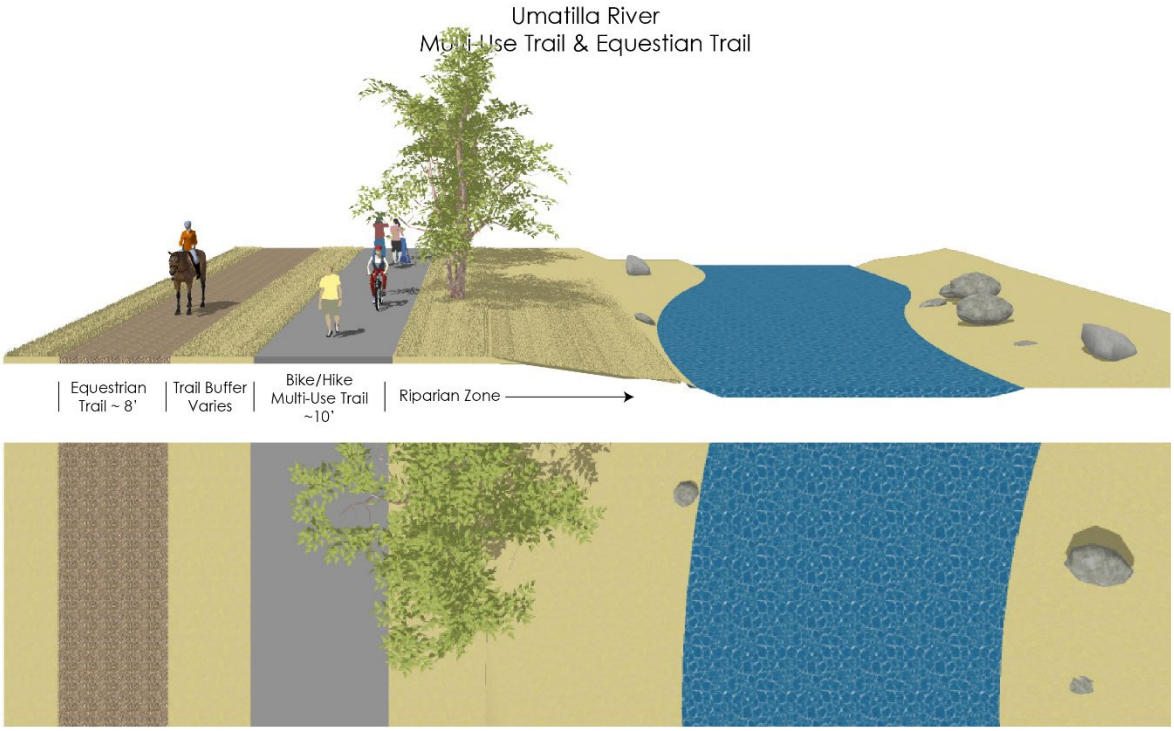


Figure A.4 Mission Road Cross-Section

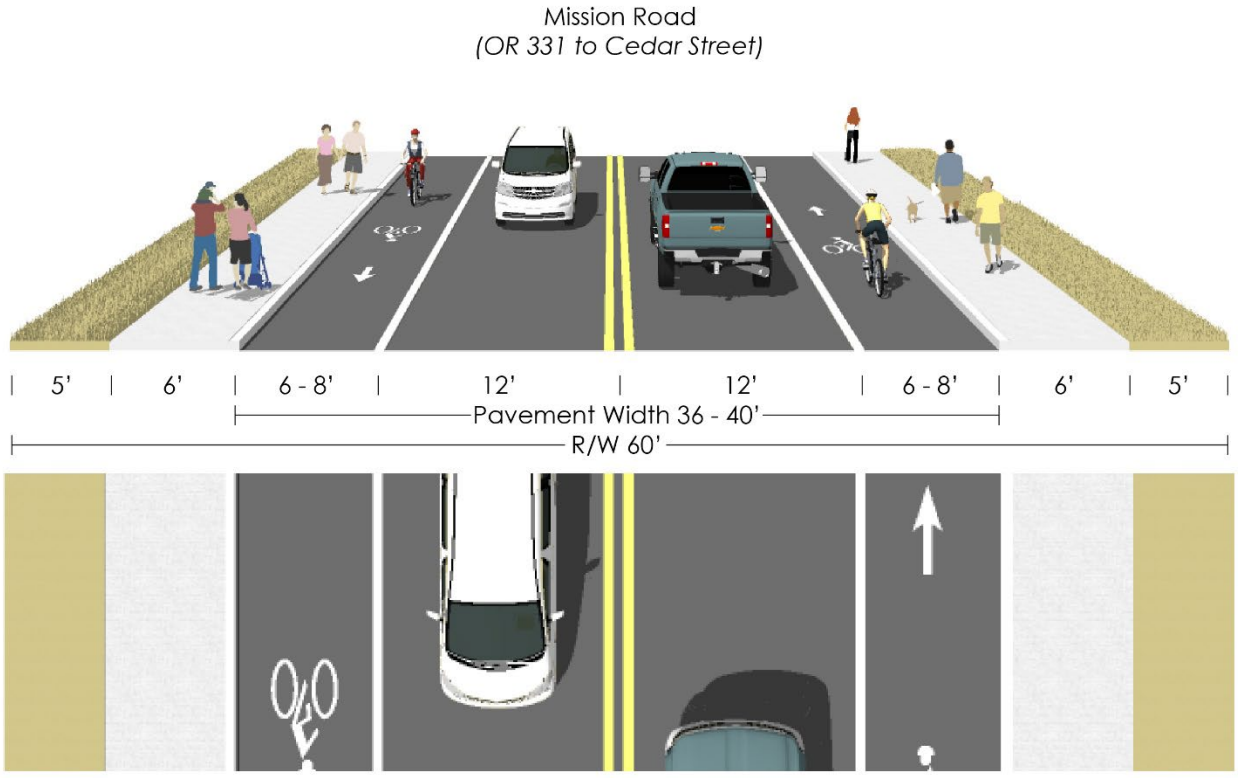


Figure A.5 Potential Signalized Intersection Widening Improvements

Figure A.6 Potential Roundabout Intersection Improvements

Figure A.7 Standard Residential Street Cross-Section

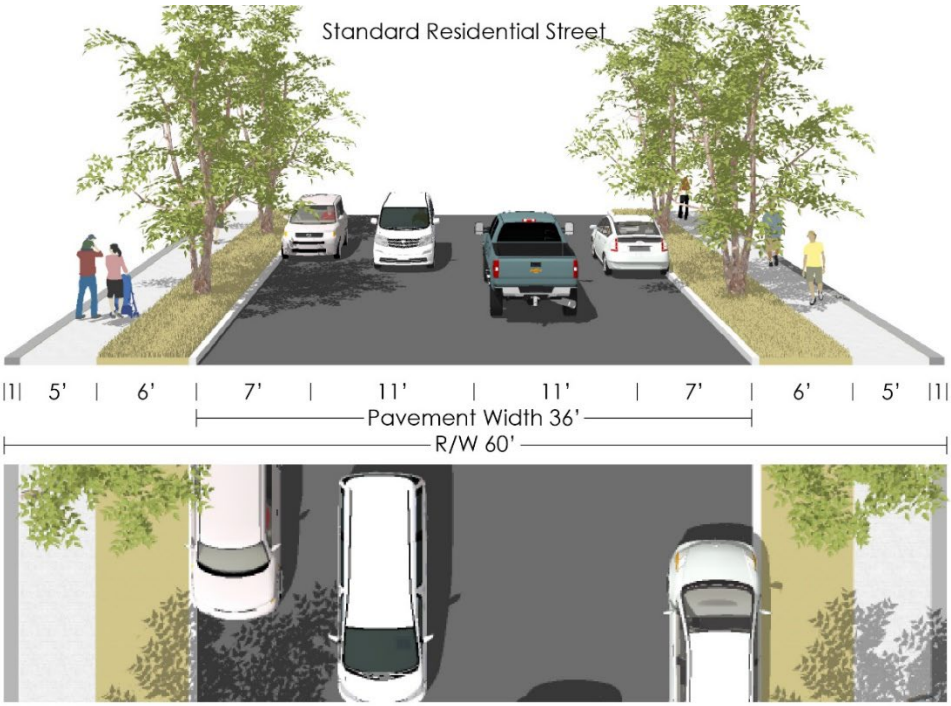


Figure A.8 Minor Residential Street Cross-Section

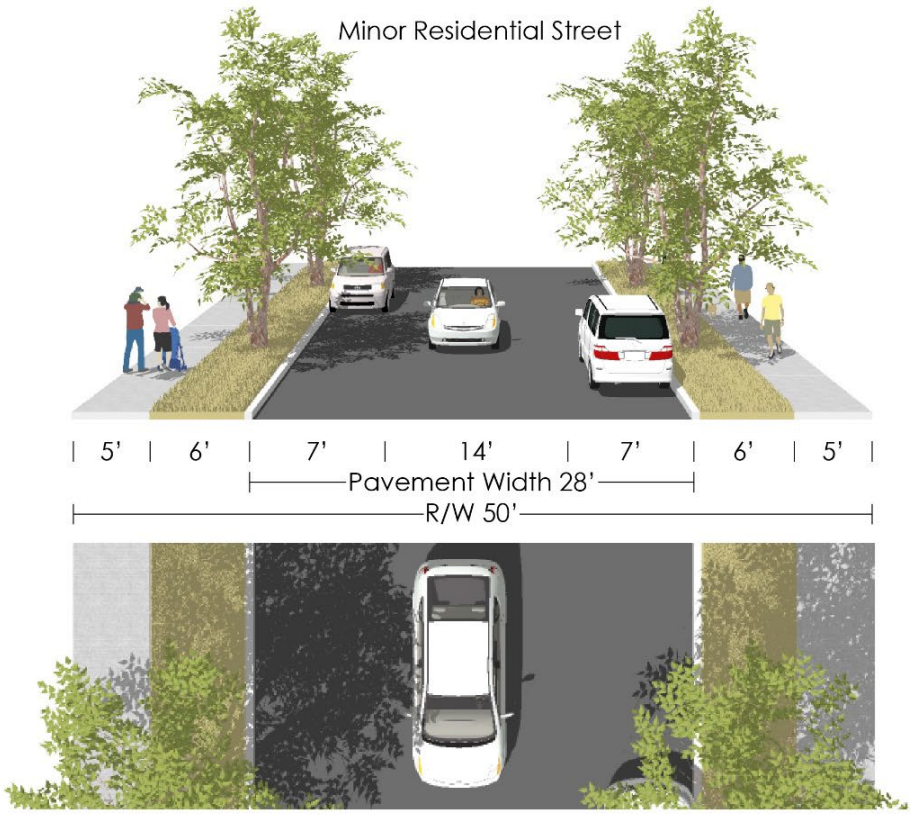
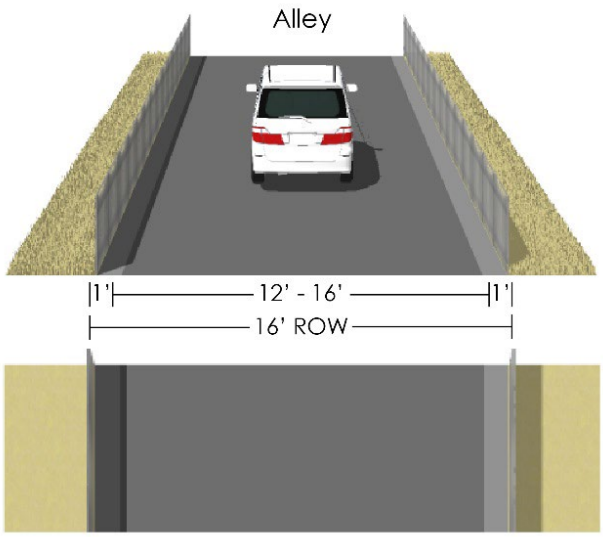


Figure A.9 Alley Cross-Section



B. TRAFFIC OPERATIONS WORKSHEETS

Intersection	
Int Delay, s/veh	4.4

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	104	18	40	135	70	81
Future Vol, veh/h	104	18	40	135	70	81
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	150	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	78	78	78	78	78	78
Heavy Vehicles, %	4	6	4	4	5	7
Mvmt Flow	133	23	51	173	90	104

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	156	0	420	145
Stage 1	-	-	-	-	145	-
Stage 2	-	-	-	-	275	-
Critical Hdwy	-	-	4.14	-	6.45	6.27
Critical Hdwy Stg 1	-	-	-	-	5.45	-
Critical Hdwy Stg 2	-	-	-	-	5.45	-
Follow-up Hdwy	-	-	2.236	-	3.545	3.363
Pot Cap-1 Maneuver	-	-	1412	-	584	889
Stage 1	-	-	-	-	875	-
Stage 2	-	-	-	-	764	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1412	-	561	889
Mov Cap-2 Maneuver	-	-	-	-	561	-
Stage 1	-	-	-	-	875	-
Stage 2	-	-	-	-	733	-

Approach	EB	WB	NB
HCM Control Delay, s	0	1.7	11
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	561	889	-	-	1412	-
HCM Lane V/C Ratio	0.16	0.117	-	-	0.036	-
HCM Control Delay (s)	12.6	9.6	-	-	7.6	0
HCM Lane LOS	B	A	-	-	A	A
HCM 95th %tile Q(veh)	0.6	0.4	-	-	0.1	-

Intersection	
Intersection Delay, s/veh	12.3
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	23	128	36	64	114	25	35	105	102	8	98	30
Future Vol, veh/h	23	128	36	64	114	25	35	105	102	8	98	30
Peak Hour Factor	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81
Heavy Vehicles, %	8	4	4	4	4	8	3	13	5	8	13	5
Mvmt Flow	28	158	44	79	141	31	43	130	126	10	121	37
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	12.1	12.5	12.9	11.1
HCM LOS	B	B	B	B

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	14%	12%	32%	6%
Vol Thru, %	43%	68%	56%	72%
Vol Right, %	42%	19%	12%	22%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	242	187	203	136
LT Vol	35	23	64	8
Through Vol	105	128	114	98
RT Vol	102	36	25	30
Lane Flow Rate	299	231	251	168
Geometry Grp	1	1	1	1
Degree of Util (X)	0.449	0.366	0.396	0.272
Departure Headway (Hd)	5.41	5.707	5.685	5.822
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	663	628	629	613
Service Time	3.472	3.775	3.75	3.895
HCM Lane V/C Ratio	0.451	0.368	0.399	0.274
HCM Control Delay	12.9	12.1	12.5	11.1
HCM Lane LOS	B	B	B	B
HCM 95th-tile Q	2.3	1.7	1.9	1.1

Intersection	
Int Delay, s/veh	2.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	52	103	132	8	4	24
Future Vol, veh/h	52	103	132	8	4	24
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	100	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	89	89	89	89	89	89
Heavy Vehicles, %	7	4	6	2	0	3
Mvmt Flow	58	116	148	9	4	27

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	157	0	-	0	385	153
Stage 1	-	-	-	-	153	-
Stage 2	-	-	-	-	232	-
Critical Hdwy	4.17	-	-	-	6.4	6.23
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.263	-	-	-	3.5	3.327
Pot Cap-1 Maneuver	1393	-	-	-	622	890
Stage 1	-	-	-	-	880	-
Stage 2	-	-	-	-	811	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1393	-	-	-	596	890
Mov Cap-2 Maneuver	-	-	-	-	596	-
Stage 1	-	-	-	-	843	-
Stage 2	-	-	-	-	811	-

Approach	EB	WB	SB
HCM Control Delay, s	2.6	0	9.5
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1393	-	-	-	831
HCM Lane V/C Ratio	0.042	-	-	-	0.038
HCM Control Delay (s)	7.7	-	-	-	9.5
HCM Lane LOS	A	-	-	-	A
HCM 95th %tile Q(veh)	0.1	-	-	-	0.1

Intersection	
Int Delay, s/veh	5.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		⇕			⇕			⇕			⇕	
Traffic Vol, veh/h	1	0	0	1	0	32	0	8	1	36	15	1
Future Vol, veh/h	1	0	0	1	0	32	0	8	1	36	15	1
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	85	85	85	85	85	85	85	85	85	85	85	85
Heavy Vehicles, %	11	0	25	22	0	3	0	2	10	3	90	18
Mvmt Flow	1	0	0	1	0	38	0	9	1	42	18	1

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	132	113	19	113	113	10	19	0	0	10	0	0
Stage 1	103	103	-	10	10	-	-	-	-	-	-	-
Stage 2	29	10	-	103	103	-	-	-	-	-	-	-
Critical Hdwy	7.21	6.5	6.45	7.32	6.5	6.23	4.1	-	-	4.13	-	-
Critical Hdwy Stg 1	6.21	5.5	-	6.32	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.21	5.5	-	6.32	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.599	4	3.525	3.698	4	3.327	2.2	-	-	2.227	-	-
Pot Cap-1 Maneuver	820	781	996	819	781	1068	1611	-	-	1603	-	-
Stage 1	881	814	-	961	891	-	-	-	-	-	-	-
Stage 2	965	891	-	856	814	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	776	761	996	803	761	1068	1611	-	-	1603	-	-
Mov Cap-2 Maneuver	776	761	-	803	761	-	-	-	-	-	-	-
Stage 1	881	793	-	961	891	-	-	-	-	-	-	-
Stage 2	931	891	-	834	793	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	9.6	8.5	0	5.1
HCM LOS	A	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1611	-	-	776	1057	1603	-	-
HCM Lane V/C Ratio	-	-	-	0.002	0.037	0.026	-	-
HCM Control Delay (s)	0	-	-	9.6	8.5	7.3	0	-
HCM Lane LOS	A	-	-	A	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0	0.1	0.1	-	-

