memo

to	Urban Renewal Agency Board
cc.	Urban Renewal Advisory Committee
from	Nathan Polanski, PE, MIG; Dustin Nilsen, City of Hood River Planning Director
re	The Heights Streetscape Plan – Phase 3 Additional Design Studies
date	April 7, 2023

This memorandum summarizes findings and project team recommendations from the additional design studies requested by the Urban Renewal Agency as part of the Heights Streetscape Phase 3 contract. The additional design studies include:

- Additional study for the design of key intersections at 13th Street/May Street and 13th Street/ Belmont Avenue/12th Street.
- The design of East/West streets in the Heights (Taylor Avenue to A Street) to identify opportunities for integrating these into the final streetscape plan.
- Refinements to the typical street cross sections of 12th and 13th Streets to reflect the distinct needs of each street and traffic calming measures for 13th Street.
- Alternatives for extending the two-way cycle on 12th Street south of the project area to Pacific Avenue.

The project team's recommendations are based on findings from these additional design studies. To continue with the development of a final concept plan the project team needs approval of the design direction for each of the additional design studies listed above.

Executive Summary

Based on our studies and the findings presented in this memo the project team's recommendations are:

Key intersections

13th Street/May Street – Roundabout: The additional cost and property impact of a roundabout compared to a traffic signal are offset by largely improved traffic operations, in particular vehicle queue lengths, which could otherwise extend onto Oak Street during 2039 summer PM peak hours, and reduced impacts for trucks coming up the hill in winter weather anticipated to worsen with a signalized intersection

13th Street/Belmont Avenue/12th Street – Traffic signal: Although a traffic signal is projected to create more delay for people travelling by car and vehicles will back up multiple blocks along 13th Street during 2039 summer PM peak hours traffic modeling does not project impacts to nearby intersections at May Street or Pacific Avenue. Compared to a roundabout, a traffic signal will also have a fraction of the impact to adjacent properties, provide more direct access for people walking and biking, and create a placemaking opportunity with the closure of Belmont between 12th and 13th Streets.

East/West Streets

The project team recommends alternating one-way streets from Taylor Avenue to A Street with parallel parking on both sides of the street, except along Taylor where angle parking may be possible on one side of the street. One-way streets are anticipated to provide more flexibility for a variety of vehicle sizes (e.g., pickup trucks, sprinter vans, delivery vehicles, etc.) for people parking and moving through the Heights and more space for people walking and biking. If increased access for people biking along Taylor Avenue and A Street are desired, "sharrows" and contra-flow bike lanes are recommended to provide bike access for people biking eastbound and westbound.

Typical street cross sections for 12th and 13th Streets

The project team has identified several refinements to the typical street cross sections developed during Phase 2 for the final concept plan. Refinements along 12th Street focus on right sizing the allocation of the 60-foot right-of-way way for: access to parking for people driving, the sidewalk experience for people walking, and providing a comfortable, dedicated place for people biking. Refinements along 13th Street focus on mitigating the impact of the center turn lane, removal of parking, and existing constraints along the edge of the right-of-way and within existing easements.

Working through these refinements has highlighted the limitation of the existing 60-foot rights-of-way and the trade-offs and sacrifices required to work within the available right-of-way. Recognizing the design of 12th and 13th Streets are constrained by the existing right of way, the project team recommends the city pursue opportunities for additional walkway space by acquiring easement or right-of-way when possible, to incorporate a 12-foot sidewalk zone into the approved cross section with the understanding and disclosure that currently this right-of-way does not exist; 12-foot sidewalk zones would increase the available space for street improvements from 60-feet to 64-feet.

Opportunities for extending a bike connection south to Pacific Avenue

The project team recommends coordinating with ODOT to explore the possibility of narrowing existing travel lanes and expanding the sidewalk zone to provide a shared use path and landscape buffer along the east side of 12th Street. A shared use path can be accommodated in a narrower space than it would take to provide separate spaces for walking and biking and would provide more comfortable separation from the roadway. At the Shell gas station and Dutch Bros. Coffee drive-thru it may not be possible to acquire an easement or expand the right-of-way to continue the 12-foot shared use path and a solution will be needed to connect to Pacific Avenue.

On-Street Parking Update

Based on recommended changes identified in this memo the future parking supply within the Heights is projected to be within 5% (~20 parking stalls) of the estimated 657 on- and off-street parking stalls needed to accommodate the 2040 peak summertime parking demand identified by the November 2021 parking study. However, it should be noted this does not account for potential parking loss at Jackson Park or the hospital based on the implementation of a roundabout at 13th/May, nor does it account for a mode shifts that the city has previously approved for increased non-vehicle traffic through the installation of pedestrian and bicycle facilities, nor the development of parking developed as part of private property redevelopment requests.

