

# **APPENDIX A.**

# **BROOKMAN ROAD ALIGNMENT CROSS SECTIONS**

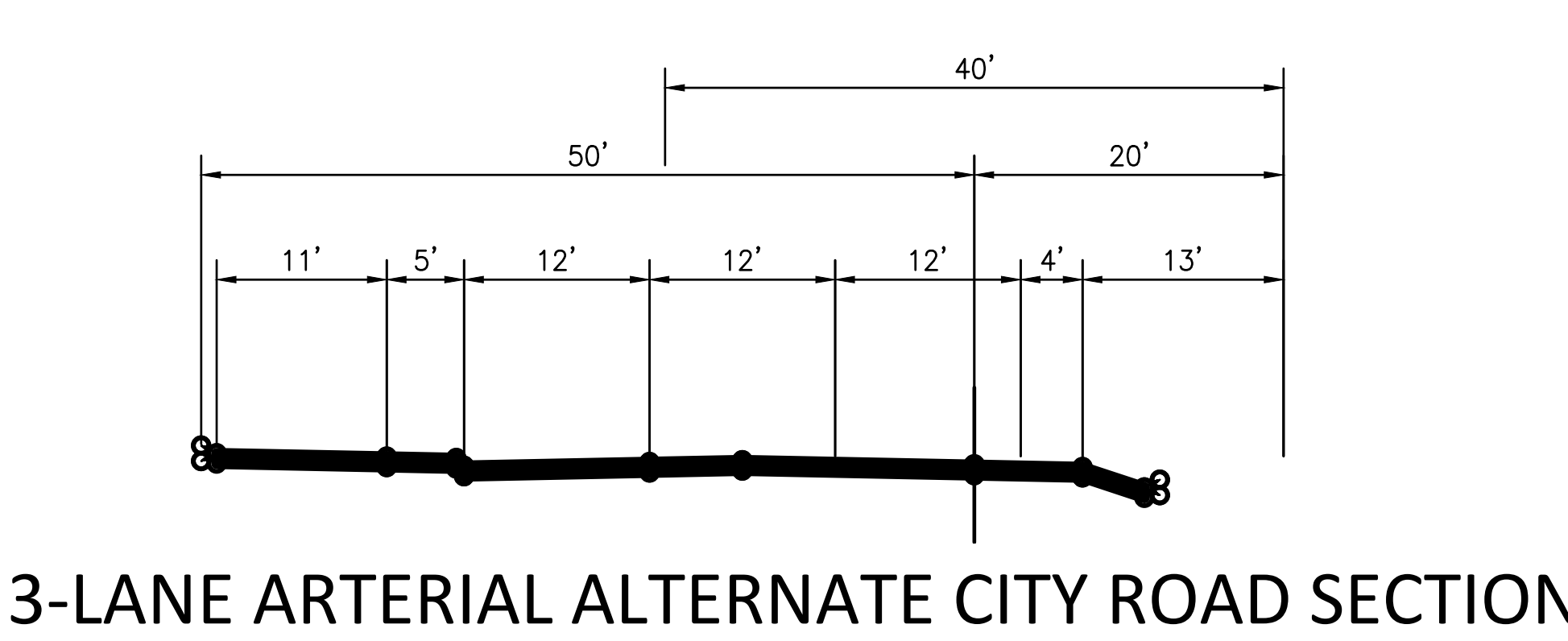
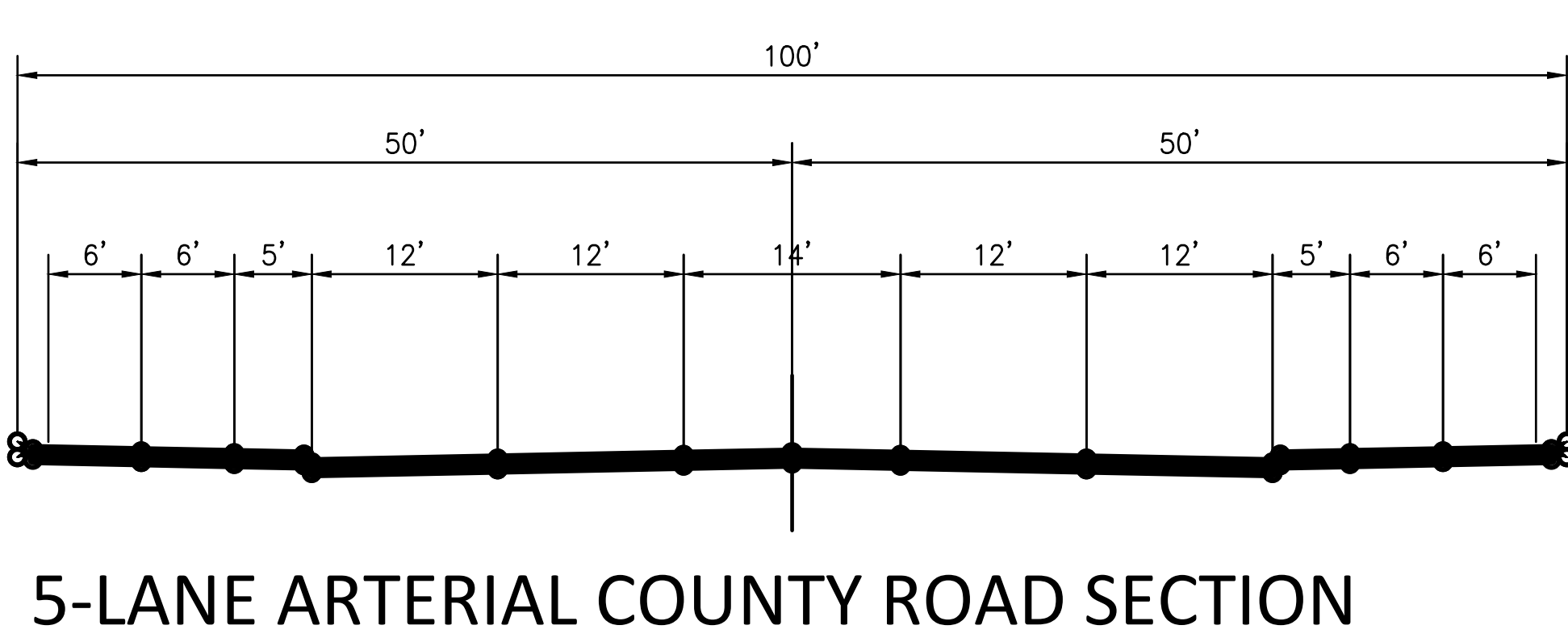
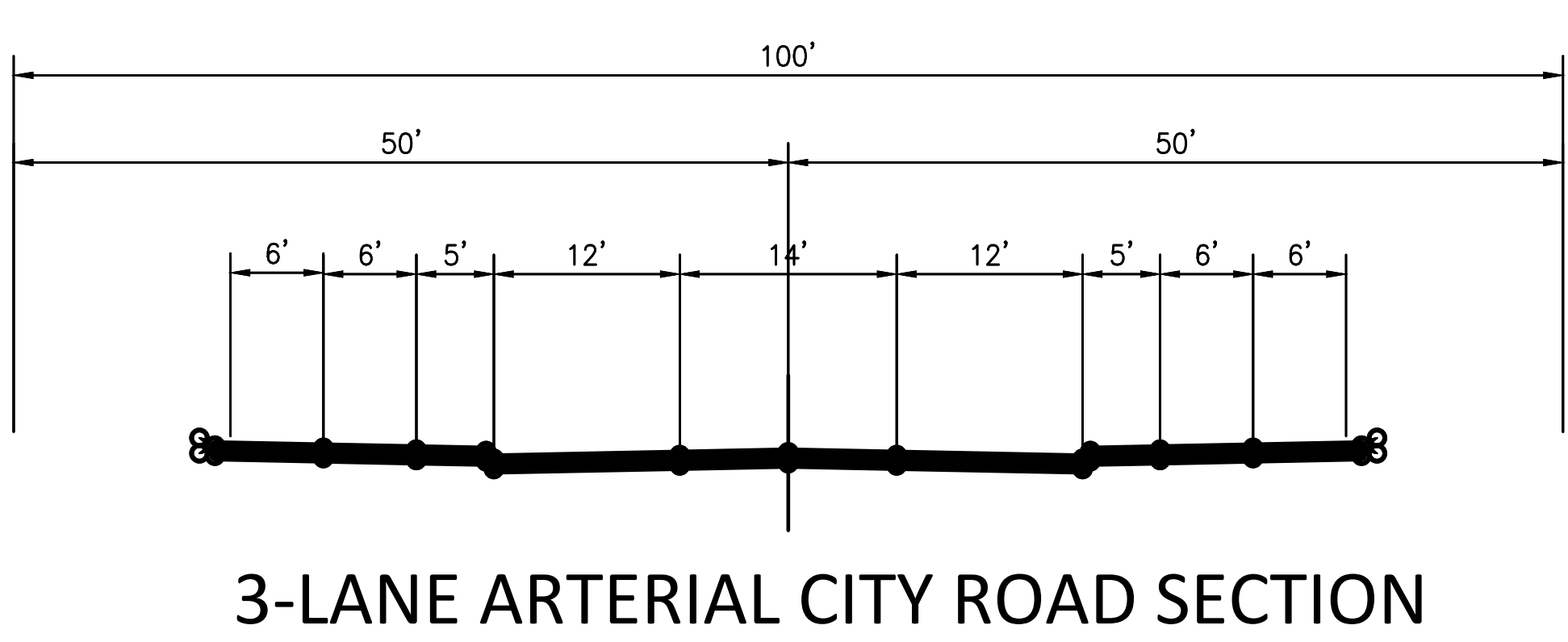
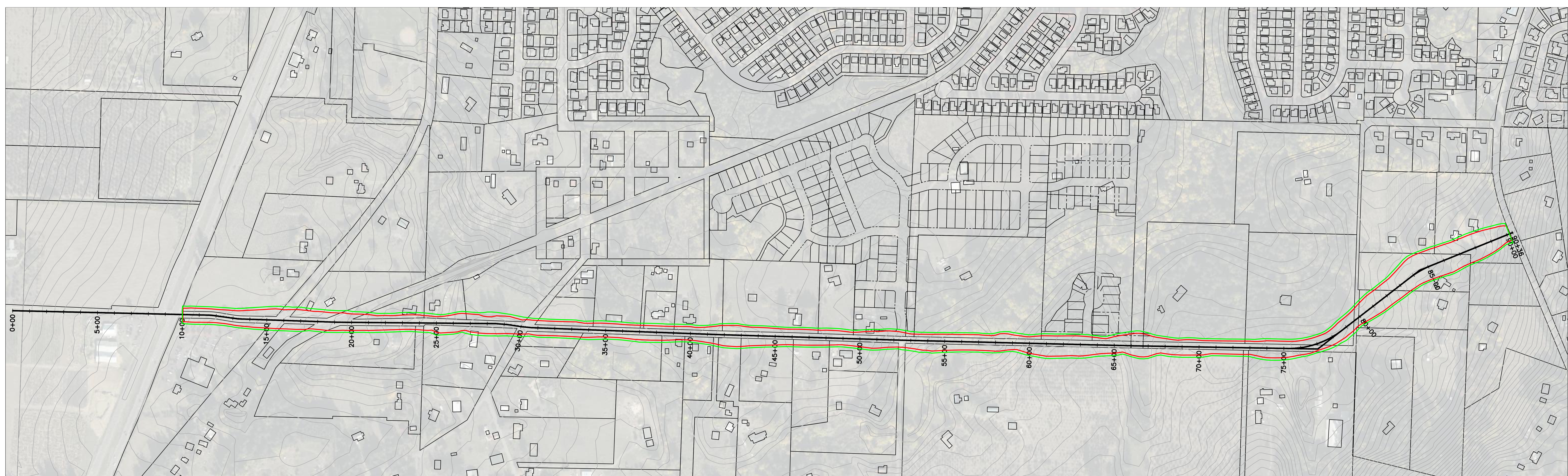
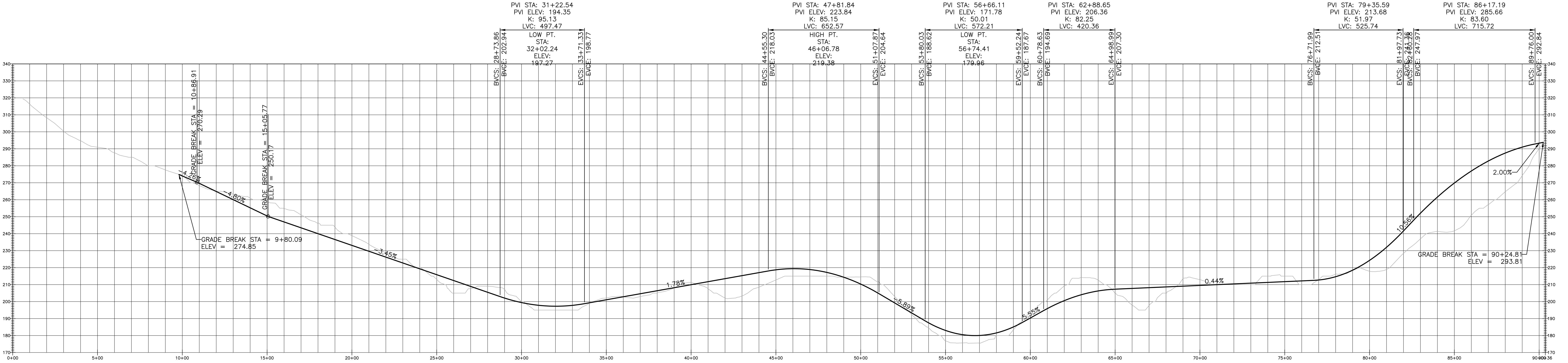