Intersection	
Int Delay, s/veh	2.8

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	38	68	24	204	186	12
Future Vol, veh/h	38	68	24	204	186	12
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	160	0	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	69	69	69	69	69	69
Heavy Vehicles, %	4	3	4	8	8	6
Mvmt Flow	55	99	35	296	270	17

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	645	279	287	0	-	0
Stage 1	279	-	-	-	-	-
Stage 2	366	-	-	-	-	-
Critical Hdwy	6.44	6.23	4.14	-	-	-
Critical Hdwy Stg 1	5.44	-	-	-	-	-
Critical Hdwy Stg 2	5.44	-	-	-	-	-
Follow-up Hdwy	3.536	3.327	2.236	-	-	-
Pot Cap-1 Maneuver	434	757	1264	-	-	-
Stage 1	764	-	-	-	-	-
Stage 2	697	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	420	757	1264	-	-	-
Mov Cap-2 Maneuver	420	-	-	-	-	-
Stage 1	739	-	-	-	-	-
Stage 2	697	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	12.1	0.8	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	1264	-	420	757	-	-
HCM Lane V/C Ratio	0.028	-	0.131	0.13	-	-
HCM Control Delay (s)	7.9	0	14.9	10.5	-	-
HCM Lane LOS	A	A	B	B	-	-
HCM 95th %tile Q(veh)	0.1	-	0.4	0.4	-	-

Intersection	
Int Delay, s/veh	3.2

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	60	60	168	41	63	191
Future Vol, veh/h	60	60	168	41	63	191
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	-	220	385	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	91	91	91	91	91	91
Heavy Vehicles, %	13	5	8	17	5	10
Mvmt Flow	66	66	185	45	69	210

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	533	185	0	0	230	0
Stage 1	185	-	-	-	-	-
Stage 2	348	-	-	-	-	-
Critical Hdwy	6.53	6.25	-	-	4.15	-
Critical Hdwy Stg 1	5.53	-	-	-	-	-
Critical Hdwy Stg 2	5.53	-	-	-	-	-
Follow-up Hdwy	3.617	3.345	-	-	2.245	-
Pot Cap-1 Maneuver	489	850	-	-	1320	-
Stage 1	821	-	-	-	-	-
Stage 2	691	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	464	850	-	-	1320	-
Mov Cap-2 Maneuver	537	-	-	-	-	-
Stage 1	821	-	-	-	-	-
Stage 2	655	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	11.1	0	2
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	537	850	1320	-
HCM Lane V/C Ratio	-	-	0.123	0.078	0.052	-
HCM Control Delay (s)	-	-	12.6	9.6	7.9	-
HCM Lane LOS	-	-	B	A	A	-
HCM 95th %tile Q(veh)	-	-	0.4	0.3	0.2	-

Intersection	
Int Delay, s/veh	3.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔		↰	↑	↱	↰	↑	↱
Traffic Vol, veh/h	9	1	2	100	3	36	2	164	101	10	239	2
Future Vol, veh/h	9	1	2	100	3	36	2	164	101	10	239	2
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	130	-	200	1000	-	330
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	87	87	87	87	87	87	87	87	87	87	87	87
Heavy Vehicles, %	8	6	9	2	12	2	8	11	3	2	11	5
Mvmt Flow	10	1	2	115	3	41	2	189	116	11	275	2

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	570	606	275	493	492	189	277	0	0	305	0	0
Stage 1	297	297	-	193	193	-	-	-	-	-	-	-
Stage 2	273	309	-	300	299	-	-	-	-	-	-	-
Critical Hdwy	7.18	6.56	6.29	7.12	6.62	6.22	4.18	-	-	4.12	-	-
Critical Hdwy Stg 1	6.18	5.56	-	6.12	5.62	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.18	5.56	-	6.12	5.62	-	-	-	-	-	-	-
Follow-up Hdwy	3.572	4.054	3.381	3.518	4.108	3.318	2.272	-	-	2.218	-	-
Pot Cap-1 Maneuver	423	406	747	486	463	853	1252	-	-	1256	-	-
Stage 1	699	660	-	809	722	-	-	-	-	-	-	-
Stage 2	720	652	-	709	649	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	397	402	747	480	458	853	1252	-	-	1256	-	-
Mov Cap-2 Maneuver	397	402	-	480	458	-	-	-	-	-	-	-
Stage 1	698	654	-	807	721	-	-	-	-	-	-	-
Stage 2	681	651	-	699	643	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	13.6	14.4	0.1	0.3
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1252	-	-	431	541	1256	-	-
HCM Lane V/C Ratio	0.002	-	-	0.032	0.295	0.009	-	-
HCM Control Delay (s)	7.9	-	-	13.6	14.4	7.9	-	-
HCM Lane LOS	A	-	-	B	B	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0.1	1.2	0	-	-

Intersection	
Int Delay, s/veh	3.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	1	1	7	66	2	28	3	238	72	32	309	0
Future Vol, veh/h	1	1	7	66	2	28	3	238	72	32	309	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	320	-	-	230	-	-	430	-	230	275	-	230
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	80	80	80	80	80	80	80	80	80	80	80	80
Heavy Vehicles, %	50	20	8	72	11	14	6	6	73	16	8	14
Mvmt Flow	1	1	9	83	3	35	4	298	90	40	386	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	836	862	386	777	772	298	386	0	0	388	0	0
Stage 1	466	466	-	306	306	-	-	-	-	-	-	-
Stage 2	370	396	-	471	466	-	-	-	-	-	-	-
Critical Hdwy	7.6	6.7	6.28	7.82	6.61	6.34	4.16	-	-	4.26	-	-
Critical Hdwy Stg 1	6.6	5.7	-	6.82	5.61	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.6	5.7	-	6.82	5.61	-	-	-	-	-	-	-
Follow-up Hdwy	3.95	4.18	3.372	4.148	4.099	3.426	2.254	-	-	2.344	-	-
Pot Cap-1 Maneuver	238	274	649	243	320	714	1151	-	-	1098	-	-
Stage 1	495	533	-	577	646	-	-	-	-	-	-	-
Stage 2	563	574	-	461	547	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	218	263	649	232	308	714	1151	-	-	1098	-	-
Mov Cap-2 Maneuver	218	263	-	232	308	-	-	-	-	-	-	-
Stage 1	494	514	-	575	644	-	-	-	-	-	-	-
Stage 2	531	572	-	437	527	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	12.8	23.2	0.1	0.8
HCM LOS	B	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	1151	-	-	218	548	232	656	1098	-	-
HCM Lane V/C Ratio	0.003	-	-	0.006	0.018	0.356	0.057	0.036	-	-
HCM Control Delay (s)	8.1	-	-	21.6	11.7	28.8	10.8	8.4	-	-
HCM Lane LOS	A	-	-	C	B	D	B	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0	0.1	1.5	0.2	0.1	-	-

Intersection	
Int Delay, s/veh	2.4

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	99	14	299	74	5	377
Future Vol, veh/h	99	14	299	74	5	377
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	260	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	91	91	91	91	91	91
Heavy Vehicles, %	5	10	23	5	10	24
Mvmt Flow	109	15	329	81	5	414

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	753	329	0	0	410	0
Stage 1	329	-	-	-	-	-
Stage 2	424	-	-	-	-	-
Critical Hdwy	6.45	6.3	-	-	4.2	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.39	-	-	2.29	-
Pot Cap-1 Maneuver	373	694	-	-	1107	-
Stage 1	722	-	-	-	-	-
Stage 2	654	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	371	694	-	-	1107	-
Mov Cap-2 Maneuver	371	-	-	-	-	-
Stage 1	722	-	-	-	-	-
Stage 2	650	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	18.3	0	0.1
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	394	1107	-
HCM Lane V/C Ratio	-	-	0.315	0.005	-
HCM Control Delay (s)	-	-	18.3	8.3	0
HCM Lane LOS	-	-	C	A	A
HCM 95th %tile Q(veh)	-	-	1.3	0	-

Intersection	
Int Delay, s/veh	0.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	1	3	370	2	1	475
Future Vol, veh/h	1	3	370	2	1	475
Conflicting Peds, #/hr	0	0	0	1	1	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	8	5	19	0	15	19
Mvmt Flow	1	3	402	2	1	516

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	922	404	0	0	405	0
Stage 1	404	-	-	-	-	-
Stage 2	518	-	-	-	-	-
Critical Hdwy	6.48	6.25	-	-	4.25	-
Critical Hdwy Stg 1	5.48	-	-	-	-	-
Critical Hdwy Stg 2	5.48	-	-	-	-	-
Follow-up Hdwy	3.572	3.345	-	-	2.335	-
Pot Cap-1 Maneuver	293	640	-	-	1087	-
Stage 1	661	-	-	-	-	-
Stage 2	586	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	292	639	-	-	1086	-
Mov Cap-2 Maneuver	292	-	-	-	-	-
Stage 1	660	-	-	-	-	-
Stage 2	585	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	12.4	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	493	1086	-
HCM Lane V/C Ratio	-	-	0.009	0.001	-
HCM Control Delay (s)	-	-	12.4	8.3	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	0	0	-

Intersection	
Int Delay, s/veh	1.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	6	1	93	26	279	0	0	186	290
Future Vol, veh/h	0	0	0	6	1	93	26	279	0	0	186	290
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	1	1	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	1	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	0	0	0	11	60	35	6	14	0	0	26	15
Mvmt Flow	0	0	0	6	1	98	27	294	0	0	196	305

Major/Minor	Minor1			Major1			Major2		
Conflicting Flow All	697	849	294	501	0	-	-	-	0
Stage 1	348	348	-	-	-	-	-	-	-
Stage 2	349	501	-	-	-	-	-	-	-
Critical Hdwy	6.51	7.1	6.55	4.16	-	-	-	-	-
Critical Hdwy Stg 1	5.51	6.1	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.51	6.1	-	-	-	-	-	-	-
Follow-up Hdwy	3.599	4.54	3.615	2.254	-	-	-	-	-
Pot Cap-1 Maneuver	394	242	674	1043	-	0	0	-	-
Stage 1	695	543	-	-	-	0	0	-	-
Stage 2	695	458	-	-	-	0	0	-	-
Platoon blocked, %					-			-	-
Mov Cap-1 Maneuver	382	0	674	1043	-	-	-	-	-
Mov Cap-2 Maneuver	382	0	-	-	-	-	-	-	-
Stage 1	673	0	-	-	-	-	-	-	-
Stage 2	695	0	-	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	11.7	0.7	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	WBLn1	SBT	SBR
Capacity (veh/h)	1043	-	644	-	-
HCM Lane V/C Ratio	0.026	-	0.163	-	-
HCM Control Delay (s)	8.5	0	11.7	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0.1	-	0.6	-	-

Intersection	
Int Delay, s/veh	11.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	239	0	26	0	0	0	0	66	3	108	84	0
Future Vol, veh/h	239	0	26	0	0	0	0	66	3	108	84	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	89	89	89	89	89	89	89	89	89	89	89	89
Heavy Vehicles, %	16	42	6	0	0	0	0	7	8	36	8	0
Mvmt Flow	269	0	29	0	0	0	0	74	3	121	94	0

Major/Minor	Minor2			Major1			Major2		
Conflicting Flow All	412	413	94	-	0	0	77	0	0
Stage 1	336	336	-	-	-	-	-	-	-
Stage 2	76	77	-	-	-	-	-	-	-
Critical Hdwy	6.56	6.92	6.26	-	-	-	4.46	-	-
Critical Hdwy Stg 1	5.56	5.92	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.56	5.92	-	-	-	-	-	-	-
Follow-up Hdwy	3.644	4.378	3.354	-	-	-	2.524	-	-
Pot Cap-1 Maneuver	570	473	952	0	-	-	1332	-	0
Stage 1	694	576	-	0	-	-	-	-	0
Stage 2	913	759	-	0	-	-	-	-	0
Platoon blocked, %					-	-		-	
Mov Cap-1 Maneuver	515	0	952	-	-	-	1332	-	-
Mov Cap-2 Maneuver	515	0	-	-	-	-	-	-	-
Stage 1	694	0	-	-	-	-	-	-	-
Stage 2	825	0	-	-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	19.6	0	4.5
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	EBLn1	SBL	SBT
Capacity (veh/h)	-	-	539	1332	-
HCM Lane V/C Ratio	-	-	0.552	0.091	-
HCM Control Delay (s)	-	-	19.6	8	0
HCM Lane LOS	-	-	C	A	A
HCM 95th %tile Q(veh)	-	-	3.3	0.3	-

Intersection	
Int Delay, s/veh	0.8

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	12	2	0	57	108	2
Future Vol, veh/h	12	2	0	57	108	2
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	160
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	67	67	67	67	67	67
Heavy Vehicles, %	18	18	10	4	5	23
Mvmt Flow	18	3	0	85	161	3

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	246	161	164	0	-	0
Stage 1	161	-	-	-	-	-
Stage 2	85	-	-	-	-	-
Critical Hdwy	6.58	6.38	4.2	-	-	-
Critical Hdwy Stg 1	5.58	-	-	-	-	-
Critical Hdwy Stg 2	5.58	-	-	-	-	-
Follow-up Hdwy	3.662	3.462	2.29	-	-	-
Pot Cap-1 Maneuver	709	844	1367	-	-	-
Stage 1	830	-	-	-	-	-
Stage 2	900	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	709	844	1367	-	-	-
Mov Cap-2 Maneuver	709	-	-	-	-	-
Stage 1	830	-	-	-	-	-
Stage 2	900	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	10.1	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1367	-	726	-	-
HCM Lane V/C Ratio	-	-	0.029	-	-
HCM Control Delay (s)	0	-	10.1	-	-
HCM Lane LOS	A	-	B	-	-
HCM 95th %tile Q(veh)	0	-	0.1	-	-

Intersection	
Int Delay, s/veh	4.7

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	112	21	45	152	81	89
Future Vol, veh/h	112	21	45	152	81	89
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	150	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	78	78	78	78	78	78
Heavy Vehicles, %	4	6	4	4	5	7
Mvmt Flow	144	27	58	195	104	114

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	171	0	469	158
Stage 1	-	-	-	-	158	-
Stage 2	-	-	-	-	311	-
Critical Hdwy	-	-	4.14	-	6.45	6.27
Critical Hdwy Stg 1	-	-	-	-	5.45	-
Critical Hdwy Stg 2	-	-	-	-	5.45	-
Follow-up Hdwy	-	-	2.236	-	3.545	3.363
Pot Cap-1 Maneuver	-	-	1394	-	547	874
Stage 1	-	-	-	-	863	-
Stage 2	-	-	-	-	736	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1394	-	521	874
Mov Cap-2 Maneuver	-	-	-	-	521	-
Stage 1	-	-	-	-	863	-
Stage 2	-	-	-	-	701	-

Approach	EB	WB	NB
HCM Control Delay, s	0	1.8	11.6
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	521	874	-	-	1394	-
HCM Lane V/C Ratio	0.199	0.131	-	-	0.041	-
HCM Control Delay (s)	13.6	9.7	-	-	7.7	0
HCM Lane LOS	B	A	-	-	A	A
HCM 95th %tile Q(veh)	0.7	0.4	-	-	0.1	-

Intersection	
Intersection Delay, s/veh	14.6
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	28	140	36	64	123	29	39	126	112	11	121	43
Future Vol, veh/h	28	140	36	64	123	29	39	126	112	11	121	43
Peak Hour Factor	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81
Heavy Vehicles, %	8	4	4	4	4	8	3	13	5	8	13	5
Mvmt Flow	35	173	44	79	152	36	48	156	138	14	149	53
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	14.1	14.5	16	13.1
HCM LOS	B	B	C	B

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	14%	14%	30%	6%
Vol Thru, %	45%	69%	57%	69%
Vol Right, %	40%	18%	13%	25%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	277	204	216	175
LT Vol	39	28	64	11
Through Vol	126	140	123	121
RT Vol	112	36	29	43
Lane Flow Rate	342	252	267	216
Geometry Grp	1	1	1	1
Degree of Util (X)	0.555	0.437	0.46	0.376
Departure Headway (Hd)	5.845	6.253	6.211	6.261
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	616	574	579	575
Service Time	3.885	4.301	4.257	4.307
HCM Lane V/C Ratio	0.555	0.439	0.461	0.376
HCM Control Delay	16	14.1	14.5	13.1
HCM Lane LOS	C	B	B	B
HCM 95th-tile Q	3.4	2.2	2.4	1.7

Intersection	
Int Delay, s/veh	2.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	57	118	136	9	5	26
Future Vol, veh/h	57	118	136	9	5	26
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	100	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	89	89	89	89	89	89
Heavy Vehicles, %	7	4	6	2	0	3
Mvmt Flow	64	133	153	10	6	29

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	163	0	-	0	419	158
Stage 1	-	-	-	-	158	-
Stage 2	-	-	-	-	261	-
Critical Hdwy	4.17	-	-	-	6.4	6.23
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.263	-	-	-	3.5	3.327
Pot Cap-1 Maneuver	1386	-	-	-	595	885
Stage 1	-	-	-	-	875	-
Stage 2	-	-	-	-	787	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1386	-	-	-	568	885
Mov Cap-2 Maneuver	-	-	-	-	568	-
Stage 1	-	-	-	-	835	-
Stage 2	-	-	-	-	787	-