Design of Key Intersections

The goal of this study is to help identify a preferred approach for the design of key intersections at 13th Street/May Street and 13th Street/Belmont Avenue/12th Street to support the approved design concept, which, includes converting 13th Street to two-way travel south of May Street and maintaining 12th Street as one-way northbound travel south of May Street.

This study included:

- Verifying the conceptual roundabout designs for traffic operations,
- Updating roundabout concepts to incorporate bicycle facilities,
- Updating signalized intersection designs, to a similar level of detail as the roundabout concepts, and
- Comparing operational and property impacts and construction cost differences between the updated roundabout and signalized intersection concepts.

Decoding terms for traffic operations

As part of the study to verify operational impacts at key intersections the project team reviewed the traffic models for each intersection design. This included reviewing key outputs from traffic models against applicable design standards. The key outputs presented on the following pages include:

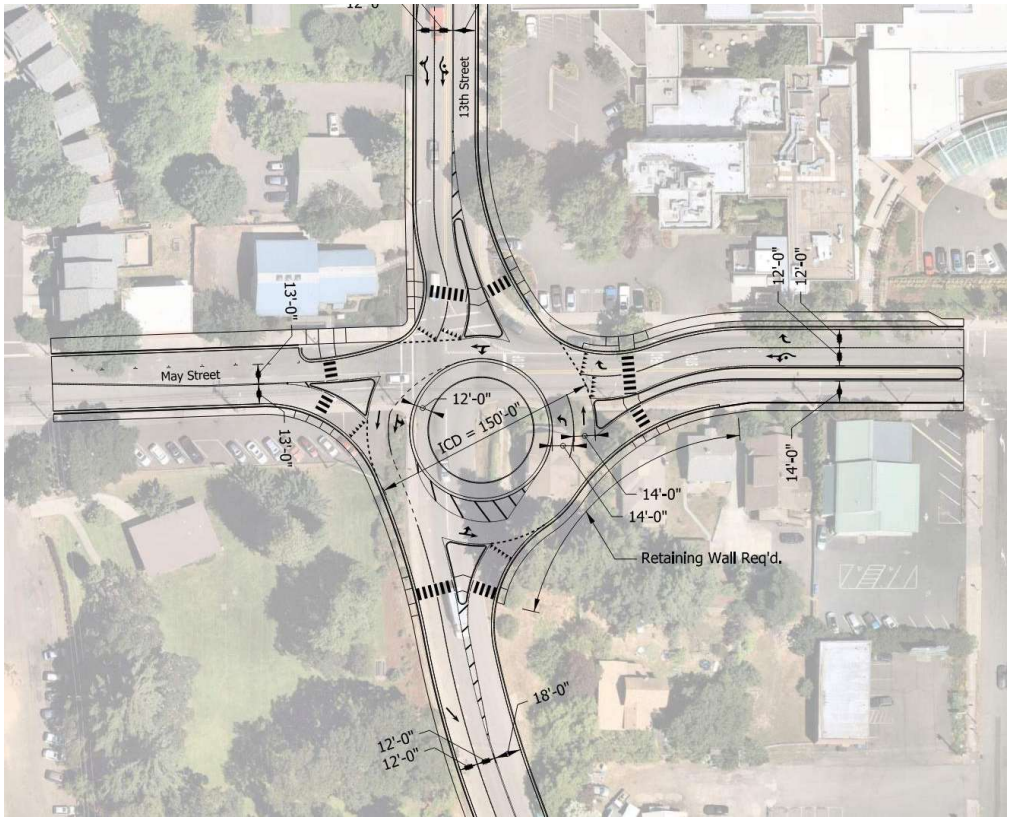
- Level of Service (LOS): how well vehicle traffic flows along a street and is expressed in letters A to F. LOS A provides the highest level of service for vehicles (e.g. free-flow traffic) but does not consider the resulting street environment for people walking or biking. LOS F provides the lowest level of service and is characterized by stop and go traffic, poor travel times, and low convenience for people driving. The city's mobility standard requires LOS E.
- Volume to capacity ratio (v/c): a measure of roadway congestion, calculated by dividing the number of vehicles passing through a section of roadway by the peak hour capacity of the roadway. ODOT's standards require a v/c ratio less than 1.0.
- Vehicle queue lengths: the distance from the stop line to the end of the last vehicle stopped in a single lane. For this analysis, queue lengths are 95th-percentile lengths for the weekday PM peak hour traffic in 2039 (i.e. this length has a 5% probability of being exceeded during the analysis period).