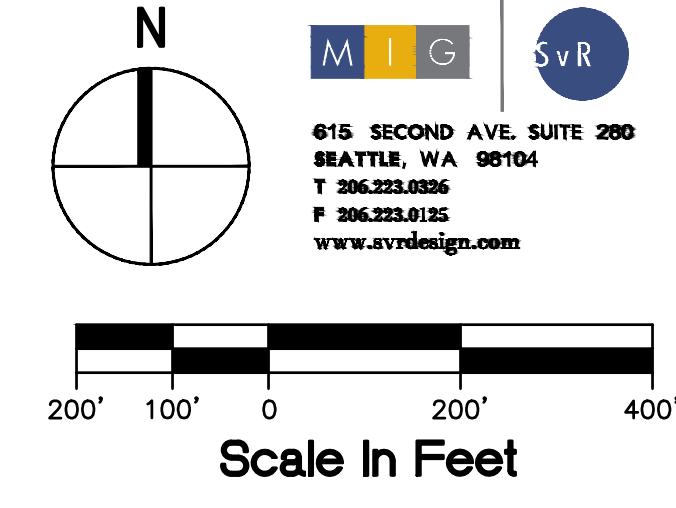
OCTOBER 2019  
DRAFT FOR INTERNAL DISCUSSION  
BROOKMAN ROAD ALIGNMENT STUDY - THIRD ROADWAY ALIGNMENT

PROFILE VIEW: THIRD ALIGNMENT



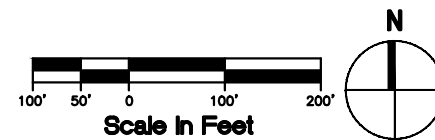
**THIRD BROOKMAN ROAD ALIGNMENT**

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- 5-LANE ARTERIAL COUNTY ROAD SECTION
- 3-LANE ARTERIAL ALTERNATE CITY ROAD SECTION

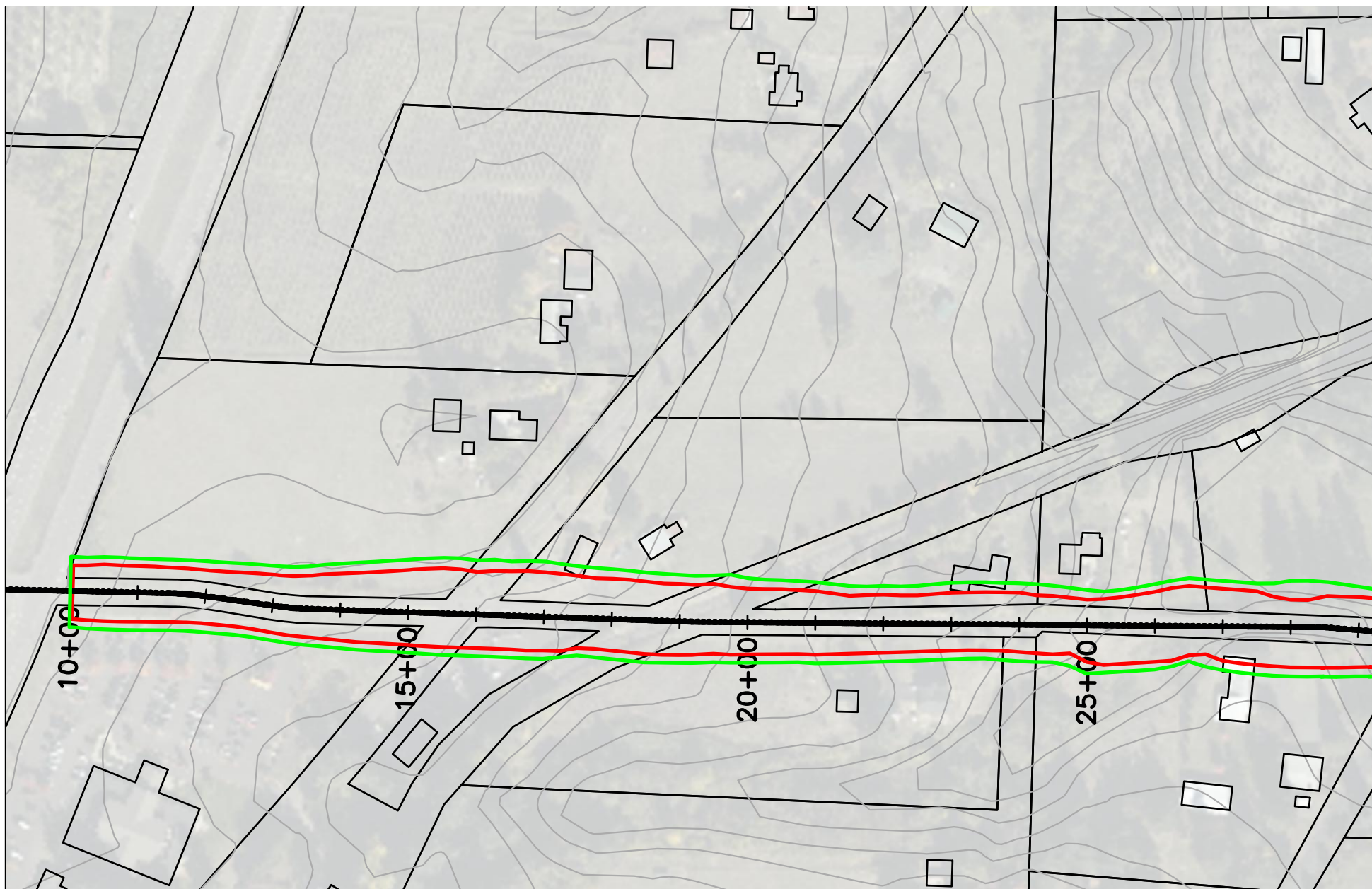




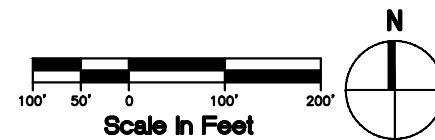
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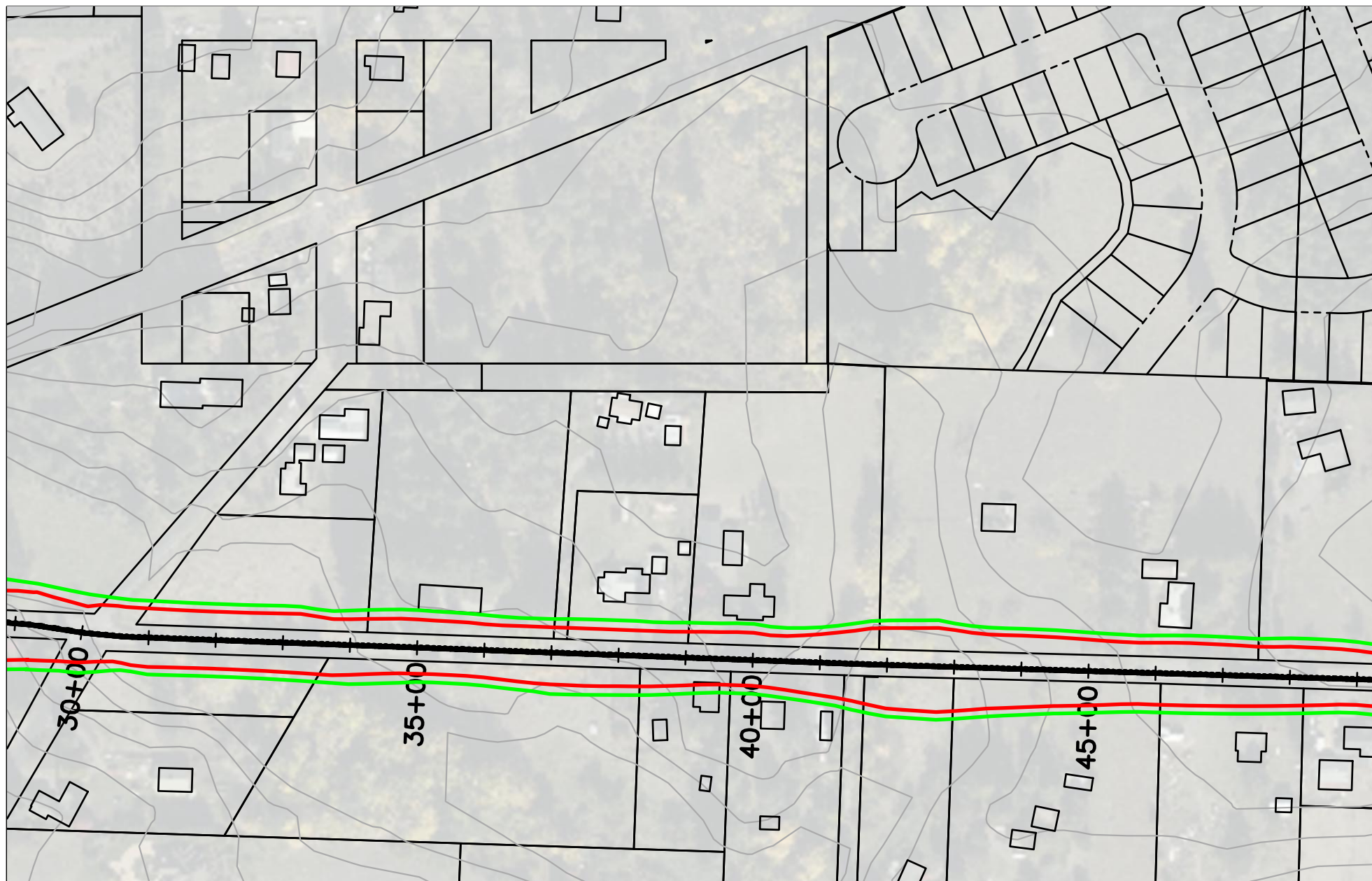
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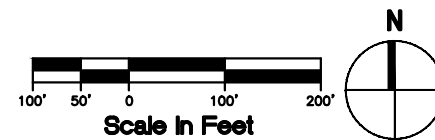