Approach	EB	WB	SB
HCM Control Delay, s	2.5	0	9.6
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1386	-	-	-	812
HCM Lane V/C Ratio	0.046	-	-	-	0.043
HCM Control Delay (s)	7.7	-	-	-	9.6
HCM Lane LOS	A	-	-	-	A
HCM 95th %tile Q(veh)	0.1	-	-	-	0.1

Intersection	
Int Delay, s/veh	5.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		⇕			⇕			⇕			⇕	
Traffic Vol, veh/h	1	0	0	2	0	34	0	10	1	39	24	1
Future Vol, veh/h	1	0	0	2	0	34	0	10	1	39	24	1
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	85	85	85	85	85	85	85	85	85	85	85	85
Heavy Vehicles, %	11	0	25	22	0	3	0	2	10	3	90	18
Mvmt Flow	1	0	0	2	0	40	0	12	1	46	28	1

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	154	134	29	134	134	13	29	0	0	13	0	0
Stage 1	121	121	-	13	13	-	-	-	-	-	-	-
Stage 2	33	13	-	121	121	-	-	-	-	-	-	-
Critical Hdwy	7.21	6.5	6.45	7.32	6.5	6.23	4.1	-	-	4.13	-	-
Critical Hdwy Stg 1	6.21	5.5	-	6.32	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.21	5.5	-	6.32	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.599	4	3.525	3.698	4	3.327	2.2	-	-	2.227	-	-
Pot Cap-1 Maneuver	793	760	983	794	760	1064	1597	-	-	1599	-	-
Stage 1	862	800	-	958	889	-	-	-	-	-	-	-
Stage 2	961	889	-	837	800	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	746	738	983	777	738	1064	1597	-	-	1599	-	-
Mov Cap-2 Maneuver	746	738	-	777	738	-	-	-	-	-	-	-
Stage 1	862	777	-	958	889	-	-	-	-	-	-	-
Stage 2	925	889	-	813	777	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	9.8	8.6	0	4.5
HCM LOS	A	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1597	-	-	746	1043	1599	-	-
HCM Lane V/C Ratio	-	-	-	0.002	0.041	0.029	-	-
HCM Control Delay (s)	0	-	-	9.8	8.6	7.3	0	-
HCM Lane LOS	A	-	-	A	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0	0.1	0.1	-	-

Intersection	
Int Delay, s/veh	2.9

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	47	70	26	230	205	16
Future Vol, veh/h	47	70	26	230	205	16
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	160	0	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	69	69	69	69	69	69
Heavy Vehicles, %	4	3	4	8	8	6
Mvmt Flow	68	101	38	333	297	23

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	718	309	320	0	-	0
Stage 1	309	-	-	-	-	-
Stage 2	409	-	-	-	-	-
Critical Hdwy	6.44	6.23	4.14	-	-	-
Critical Hdwy Stg 1	5.44	-	-	-	-	-
Critical Hdwy Stg 2	5.44	-	-	-	-	-
Follow-up Hdwy	3.536	3.327	2.236	-	-	-
Pot Cap-1 Maneuver	393	729	1229	-	-	-
Stage 1	740	-	-	-	-	-
Stage 2	666	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	378	729	1229	-	-	-
Mov Cap-2 Maneuver	378	-	-	-	-	-
Stage 1	712	-	-	-	-	-
Stage 2	666	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	13.1	0.8	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	1229	-	378	729	-	-
HCM Lane V/C Ratio	0.031	-	0.18	0.139	-	-
HCM Control Delay (s)	8	0	16.6	10.7	-	-
HCM Lane LOS	A	A	C	B	-	-
HCM 95th %tile Q(veh)	0.1	-	0.6	0.5	-	-

Intersection	
Int Delay, s/veh	3.4

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	69	69	187	48	74	201
Future Vol, veh/h	69	69	187	48	74	201
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	-	220	385	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	91	91	91	91	91	91
Heavy Vehicles, %	13	5	8	17	5	10
Mvmt Flow	76	76	205	53	81	221

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	588	205	0	0	258	0
Stage 1	205	-	-	-	-	-
Stage 2	383	-	-	-	-	-
Critical Hdwy	6.53	6.25	-	-	4.15	-
Critical Hdwy Stg 1	5.53	-	-	-	-	-
Critical Hdwy Stg 2	5.53	-	-	-	-	-
Follow-up Hdwy	3.617	3.345	-	-	2.245	-
Pot Cap-1 Maneuver	454	828	-	-	1289	-
Stage 1	804	-	-	-	-	-
Stage 2	666	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	425	828	-	-	1289	-
Mov Cap-2 Maneuver	507	-	-	-	-	-
Stage 1	804	-	-	-	-	-
Stage 2	624	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	11.6	0	2.1
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	507	828	1289	-
HCM Lane V/C Ratio	-	-	0.15	0.092	0.063	-
HCM Control Delay (s)	-	-	13.3	9.8	8	-
HCM Lane LOS	-	-	B	A	A	-
HCM 95th %tile Q(veh)	-	-	0.5	0.3	0.2	-

Intersection	
Int Delay, s/veh	4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔		↰	↑	↱	↰	↑	↱
Traffic Vol, veh/h	11	1	2	108	4	54	2	170	111	16	251	3
Future Vol, veh/h	11	1	2	108	4	54	2	170	111	16	251	3
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	130	-	200	1000	-	330
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	87	87	87	87	87	87	87	87	87	87	87	87
Heavy Vehicles, %	8	6	9	2	12	2	8	11	3	2	11	5
Mvmt Flow	13	1	2	124	5	62	2	195	128	18	289	3

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	622	652	289	527	527	195	292	0	0	323	0	0
Stage 1	325	325	-	199	199	-	-	-	-	-	-	-
Stage 2	297	327	-	328	328	-	-	-	-	-	-	-
Critical Hdwy	7.18	6.56	6.29	7.12	6.62	6.22	4.18	-	-	4.12	-	-
Critical Hdwy Stg 1	6.18	5.56	-	6.12	5.62	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.18	5.56	-	6.12	5.62	-	-	-	-	-	-	-
Follow-up Hdwy	3.572	4.054	3.381	3.518	4.108	3.318	2.272	-	-	2.218	-	-
Pot Cap-1 Maneuver	391	382	734	462	442	846	1236	-	-	1237	-	-
Stage 1	675	642	-	803	718	-	-	-	-	-	-	-
Stage 2	699	641	-	685	630	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	355	376	734	454	434	846	1236	-	-	1237	-	-
Mov Cap-2 Maneuver	355	376	-	454	434	-	-	-	-	-	-	-
Stage 1	674	632	-	801	717	-	-	-	-	-	-	-
Stage 2	643	640	-	672	621	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	14.8	15.4	0.1	0.5
HCM LOS	B	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1236	-	-	385	534	1237	-	-
HCM Lane V/C Ratio	0.002	-	-	0.042	0.357	0.015	-	-
HCM Control Delay (s)	7.9	-	-	14.8	15.4	8	-	-
HCM Lane LOS	A	-	-	B	C	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0.1	1.6	0	-	-

Intersection	
Int Delay, s/veh	3.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	1	1	8	70	2	29	3	253	76	33	328	0
Future Vol, veh/h	1	1	8	70	2	29	3	253	76	33	328	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	320	-	-	230	-	-	430	-	230	275	-	230
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	80	80	80	80	80	80	80	80	80	80	80	80
Heavy Vehicles, %	50	20	8	72	11	14	6	6	73	16	8	14
Mvmt Flow	1	1	10	88	3	36	4	316	95	41	410	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	883	911	410	822	816	316	410	0	0	411	0	0
Stage 1	492	492	-	324	324	-	-	-	-	-	-	-
Stage 2	391	419	-	498	492	-	-	-	-	-	-	-
Critical Hdwy	7.6	6.7	6.28	7.82	6.61	6.34	4.16	-	-	4.26	-	-
Critical Hdwy Stg 1	6.6	5.7	-	6.82	5.61	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.6	5.7	-	6.82	5.61	-	-	-	-	-	-	-
Follow-up Hdwy	3.95	4.18	3.372	4.148	4.099	3.426	2.254	-	-	2.344	-	-
Pot Cap-1 Maneuver	221	256	629	225	301	697	1128	-	-	1076	-	-
Stage 1	479	519	-	563	634	-	-	-	-	-	-	-
Stage 2	547	560	-	444	533	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	202	245	629	214	288	697	1128	-	-	1076	-	-
Mov Cap-2 Maneuver	202	245	-	214	288	-	-	-	-	-	-	-
Stage 1	477	499	-	561	631	-	-	-	-	-	-	-
Stage 2	515	558	-	419	513	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	13	26.2	0.1	0.8
HCM LOS	B	D		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	1128	-	-	202	536	214	638	1076	-	-
HCM Lane V/C Ratio	0.003	-	-	0.006	0.021	0.409	0.061	0.038	-	-
HCM Control Delay (s)	8.2	-	-	22.9	11.9	33	11	8.5	-	-
HCM Lane LOS	A	-	-	C	B	D	B	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0	0.1	1.9	0.2	0.1	-	-

Intersection	
Int Delay, s/veh	2.6

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	103	16	316	77	6	400
Future Vol, veh/h	103	16	316	77	6	400
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	260	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	91	91	91	91	91	91
Heavy Vehicles, %	5	10	23	5	10	24
Mvmt Flow	113	18	347	85	7	440

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	801	347	0	0	432	0
Stage 1	347	-	-	-	-	-
Stage 2	454	-	-	-	-	-
Critical Hdwy	6.45	6.3	-	-	4.2	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.39	-	-	2.29	-
Pot Cap-1 Maneuver	350	678	-	-	1086	-
Stage 1	709	-	-	-	-	-
Stage 2	633	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	347	678	-	-	1086	-
Mov Cap-2 Maneuver	347	-	-	-	-	-
Stage 1	709	-	-	-	-	-
Stage 2	627	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	19.9	0	0.1
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	371	1086	-
HCM Lane V/C Ratio	-	-	0.352	0.006	-
HCM Control Delay (s)	-	-	19.9	8.3	0
HCM Lane LOS	-	-	C	A	A
HCM 95th %tile Q(veh)	-	-	1.6	0	-

Intersection	
Int Delay, s/veh	0.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	1	3	390	2	1	502
Future Vol, veh/h	1	3	390	2	1	502
Conflicting Peds, #/hr	0	0	0	1	1	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	8	5	19	0	15	19
Mvmt Flow	1	3	424	2	1	546

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	974	426	0	0	427	0
Stage 1	426	-	-	-	-	-
Stage 2	548	-	-	-	-	-
Critical Hdwy	6.48	6.25	-	-	4.25	-
Critical Hdwy Stg 1	5.48	-	-	-	-	-
Critical Hdwy Stg 2	5.48	-	-	-	-	-
Follow-up Hdwy	3.572	3.345	-	-	2.335	-
Pot Cap-1 Maneuver	272	622	-	-	1066	-
Stage 1	646	-	-	-	-	-
Stage 2	567	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	271	621	-	-	1065	-
Mov Cap-2 Maneuver	271	-	-	-	-	-
Stage 1	645	-	-	-	-	-
Stage 2	566	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	12.7	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	469	1065	-
HCM Lane V/C Ratio	-	-	0.009	0.001	-
HCM Control Delay (s)	-	-	12.7	8.4	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	0	0	-

Intersection	
Int Delay, s/veh	1.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	9	1	98	38	294	0	0	197	306
Future Vol, veh/h	0	0	0	9	1	98	38	294	0	0	197	306
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	1	1	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	1	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	0	0	0	11	60	35	6	14	0	0	26	15
Mvmt Flow	0	0	0	9	1	103	40	309	0	0	207	322

Major/Minor	Minor1			Major1			Major2		
Conflicting Flow All	757	918	309	529	0	-	-	-	0
Stage 1	389	389	-	-	-	-	-	-	-
Stage 2	368	529	-	-	-	-	-	-	-
Critical Hdwy	6.51	7.1	6.55	4.16	-	-	-	-	-
Critical Hdwy Stg 1	5.51	6.1	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.51	6.1	-	-	-	-	-	-	-
Follow-up Hdwy	3.599	4.54	3.615	2.254	-	-	-	-	-
Pot Cap-1 Maneuver	363	219	660	1018	-	0	0	-	-
Stage 1	666	519	-	-	-	0	0	-	-
Stage 2	681	443	-	-	-	0	0	-	-
Platoon blocked, %					-			-	-
Mov Cap-1 Maneuver	346	0	660	1018	-	-	-	-	-
Mov Cap-2 Maneuver	346	0	-	-	-	-	-	-	-
Stage 1	635	0	-	-	-	-	-	-	-
Stage 2	681	0	-	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	12.2	1	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	WBLn1	SBT	SBR
Capacity (veh/h)	1018	-	613	-	-
HCM Lane V/C Ratio	0.039	-	0.185	-	-
HCM Control Delay (s)	8.7	0	12.2	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0.1	-	0.7	-	-

Intersection	
Int Delay, s/veh	12.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	239	0	55	0	0	0	0	93	11	116	90	0
Future Vol, veh/h	239	0	55	0	0	0	0	93	11	116	90	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	89	89	89	89	89	89	89	89	89	89	89	89
Heavy Vehicles, %	16	42	6	0	0	0	0	7	8	36	8	0
Mvmt Flow	269	0	62	0	0	0	0	104	12	130	101	0

Major/Minor	Minor2			Major1			Major2		
Conflicting Flow All	471	477	101	-	0	0	116	0	0
Stage 1	361	361	-	-	-	-	-	-	-
Stage 2	110	116	-	-	-	-	-	-	-
Critical Hdwy	6.56	6.92	6.26	-	-	-	4.46	-	-
Critical Hdwy Stg 1	5.56	5.92	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.56	5.92	-	-	-	-	-	-	-
Follow-up Hdwy	3.644	4.378	3.354	-	-	-	2.524	-	-
Pot Cap-1 Maneuver	527	433	943	0	-	-	1286	-	0
Stage 1	675	561	-	0	-	-	-	-	0
Stage 2	881	729	-	0	-	-	-	-	0
Platoon blocked, %					-	-		-	
Mov Cap-1 Maneuver	471	0	943	-	-	-	1286	-	-
Mov Cap-2 Maneuver	471	0	-	-	-	-	-	-	-
Stage 1	675	0	-	-	-	-	-	-	-
Stage 2	787	0	-	-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	23.2	0	4.6
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	EBLn1	SBL	SBT
Capacity (veh/h)	-	-	520	1286	-
HCM Lane V/C Ratio	-	-	0.635	0.101	-
HCM Control Delay (s)	-	-	23.2	8.1	0
HCM Lane LOS	-	-	C	A	A
HCM 95th %tile Q(veh)	-	-	4.4	0.3	-

Intersection	
Int Delay, s/veh	0.9

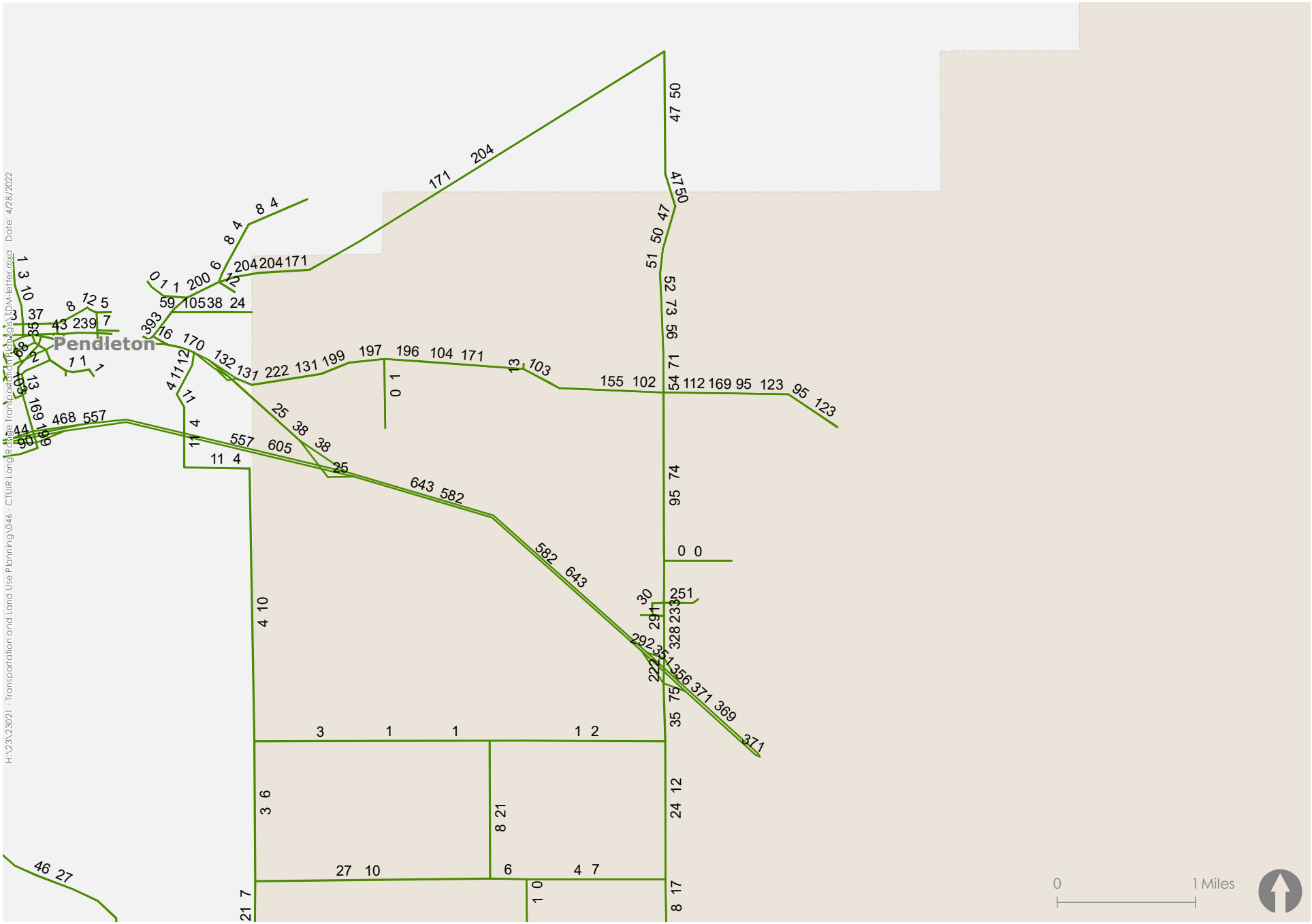
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	17	3	2	87	142	3
Future Vol, veh/h	17	3	2	87	142	3
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	160
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	67	67	67	67	67	67
Heavy Vehicles, %	18	18	10	4	5	23
Mvmt Flow	25	4	3	130	212	4