13th Street/May Street

Intersection Layout

The project team reviewed the roundabout layout (Figure 1) developed by the City's roundabout design consultant to identify potential design refinements and incorporate bicycle facilities into the layout.

Figure 1: Roundabout layout for May Street/13th Street by American Structurepoint



Design refinements include:

- the removal of the second circulating lane on the east side of the intersection, which was found to be in excess of the needed intersection capacity,
- modifications to May Street east and west of the roundabout to accommodate a two-way cycle track on the south side of May Street, and
- narrowing travel lanes on 13th Street north of the roundabout to accommodate bike lanes as shown in the City's Transportation System Plan (TSP).

The project team also reviewed and refined a signalized intersection concept to compare to the roundabout to understand property impacts, operational impacts, and construction cost differences.

Figures 2 and 3 below show the refined concepts for a roundabout and traffic signal.

Figures 2 and 3: Refined intersection concepts for May Street/13th Street

Operational Impacts

The refined intersection layouts were also reviewed for operational impacts to vehicular traffic for each concept based on forecasted weekday p.m. peak hour traffic volumes for the year 2039, representing summertime conditions. The following tables compare the level of service (LOS), delay, and volume-to-capacity (v/c) ratio between a traffic signal and a roundabout at 13th Street/ May Street.

As shown in Table 1, the roundabout is expected to operate with similar levels of delay as the TSP Build alternative. A signalized alternative is expected to operate with more delay, nearly 80 seconds on average, due to right turn on red restrictions and exclusive bicycle phasing for a two-way cycle track.

Table 1: Refined Intersection operations results at 13th Street/May Street

SCENARIO	LOS	DELAY (SEC)	V/C
TSP BUILD	C	31	0.96
SIGNAL (WITHOUT TWO-WAY CYCLE TRACK)	D	44	0.94
SIGNAL (WITH TWO-WAY CYCLE TRACK)	E	80	1.03
ROUNDABOUT	C	18 [A]	0.86

- Analysis represents year 2039 weekday PM peak hour in the summer.
- Bold and red indicates a "failing" condition, which could be a v/c ratio of 1.0 or greater or a LOS F.
[A] Note that delay at the roundabout does not take into account delay associated with an enhanced cycle track crossing (such as the use of a rectangular rapid-flashing beacon) on the south leg.

Looking at vehicle queue lengths (Table 2) a roundabout has significantly shorter queue lengths, whereas a traffic signal with a two-way cycle track is projected to back up traffic to Oak Street and beyond during summer p.m. peak periods, which is an unacceptable outcome that could not be recommended by the project team.

Table 2: 13th Street/May Street Vehicle Queue Lengths

INTERSECTION CONTROL	SOUTHBOUND	NORTHBOUND
SIGNAL W/O 2-WAY CYCLE TRACK	approx. to State St	approx. to A St
SIGNAL W/ 2-WAY CYCLE TRACK	beyond Oak St with queues on Oak St	beyond Belmont Ave
ROUNDABOUT	approx. 100'	approx. 200'