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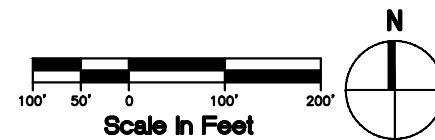
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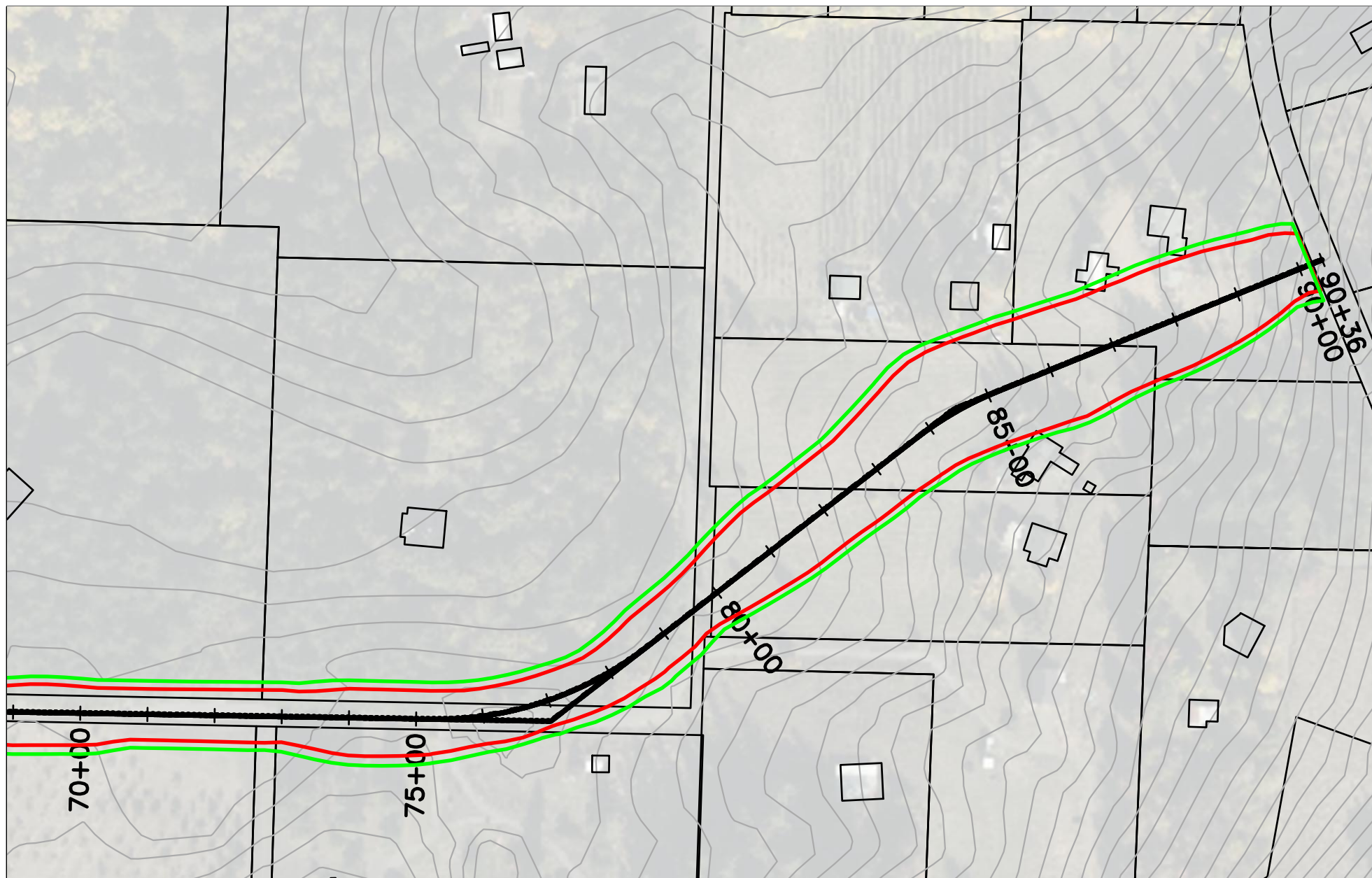
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- BROOKMAN ROAD ALIGNMENT**
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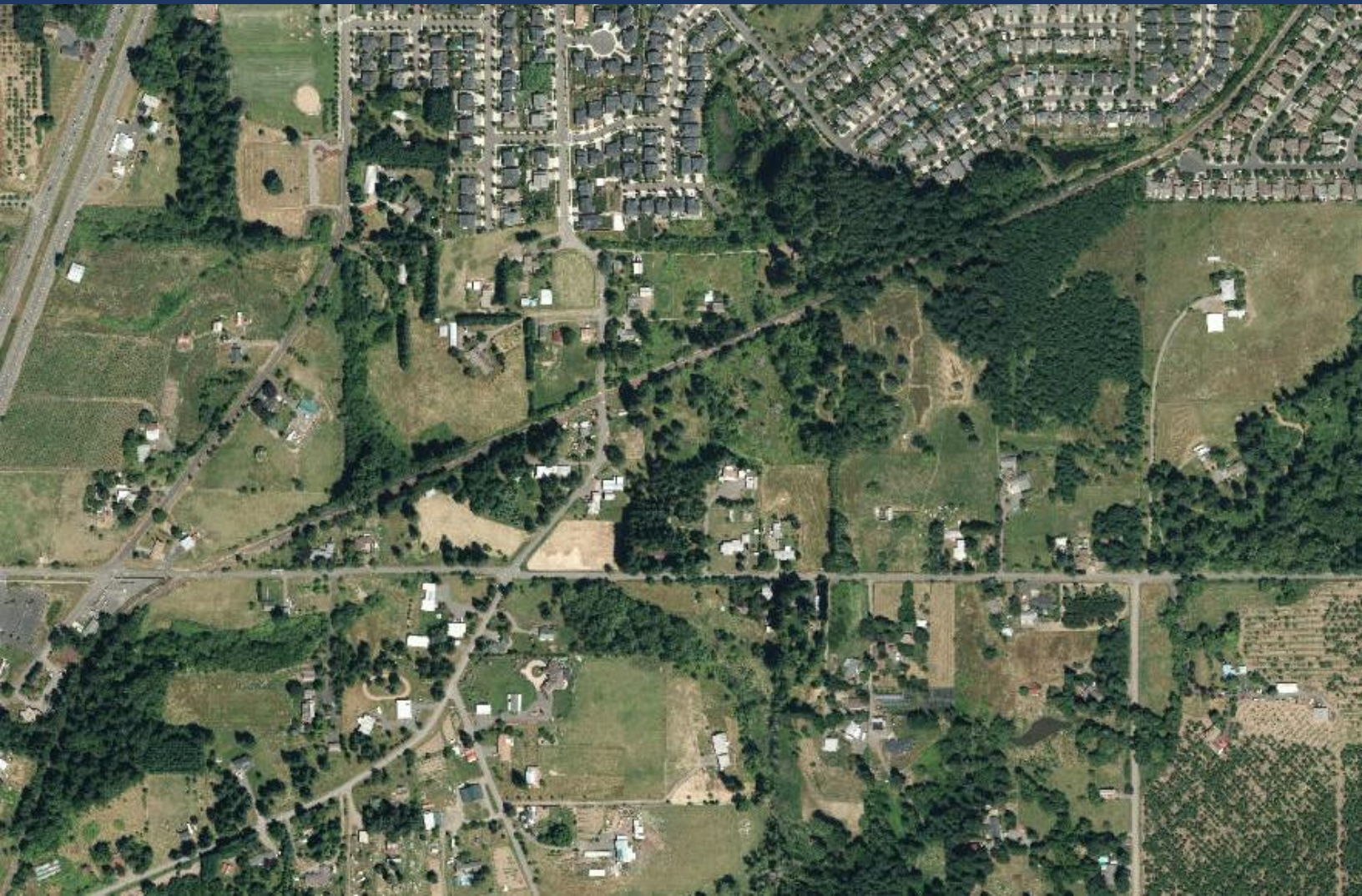

  
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**B.1**

# **ADDENDUM TO THE BROOKMAN ADDITION CONCEPT PLAN**







City of  
**Sherwood**  
Oregon

*Home of the Tualatin River National Wildlife Refuge*

## **B.1**

# **ADDENDUM TO THE BROOKMAN ADDITION CONCEPT PLAN**





# PROJECT PURPOSE

The purpose of this document is to summarize analysis and identify changes, as applicable, to the alignment and road classification of SW Brookman Road. As the alignment could also affect future land use designations, land uses were also evaluated to determine whether changes to the land use designations identified in the adopted Brookman Addition Concept Plan should also be modified.

In 2019, the City of Sherwood received a Metro 2040 Community Planning grant to refine the Concept Plan. Many factors have changed since the adoption of the Brookman Concept Plan in 2010 including the new Sherwood High School, ODOT requirements for a connection with Highway 99W, Washington County changes to the classification of Brookman Road, annexation requests, and land-use applications for new developments. In a coordinated effort with Washington County, ODOT, and Metro, the City began an effort to analyze the alignment and possible design of Brookman Road.