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	348	212	216	0	-	0
Stage 1	212	-	-	-	-	-
Stage 2	136	-	-	-	-	-
Critical Hdwy	6.58	6.38	4.2	-	-	-
Critical Hdwy Stg 1	5.58	-	-	-	-	-
Critical Hdwy Stg 2	5.58	-	-	-	-	-
Follow-up Hdwy	3.662	3.462	2.29	-	-	-
Pot Cap-1 Maneuver	618	789	1308	-	-	-
Stage 1	787	-	-	-	-	-
Stage 2	853	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	617	789	1308	-	-	-
Mov Cap-2 Maneuver	617	-	-	-	-	-
Stage 1	785	-	-	-	-	-
Stage 2	853	-	-	-	-	-

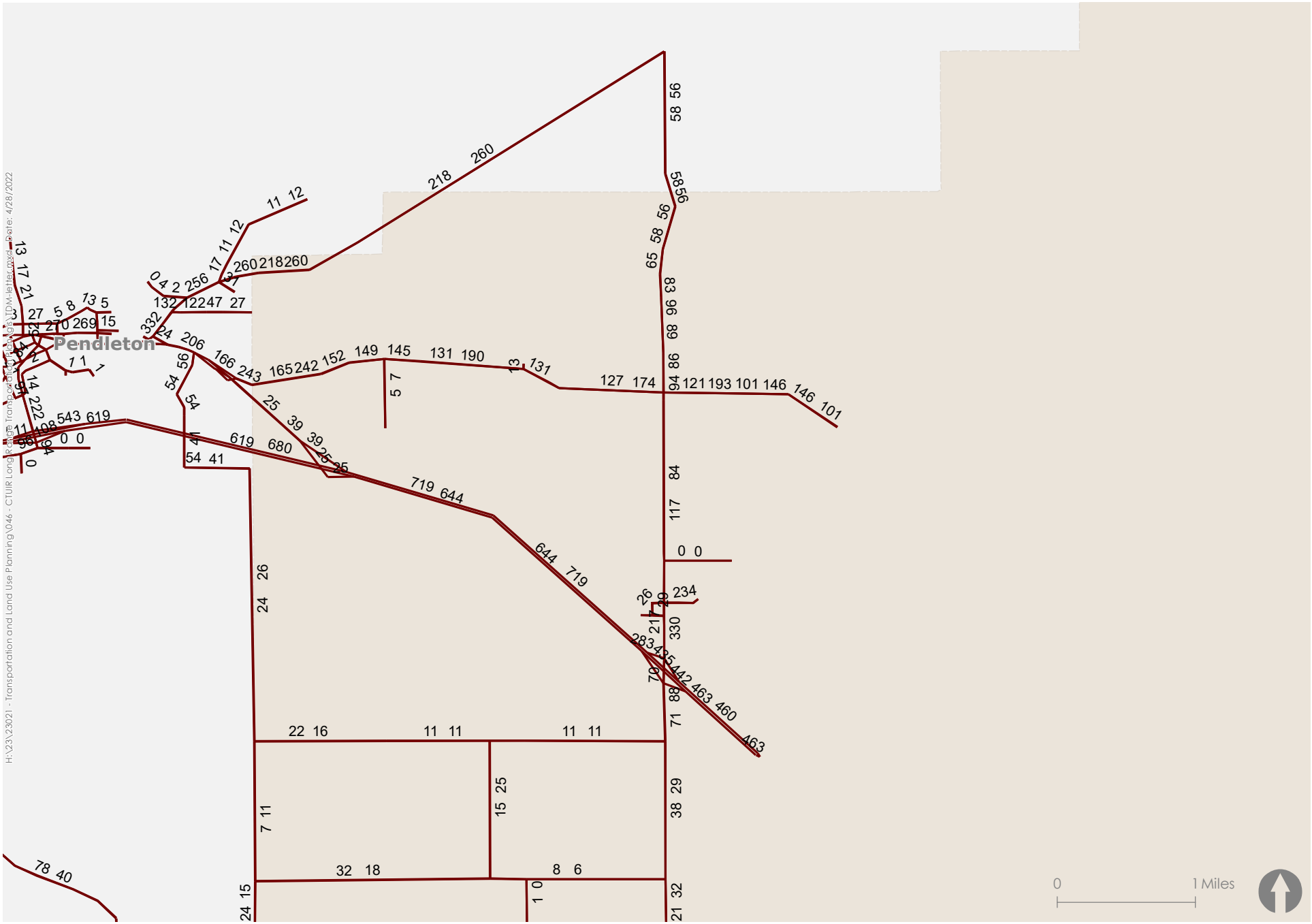
Approach	EB	NB	SB
HCM Control Delay, s	10.9	0.2	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1308	-	638	-	-
HCM Lane V/C Ratio	0.002	-	0.047	-	-
HCM Control Delay (s)	7.8	0	10.9	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0	-	0.1	-	-

C. TRAVEL DEMAND MODEL DATA



Travel Demand Model Output
2015 Base Year



Travel Demand Model Output
2040 Future Year

D. CRASH ANALYSIS WORKSHEETS

General & Site Information	
Analyst:	Kittelson & Associates, Inc.
Agency/Company:	ODOT
Date:	3/14/2022
Project Name:	CTUIR TSP

Intersection Crash Data

Intersection	Intersection Type	Year 2016	2017	2018	2019	2020	Total
Mission Road/Timíne Way	Rural 3ST	0	0	0	0	1	1
Mission Road/OR 331	Rural 4ST	0	0	1	0	3	4
Mission Road/Short Mile Road	Rural 3ST	0	0	0	0	0	0
Mission Road/Emigrant Road-Cayuse Road	Rural 3ST	0	0	0	0	0	0
OR 331/Timíne Way	Rural 3ST	1	0	0	0	0	1
OR 331/Wildhorse Boulevard	Rural 3ST	0	1	0	0	0	1
OR 331/Kusi Road	Rural 4ST	0	1	1	1	0	3
OR 331/Spilya Road	Rural 4ST	2	0	0	2	0	4
OR 331/Arrowhead Travel Plaza Access	Rural 3ST	1	0	1	0	1	3
OR 331/Kash Kash Road	Rural 3ST	0	0	0	0	0	0
I-84/OR 331 Interchange Westbound Ramps	Rural 3ST	0	0	1	2	0	3
I-84/OR 331 Interchange Eastbound Ramps	Rural 3ST	2	0	0	1	1	4
S Market Road/Tokti Road	Rural 3ST	0	0	0	0	0	0
							0
							0
							0
							0
							0
							0
							0
							0
							0
							0
							0
							0
							0
							0
							0
							0
							0
							0
							0
							0
	Total	6	2	4	6	6	24

Intersection Population Type Crash Rate
Average Crash Rate per intersection type

Intersection Pop. Type	Sum of Crashes	Sum of 5-year MEV	Avg Crash Rate for Ref Pop.	INT in Pop
Rural 3SG	0	0		
Rural 3ST	13	97	0.1347	10
Rural 4SG	0	0		
Rural 4ST	11	40	0.2745	3
Urban 3ST	0	0		
Urban 3SG	0	0		
Urban 4ST	0	0		
Urban 4SG	0	0		

Critical Rate Calculation

Intersection	AADT Entering Intersection	5-year MEV	Crash Total	Intersection Population Type	Intersection Crash Rate	Reference Population Crash Rate	Critical Rate	Over Critical
Mission Road/Timíne Way	4,480	8.2	1	Rural 3ST	0.12	0.13	0.41	Under
Mission Road/OR 331	7,680	14.0	4	Rural 4ST	0.29	APM Exhibit 4-1		
Mission Road/Short Mile Road	3,230	5.9	0	Rural 3ST	0.00	0.13	0.47	Under
Mission Road/Emigrant Road-Cayuse Road	950	1.7	0	Rural 3ST	0.00	0.13	0.88	Under
OR 331/Timíne Way	5,320	9.7	1	Rural 3ST	0.10	0.13	0.38	Under
OR 331/Wildhorse Boulevard	5,830	10.6	1	Rural 3ST	0.09	0.13	0.37	Under
OR 331/Kusi Road	6,690	12.2	3	Rural 4ST	0.25	APM Exhibit 4-1		
OR 331/Spilya Road	7,590	13.9	4	Rural 4ST	0.29	APM Exhibit 4-1		
OR 331/Arrowhead Travel Plaza Access	8,680	15.8	3	Rural 3ST	0.19	0.13	0.32	Under
OR 331/Kash Kash Road	8,520	15.5	0	Rural 3ST	0.00	0.13	0.32	Under
I-84/OR 331 Interchange Westbound Ramps	8,810	16.1	3	Rural 3ST	0.19	0.13	0.32	Under
I-84/OR 331 Interchange Eastbound Ramps	5,260	9.6	4	Rural 3ST	0.42	0.13	0.38	**Over**
S Market Road/Tokti Road	1,810	3.3	0	Rural 3ST	0.00	0.13	0.62	Under

General & Site Information	
Analyst:	Kittelson & Associates, Inc.
Agency/Company:	ODOT
Date:	3/14/2022
Project Name:	CTUIR TSP

Reference Population Type Crash Rates

Segment Reference Population Type	Population Type Number	No. of Segs in Reference Population	Sum of Crashes	Sum of MVMT	Avg Crash Rate for Ref Pop.
Rural Minor Arterial	1	8	14	28.0	0.50
Rural Major Collector	2	5	20	38.5	0.52
Rural Minor Collector	3	2	3	3.0	Not enough sites
Rural Local	4	5	6	16.7	0.36
	5				
	6				

Crash Rate Table II

2019 rate	2018 rate	2017 rate	Average
1.16	1.17	1.34	1.22
1.25	1.59	1.51	1.45
3.24	0.86	0.93	1.68
0	0	8.43	2.81

Critical Rate Calculation

Segment	Ref. Pop. Type	Begin Milepoint	End Milepoint	5 Year Crash Total	AADT	Segment Length	Pop. Type Number	MVMT	Segment Crash Rate	Ref. Pop. Crash Rate	Critical Rate	Over Critical	Roadway
1	Rural Minor Arterial			5	2900	1.48	1	7.84	0.64	0.50	0.98	Under	OR 331
2	Rural Minor Arterial			2	4400	0.24	1	1.91	1.05	0.50	1.60	Under	OR 331
3	Rural Minor Arterial			4	4800	0.97	1	8.54	0.47	0.50	0.96	Under	OR 331
4	Rural Minor Arterial			1	4600	0.31	1	2.57	0.39	0.50	1.42	Under	OR 331
5	Rural Minor Arterial			0	6100	0.10	1	1.07	0.00	0.50	2.09	Under	OR 331
6	Rural Minor Arterial			0	7000	0.11	1	1.42	0.00	0.50	1.83	Under	OR 331
7	Rural Minor Arterial			0	8500	0.20	1	3.11	0.00	0.50	1.32	Under	OR 331
8	Rural Minor Arterial			2	5000	0.17	1	1.58	1.27	0.50	1.74	Under	OR 331
9	Rural Minor Collector			2	1800	0.42	3	1.38	1.45	Not enough sites			Market Rd
10	Rural Major Collector			10	3300	2.11	2	12.70	0.79	0.52	0.89	Under	Mission Rd
11	Rural Major Collector			0	3300	0.59	2	3.57	0.00	0.52	1.29	Under	Mission Rd
12	Rural Major Collector			1	3700	0.46	2	3.10	0.32	0.52	1.35	Under	Mission Rd
13	Rural Major Collector			7	4400	1.64	2	13.15	0.53	0.52	0.88	Under	Mission Rd
14	Rural Local			1	300	2.08	4	1.14	0.88	0.36	1.72	Under	Emmigrant Rd
15	Rural Local			1	2100	0.64	4	2.46	0.41	0.36	1.19	Under	Timíne Wy
16	Rural Minor Collector			1	900	0.97	3	1.59	0.63	Not enough sites			Shortmile Rd
17	Rural Major Collector			2	700	4.68	2	5.98	0.33	0.52	1.09	Under	Cayuse Rd
18	Rural Local			0	2200	1.38	4	5.55	0.00	0.36	0.87	Under	Wildhorse Blvd
19	Rural Local			4	4600	0.87	4	7.26	0.55	0.36	0.79	Under	Kusi, Spilya, Kash Kash
20	Rural Local			0	200	0.85	4	0.31	0.00	0.36	3.74	Under	Tokti Rd
21													
22													
23													
24													
25													
26				3	2500	0.30							Kusi Road
27				0	2000	0.28							Spilya Road
28				1	100	0.28							Kash Kash Road
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E. PLANNED PROJECTS AND PREVIOUS FEEDBACK

The project team reviewed a list of background documents provided in the scope of work to understand projects previously planned within the Umatilla Indian Reservation (UIR). These projects will be brought to the alternatives development stage of the process to determine if they should be included in the Confederated Tribes of Umatilla Indian Reservation (CTUIR) Transportation System Plan (TSP) update. In addition, feedback provided through community and stakeholder outreach for the projects listed below is summarized for further consideration.

2001 CTUIR TSP

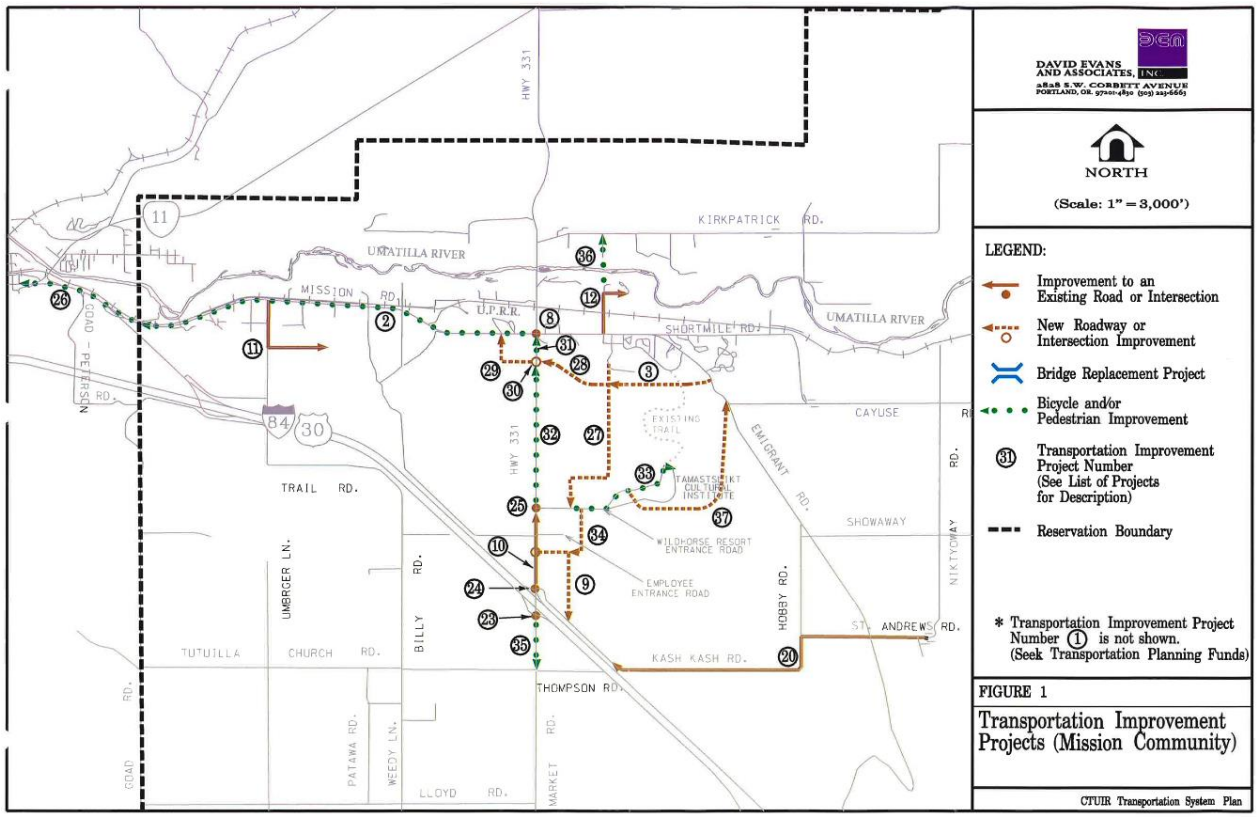
CTUIR staff provided a list of completed projects since adoption of the 2001 CTUIR TSP. The uncompleted projects to consider further in the TSP update are listed below. The corresponding figures are provided at the end of this section.