- Analysis represents year 2039 weekday PM peak hour in the summer

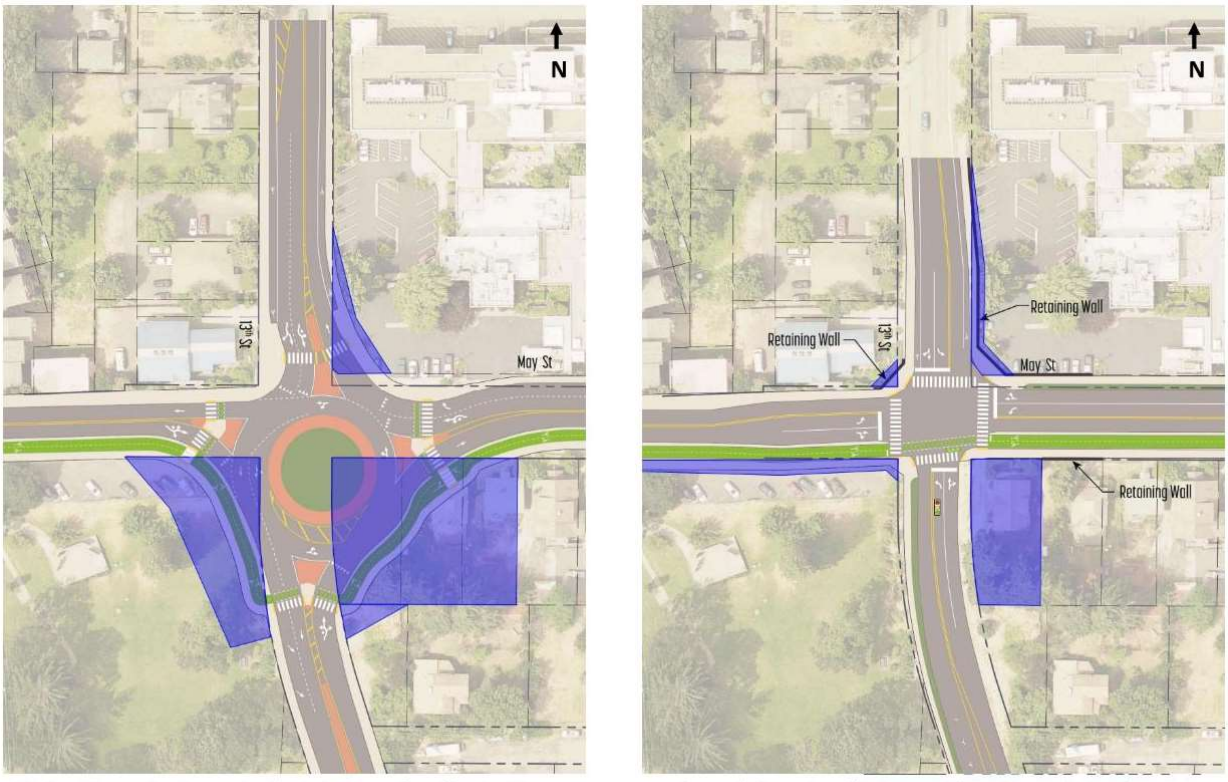
Property Impacts

Figure 4 shows potential property impacts based on the refined intersection concepts shown in Figure 2 and 3. The potential impacts to existing properties at each corner include:

- NW Corner of intersection (Behavioral health building):
  - Roundabout – it appears a roundabout could be sited without impacting this property.
  - Traffic signal – a corner of the property and the existing retaining wall at the back of sidewalk are anticipated to be impacted.
- NE Corner of intersection (Main hospital campus):
  - Roundabout – impacts to the existing hospital parking area are anticipated. Impacts include loss of parking (~7-9 stalls based on Figure 4), however, reconfiguration of the parking lot is not anticipated to change circulation within the parking lot.

  - Traffic signal – impacts to the existing hospital parking area are anticipated. Impacts include loss of parking (~8-11 stalls based on Figure 4); however, reconfiguration of the parking lot is not anticipated to change circulation within the parking lot.
- SE Corner of intersection (Residential Lots):
  - Roundabout – impacts three full residential parcels and requires driveway access to be modified for a fourth parcel. A fifth parcel is partially impacted.
  - Traffic signal – impacts one full residential parcel (due to loss of driveway access) and likely requires a retaining wall along the front of a second residential parcel.
- SE Corner of intersection (Jackson Park):
  - Roundabout – impacts are expected to an area of the park including the slope up to the roadway and a portion of the existing parking lot at the corner including the driveway near 13th Street to accommodate the cycle track. Retaining walls may be able to reduce the overall impact.
  - Traffic signal – impacts a portion of the existing parking lot at the corner and the existing driveway, however in a different configuration than a roundabout to accommodate intersection channelization on May Street.

Figure 4: Potential property impacts at 13th Street/May Street for future intersection improvements.



Note: Property impacts depicted are for illustration purposes only and do not reflect exact locations. Actual locations will be identified as a part of future intersection design.

Cost Considerations

Using the refined intersection layouts for a roundabout and traffic signal we have also examined the potential construction costs for future intersection improvements. This cost analysis focuses only on surface level features (i.e., paving and landscape restoration), does not include costs for utility relocations, right-of-way acquisition, or soft costs, and is not intended to reflect or provide a future project cost; instead, this analysis has been prepared to help compare future intersection improvements.

The comparative level cost analysis for a roundabout and traffic signal are based on the itemization and quantity tabulation of expected surface improvements as shown in Figures 2 and 3. Based on this analysis we anticipate the construction cost, in 2023 dollars, of a future roundabout could be $4M-$6.5M whereas a traffic signal could be $3M-$5M.