The following goals provided direction during the plan refinement process.

- 1. Developing and analyzing potential design concepts for Brookman Road.
- 2. Identifying an alignment that best reflects the future transportation needs of the community.
- 3. Providing multi-modal transportation facilities.
- 4. Minimizing impacts to properties in the Concept Plan area.
- 5. Reviewing zoning compatibility against potential alignments.
- 6. Aligning the final recommendation with City and County transportation plans.

The Sherwood TSP and Brookman Addition Concept Plan originally identified the future function

of SW Brookman Road as a three-lane collector facility with bicycle and pedestrian improvements. The Washington County TSP and I-5/99W Connector Study (included as part of Metro’s 2018 Regional Transportation Plan) identify SW Brookman Road as a 5-lane arterial in the future. Following this designation by the County, the Sherwood TSP was amended to designate SW Brookman Road as a 5-lane arterial; constructing the road as a three-lane arterial but reserving additional road right-of-way for five lanes. In addition to widening SW Brookman Road to accommodate either a three-lane or five-lane cross-section, the Sherwood TSP and other planning documents have identified the need to realign SW Brookman Road slightly to the north to provide safe geometrics for turning movements to and from side streets.

This document is organized into the following sections:

- 1. **Background**, which provides the context for completing this project.
- 2. **Public Engagement**, which covers the two engagement opportunities over the course of the project and overall themes that emerged.
- 3. **Brookman Road Design Alternatives**, which summarizes the cross-section alternatives and roadway alignments analyzed for the project.
- 4. **Transportation Analysis**, which highlights key points from the evaluation of future conditions to determine the long-term roadway and intersection capacity and operational needs from the transportation analysis prepared by DKS and Associates.
- 5. **Implementation**, which includes the final recommendation and next steps for implementation.



## BACKGROUND

The Brookman Addition Concept Plan, adopted by the city Council in June 2009, is a guide for the creation of a new 250-acre community in Sherwood. The Concept Plan identifies the general location and intensity of future land uses, including medium-low to high density residential, mixed use commercial, employment, parks, and open space. A conceptual layout of basic infrastructure systems including transportation, trails, utilities, and stormwater management has been integrated with future land uses. The Concept Plan follows a 2002 decision by Metro to bring the area into the regional urban growth boundary (UGB).

The 2009 concept planning effort included a comprehensive review of the existing inventory of land use, Goal 5 resources, transportation and public facilities, a market study, and a survey of the needs of current residents and property owners. The Concept Plan also identified future land uses, public facilities, including parks and open space, civic uses, and transportation corridors. Until annexation occurs, the Brookman area will remain in unincorporated Washington County. Since the Plan's adoption, the City has applied zoning to land annexed into the Sherwood City Limits consistent with the general land use categories identified within the Concept Plan and Sherwood Comprehensive Plan. Those areas are already in various stages of development

The Concept Plan and the City's Transportation System Plan designates Brookman Road as a collector roadway with the OR 99W/Brookman Road intersection realigned approximately 1,300 feet to the north of the existing intersection.

Brookman Road is intended to serve as the primary east-west connection between OR 99W and Ladd Hill Road. Figure 1 illustrates the proposed location of the road constructed as a three-lane collector. The realigned Brookman Road would also include a new grade separated crossing of the railroad tracks. The plan also proposed a physically separated multi-use pathway for bicyclists and pedestrians running parallel to Brookman Road.

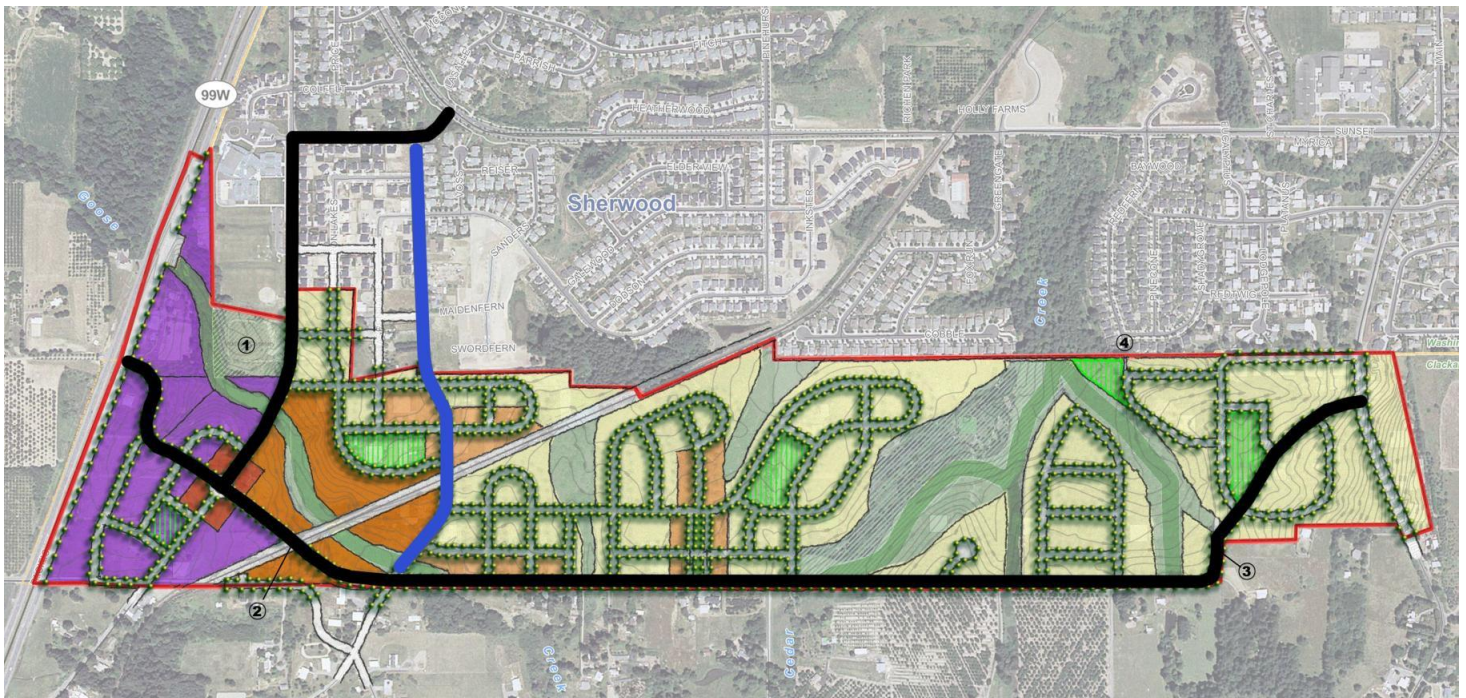
Since the adoption of the 2009 Concept Plan, the Washington County TSP states access spacing and other requirements will need to be evaluated on a case by case basis. Along collector roadways, access spacing should be a minimum of 100

The long-term intent was to reevaluate the Concept Plan in a coordinated multi-agency effort to determine the future function, general capacity, and design needs for Brookman Road and as a three-lane roadway and as a possible five-lane Arterial.

feet and a maximum of 400 feet to meet City of Sherwood and Washington County standards. The Concept Plan achieves these standards, with several minor exceptions. Access spacing greater than 400 feet occurs along green spaces where motor vehicle access will not be provided, as well as at the grade-separated rail crossing on Brookman Road. The long-term intent was to reevaluate the Concept Plan in a coordinated multi-agency effort to determine the future function, general capacity, and design needs for Brookman Road as a three-lane roadway and as a possible five-lane Arterial.

However, as development has begun in the Brookman Area, the City is attempting to address a lack of uniform street classifications for Brookman Road. Additionally, the City is seeking to review the current land uses to assure they are still appropriate as the area builds out. This review includes an analysis of the potential urban development and the intersection of an additional arterial road with OR 99W (Pacific Highway). During the development of the Brookman Addition Concept Plan the location of a southern arterial i-5 connector was not known and the Concept Plan indicated Brookman Road could serve as a collector roadway and that the existing intersection of SW Brookman Road and 99W be realigned north to avoid conflicts with the southern arterial. Since the adoption of the Concept Plan, SW Brookman Road has been designated as a 5-lane arterial by both the Washington County and City of Sherwood transportation system plans to provide for future flexibility. Both recognized that additional multi-agency planning efforts were needed to reevaluate the needs of SW Brookman Road and refine the Concept Plan.



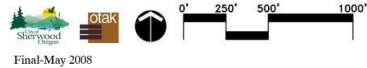


## Brookman Addition Concept Plan

### Functional Street Classification

#### Notes:

1. Existing Cemetery (Constrained Land)
2. Railroad Crossing (Grade Separated)
3. All street alignments are conceptual.
4. Redfern connection is pedestrian, bicycle and emergency access only.



### Legend

High Density Residential 24 du/ac	Neighborhood Parks (Locations are conceptual)
Medium Density Residential- High 11 du/ac	Constrained Lands (Goal 5 resource lands, subject to on-site verification)
Medium Density Residential- Low 8 du/ac	Constrained Lands (Vegetated corridor proxy, subject to on-site verification)
Commercial / Mixed Use	Constrained Lands (Potential wetlands, subject to on-site verification)
Employment	Collector
	Neighborhood Roads

Figure 1: 2009 Brookman Additional Concept Plan Functional Street Classification and Zoning

## PUBLIC ENGAGEMENT

The planning process engaged local landowners and residents at two events during the project: in-person stakeholder meetings during the project initiation phase of the project and an online open house to vet potential Brookman Road alignments. Public information, including information about opportunities to provide input, was distributed through established City communication channels and direct mailings to area addresses. A project webpage on the Sherwood website served as an informational portal through the plan refinement process.

### Stakeholder Meetings – June 12, 2019

At the outset of the planning process, the project team met with developers currently active in the Brookman area, landowners, residents, and businesses in the plan area. These in-person

interviews provided insights into key issues and opportunities along the Brookman Road corridor. Several key themes emerged from the stakeholder interviews:

- » **Brookman Road is not safe in its current condition.** Due to a variety of users, the lack of right-of-way creates an unsafe road. High vehicle speeds, restricted site lines, and tight curves add to a consensus that immediate improvements are needed to address safety.
- » **The vision should reflect the area.** Participants articulated a vision for the future of Brookman Road which included safety for all users, including wildlife; a primarily residential road that incorporates scenic qualities; a practical design that is not overbuilt; and serves local land uses.



» **Any future design should accommodate growth.** As Sherwood grows, there should be a long-term vision in place of where growth should occur and what improvements need to be made to accommodate that growth. However, road improvements could be focused on improving capacity within the UGB, not in periphery locations such as Brookman Road.

» **Consider connections to the north of Brookman.** Some participants identified a potential connection to the area using Redfern Place.

» **Clarity on the cost of the project.** The size and potential cost of modifying Brookman Road from its current conditions to an arterial should be clear and transparent.