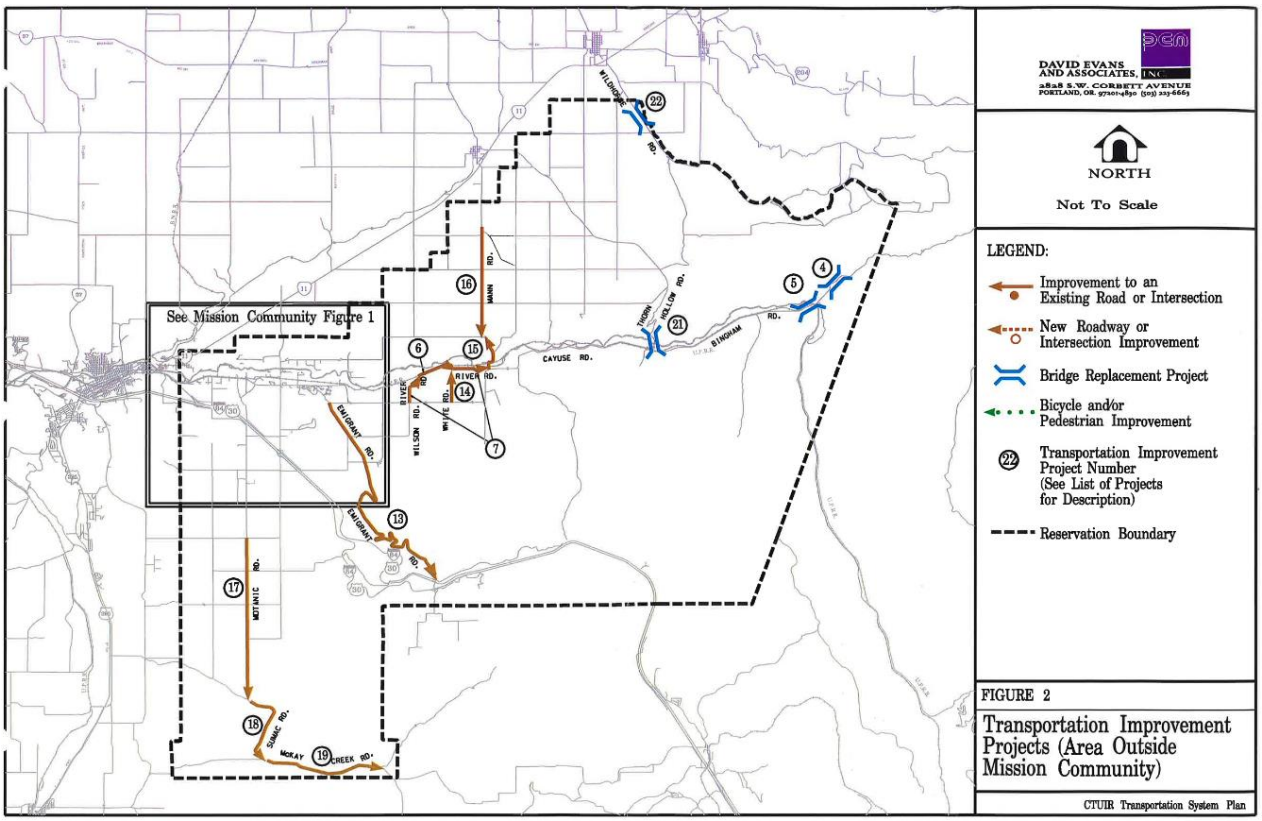
- Roadway System
    - 1: Seek Transportation Planning Funds – The BIA has stated that planning dollars are available for the CTUIR. In order to receive this money the CTUIR must identify planning to be the fust priority above all other projects listed in the priority list of transportation improvements.
    - 3: East-West Connector Road (Phase I) – Construct a new urban/rural connector road from near Aspen Way to proposed North-South Connector Road. Timing for this project will be dictated by planned developments in the area (East Bench Subdivision).
    - 6: River Road (Phase I) – Widen, align, shoulder, and add gravel from the railroad crossing east to White Road. Tribe to take over ownership of two at-grade railroad crossings and pave crossings with asphalt.
    - 9: Kash Kash Road at Highway 331 – Close existing access to Highway 331 and reroute Kash Kash Road north to a new intersection with the highway. Add exclusive left-turn lanes on the highway approaches to new intersection. Also constuct new driveway/street access on the west side of the intersection, opposite of Kash Kash Road. Install new traffic signal when warranted.
    - 10: Highway 331 Median – Construct a non-traversable landscaped median along Highway 331 from the I-84 westbound ramps to the Wildhorse Resod Entrance Road. This project also includes bicycle/pedestrian improvements.
    - 13: Emigrant Road – Add shoulders and repave Emigrant Road (County Road #937) from Mission Road to Poverly Flat 15: North Cayuse Road – Widen, align, shoulder, and pave North Cayuse Road (County Road #925) from River Road north to Mar¡n Road.
    - 16: Mann Road – Widen, align, shoulder, and pave Mann Road (County Road #925) from Crawford Hollow Road south to North Cayuse Road.
    - 17: Motanic Road – Widen, align, shoulder, and pave Motanic Road (County Road #1031) from Best Road south to Spring Creek Road.
    - 18: Sumac Road – Widen, align, shoulder, and pave Sumac Road (County Road #1050) from Spring Creek Road south to McKay Creek Road.
    - 19: McKay Creek Road – Widen, align, shoulder, and add gravel along McKay Creek Road (County Road #1050) from Sumac Road east to North Fork McKay Creek Road.
    - 22: Wildhorse Creek Bridge – Replace County Bridge #59C401 along Wild Horse Road (County Road #685). This bridge is structurally deficient.
    - 23: I-84 EB Ramps at Highway 331 – Construct exclusive left- and right-turn lanes on the off-ramp approach. Install a traffic signal when warranted.
    - 24: I-84 WB Ramps at Highway 331 –Construct exclusive left- and right-turn lanes on the off-ramp approach and an exclusive right-turn lane on the north approach. Install a traffic signal when warranted.

- 25: Wildhorse Resort Entrance Road at Highway 331 – Add an exclusive left-turn lane on the north approach of the highway. Install a traffic signal when warranted.
- 27: North-South Connector Road – Construct a new north-south connector road from the Wildhorse Resort Entrance Road to “A” Street.
- 28: East-West Connector Road (Phase II) – Extend rural connector road from proposed North-South Connector Road to Highway 331. Timing for this project will be dictated by planned developments in the area.
- 32: Highway 331 Shoulder Widening – Provide 8-foot paved shoulders along Highway 331 from Wildhorse Resort Entrance Road to proposed East-West Connector Road.
- 37: Tamastslikt Cultural Institute Connector Road – Construct a new connector road from the Tamastslikt Cultural Institute to the proposed east-west connector road, near the Cayuse Road/Emigrant Road intersection.

- Pedestrian and Bicycle Systems
  - 26: Mission Road Bike/Ped Facility (Phase II) – Complete the extension of a bicycle/pedestrian facility to the City of Pendleton along Mission Road/US Highway 30.
  - 31: Highway 331 Sidewalk and Bike Lanes – Provide bike lanes, curb and gutter, and sidewalks along Highway 331 from Mission Road to proposed East-West Connector Road.
  - 33: Wildhorse Resort Entrance Road Path – Construct a multi-use path from Tamastslikt Cultural Institute to the Wildhorse Casino.
  - 35: South Market Road Path – Construct a multi-use path along the west side of South Market Road from Tutuilla Church Road to the I-84 interchange.
  - 36: Path Across Umatilla River – Construct a multi-use path in the vicinity of Pan Lane and extending across the Umatilla River to connect with Kirkpatrick Road.

2001 CTUIR TSP Project Maps





MISSION COMMUNITY MASTER PLAN

The list below includes all the projects from the master plan. The project team will verify if any have been completed as part of the TSP update process. The corresponding figures are provided at the end of this section.

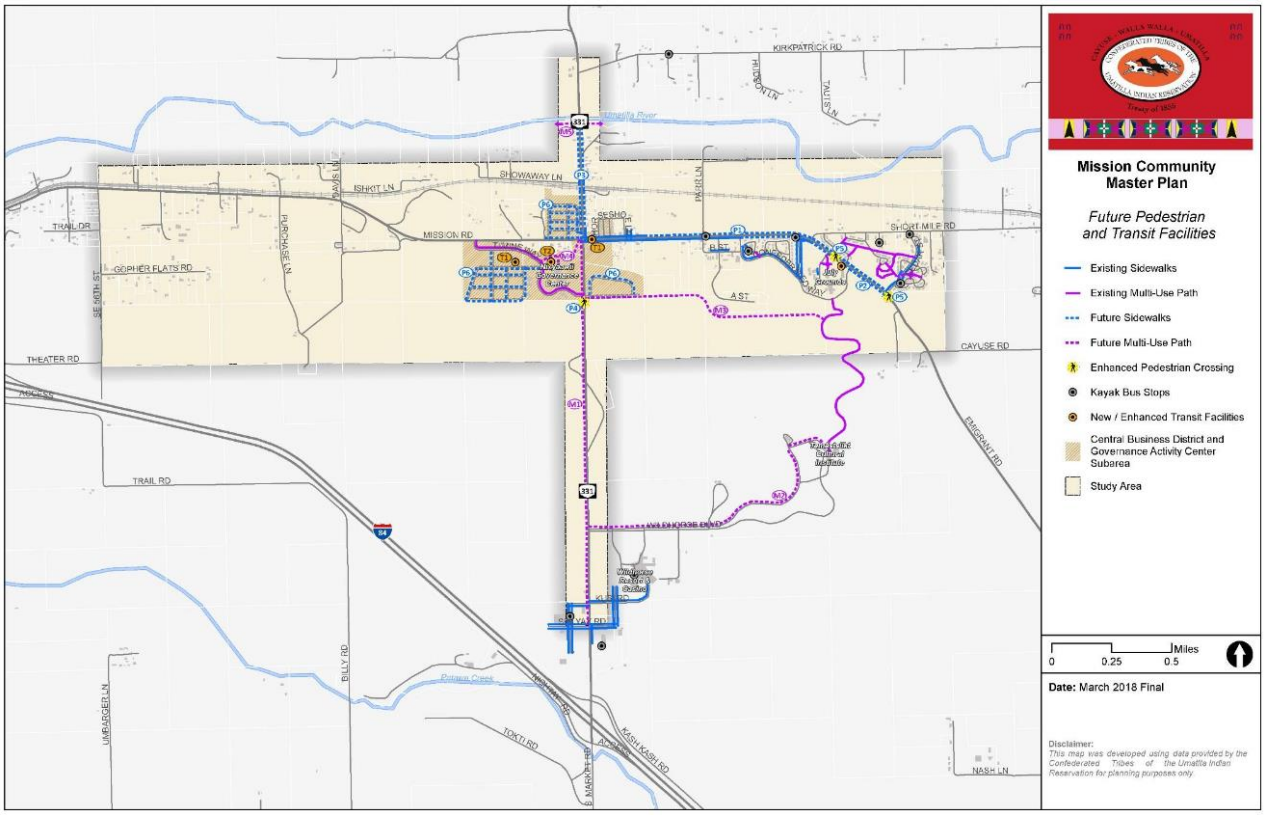
- Roadway System
    - Intersection project alternatives at OR 331/Mission Road include signalization or a single lane roundabout. The plan calls for these improvement alternatives to the OR 331 and Mission Road intersection:
        - Option 1: Signalize the intersection; Construct separate left-turn lanes on all four intersection approaches; and Construct a separate right turn lane on the northbound approach.
        - Option 2: Construct a single lane roundabout; and Realign the northbound and southbound approaches to avoid impacts to the Mission Market.
- Transit System
    - Based on feedback provided during the Mission Community Master Plan, there is a general desire from resident and transit riders for transit shelters at existing stops throughout the Mission study area. In addition, two projects were identified:
    - T1: (For multiple locations) Install new transit amenities including new shelters with real-time transit tracking, benches, lighting, etc.
    - T2: Designate some existing parking spaces within the Nixyaawii Governance Center for use as a park-and-ride for Mission community members riding Kayak to other regional locations.
- Pedestrian System
    - P1: Install six-foot sidewalks along the north side of Mission Road.
    - P2: Complete the sidewalk network along the south side of Mission Road from Confederated Way to Cedar Street. Widen existing sidewalks near the Four Corners area to six feet and address the existing mailbox obstructions located across from Lucky Seven.
    - P3: Install sidewalks along the east and west sides of OR 331.
    - P4: Install an enhanced pedestrian crossing treatment. Treatment may include signalization (if warranted) or a grade separated undercrossing of OR 331.
    - P5: Install an enhanced pedestrian crossing such as a Rectangular Rapid Flashing Beacon.
    - P6: Install sidewalks along all new residential and mixed-use streets.
- Pedestrian and Bicycle Systems
    - M1: Construct a separated paved multi-use path along the west side of OR 331 from Mission Road to Spilya Road.
    - M2: Construct a paved multi-use path along the north side of Wildhorse Boulevard. Could be a separated path or as an extension of the existing road surface.
    - M3: Construct a new multi-use path along the top of the bluff connecting OR 331 to the Tamastslikt Trail.
    - M4: Construct a new multi-use path connecting the Nixyáawii Governance Center to the Four Corners Area.
    - M5: Construct a new multi-use trail along the south side of the Umatilla River on in parallel but offset from the river where applicable.
    - Consider the construction of a new multi-use trail connection between the Nixyaawii Governance Center and the employment areas near the Wildhorse Casino and Coyote Business Park. This

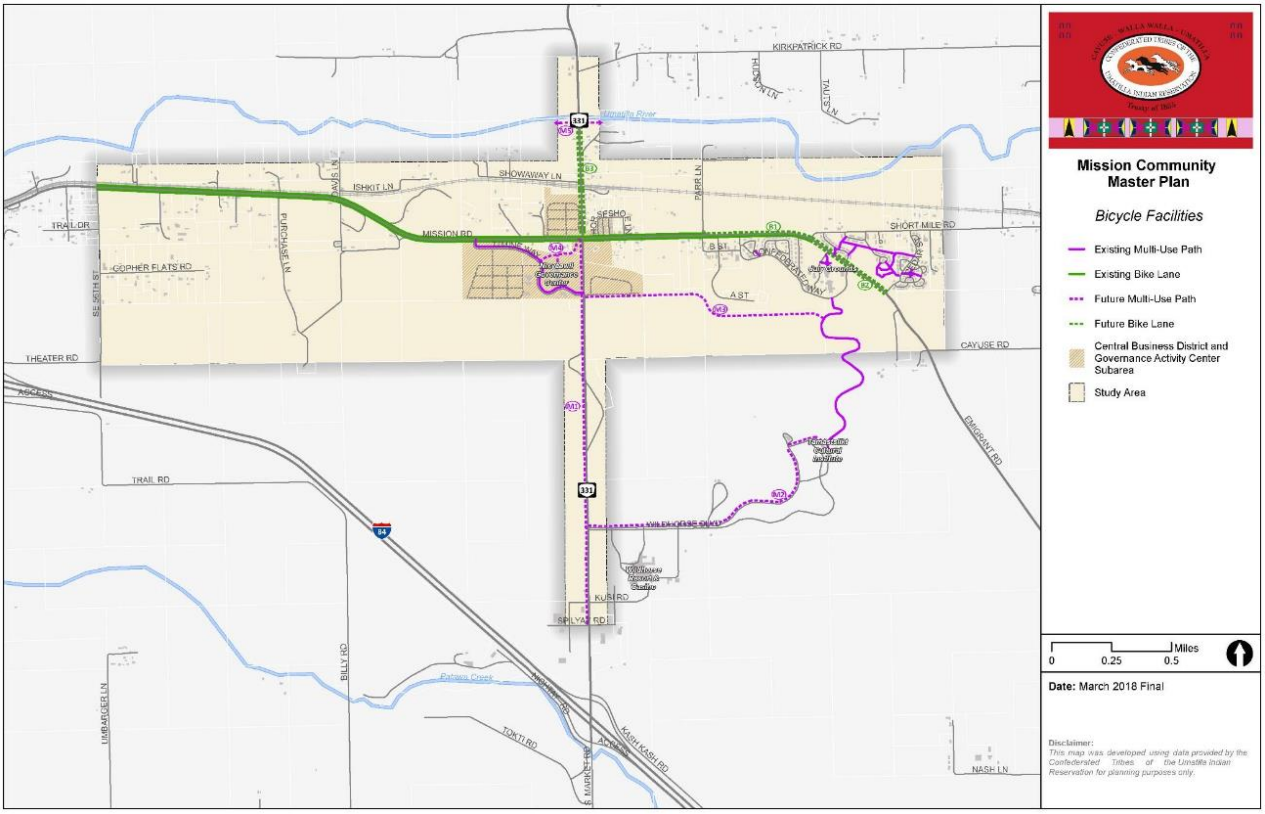
connection would likely necessitate a formal pedestrian crossing treatment along the OR 331 corridor.