A roundabout will also require more additional cost for right-of-way acquisition, which could include costs for land purchase, relocation, administrative costs, legal costs, and condemnation.

We also anticipate a roundabout may require more costs to relocate existing utilities (public – e.g., water lines; private – e.g., electrical and communication distribution lines)

Project Team Recommendation – 13th Street/May Street Intersection

Based on the findings summarized above and in the context of the community's priority goals established during Phase 1 the project team recommends a roundabout for intersection control.

The key factor in this determination is the projected traffic impact for a traffic signal. Although a roundabout will cost more to implement, have greater impact on adjacent properties, and require a longer path of travel for people walking and biking through the intersection, the potential traffic delays for a roundabout are considerably less when compared to a traffic signal. A roundabout will also have less impact on freight and delivery trucks coming up the hill in winter than a signal, which was an issue raised by emergency service providers and local businesses.

13th Street/Belmont Avenue/12th Street

Intersection Concepts

The project team reviewed the double roundabout layouts developed during Phase 2 to:

- identify how bike facilities can be incorporated,
- understand how the double roundabout impacts on-street parking, and
- explore opportunities for placemaking.

An updated double roundabout layout is shown in Figure 5.

Figure 5: Updated double roundabout at 13th Street/Belmont Ave/12th Street

The team also developed a signalized intersection concept to provide a more comparable alternative to the double roundabout for this set of intersections to compare operational impacts, property impacts, placemaking opportunities, and cost differences.

To develop a comparable signalized intersection concept, the project team explored four different intersection configurations to manage traffic through the intersections on Belmont Avenue (Figure 6).

Figure 6: Signalized intersections configurations considered at 13th Street/Belmont Ave/12th Street

Option 1 - One-way eastbound traffic on Belmont

Option 2 – Close Belmont

Option 3 – Widen 13th for 2 SB lanes

Option 4 – One-way westbound traffic on Belmont

These intersection configurations provide different ways to manage traffic on Belmont Avenue with a traffic signal at 13th Street and come with a variety of pros, cons, and opportunities related to on-street parking, neighborhood circulation, and placemaking. Each configuration was evaluated for traffic operations and a summary of the analysis is shown in Table 3.

Table 3: Traffic Signal Configurations - Intersection Congestion and Vehicle Queue Lengths

CONFIGURATION	LOS	DELAY (SEC)	V/C	CALCULATED QUEUE LENGTHS (NORTHBOUND)	(SOUTHBOUND)
OPTION 1 – ONE-WAY EB	C	20	0.98	1,000’	650’
OPTION 2 – CLOSE BELMONT	B	17	0.83	1,125’	450’
OPTION 3 – TWO LANES SB	B	18	0.92	375’	650’
OPTION 4 – ONE-WAY WB	D	39	0.92	1,375’	850’

Although Option 3 results in the shortest queue lengths it requires an additional lane that for pedestrians to cross and eliminates all parking in proximity to Belmont. Of the remaining configurations, Option 2, which closes Belmont Avenue between 13th Street and 12th Street, performs as well or better than the others from an operations standpoint, simplifies traffic movements to improve safety for all users, has less impact to parking on 13th Street, and creates a significant placemaking opportunity. Option 2 is also similar to a configuration discussed with ODOT staff during a review of the preliminary design alternatives toward the end of Phase 2. A rendered plan of Option 2 is shown in Figure 7.

Figure 7: Comparable signalized intersection for intersections at 13th Street/Belmont Ave/12th Street

Operational Impacts

Using these refined intersection layouts for a double roundabout and signalized intersection, we reviewed and compared the operational impacts to vehicular traffic based on forecasted weekday p.m. peak hour traffic volumes for the year 2039, representing summertime conditions. Table 4 compares the level of service (LOS), delay, volume-to-capacity (v/c) ratio, and vehicle queue lengths between a traffic signal and a double roundabout at 13th Street/Belmont Avenue/12th Street.

As shown in Table 4, the traffic signal and double roundabout are both expected to operate at Level of Service B or better with limited delay, however, the vehicle queue lengths for southbound traffic are much longer for a signalized intersection and extend to Taylor Avenue. Although longer than the roundabout the anticipated backup does not extend far enough north or south to impact nearby intersections at May Street or Pacific Avenue during summer p.m. peak periods.