» **Transparency from the City.** Several participants requested frequent and transparent communication from City staff regarding current and future planning efforts for the area.

A summary of the meeting is included as **Attachment 1** to this addendum.

#### *Online Workshop – April 2020*

A public workshop was planned in March of 2020 to discuss potential Brookman Road design alternatives. Prior to holding the meeting, State of Oregon requirements to reduce the spread of COVID-19 restricted large gatherings. As a result, the in-person event was hosted as an online open house, which provided the same information as what would have been presented at the in-person event. An online event was produced as a PowerPoint presentation that the public could view. A draft of this was first presented to the City Council on April 7, 2020. The presentation was hosted on the City website and the community was encouraged to provide comments to the consulting team. The online open house was available from April 15, 2020 through May 4, 2020, during which two comments were received. Comments included requests for preservation of the existing community and requests that the City study the area through the prism of developer buildability.

## **BROOKMAN ROAD DESIGN ALTERNATIVES**

Three cross section options and alignment alternatives were developed during the project to identify potential tradeoffs between various options, road configurations, and potential revisions to the existing alignment identified in the Concept Plan. The following three alternative concepts were presented as potential designs for SW Brookman Road as the area is annexed and developed. Both three- and five-lane cross sections were considered as well as multiple alignment options. Both cross sections are assumed to be constructible for any of the alignments.

Three- and five-lane options were considered because:

- » The Concept Plan identifies Brookman Road as a three-lane collector. The TSP originally included the future roadway as a three-lane collector with the western terminus north of the existing intersection, consistent with the Figure 1 of the Concept Plan.
- » Washington County has identified in its TSP that Brookman Road should be a five-lane limited access arterial along the length of the roadway. The location of Brookman Road was not identified specifically, but is assumed to be the general location of the existing alignment.

Prior to developing the Brookman Road Alignment options, the City, Washington County and ODOT coordinated to confirm that existing plans are incorporated into the alignment and cross section options. The results of this coordination informed the cross sections and alignment options, which were then vetted through the March online open house.

## **CROSS SECTION OPTIONS**

The following cross sections provide general guidance on how Brookman Road could be constructed at some point in the future. No construction (other than what is required to be constructed as part of subdivisions already being constructed or within the entitlement process) is proposed. If construction were to occur in the future, additional site analysis and public outreach would occur as part of the formal design process.



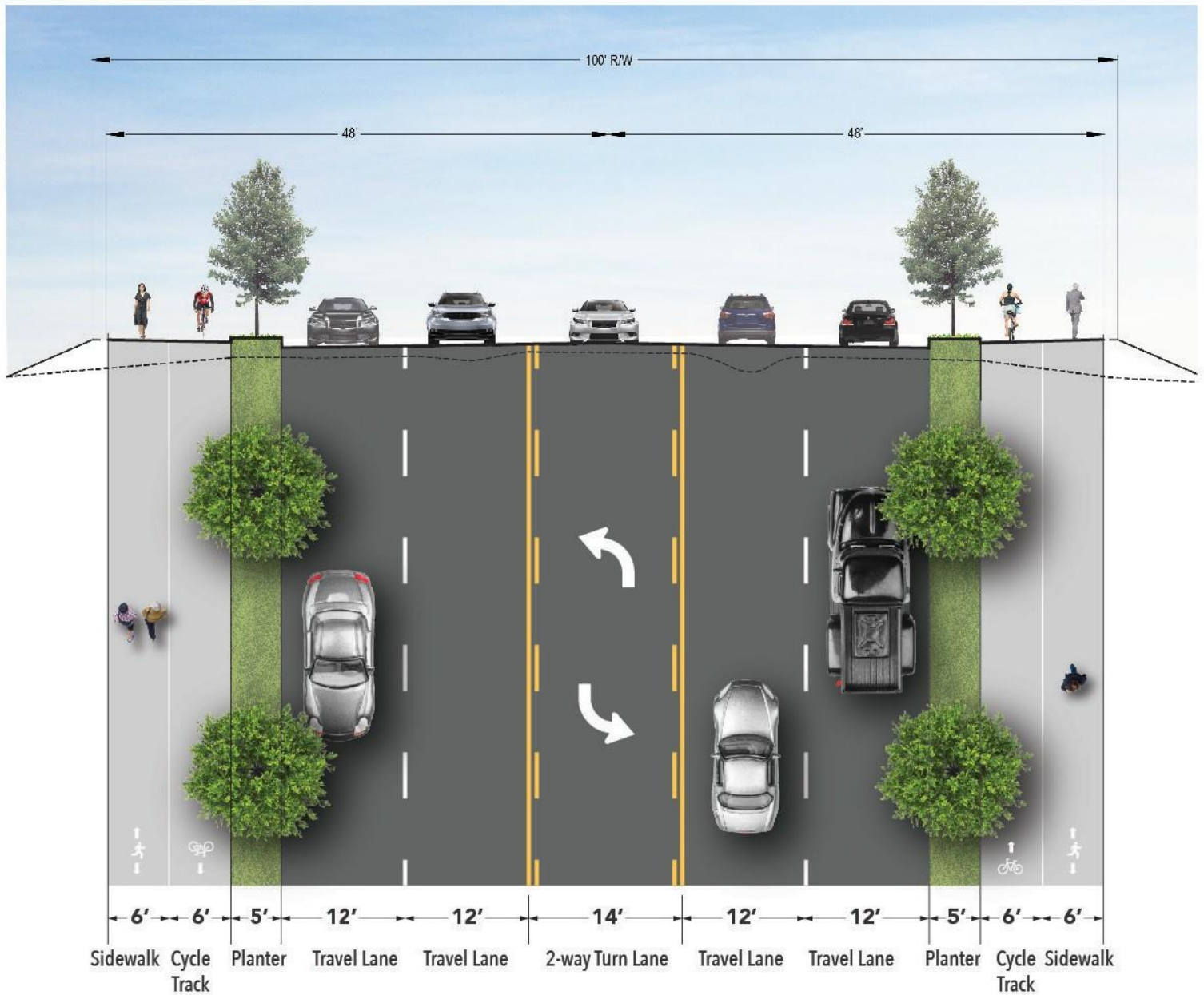


Figure 2: 5-Lane Cross Section

### OPTION 1: 5-LANE CROSS SECTION

This option includes two 12-foot lanes in each direction with a 14-foot center turn lane, planting strips, six-foot cycle tracks, and six-foot paved sidewalks. In total, the road and associated improvements would be 96 feet wide. Option 1

would be built to County standards and Washington County transportation system plan designations for SW Brookman Road as a 5-lane arterial, which would also likely require access modifications to meet access spacing standards.



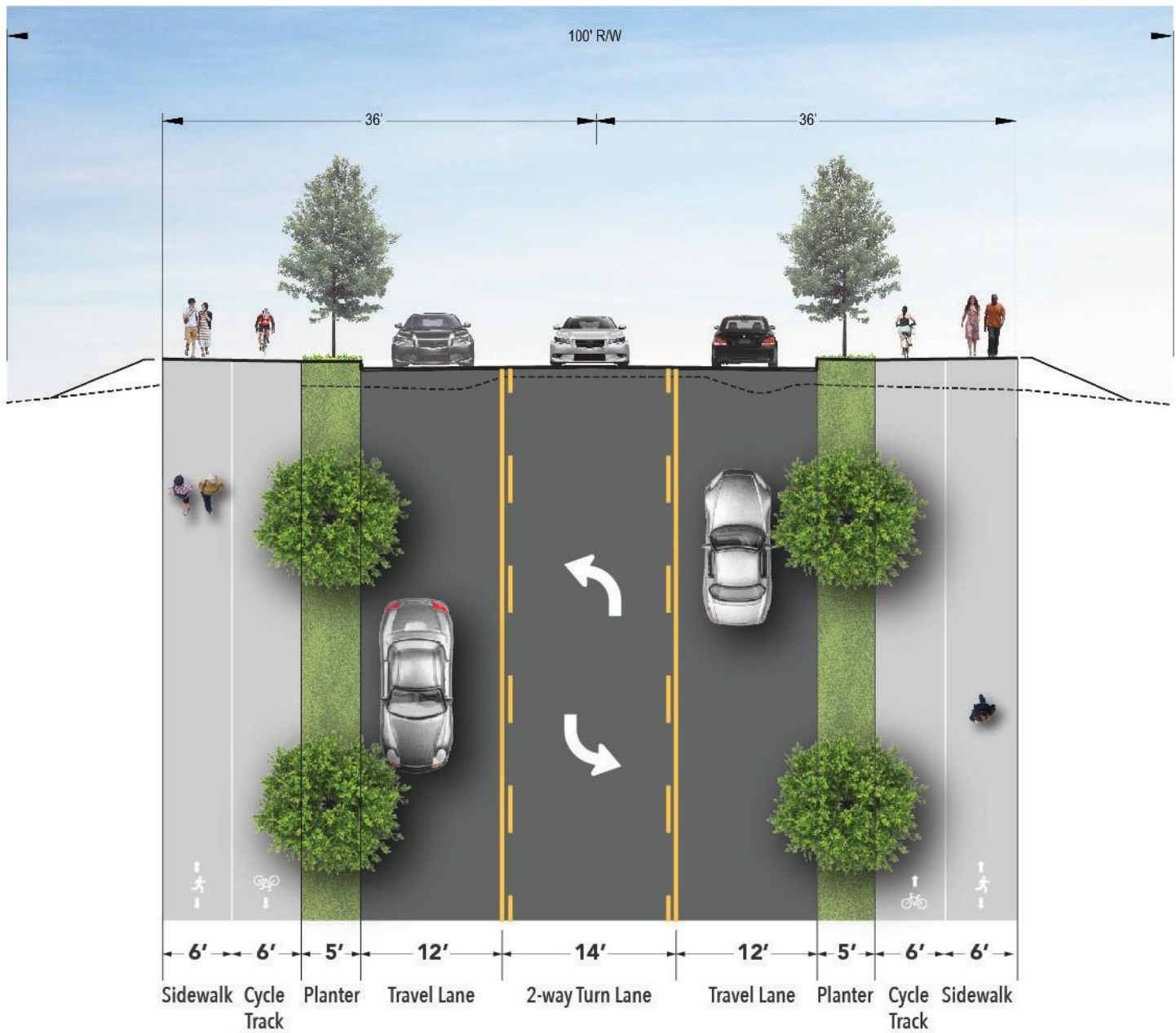


Figure 3: 3-Lane Cross Section

### OPTION 2: 3-LANE CROSS SECTION (CONCEPT PLAN CROSS SECTION)

This cross section is the cross section that was adopted as part of the Brookman Addition Concept Plan and classified as a collector roadway. The three-lane cross section includes one 12-foot lane

in each direction and one 14-foot center turn lane, five-foot wide planting strip, six-foot bicycle track, and a six-foot sidewalk for a total width of 72 feet.