- Consider the development of a new multi-use trail connection within or along the greenway that runs parallel to Mission Road. This improvement would offer a nature-based alternative to walking along Mission Road.
- Consideration enhancements to existing and new pedestrian crossings including: raised crosswalk, Rectangular Rapid Flashing Beacons (RRFBs), raised median island, enhanced striping patterns, and curb extensions.

- Bicycle System
  - B1: Widen Mission Road and install bicycle lanes along the north side all the way east to Cedar Street.
  - B2: Widen Mission Road and install bicycle lanes along the south side from Short Mile Road to Cedar Street.
  - B3: Install bicycle lanes along the east and west sides of OR 331.
- Outreach insight: key destinations include employment centers (Wildhorse Casino, Coyote Business Park, Nixyaawii Governance Center, BIA Headquarters), Nixyaawii Community School, Cultural Centers (July Grounds, Mission Tribal Longhouse), Parks (Wetland Community Park, golf course, Umatilla River), and Neighborhoods (Mission Creek Subdivision and surrounding neighborhoods, future Bowman Property neighborhood development, future Four Corners neighborhood development)

2018 Mission Community Master Plan Project Maps

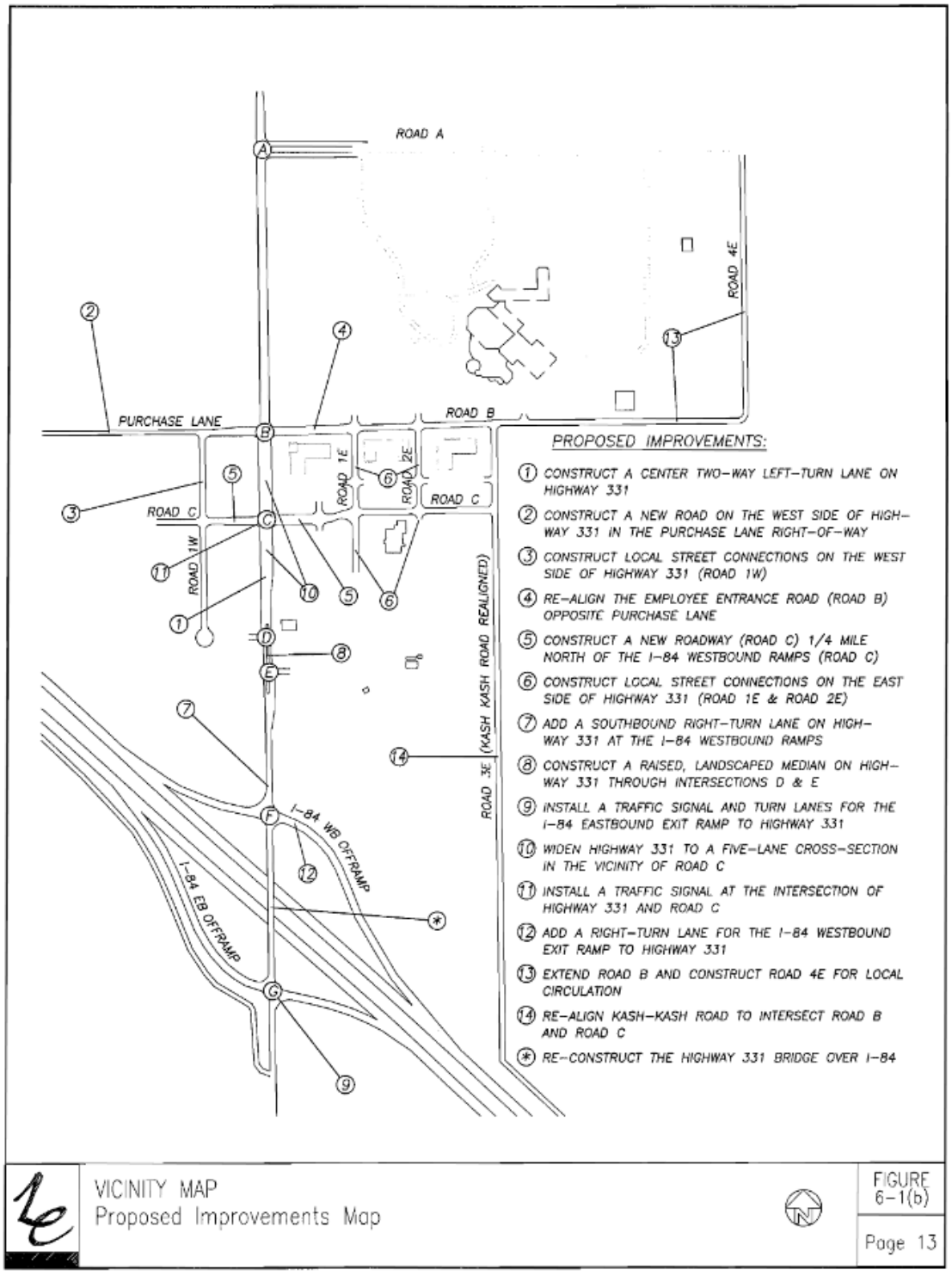




OR 331 ACCESS MANAGEMENT IMPLEMENTATION STRATEGY AND CIRCULATION PLAN

15 proposed improvements were identified for OR 331 between Mission Road and the I-84 eastbound ramp terminals, described and shown in the map.

2006 OR 331 Access Management Implementation Strategy and Circulation Plan Preferred Option Map



UMATILLA COUNTY TSP

The Umatilla County TSP includes a separate table (Table 7-10) that summarizes projects within the Umatilla Indian Reservation boundary. The project team will verify if any have been completed as part of the TSP update process.

- Roadway System (projects from Table 7-10)
    - 1: Emigrant Road – Repave and shoulder
    - 2: River Road – Widen, align, shoulder, pave
    - 3: White Road – Widen, align, shoulder, pave
    - 4: North Cayuse Road – Widen, align, shoulder, pave
    - 5: Mann Road – Widen, align, shoulder, pave
    - 6: Motanic Road – Widen, align, shoulder, pave
    - 7: Sumac Road – Widen, align, shoulder, pave
    - 8: McKay Creek Road – Widen, align, shoulder, pave
    - 9: Kash Kash Road/St. Andrews Road – Widen, align, shoulder, pave, and repave
    - 10: Gibbon/Umatilla River Bridge – Bridge Replacement/SR>55
    - 11: Thornhollow Cattle Pass Bridge – Bridge Replacement (structurally deficient)
    - 12: Wild Horse Creek Bridge – Bridge Replacement (structurally deficient)
    - The recommended minimum shoulder width for OR 311 is 8 feet (Table 7-11)

SAFE ROUTES TO SCHOOL PLAN

The Safe Routes to School Plan Phase I was completed in 2020, including an initial plan document with sections to complete in Phase II. The Phase I improvement map is provided at the end of this section.

- Pedestrian and Bicycle Systems
    - Complete Phase II of the plan, resulting in projects and programs to include in the updated TSP for future funding opportunities and implementation. Phase II will complete the plan document already started through Phase I. The map below summarizes the improvements proposed through Phase I.
    - Outreach insights:
        - Hwy 331 and Mission Rd intersection is a significant barrier for people walking and biking near the Nixyáawii Community School.
        - Community members would like to be able to walk longer distances to reach the school and other destinations such as the Senior Center, Wildhorse Casino, and Pendleton

2020 Safe Route to School Plan Phase I Improvements Maps

Map produced July 2020

Legend

- Crosswalk
- Sidewalk Improvements
- Curb Ramp
- R13-7
- Multi-use path
- Buffered bike lane with pavement markings
- R1-6a
- W11-2 with 16-9P
- W11-2 with 16-7P
- S1-1 with 16-9P
- S1-1 with 16-7P

1. Mission Road and Hwy 331: Install perpendicular curb ramps on all four corners of the intersection. Install 2' wide high visibility white thermoplastic continental crosswalk markings across each leg of the intersection. Upgrade the stormwater system and review pedestrian lighting needs at the intersection, as necessary.

2. Parking along Mission Road: Install bike lane symbol pavement markings and stripe a buffer within the existing bike lanes east of the Four Corners intersection about 2,100 feet along the north side of the road and about 4,200 feet along the south side of the road. Install accompanying bike lane signs.

3. Mission Road and Hwy 331: Review the community's desire to construct a multi-use path along the south side of the road as had been indicated in previous planning documents. Consider enhanced crossings across Mission Rd, such as at Alexander Ln and Ti'mine Way, based on anticipated crossing demand.

4. Mission Road and Horseshoe Lane: Install perpendicular curb ramps on each side of Mission Rd. Install 2' wide high visibility white thermoplastic continental crosswalk markings with associated warning signage across Mission Rd (R1-6a, W11-2 with 16-7P and W11-2 with 16-9P).

5. Mission Road and B St: Install 2' wide high visibility white thermoplastic continental crosswalk markings with perpendicular curb ramps and associated warning signage, across Mission Rd, on the east leg of the Parr Ln/B St and Mission Rd intersection (R1-6a, W11-2 with 16-7P and W11-2 with 16-9P).

6. Hwy 331: Install 6' sidewalks along the east side of Hwy 331 north of the existing sidewalk at the Four Corners intersection extending to Showaway Ln. Install a 12' multi-use path along the west side of Hwy 331 south of the Four Corners intersection extending to Ti'Mine Way.

7. Ti'Mine Way: Install bidirectional Pedestrian Crossing signs (S1-1 with W16-7P, S1-1 with W16-9P) in advance of the crosswalks on Ti'Mine Way.

Mission Road between Confederated Way and Cedar Street: Install 6'sidewalks along the south side of Mission Rd / Cayuse Rd between the western intersection of Confederated Way and Cedar St (not pictured in map extent).
Install 6' sidewalks along the north side of Cayuse Rd between Short Mile Rd and Cedar St, as project budget allows (not pictured in map extent).
Upgrade the two existing marked crosswalks to ADA standards within the segment of roadway, and review additional marked crossing locations if installing only south side sidewalks (not pictured in map extent).

F. ACTIVE TRANSPORTATION AND TRANSIT TOOLBOX

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851 SW 6th Avenue, Suite 600
Portland, OR 97204
P 503.228.5230

This document provides a compilation of active transportation treatments including bicycle, pedestrian and transit development features that could potentially be considered for inclusion in the Confederated Tribes of Umatilla Indian Reservation (CTUIR) Transportation System Plan Update (TSP). This toolbox provides illustrative examples of design elements, including text explanations of the pros and cons for use within the TSP study area, and outlines the approximate right-of-way (ROW) as well as other factors to consider in development of alternatives.

ACTIVE TRANSPORTATION TREATMENTS

The treatments are organized into the following categories:

- Bicycle Facilities & Amenities
- Pedestrian Facilities & Amenities
- Transit Facilities & Amenities

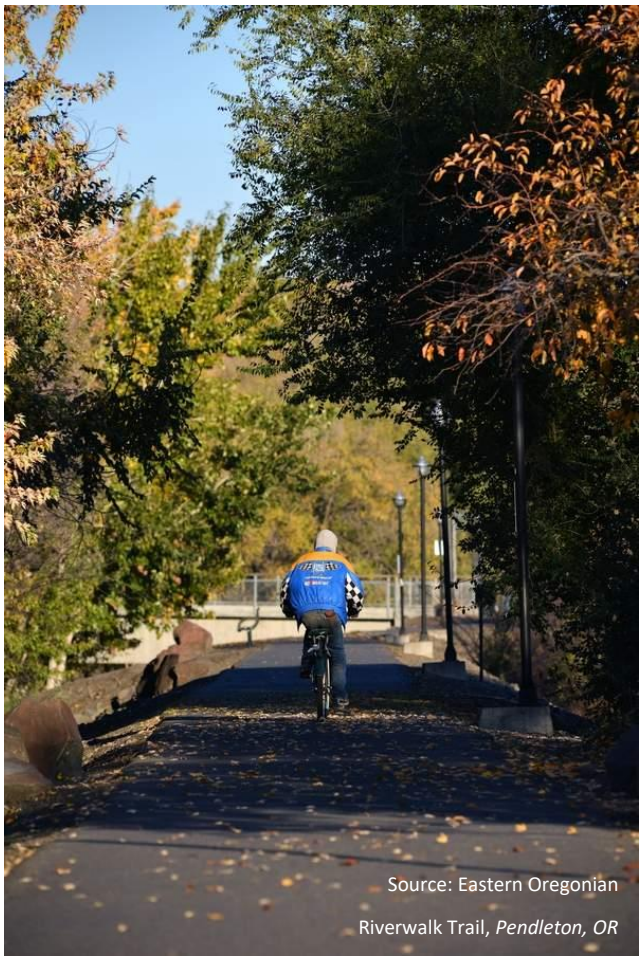
Headers and footers indicate the categories. Where applicable, the treatments are organized from highest level of protection to lowest level of protection. Typically, the treatments that provide the most protection will have the highest appeal to a wide variety of users. For example, bicycle treatments are commonly categorized by the level of separation they provide bicyclists from motor vehicles. Separated facilities have been found to attract more bicyclists of a variety of ages and abilities and are generally considered “lower stress” facilities. However, separated facilities must be carefully designed to allow for safe crossings and turning movements for both motor vehicles and bicyclists at intersections. As another example, treatments for pedestrian mid-block crossings range from a high-level of protection with a pedestrian signal to a lower level of protection with a high-visibility crosswalk. Intermediary levels of protection can be provided with a pedestrian hybrid beacon or rectangular rapid flashing beacon.

Each treatment page also includes a section with resources for additional guidance on that treatment. The ODOT Blueprint for Urban Design can also be used as a resource for identifying appropriate treatment types based on a performance based, context sensitive, and practical design approach to accommodate all modes of transportation.

Bicycle Facilities

MULTI-USE PATH

Cost: $$$



Source: Eastern Oregonian

Riverwalk Trail, *Pendleton, OR*

Powder River Trail, *Baker City, OR*

Multi-use paths are paved, bi-directional, trails away from roadways that can serve both pedestrians and bicyclists. Multi-use paths can be used to create longer-distance links within and between communities and provide regional connections. They play an integral role in recreation, commuting, and accessibility due to their appeal to users of all ages and skill levels.

Benefits

- Provides facility for both pedestrians and bicyclists in less space than separate facilities.
- Separation from motor vehicles can attract users of all levels.

Constraints

- May be unsafe in areas with frequent crossings or driveways.
- When parallel to roadways, requires substantial space for buffer.
- Potential for conflicts between bicyclists and pedestrians due to shared facility.
- Isolated paths may introduce personal security concerns.

Typical Applications

- Medium- to long-distance links within and between communities that also serve as recreational facilities.
- Parallel to roads in rural areas where sidewalks and on-street facilities are not present.

Design Considerations

- Best suited in areas where roadway crossings can be minimized (such as parallel to travel barriers such as highways, railroad tracks, rivers, shorelines, natural areas, etc.).
- Necessitate high-visibility treatments for crossings.
- A minimum width of 10 feet is recommended for low-pedestrian/bicycle-traffic contexts; 12 to 20 feet should be considered in areas with moderate to high levels of bicycle and pedestrian traffic.
- Pavement markings can be used to indicate distinct space for pedestrian and bicycle travel.

Additional Guidance

- AASHTO Guide for the Development of Bicycle Facilities
- ODOT Highway Design Manual

BUFFERED BIKE LANE

Cost: $-$$$

Bend, OR

Source: movingahead.org

Buffered bicycle lanes are on-street lanes that include an additional striped buffer of typically 2-3 feet between the bicycle lane and the vehicle travel lane and/or between the bicycle lane and the vehicle parking lane.

Benefits

- A parking-edge buffer on streets with on-street parking can reduce the likelihood of "dooring."
- Increased separation from motor vehicles (over standard bicycle lanes) can increase bicyclist comfort.

Constraints

- Does not provide physical protection and therefore may not attract bicyclists of all levels.
- The additional width provided by the buffer may invite motorists to illegally park in the lane if not adequately signed and enforced.

Typical Applications

- Long-distance links within and between communities.
- Streets with sufficient pavement width to provide a buffer.
- Widely applicable in both urban and rural settings.
- Segments of the bicycle network with moderate vehicle speeds or volumes.

Design Considerations

- Typical buffer width is 2-3 feet, in addition to standard bicycle lane width of 5-6 feet, but a combined width of 6 feet is acceptable.
- Green pavement markings or striping can add visibility and awareness in "conflict areas" or intersections where bicycle and vehicle travel paths cross.
- Buffer space can have markings or rumble strips to deter vehicles from traveling or parking in the space.

Additional Guidance

- AASHTO Guide for the Development of Bicycle Facilities
- NACTO Urban Bikeway Design Guide
- ODOT Highway Design Manual
- ODOT Bicycle and Pedestrian Design Guide

ONE-WAY SEPARATED BIKE LANE

Cost: $-$$$


Portland, OR

Portland, OR


Boise, ID

A one-way separated bike lane (SBL), also known as a cycle track or protected bike lane, is a bicycle facility within the street right-of-way separated from motor vehicle traffic by a buffer and a physical barrier, such as planters, flexible posts, parked cars, or a mountable curb. On two-way streets, a one-way SBL would be found on each side of the street, like a standard bike lane.

Benefits

- Provides physical separation from motor vehicle traffic, which can attract users of all levels.
- Buffer can provide opportunities for landscaping.
- Reduced risk of "dooring" when parked cars are present.