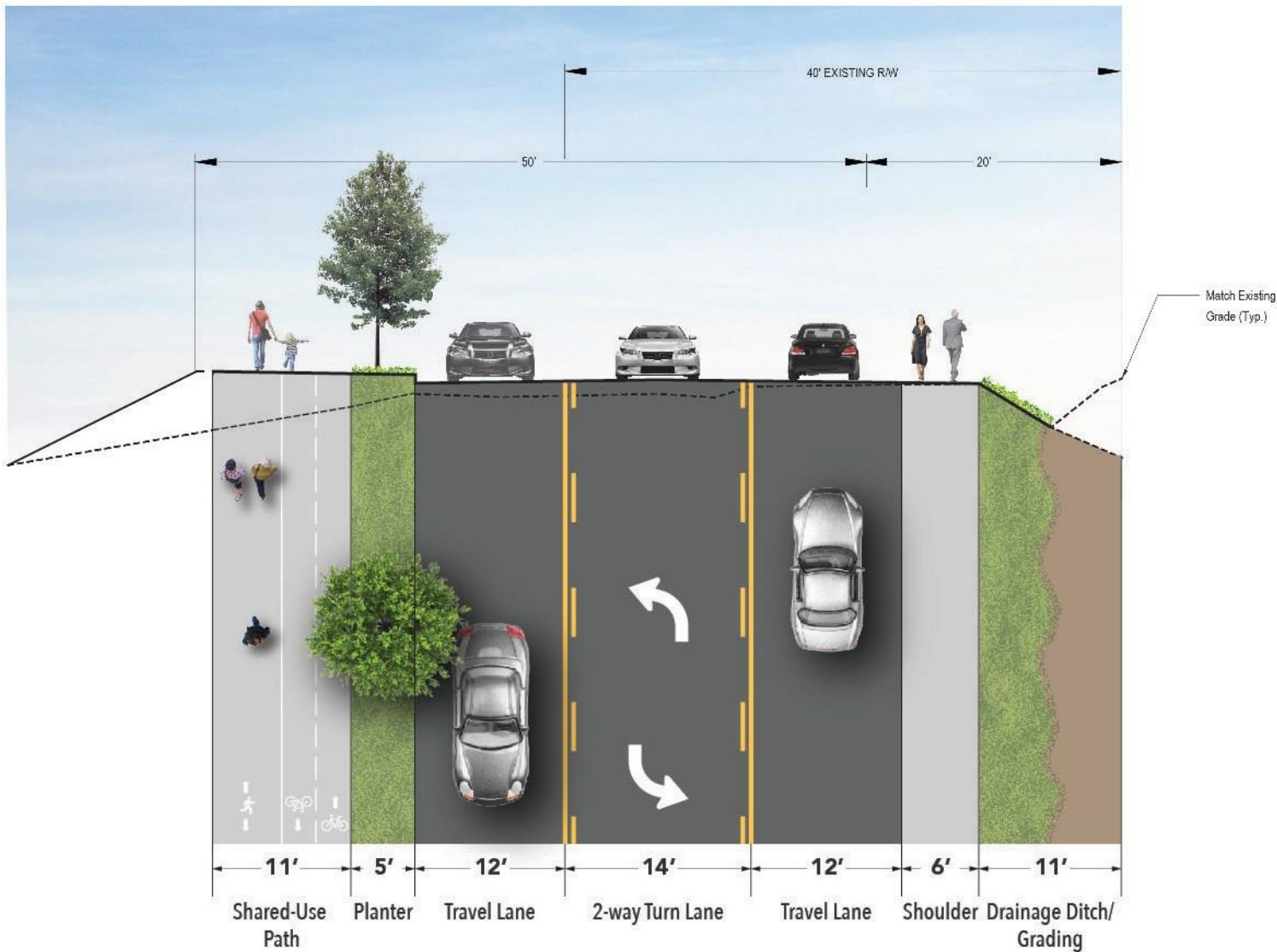


Figure 4: 3-Lane Transitional Road Cross Section

### OPTION 3: 3-LANE TRANSITIONAL ROAD

Brookman Road currently serves as the southern boundary for Metro’s Urban Growth Boundary (UGB). The north side of the roadway is within the existing UGB, while the south side is outside of the UGB and designation and Urban Reserve, and designation that identifies the area as potentially developable if the UGB were expanded in the future to include this land. Washington County, because it is also planning and designing facilities within the County on the edge of the UGB, has developed conceptual “transitional street concepts” that provides urban style road features for areas within the UGB while still maintaining rural standards for adjacent parcels outside of the UGB on the opposite side of the roadway. This

concept is similar to the County’s transitional street concept and is consistent with the requirements for development currently underway for land within the Brookman Road City Limits.

This three-lane concept includes 12-foot travel lanes with a 14-foot center turn lane. The north side of the road contains a five-foot planting strip and an 11-foot shared-use path. The south side of the road has a six-foot shoulder and an 11-foot drainage ditch. The road and all improvements measure 70 feet in width. This option would allow for the road to expand to a 5-lane arterial consistent with the County and Sherwood TSP designation if traffic volumes increase in the future when additional road capacity is needed.





Figure 5: Brookman Road Concept Plan refinement planning recommended alignment. Full graphic attached as Appendix A



Figure 6: Brookman Concept Plan Subareas and Alignment Options Considered

## CORRIDOR ANALYSIS

The Brookman Addition Concept Plan divided the area into three distinct subareas during the planning process: the western subarea, central subarea, and eastern subarea. Brookman Road also has unique design considerations within each of these areas. This analysis considered the original Brookman Road alignment recommended in the Concept Plan as well as a number of options in the western and eastern subareas to identify connections that minimized impacts to property while still meeting transportation demands.

### WESTERN SUBAREA

The 2009 Concept Plan defined the western subarea as approximately 80 acres located between the two large transportation barriers, OR 99W to the west and the rail corridor to the east. The purpose of this area was to capitalize on highway access and visibility by providing



Figure 7: Western Subarea Closeup



space for business and employment opportunities. In the western subarea, SW Brookman Road would be realigned to provide better access through the sub-area and a new intersection would be constructed for SW Brookman Road and OR 99W about 1,300 feet to the north. The railroad crossing would be grade separated, requiring additional right-of-way for the approaches. By shifting the intersection, SW Brookman Road would be separated from the potential Southern Arterial connection at OR 99W.

### Recommended Corridor Alignment

The intersection and alignment proposed in the Concept Plan would require extensive amounts of new right-of-way and a grade-separated over crossing. This refinement plan recommends Alignment Option 2, maintaining SW Brookman

Road's existing right-of-way and intersection with OR 99W. This would also align with the Chapman Road intersection and future connections to Sherwood West. Under the 2009 Concept Plan, Brookman Road would cross the existing rail line at a 90-degree angle. Following meetings with the City, Washington County, and ODOT Rail Division, it was determined that the refinement plan would not require a 90-degree crossing, although bicycle paths would cross at 90-degree to ensure a safer crossing . If the intersection of SW Brookman Road and OR 99W becomes signalized in the future, there will need to be improvements on eastbound OR 99W that signals to traffic that they are entering an urban area. Representatives from Northwest Natural Gas have reviewed the recommended corridor alignment. There will be a continued need for coordination due to the existing facility along the road. To ensure there are no significant impacts to the natural gas facility and proper right-of-way is obtained on the north side of Brookman Road, a requirement of the annexation process for properties located west of the railroad tracks, north of Brookman Road to the current city boundary, will be the completion of further analysis of the roadway in the western subarea identifying road alignment and right of way needs.

Figure 8: Western Alignment Options.

Alignment Option 1, shown in blue, is consistent with the alignment proposed under the original Concept Plan.

Alignment Option 2, shown in red, follows the alignment of Brookman Road as it exists today.

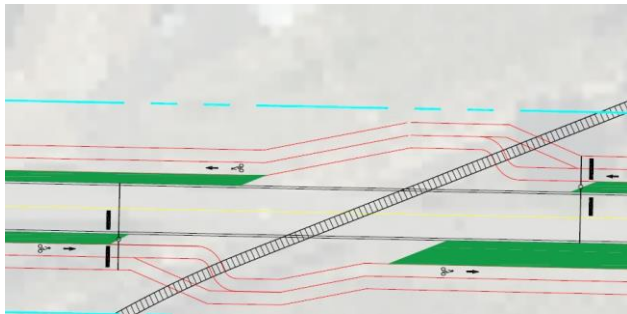


Figure 9: Recommended Rail Crossing



Figure 10: Conceptual design of the western portion of the Brookman Addition with the new Brookman Road alignment. Traffic calming measures should be reviewed to mitigate and reduce vehicle trips through the neighborhood to the north.



## CENTRAL SUBAREA

The 2009 Concept Plan's central subarea was designed to be a walkable residential area that allows a mix of housing types while maintaining a lower residential density. Brookman Road would provide the primary east-west access at the southern edge of the neighborhood.

Within this area, the general alignment of Brookman Road would be maintained to minimize impacts to property and natural resources. Additionally, there are sections of this subarea that are being constructed with half-street improvements as part of adjacent subdivision development.

### *Recommended Corridor Alignment*

This refinement plan recommends maintaining the existing road alignment. Future road construction and widening would analyze mitigation options such as a retaining wall or other measures to minimize right-of-way acquisition. Some newly approved subdivisions are already building half-street improvements on portions of the north side of Brookman Road while others are paying a fee-in-lieu for improvements that would be placed in a dedicated fund for future improvements.

## EASTERN SUBAREA

Bordered by Cedar Creek to the west and Ladd Hill Road to the east, the eastern subarea is designated for single-family detached dwelling units. SW Brookman Road would still provide primary east-west access to the neighborhood with enhanced pedestrian and bicycle facilities. Currently, the eastern section of Brookman Road curves sharply to the north, traveling approximately 1,300 feet before curving sharply to the east past existing homes and connecting to Ladd Hill Road. Under the 2009 Concept Plan, SW Brookman Road would veer south to avoid using the narrow road past existing homes and that second sharp turn.

### *Recommended Corridor Alignment*

This refinement plan recommends Alignment Option 3, which shifts the northern curve to south and shortens the connection to Ladd Hill Road. This would flatten out the first sharp curve and minimize impacts to existing residences, but would require new right-of-way acquisition to make the new connection to Ladd Hill. This recommended alignment is not currently shown in the Clackamas County TSP.

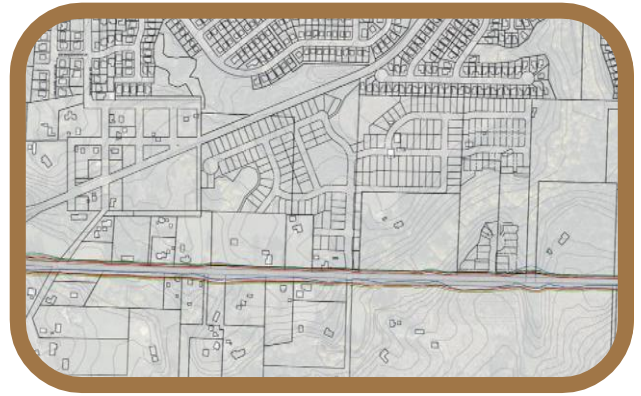


Figure 11: Central Subarea Closeup



Figure 12: Eastern Subarea Closeup



Figure 13: Eastern Alignment Options

Alignment Option 1, shown in blue, is consistent with the alignment proposed under the original Concept Plan

Alignment Option 2, shown in red, follows the alignment of Brookman Road as it exists today.

Alignment Option 3, shown in green, shows the refinement plan recommendation.



Figure 14: Study Area Intersections

## TRANSPORTATION ANALYSIS

A transportation analysis was conducted for SW Brookman Road between OR 99W and SW Ladd Hill Road to evaluate corridor alternatives. The analysis inventoried existing transportation facilities including operational analysis, a review of historical plans for SW Brookman Road, and an evaluation of future conditions to determine the long-term roadway and intersection capacity and operational needs.

Four study intersections were selected along the corridor and included:

- » OR 99W (SW Pacific Hwy W) and SW Brookman Road
- » SW Old Highway 99 W and SW Brookman Road
- » SW Middleton Road and SW Brookman Road
- » SW Ladd Hill Road and SW Brookman Road

SW Brookman Road is under County jurisdiction and is classified as an arterial. The two-lane road has a posted speed of 35 mph and only a segment of built sidewalk.

Table 1: Roadway Characteristics within Study Area

Roadway	Jurisdiction	Functional Classification	Cross Section	Posted Speed (mph)	Sidewalks	Bicycle Lanes
SW Brookman Road	County	Arterial	2 lanes	35 mph	Partial*	No
OR 99W (SW Pacific Hwy W)	ODOT	Principal Arterial	4 lanes (divided)	55 mph	No	No
SW Old Highway 99 West	City	Collector	2 lanes	35 mph	No	No
SW Middleton Road	City	Neighborhood / Local <sup>1</sup>	2 lanes	Unposted	No	No
SW Ladd Hill Road	City	Arterial	2 lanes	Unposted	No	No

<sup>1</sup> SW Middleton Road is classified as a neighborhood roadway north of SW Brookman Road and designated as a local street to the south.





## EXISTING FACILITIES

### *Existing Land Use*

The Concept Plan area consists of residences located on large lots, particularly along SW Brookman Road. The area has not been fully built out and many parcels remain largely undeveloped. Immediately north of the Concept Plan area are residential subdivisions.

### *Existing Natural Resources*

SW Brookman Road is moderately sloped as it is adjacent to Goose creek and Cedar Creek.

These landforms and drainages create a series of small hills and dips along Brookman Road. Along SW Brookman Road there are riparian corridors and habitat as well as potential wetlands. The

topography of Brookman Road makes it challenging to construct the type of facility identified in Metro's Regional Transportation Plan and Washington County and Sherwood Transportation System Plans.

### *Existing Access*

SW Brookman Road serves as the primary east- west route through the Concept Plan area, connecting with OR 99W to the west and Ladd Hill Road to the east. Several side streets connect to SW Brookman Road and many existing homes have driveway access to Brookman.

### *Pedestrian Facilities*

Sidewalks are present for only 500 feet of one side of SW Brookman Road in between OR 99W and Old Highway 99 West. Most of the study area lacks adequate pedestrian facilities.

### *Bicycle Facilities*

There were no bicycle lanes or other facilities within the study area, though bicyclists have the option to share the roadway with motor vehicles. The study area as a whole lacks bicycle connectivity.

### *Transit Facilities*

There are no transit facilities located directly within the study area, although services from TriMet and Yamhill County Transit serve Sherwood north of the study area. Daily fixed route service from TriMet is provided via Route 94 and Route 93, departing from downtown Sherwood and connecting to downtown Tigard and downtown Portland. Fixed route service from Yamhill County Transit provides connections from McMinnville to Tigard on weekdays, with two stops in Sherwood, the closest located over 2 miles from the study area. An inactive railroad crossing exists approximately 250 ft. east of 99W and Brookman Road.

### *Roadway Volumes*

The study area roadways are used by motor vehicles, pedestrians, and bicyclists. The activity for each of these categories was recorded at each study intersection during the evening peak period (4 PM to 6 PM). Motor vehicle volumes were relatively low on SW Brookman Road during this time, although 99W carries significant volumes with over 3,700 vehicles during the evening peak. Count data indicates that little to no pedestrian activity occurs within the area and only three bicyclists were counted in total, all of them riding through the intersection at 99W and Brookman Road.

Table 2: Existing 2019 Intersection Operations

Intersection	Jurisdictional Standard	LOS	PM Peak Hour Delay	V/C
<i>Unsignalized</i>				
OR 99W (SW Pacific Hwy W) / SW Brookman Road	0.99 V/C	D / <b>F</b>	<b>&gt; 200</b>	<b>&gt; 2.0</b>
SW Old Highway 99 West / SW Brookman Road	LOS E 0.90 V/C	A / A	9.4	0.02
SW Middleton Road / SW Brookman Road	LOS E 0.90 V/C	A / A	9.6	0.11
SW Ladd Hill Road / SW Brookman Road	LOS E 0.90 V/C	A / B	10.3	0.09

### Intersection Operations

Three of the four study area intersections operate within the corresponding jurisdictional standard. The intersection at OR 99W and SW Brookman Road is the only intersection that falls within ODOT jurisdiction, and has a performance target of V/C ratio (which represents the sufficiency of an intersection to accommodate vehicular demand, also known as volume to capacity) equal to or less than 0.99 outside the Town Center under the Oregon Highway Plan. All other study intersections fall under City of Sherwood jurisdiction and have a target of level of service D or a v/c ratio equal to or less than 0.85 for all way stop or roundabout intersections, and a target of level of service E or a v/c ratio equal or less than 0.90 for unsignalized two way stop controlled intersections. Level of service (LOS) is a mechanism used to determine how well a transportation facility is operating from a traveler's perspective. Typically, six levels of service are defined and each is assigned a letter designation from A to F, with LOS A representing the best operating conditions, and LOS F the worst.

The intersection of OR 99W and SW Brookman Road operates below the standard level of service. Excessive delays on side street movements and major street turning movements cause OR 99W and SW Brookman Road to operate well below ODOT mobility standards.

### PROJECTED FUTURE CONDITIONS

#### Future Land Use

The Concept Plan designated future land-uses along Brookman Road including light industrial, high density residential, and medium density residential – high, however the majority of zoning consists of medium density residential – low. The Concept Plan intends to buffer lower density residential areas from the major transportation corridors with higher intensity land uses, wide sidewalks, trees, and generous landscaping.

#### Future Traffic

In the transportation analysis, Metro and Sherwood TSP future travel demand models were used for developing traffic volumes in the study area for the year 2040. The models generally contain regionally significant facilities, typically arterials and above, with some collector roadways. The project team reviewed network elements of the travel demand models in the study area (speeds, number of travel lanes, capacities, etc.) for consistency between facility types and with the existing roadway network and refined the models in the study area.

The baseline (2015) and future (2040) travel demand models were used to develop future year 2040 traffic volumes. The 2040 model includes regional improvements that are generally expected to be funded by 2040.



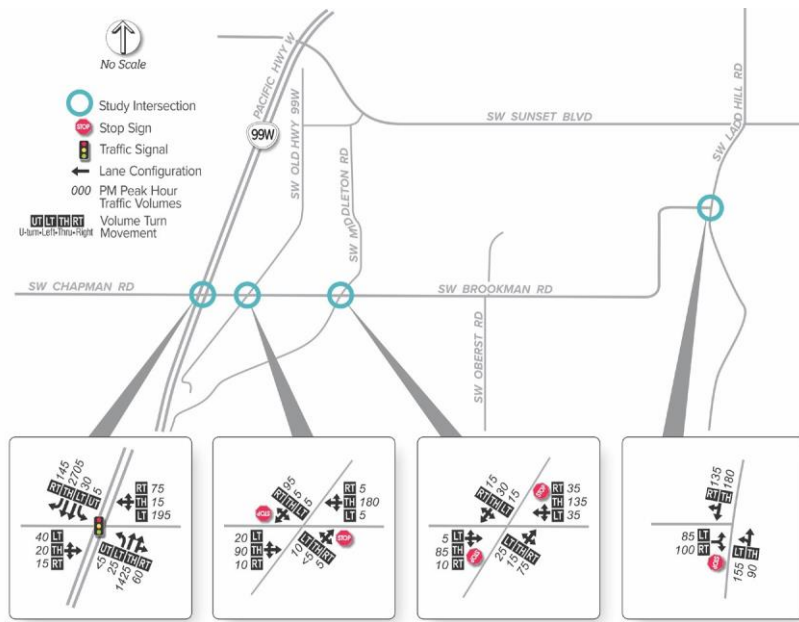


Figure 15: Future Year 2040 Peak PM Traffic Volumes

The following improvements were accounted for: The OR 99W and Brookman Road. Realign OR 99W intersection with Brookman Road a ¼-mile to the north and install a traffic signal, westbound left turn lane and southbound right turn lane. Construct grade separated rail crossing with realignment of Brookman Road (Sherwood TSP, Project D14; Brookman Concept Plan; Metro RTP, Financially Constrained Project #12047).

- » Middleton Road /Brookman Road –Move stop signs to north and south approaches and add a southbound left turn lane (Sherwood TSP, Medium-Term Project D34).
- » Ladd Hill Road /Brookman Road –All-way stop control with southbound right turn lane (Brookman Concept Plan).
- » Ladd Hill Road (Sunset Boulevard to UGB) –Upgrade to three-lane facility (Sherwood TSP, Medium-Term Project D7; Metro RTP, Financially Constrained Project #10693)
- » Sunset Boulevard (Aldergrove Avenue to Eucalyptus Terrace) –Upgrade to three-lane facility (Sherwood TSP, Medium-Term Project D15).
- » Baker Road (Sunset Boulevard to UGB) – Upgrade to two-lane facility (Sherwood TSP, Medium-Term Project D27).

The 2040 model was modified to represent each roadway network scenario described further below.

Future volumes were developed for the options, shown in Figure 2. Based on the model output, neither roadway cross-section option (three-lane or five-lane) is expected to significantly shift travel patterns to Brookman Road in the study area. Both cross-sections are expected to accommodate mostly local traffic and alleviate only some of the congestion on nearby parallel routes (Sunset Boulevard, Tualatin-Sherwood Road, etc.).

The future operating conditions at the study intersections were determined for the PM peak hour based on the 2010 Highway Capacity Manual methodology for unsignalized intersections and 2000 Highway Capacity Manual methodology for signalized intersections. Table 3 shows operational results for the Baseline scenario, where roadway configurations and cross-sections remain the same as in existing conditions while volumes increase in the year 2040.