Constraints

- Requires additional right-of-way over standard bike lane.
- Construction may be more expensive than standard bike lane.
- May introduce street maintenance considerations, depending on buffer type.

Typical Applications

- Roadway segments with sufficient right-of-way or where a "road diet" (vehicle lane reduction) can be implemented.
- Key segments of the bicycle network where more protection is desirable, such as areas with higher traffic volumes or speeds, or routes to common destinations, like schools.
- Roadways with infrequent driveways and side street accesses.

Design Considerations

- Intersections must be designed to ensure visibility of bicyclists using the facility. Treatments include separate signal phases for bicyclists and high visibility pavement markings.
- Buffer type can vary depending on context, presence of parking, and available right-of-way.
- Green pavement markings or striping can add visibility and awareness in "conflict areas" or intersections where bicycle and vehicle travel paths cross.

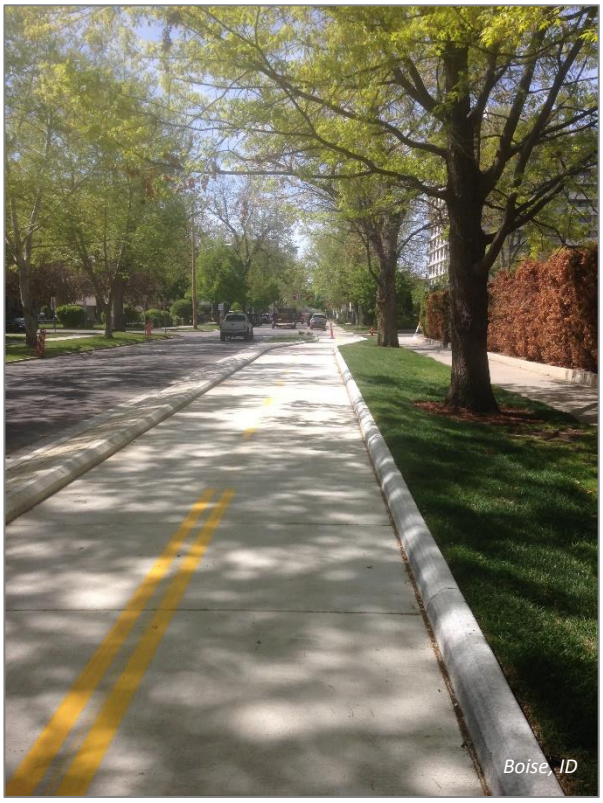
Additional Guidance

- NACTO Urban Bikeway Design Guide
- CROW Design Manual for Bicycle Traffic
- ODOT Highway Design Manual
- ODOT Bicycle and Pedestrian Design Guide
- FHWA Separated Bike Lane Planning and Design Guide

TWO-WAY SEPARATED BIKE LANE

Cost: $-$$$


Klamath Falls, OR


Boise, ID

A two-way separated bike lane (SBL), also known as a two-way cycle track or protected bike lane, is a facility within the street right-of-way separated from motor vehicle traffic by a buffer and a physical barrier, such as planters, flexible posts, parked cars, or a mountable curb. Two-way SBLs serve bi-directional bicycle travel within the facility on one side of the street.

Benefits

- Requires less right-of-way than a one-way SBL, due to the need for only one buffer.
- Provides physical separation from motor vehicle traffic, which can attract users of all levels.
- Reduced risk of "dooring" when parked cars are present.

Constraints

- May be less intuitive due to apparent "wrong-way" travel on one side of street.
- Concern about crashes in areas with frequent crossings or driveways.
- Construction may be more expensive than standard bike lane.
- May introduce street maintenance considerations, depending on buffer type.

Typical Applications

- On-street connections between off-street multi-use paths.
- Roadways with infrequent driveways and side street accesses.
- Key segments of the bicycle network where more protection is desirable, such as areas with higher traffic volumes or speeds or routes to common destinations, like schools.
- On one-way streets where two-way bicycle travel is desirable.

Design Considerations

- Intersections must be designed to ensure visibility of bicyclists using the facility. Treatments include separate signal phases for bicyclists and high visibility pavement markings.
- Buffer type can vary depending on context, presence of parking, and available right-of-way.
- Green pavement markings or striping can add visibility and awareness in "conflict areas" or intersections where bicycle and vehicle travel paths cross.

Additional Guidance

- Same as for one-way SBLs

STANDARD BIKE LANE

Cost: $-$$$

Heppner, OR

Redmond, OR

A standard bike lane is an on-street facility that provides space designated for bicyclists, separated from vehicles by pavement markings.

Benefits

- Provides a designated facility for bicyclists using the minimum pavement width.
- Provides increased visibility for bicyclists.
- Relatively inexpensive treatment when pavement width is available.

Constraints

- Can position bicyclists in the "door zone" if located adjacent to parked vehicles without a buffer.
- Motorists may illegally park in the lane if not adequately signed and enforced.
- Does not provide physical protection or horizontal buffer from vehicles and therefore does not attract bicyclists of all levels.

Typical Applications

- Arterials, collectors, and other non-local streets with speeds higher than 25 mph or over 3,000 average daily motorized traffic volumes.
- Streets without sufficient right-of-way or pavement width for buffered bike lanes or separated bike lanes (SBLs).

Design Considerations

- Typical bike lane width is 6 feet, with 5 feet in constrained locations. A minimum 4-foot width can be used on constrained segments where on-street parking is not present.
- Green pavement markings or striping can add visibility and awareness in "conflict areas" or intersections where bicycle and vehicle travel paths cross.

Additional Guidance

- AASHTO Guide for the Development of Bicycle Facilities
- NACTO Urban Bikeway Design Guide
- ODOT Highway Design Manual
- ODOT Bicycle and Pedestrian Design Guide

PAVED SHOULDER

Cost: $-$$

Tucson, AZ


Irrigon, OR

A paved road shoulder can serve as a bicycle facility that provides space separated from motor vehicle traffic in rural areas.

Benefits

- Provides a space separated from motorists.
- Requires less right-of-way than a separated multi-use path.

Constraints

- Does not provide physical protection from vehicles and may not attract bicyclists of all levels.
- Shoulders serving other uses, such as broken-down vehicles, may force bicyclists into travel lanes.

Typical Applications

- Typically applied on rural roadways.
- Also used as an interim treatment in urbanizing areas.

Design Considerations

- A 6-foot width is preferred to accommodate bicycle travel, with a 4-foot minimum in constrained areas. Greater widths can be used in higher-speed locations.
- Rumble strips or profiled striping can be used to enhance safety and minimize motorists encroaching on the shoulder.

Additional Guidance

- AASHTO Guide for the Development of Bicycle Facilities
- ODOT Highway Design Manual
- ODOT Bicycle and Pedestrian Design Guide

SHARED LANE ROADWAYS

Cost: <$

Prince George's County, MD

Portland, OR


Boise, ID

Shared lane roadways include roadways without separate bicycle facilities on which bicycle travel is not prohibited. Most roadways, with the exception of some limited access freeways, are "shared lane roadways" if they do not have a different type of bicycle facility. Shared lane roadways that are part of a designated bicycle network may include shared lane markings ("sharrows") or signage to indicate the legal presence of bicyclists in the travel lane.

Benefits

- Allows for bicycle travel when other treatments are not feasible.
- Low- to no-cost.

Constraints

- Does not provide any separation from vehicles.
- Without additional traffic-calming treatments, it is likely to attract only strong and fearless bicyclists.

Typical Applications

- Rural roadways without shoulders often use "share the road" signage to indicate to road users that bicyclists may be present.
- Sharrows are typically used in urban or suburban locations on bicycle network links where other facilities are not present.

Design Considerations

- Sharrows should be placed at least 4 feet from the edge of the curb or on-street parking.

Additional Guidance

- ODOT Bicycle and Pedestrian Design Guide
- ODOT Highway Design Manual
- Manual on Uniform Traffic Control Devices (MUTCD)

BICYCLE PARKING

Cost: $


Baker City, OR


Boise, ID

Devices and/or areas that allow secure bicycle parking, often located at areas of high bicycle and pedestrian traffic such as bus stations, shopping centers, schools, and multi-use trails.

Benefits

- Provides a secure location to store and lock bicycles.
- Relatively inexpensive and easy installation.
- Encourages community bicycle use and makes local attractions/businesses more accessible to bicyclists.

Constraints

- Requires space in potentially busy areas, such as sidewalks.
- May remove on-street parking space if located on the roadway.

Typical Applications

- Typically provided at areas of high bicycle and pedestrian traffic such as bus stations, shopping centers, schools, and multi-use trails.

Design Considerations

- The size and design of the bicycle rack can vary based on the estimated number of users and available space.
- Covered bicycle parking can provide protection from the weather for parked bicycles and people as they lock and unlock bikes. Bike lockers can provide additional security.
- If possible, bicycle racks should be placed immediately adjacent to the entrance/location they serve.
- Rack should not be placed to block the entrance of a building or inhibit pedestrian flow.
- Racks should be easy to find, convenient, and secure.

Additional Guidance

- APBP Bicycle Parking Guidelines

Pedestrian Facilities

PEDESTRIAN PATH (SIDEPATH)

Cost: $$


Heppner, OR


Portland, OR

A pedestrian path is a hard-surface path adjacent to the roadway in lieu of a sidewalk in areas where other bicycle facilities exist. Similar to a multi-use path, pedestrian paths are narrower in width and generally do not invite bicycle travel.

Benefits

- Provides a hard surface for pedestrians buffered from the roadway.
- Requires less right-of-way than a multi-use path.
- Lower cost than construction of a full sidewalk with curb and gutter.

Constraints

- May also attract bicyclists, creating the potential for conflicts between pedestrians and bicyclists.

Typical Applications

- In constrained rural areas where sidewalks are not present and multi-use paths cannot be accommodated.
- As an interim treatment in urbanizing areas to make connections between sidewalk facilities.

Design Considerations

- Typically 5- to 8-foot wide asphalt surface.
- Pedestrian paths are typically separated from the roadway by a gravel or vegetated buffer instead of a curb and gutter.
- Should follow ADA standards to allow for universal access.
- Though not intended for bicyclists, pedestrian paths may attract bicyclists if a separate bicycle facility is not provided.

Additional Guidance

- FHWA Designing Sidewalks and Trails for Access
- ODOT Highway Design Manual

Pedestrian Facilities

SIDEWALK

Cost: $$$


Boise, ID


Heppner, OR

A sidewalk is a dedicated pedestrian facility adjacent to the roadway and separated from traffic by a curb.

Benefits

- Provides pedestrians with a dedicated physically-separated space.
- Provides means of mobility for people using wheelchairs, people with strollers, or others who may not be able to travel on an unpaved surface.

Constraints

- Adding a concrete curb and sidewalk to streets adds a substantial expense to the overall construction cost.
- Stormwater drainage needs to be considered when retrofitting existing streets.

Typical Applications

- Typically provided on urban (non-rural) and residential streets, with the exception of limited access freeways.
- Typically added to streets in urbanizing areas as development occurs.

Design Considerations

- Typically 6 to 8 feet wide. Sidewalks should be constructed at least 5 feet wide, with a minimum of 4 feet of clear width, excluding a shy distance of 1.5 feet from the curb and any adjacent obstructions.
- A landscaped buffer is preferable in residential areas and in locations with higher traffic speeds and volumes.
- Wider sidewalks of 12 to 20 feet can be beneficial in commercial or "town center" areas in order to accommodate higher pedestrian volumes, street furniture, pedestrian scale lighting, business signage, bike parking, transit stops, and other amenities.

Additional Guidance

- ODOT Highway Design Manual.
- ODOT Bicycle and Pedestrian Design Guide
- AASHTO Green Book
- NACTO Urban Streets Design Guide

SHOULDER PEDESTRIAN FACILITY

Cost: $-$$


Portland, OR


Boise, ID

A paved shoulder facility provides access for pedestrians on a hard surface in rural areas where sidewalks are not present.

Benefits

- Provides a hard surface space separated from motorists.
- Requires less right-of-way than a separated multi-use path.
- More cost-effective than installing sidewalks.

Constraints

- Does not provide physical protection of a curb and may not be comfortable for all users.
- Shoulders serving other uses, such as broken-down vehicles, may force pedestrians into travel lanes.

Typical Applications

- Typically applied on rural roadways.
- Also used as an interim treatment in urbanizing areas.

Design Considerations

- A 6-foot width is preferred to accommodate pedestrian travel, with a 4-foot minimum of paved surface in constrained areas. Greater widths can be used in higher-speed locations.
- Rumble strips or profiled striping can be used to enhance safety and minimize motorists encroaching on the shoulder.

Additional Guidance

- ODOT Highway Design Manual
- AASHTO Green Book

PEDESTRIAN HYBRID BEACON

Cost: $$$-$$$$

Juneau, AK


Boise, ID

A pedestrian hybrid beacon (sometimes called a HAWK signal) is a pedestrian activated signal that is unlit when not in use. It begins with a yellow light alerting drivers to slow, and then displays a solid red light requiring drivers to remain stopped while pedestrians cross the street. Finally, the beacon shifts to flashing red lights to signal that motorists may proceed after pedestrians have completed their crossing.

Benefits

- Has nearly 100 percent rate of motorist yielding behavior at crossing locations.
- Improves pedestrian safety and reduces pedestrian-involved crashes.
- Less delay to motor vehicle drivers than a signal.

Constraints

- Must be activated by pedestrians.
- More costly than other crossing treatments.

Typical Applications

- Midblock crossings with high pedestrian or bicycle demand and/or high traffic volumes.
- At locations where multi-use paths intersect with roadways.

Design Considerations

- The push button to activate the pedestrian hybrid beacon should be easily accessible by pedestrians, wheelchair users, and bicyclists (if applicable).

Additional Guidance

- Manual on Uniform Traffic Control Devices (MUTCD)
- NACTO Urban Street Design Guide
- NCHRP Report 562 Improving Pedestrian Safety at Unsignalized Crossings
- http://safety.fhwa.dot.gov/provencountermeasures/

RECTANGULAR RAPID FLASHING BEACON (RRFB)

Cost: $$-$$$

Pendleton, OR


Irrigon, OR


Bend, OR

These crossing treatments include signs that have a pedestrian-activated "strobe-light" flashing pattern to attract motorists' attention and provide awareness of pedestrians and/or bicyclists that are intending to cross the roadway.

Benefits

- Provides a visible warning to motorists at eye level.
- Increases motorists yielding behavior at crossing locations over round yellow flashing beacons (80 to 100 percent compliance).
- Allows motorists to proceed after yielding to pedestrians and bicyclists.

Constraints

- Flashing beacons must be activated by pedestrians.
- Motorists may not understand the flashing lights of the RRFB, so compliance may be lower than with a traffic signal.

Typical Applications

- Midblock crossings with medium to high pedestrian or bicycle demand and/or medium to high traffic volumes.
- Locations where multi-use paths intersect with roadways.

Design Considerations

- The push button to activate the RRFB should be easily accessible by pedestrians, wheelchair users, and bicyclists (if applicable).
- Consider adding a push button in the median island for crossings of multi-lane facilities.

Additional Guidance

- Manual on Uniform Traffic Control Devices (MUTCD)
- NACTO Urban Street Design Guide
- NCHRP Report 562 Improving Pedestrian Safety at Unsignalized Crossings
- ODOT Bicycle and Pedestrian Design Guide

CROSSING ISLAND (PEDESTRIAN REFUGE)

Cost: $-$$


Bend, OR

Sacramento, CA

A crossing island in the median provides a protected area in the middle of a crosswalk for pedestrians to stop while crossing the street. Also called pedestrian refuge islands or median refuges, they can be used at intersections or mid-block crossings.

Benefits

- Reduces pedestrian exposure at marked and unmarked crosswalks.
- Requires shorter gaps in traffic to cross the street.
- Allows pedestrians to cross in two phases.
- Proven safety countermeasure.

Constraints

- Streets with constrained right-of-way may not have sufficient width to allow for a crossing island.

Typical Applications

- Preferred treatment for crossings of multi-lane streets.
- Often used in areas with high levels of vulnerable pedestrian users, such as near schools or senior centers/housing.
- Often applied in areas with high traffic volumes or with a pedestrian crash history.

Design Considerations

- Must have at least 6 feet of clear width to accommodate people using wheelchairs.
- At crossing locations where bicyclists are anticipated, a width of 10 feet or greater is desirable to accommodate bicycles with trailers or groups of bicyclists.
- Can be applied in conjunction with other traffic control treatments.

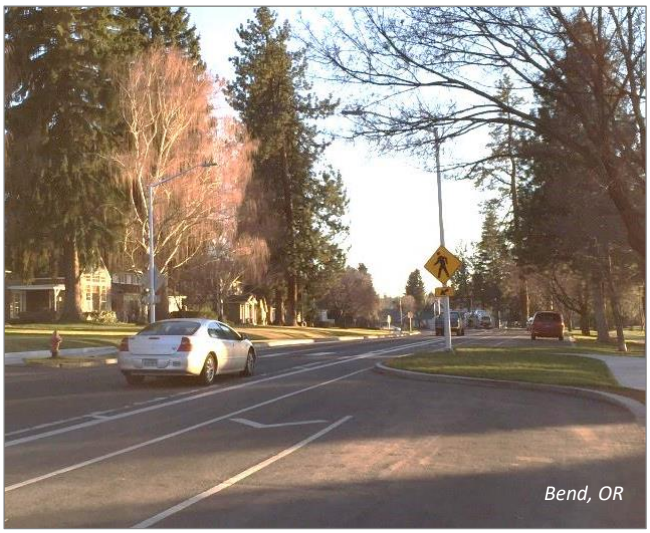
Additional Guidance

- ODOT Bicycle and Pedestrian Design Guide
- NACTO Urban Streets Design Guide
- NCHRP Report 562 Improving Pedestrian Safety at Unsignalized Crossings
- http://safety.fhwa.dot.gov/provencountermeasures/

BULB-OUT/CURB EXTENSIONS

Cost: $$


Heppner, OR


Bend, OR

An extension of the curb or the sidewalk into the street (in the form of a bulb), usually at an intersection, that narrows the vehicle path, inhibits fast turns, and shortens the crossing distance for pedestrians.