Table 3: Future 2040 Baseline Intersection Operations

Intersection	Jurisdictional Standard	PM Peak Hour		
		LOS	Delay	V/C
Signalized				
OR 99W (SW Pacific Hwy W) / SW Brookman Road	0.99 V/C	D	40.7	1.06
Unsignalized				
SW Old Highway 99 West / SW Brookman Road	LOS E 0.90 V/C	A / B	11.5	0.14
SW Middleton Road / SW Brookman Road	LOS E 0.90 V/C	A / B	12.1	0.18
SW Ladd Hill Road / SW Brookman Road	LOS E 0.90 V/C	A	10.0	0.30

Table 4: Future Build Intersection Operations (PM Peak Hour)

Intersection	Jurisdictional Standard	3-lane Cross-section			5-lane Cross-section		
		LOS	Delay	V/C	LOS	Delay	V/C
Signalized							
OR 99W (SW Pacific Hwy W) / SW Brookman Road	0.99 V/C	D	52.0	1.03	D	51.5	0.99
Unsignalized							
SW Old Highway 99 West / SW Brookman Road	LOS E 0.90 V/C	A / B	11.5	0.13	A / B	11.7	0.17
SW Middleton Road / SW Brookman Road	LOS E 0.90 V/C	A / B	12.1	0.18	A / B	10.4	0.12
SW Ladd Hill Road / SW Brookman Road	LOS E 0.90 V/C	A	10.0	0.30	B	10.4	0.33



Table 5: Mitigated 2040 Intersection Operations (PM Peak Hour)

Intersection	Jurisdictional Standard	3-lane Cross-section		
		LOS	Delay	V/C
OR 99W (SW Pacific Hwy W) / SW Brookman Road	0.99 V/C	D	51.5	0.99

Table 6: 95th Percentile Queues at SW Brookman Road and Rail Crossing

Direction of Travel	95 <sup>th</sup> % Queue (ft)	Available storage (ft) <sup>a</sup>
Eastbound	75	125
Westbound	375	735

<sup>a</sup> Measured to the nearest intersection.

### Potential Mitigations

The OR 99W and SW Brookman Road intersection is forecasted to operate below standard on the side street approaches under the 3-lane cross-section scenario, while other intersections remain relatively the same in terms of operations for both scenarios. Adding dual westbound left turn lanes would mitigate 99W and Brookman Road in the 3-lane cross section scenario as shown above.

Constructing an additional left turn lane at the intersection would be more cost-effective than constructing a 5-lane cross-section on SW Brookman Road east of the intersection.

### Active Rail

A railroad crossing exists approximately 250 feet east of SW Old Highway 99 West and SW Brookman Road. A queuing assessment was completed that quantified the potential impacts of queued vehicles on SW Brookman Road. The queuing assessment was based on 30-minute train frequencies with two minutes of total gate downtime for each train crossing SW Brookman Road affecting eastbound and westbound vehicle travel. Predicted traffic volumes in 2040 were used to measure the 95th percentile vehicle queues with a one lane approach at the railroad crossing in each direction.

approa

The 95th percentile eastbound queues were measured to be about 75 feet (three vehicles) in length, which could easily accommodate the available 300 feet of space between the rail crossing and SW Old Highway 99 West / SW Brookman Road. OR 99W is located 850 feet west of the rail crossing and would not be impacted by the delay caused by an active rail line. The 95th-percentile westbound queues were measured to be 375 feet, easily accommodated by the 735 feet of storage available to SW Middleton Road. If the railroad tracks were to become active in the future, queue lengths would be accommodated by existing road space and would not back up to SW Old Highway 99 West or 99W.





# IMPLEMENTATION

Based on technical analysis, coordination with City, Washington County, and ODOT, the following amendments are recommended to the Concept Plan:

- » **Land Use.** The existing zoning identified in the 2009 Concept Plan should remain; no zoning changes are necessary to implement the refinement plan recommendation.

*Further Action:* Traffic calming measures will be reviewed and evaluated in the future western subarea to mitigate and reduce vehicle trips through the existing neighborhood to the north.

- » **Interim Design.** The 3-lane alternative road design (Option 3) should be used in the interim until a full 5-lane road is needed. Adding dual westbound left turn lanes would mitigate 99W and Brookman Road and allow the intersection to operate within the proper jurisdictional standard for level of service and volume to capacity ratio.

The interim design would feature an 11-foot shared use path on the northern side of the road.

*Further Action:* Amend text in the existing concept plan pages 5, 18, 20, 21-24 to reflect the interim design. Replace map on page 23 with new recommended road alignment. Update other maps within the concept plan to show the new alignment. Include the 3-lane alternative cross-section graphic as a figure.

- » **Long Term Design.** The 5-lane street design should remain as the official long-term design with an arterial designation.

*Further Action:* Amend pages 5, 18, 20, 21-24 to include references to a future 5-lane road. Include the 5-lane cross section graphic as a figure.

- » **Location.** The location of Brookman Road should remain the same in the central subarea and continue to provide primary east-west access at the edge of the plan area. In the western subarea, the alignment should deviate from the original Concept Plan and instead continue along its existing path. In the eastern subarea, the southernmost alignment option is preferred due to existing grades and has the least impact to existing residential development.

*Further Action:* Include graphics of the alignment in each subarea in the existing concept plan. Amend text on pages 18, 20, and 21 to reflect new alignment.

*Further Action:* To ensure there are no significant impacts to the natural gas facility and proper right-of-way is obtained on the north side of Brookman Road, a requirement of the annexation process for properties located west of the railroad tracks, north of Brookman Road to the current city boundary, will be the completion of further analysis of the roadway in the western subarea identifying road alignment and right of way needs.

- » **Rail Crossing.** The railroad crossing should be designed to protect bike and pedestrian users by having a multi-use path cross the tracks at a 90-degree angle.

*Further Action:* Include rail crossing designs as figure in concept plan. Add bullet point discussing recommended road alignment in relation to the railroad on page 18.

- » **Community Aspiration.** There is a community desire for efficient access and connection across Highway 99w in the Brookman and Sherwood West areas. This long-term vision of a vehicle overcrossing



warrants additional analysis and study. An overcrossing in this area needs to be reviewed comprehensively in conjunction with land-uses, travel demand in these two areas, goals and policies in the City's Transportation and Comprehensive Plans, and in coordination with Washington County, ODOT Region 1 and 2, ODOT Rail, property owners, and other identified stakeholders.

The recommended interim and long-term design of Brookman Road does not preclude an overcrossing. Speaking with representatives from ODOT Region 1 and 2, ODOT Rail, and Washington County Land Use and Transportation Department, all agencies believe an overcrossing is achievable in this area, and possibly could occur within the planned location of Brookman but will require additional analysis and study to address: location, connection to Sherwood West, facility size, impacts to surrounding land uses and existing roads, and identified as a project in City's TSP including potential funding sources.

The study area would include Brookman and the two designated urban growth expansion areas (Sherwood West and Brookman South). At this time, the current level of traffic at the intersection of Brookman and Highway 99W does not necessitate the need for a grade separation crossing, and the only funding identified for future improvements is the signalization of Brookman Road at Highway 99w.

**Further Action:** A comprehensive study is needed of a grade separated crossing to connect Brookman and Sherwood West, coordinated with agency partners, and to identify this project in the City's TSP, including cost estimates and funding strategies.

Following the adoption of this Refinement Plan, the City will coordinate with Clackamas County to adopt the eastern alignment within their Transportation System Plan.

A new intergovernmental agreement (IGA) or an addendum to the existing IGA will also be needed. The current IGA between Clackamas County and Washington County is specific to the existing alignment of Brookman on the border between the two.

The City of Sherwood will continue to work with new developers to either construct or pay in-lieu fees for their share of future road improvements.

The City of Sherwood, Washington County, and ODOT will continue to work together and seek funding to implement the road improvements.

The following table notes the page number, item, and recommended changes to the Sherwood Transportation Plan to reflect the outcomes of the Addendum to the Brookman Addition Concept Plan.

Page #	Item	TSP Amendments
<i>Volume 1: Sherwood Transportation System Plan</i>		
18	Figure 5	Update figure to show new Brookman Road alignment
21	Figure 6: 2035 Motor Vehicle Conditions	Update figure to show new Brookman Road alignment
36	Text in Project D14 in Table 1:	The intersection of Brookman Rd and OR 99W to be improved with the installation of a traffic signal. All traffic signals on the state highway system need to be approved by the State Traffic Engineer and design coordination with ODOT is needed to ensure that the improvements are done in a manner that improves driver expectation and safety. The design of the intersection may result in the need for additional right of way to improve the intersection alignment.
41	Figure 11: Motor Vehicle Projects	Update figure to show new Brookman Road alignment and classification
42	Figure 12: Pedestrian Projects	Update figure to show new Brookman Road alignment
43	Figure 13: Biking Projects	Update figure to show new Brookman Road alignment
44	Figure 14	Update figure to show new Brookman Road alignment
57	Figure 17: Street Functional Classification	Update figure to show new Brookman Road alignment
60	Figure 18: Local Street Connectivity	Update figure to show new Brookman Road alignment
64	Figure 19: Through Truck Routes	Update figure to show new Brookman Road alignment
72	Figure 20: 2035 Non-SOV Share	Update figure to show new Brookman Road alignment
73	Text Amendment	Function and Design of Brookman Road and Concept Plan Area Update: Brookman Road is a rural corridor that sits on the southern edge of the Urban Growth Boundary(UGB). Through the Brookman Addition Concept Plan, it was identified that the road was needed to provide access to areas south of Sunset Road. The I-5 to 99W Connector project had conceptually identified the "Southern Arterial" as the primary east-west mobility route through the area, with an alignment along or just south of Brookman Road. Since the time of those planning efforts, additional planning efforts in the Basalt Creek area have refined the eastern portion of the "Southern Arterial". The



		<p>Brookman Road Concept Plan Area underwent a multiagency refinement planning effort in 2019 and 2020. The results of that process recommended that Brookman Road should use a 3-lane "transitional" road design as the interim design until additional road capacity is needed. Brookman Road will maintain its Arterial designation, allowing widening to a five-lane arterial consistent with the Washington County and Sherwood TSP. This effort ensures the appropriate right of way can be reserved as the area is urbanized while providing accessibility to future development. While the majority of the existing road alignment would remain the same, the refinement process also recommended the following:</p> <ol style="list-style-type: none"><li>1. A comprehensive study is needed of a grade separated crossing to connect Brookman and Sherwood West, coordinated with agency partners, and identify this project in the City's TSP, including cost estimates and funding strategies.</li><li>2. To ensure there are no significant impacts to the natural gas facility and proper right-of-way is obtained on the north side of Brookman Road, a requirement of the annexation process for properties located west of the railroad tracks, north of Brookman Road to the current city boundary, will be the completion of further analysis of the roadway to identify road alignment and right-of-way needs in the western subarea.</li><li>3. The intersection of Brookman Road and Ladd Hill Road be realigned approximately 700 feet to the south to flatten out a sharp curve and minimize impacts to residences.</li></ol>
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