Benefits

- Shortens crossing distances for pedestrians.
- Reduces motorist turning speeds.
- Increases visibility between motorists and pedestrians.
- Enables permanent parking
- Enables tree and landscape planting and water runoff treatment.

Constraints

- Can only be used on streets with unrestricted on-street parking.
- Physical barrier can be exposed to traffic.
- Greater cost and time to install than standard crosswalks.
- Can present turning radius problems to large vehicles.

Typical Applications

- Mid-block or intersection pedestrian crossings on streets with unrestricted on-street parking.
- Streets with on-street parking where pedestrian volumes ≥ 20 pedestrians per hour, ADT ≥ 1,500 vehicles per day, and average right-turn speeds ≥ 15 mph.

Design Considerations

- Include a narrow passage for bicyclists to prevent conflict with vehicles.
- Provide accessible curb ramps and detectible warnings.
- Include landscaping on the curb extension to differentiate path for pedestrian travel, especially for pedestrians with vision impairments.

Additional Guidance

- ITE/FHWA Report Traffic Calming: State of the Practice
- FHWA Designing Sidewalks and Trails for Access *Part II of II: Best Practices Design Guide*

RAISED PEDESTRIAN CROSSING

Cost: $$


Orlando, FL


Pendleton, OR


Sanford, FL

Raised pedestrian crossings bring the level of the roadway even with the sidewalk, providing a level pedestrian path and requiring vehicles to slow. Raised crossings can be used at midblock crosswalks or intersections.

Benefits

- Provides a better view for pedestrians and motorists
- Slows down motorists.

Constraints

- Can be difficult to navigate for busses, large trucks, snow plows, and low ground clearance vehicles.
- Relatively expensive.
- Forces emergency vehicles to slow down

Typical Applications

- Raised crosswalks are typically provided at midblock crossings on two-lane roads where pedestrian volumes ≥ 50 pedestrians per hour and speed control is needed.
- Raised crosswalks may be provided at intersections where low-volume streets intersect with high-volume streets or where a roadway changes character (such as from commercial to residential).
- Raised crosswalks should not be used on transit routes or where there are steep grades or curves.

Design Considerations

- Raised crosswalks should be even with the sidewalk in height and at least as wide as the crossing or intersection.
- Provide detectable warnings for pedestrians where they cross from the sidewalk in to the crossing area.
- Consider drainage needs and provide appropriate treatments.
- Use colored asphalt as opposed to brick or decorative surface materials to make the crossing smoother for those with mobility impairments.

Additional Guidance

- ITE/FHWA Report Traffic Calming: State of the Practice
- FHWA Designing Sidewalks and Trails for Access *Part II of II: Best Practices Design Guide*

HIGH VISIBILITY CROSSWALK

Cost: $

Mount Rainier, MD

Heppner, OR

Boise, ID

High visibility crosswalks consist of reflective roadway markings and accompanying signage at intersections and priority pedestrian crossing locations.

Benefits

- Communicates potential for pedestrian crossings to motorists.
- Designates a preferred crossing location for pedestrians.
- Motorists are required to stop for pedestrians entering crosswalks.
- Low cost.

Constraints

- Can be more effective with other types of traffic control (signals, stop signs).
- At uncontrolled locations (midblock), motorist compliance is not as high as with other treatments.

Typical Applications

- High visibility crosswalks are typically applied at intersections of arterials, collectors, and/or other facilities with moderate to high vehicle volumes and speeds.
- Can be applied at mid-block locations, especially in conjunction with other treatments.

Design Considerations

- Crosswalk striping can vary, and may include continental striping (top photo), ladder striping, zebra striping (middle photo), etc.
- Can be constructed with paint or thermoplastic material.
- Minimum width is 6 feet, but wider crossings are preferred in areas with high number of pedestrians.

Additional Guidance

- NCHRP Report 562 Improving Pedestrian Safety at Unsignalized Crossings
- ODOT Bicycle and Pedestrian Design Guide

STREET FURNITURE AND LIGHTING

Cost: $-$$$

Austin, TX

Ft Lauderdale, FL

Street furniture includes pedestrian seating, information/ wayfinding structures, and trash cans. Street furniture and lighting can be used to enhance the pedestrian experience and encourage pedestrian activity on a street.

Benefits

- Encourages walking and sense of comfort and security for pedestrians.
- Street furniture can be relatively inexpensive and easy installation.
- Encourages foot traffic and can make local attractions/ businesses inviting.

Constraints

- Requires space in potentially busy areas, such as sidewalks.
- Can reduce the pedestrian travel spaces on narrower sections.

Typical Applications

- Typically provided at areas of high bicycle and pedestrian traffic such as bus stations, shopping centers, schools, and multi-use trails.
- Street furniture and pedestrian-scale lighting is usually provided on corridors with commercial activity and anticipated high-pedestrian use.

Design Considerations

- Street furniture should not be placed to block the entrance of a building or inhibit pedestrian flow.
- The type and size of street furniture should be based on the available space and anticipated demand.
- Street furniture should be accessible to all users.

Additional Guidance

- AASHTO Roadway Lighting Design Guide

Transit Facilities/Service Types

BUS STOP

Cost: $$$

Molalla, OR

Pendleton, OR

Transit stop shelters help protect passengers waiting to load the bus from the elements and provides a great level of comfort. They also increase the visibility of transit stops and attractiveness for riders.

Benefits

- Provides protection from the elements and a place to sit for people waiting for transit.
- Provides a prominent visual cue about where the transit stop is located.

Constraints

- Require sufficient space along the street for bus to safely pull over and stop.
- Sign poles and stop amenities require maintenance

Typical Applications

- Install bus stops at locations with potential or existing transit demand
- Inclusion of amenities, such as shelters and seating, can be determined based upon daily boardings or market served (e.g. bus stop at senior center probably needs seating)

Design Considerations

- The style of the transit stop shelter can depend on the preferences of the local jurisdiction.
- At stops with a high number of daily boardings (i.e. over 100), a larger shelter or multiple shelters should be considered.
- Shelters should be cleaned and maintained regularly.
- Shelters should have transparent sides for greater visibility and panels should be resistant to fading or clouding.

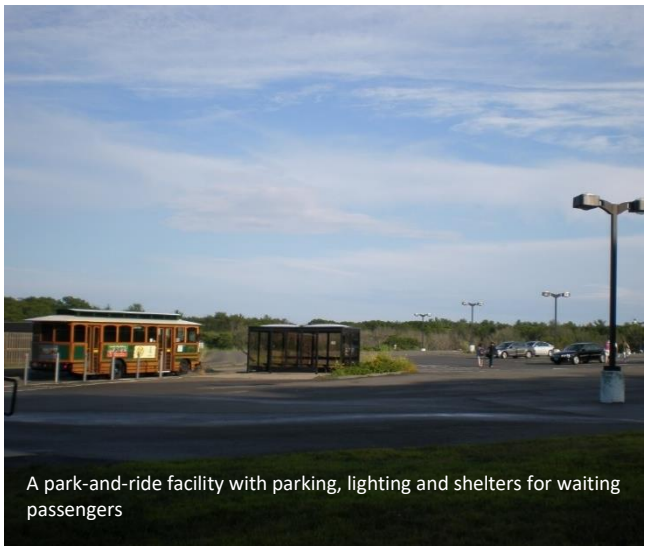
Additional Guidance

- TCRP Report 19: Guidelines for the Location and Design of Bus Stops
- Transit in Small Cities: A Primer for Planning, Siting and Designing Transit Facilities in Oregon

Transit Facilities/Service Types

PARK-AND-POOL OR PARK-AND-RIDE

Cost: $



A park-and-ride facility with parking, lighting and shelters for waiting passengers

People meet at a park-and-pool facility to commute by vanpool

Application to Ontario

Park-and-pool may be a low-cost option for organizing rides between Ontario and common work, shopping, and service destinations such as Caldwell, Nampa, Meridian, and Boise. Park-and-pool locations could be upgraded to transit stops depending on future demand.

Park-and-pool or park-and-ride facilities allow travelers to drive to a parking facility, park, and use transit or carpool to their eventual destination. Park-and-ride or park-and-pool lots may be owned by a city, transit agency, or by a business that has excess parking during typical work hours.

Benefits

- Reduces the need for parking in downtown areas and activity centers
- Reduces single-occupant vehicle travel, which supports environmental goals
- Saves money by reducing gas costs for individual commuters

Constraints

- Requires agreement with property owners to allow shared parking between users

Typical Applications

- These programs work well in rural or suburban areas where fixed-route transit is limited, and in communities with long commutes and common work destinations.
- They may be located in a downtown area, at the edge of a downtown, or within a neighborhood.

Design Considerations

- Integrate park-and-ride/park-and-pool lots into existing downtowns to provide a central meeting point for people to meet and pool or take transit
- Add aesthetic treatments such as landscaping to integrate the parking area into the surrounding neighborhood.
- Provide adequate signage visible from the street indicating that parking is available, at what times, and at what (if any) cost. Ensure signage clearly states that park-and-ride/park-and-pool users are allowed to park

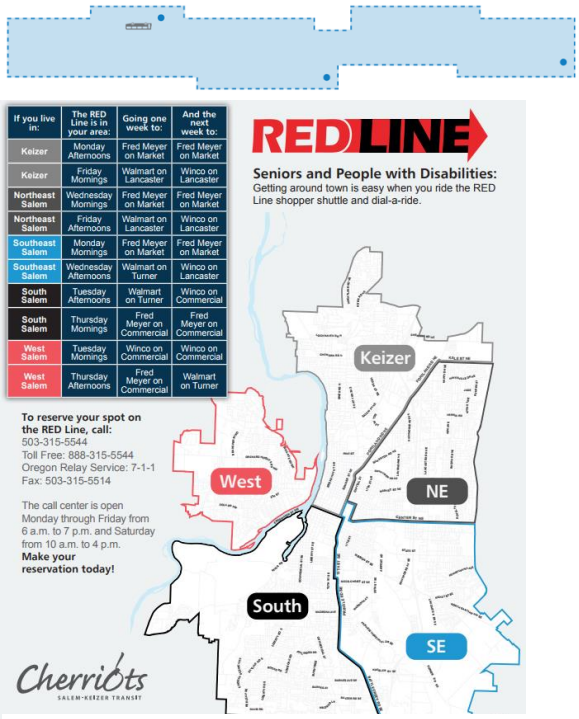
Additional Guidance

- TCRP Report 19: Guidelines for the Location and Design of Bus Stops
- Transit in Small Cities: A Primer for Planning, Siting and Designing Transit Facilities in Oregon

Transit Facilities/Service Types

DEMAND-RESPONSE SERVICE

Cost: $$$



Cherriots RED Line is an example of both a shopper shuttle and zone service

Demand-response services pick-up and drop-off passengers at their door or at the curb. Transit vehicles providing demand-response service do not follow a fixed route, but travel throughout the community transporting passengers according to their specific requests. Passengers must call ahead to book a trip.

Benefits

- High level of service for those with mobility challenges

Constraints

- Demand-response typically has low productivity, carrying 2-3 passengers per hour compared to other transit services
- Passengers must schedule service in advance

Typical Applications

- Works well in low-density areas without a strong market for fixed-route transit
- Often used to serve markets that have mobility challenges

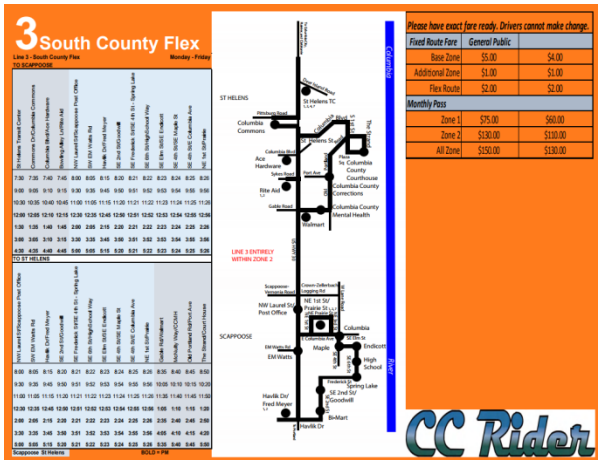
Service Variations

- *Shopper Shuttle* - A shopper shuttle caters to shopping trips. Shopper shuttles may be provided daily or periodically, connecting passengers from their home to a major shopping destination.
- *Zone Service* – In rural or suburban communities, transit agencies may provide service in a particular neighborhood or zone during days of the week
- *Taxi Vouchers* – Public agencies may subsidize taxi fares as a way of providing demand-response service using existing general public taxi services. Passengers may either buy vouchers in advance at a discounted rate or pay the fare and submit for reimbursement.
- *Volunteer Programs* – Volunteers may subsidize taxi fares as a way of providing demand-response service using existing general public taxi services. Passengers may either buy vouchers in advance at a discounted rate or pay the fare and submit for reimbursement.
- *Vanpools* – Vanpools are a prearranged ridesharing service in which a number of people travel together on a regular basis in a van. Vanpools may be publicly operated, employer operated, individually owned, or leased.

Transit Facilities/Service Types

FLEX SERVICE

Cost: $$



CC Rider's Route 3 provides flex service between Scappoose and St. Helen's. Riders can call in advance to schedule a pick-up no more than ½ mile from the published route.

Flex service is a hybrid service type that combines the structure of a fixed-route with the flexibility of demand-response service. There are many models of flex service, ranging from those that are primarily fixed routes but offer limited deviations upon request, to those that are primarily demand-response zones but offer fixed time points.

Benefits

- In lower demand areas where deviations can be accommodated, both fixed-route and ADA paratransit service can be provided with one vehicle
- Meets ADA paratransit requirements as long as schedule builds in additional time for deviations and service is open to the general public

Constraints

- Deviations add travel time and may discourage choice riders
- In rural areas with disconnected road networks, accommodating out-and-back deviations may add significant travel time

Typical Applications

- Flex service works in areas with low to medium densities where deviations to pick-up passengers can be supported while maintaining service along advertised routes.

Service Variations

- *Point-Deviated Service* – Point deviated routes have several fixed timepoints, and passengers who live between the time points may call to request a curbside pick-up. The driver takes the most direct route between time points to pick-up each passenger.
- *Deviated Service* – Deviated service operates via a set route. Passengers may call ahead to request a deviation from that route, and as long as the pickup allows the bus to stay on schedule, the driver will deviate from the route to pick-up a passenger in front of their destination. Deviations are "out-and-back," meaning the bus returns back to the same point at which it started the deviation.

Transit Facilities/Service Types

FIXED-ROUTE

Cost: $$

Fixed-route service means that transit vehicles run along a set route during a set schedule. Typically, fixed-route service is characterized by designated bus stops where passengers board and alight, and is supported with service information (maps and timetables).

Service Variations

Local Route

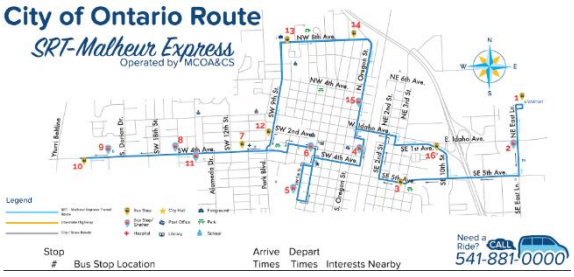
Transit Service that involves frequent stops that circulate passengers within a community

Intercity

Intercity transit routes provide direct service along major travel corridors with limited stops. These routes typically service longer distances than local fixed-routes. Between destinations, intercity services typically operate on arterials or interstate roadways.

Commuter

Commuter service is specifically designed to bring people from residential areas to employment centers. These routes may look similar to intercity routes, but only operate during employment peak hours.



The SRT-Malheur Express and Snake River Transit services provide a mix of local and intercity service between Ontario, Fruitland and Payette.

Benefits

- Predictable service that riders can access by following the schedule and map
- Cost effective (cost per rider) when serving high ridership corridors
- Can provide fairly direct travel times competitive with driving, making service more attractive to choice riders

Constraints

- Not well suited to serving large service areas or dispersed origins and destination
- Requires ADA complementary paratransit service (demand-response) within ¾ mile of fixed route, operating during the same days and hours

Typical Applications

- Connects origins and destinations within a community or between communities

Service Variations

- *Point-Deviated Service* – Point deviated routes have several fixed timepoints, and passengers who live between the time points may call to request a curbside pick-up. The driver takes the most direct route between time points to pick-up each passenger.
- *Deviated Service* – Deviated service operates via a set route. Passengers may call ahead to request a deviation from that route, and as long as the pickup allows the bus to stay on schedule, the driver will deviate from the route to pick-up a passenger in front of their destination. Deviations are "out-and-back," meaning the bus returns back to the same point at which it started the deviation.