Table 4: Intersection Congestion and Vehicle Queue Lengths

OPTION	LOS	DELAY (SEC)	V/C	CALCULATED QUEUE LENGTHS (NORTHBOUND)	(SOUTHBOUND)
TRAFFIC SIGNALS (13TH STREET)				Southbound	Northbound
OPTION 2 – CLOSE BELMONT	B	17	0.83	1,125'	450'
ROUNDABOUTS					
13TH STREET/ BELMONT AVENUE	A	8	0.56	100'	-
12TH STREET/ BELMONT AVENUE	A	3	0.66	-	200'

Roundabout analysis completed by American Structurepoint, Inc, May 31, 2022
*To the south: Nix Dr – 600'; Pacific Ave – 1100',
*To the north: B Street 450'; Taylor Ave – 1000'; May St - 1400'

Property Impacts

Potential property impacts for the refined intersection concepts at Belmont Ave are shown in Figure 8.

A double roundabout could impact up to five full parcels, including three buildings with existing businesses, and parts of two additional parcels. It should be noted there are other ways to layout a double roundabout depending on specific constraints and design parameters given, however, it is our opinion that the general footprint is likely to be similar in size, and impacts to adjacent properties will be significant particularly when compared to a signalized alternative.

A signalized intersection could be developed to limit property impacts to only the central parcel south of Belmont Avenue between 12th and 13th Streets, which would be impacted by construction and significant limitation of access points in proximity to new intersections.

Figure 8: Potential property impacts at Belmont intersections for future intersection improvements.

Note: Property impacts depicted are for illustration purposes only and do not reflect exact locations. Actual locations will be identified as a part of future intersection design.

Cost Considerations

Using the refined intersection layouts for a double roundabout and traffic signal the project team examined the potential construction costs for future intersection improvements. This cost analysis focuses on surface level features (i.e., paving and landscape restoration), does not include costs for utility relocations, right-of-way acquisition, or soft costs, and is not intended to reflect or provide a future project cost; instead, this analysis has been prepared to help guide compare future intersection improvements.

The comparative level cost analysis for a double roundabout and traffic signal are based on the itemization and quantity tabulation of expected surface improvements as shown in Figures 2 and 3. Based on this analysis we anticipate the construction cost, in 2023 dollars, of a future double roundabout could be $6M-$9.5M whereas a traffic signal could be $3.5M-$5.5M.

A double roundabout will require additional cost for right-of-way acquisition, which include costs for land purchase, relocation, administrative costs, legal costs, and condemnation.

The project team also anticipates a double roundabout may require more costs to relocate existing utilities (public – e.g., water lines; private – e.g., electrical and communication distribution lines).

Project Team Recommendation – 13th Street/Belmont Ave/12th Street Intersection

Based on the findings summarized above and in context of the community's priority goals established in Phase 1 the project team recommends a signalized intersection for intersection control.

Although a double roundabout has less traffic delay and a fraction of the queueing length for vehicles when compared to a signalized intersection, it comes at a significant cost to acquire property and impact to existing businesses. A signalized intersection allows more direct access for people walking and biking through this set of intersections when compared to a double roundabout. With a signalized intersection, vehicle backups are not anticipated to impact traffic at May Street or Pacific Avenue. Closing Belmont also creates a placement opportunity at the south entrance to the Heights.

East/West Street Design

The project team explored two scenarios for the design and circulation of East/West Streets between May Street and Belmont Avenue. One scenario uses a combination of one- and two-way streets to move local traffic while a second scenario relies only on one-way streets. In addition to considerations for vehicle circulation, the scenarios explored opportunities to maximize on-street parking and provide enhanced access for people walking and biking along Taylor Avenue and B Street.

Existing Conditions

Taylor Avenue is a 60' right-of-way, with two-way travel and parking on both sides of the street.

A, B, and C Streets are 50' rights-of-ways, with two-way travel and parking on one side of the street, except C Street, which has parking on both sides of the street.

Contra-flow Bike Lane

To improve access for people biking, each scenario provides a place for people biking on Taylor Avenue and A Street in the east and west directions regardless of the direction of vehicle traffic. To accomplish this within the existing right-of-way while providing parking on both sides of the street, each scenario introduces a new type of bike lane – a contra-flow bike lane.

"Contra-flow bicycle lanes are bicycle lanes designed to allow bicyclists to ride in the opposite direction of motor vehicle traffic. They convert a one-way traffic street into a two-way street: one direction for motor vehicles and bikes, and the other for bikes only." (NACTO's Urban Bikeway Design Guide)

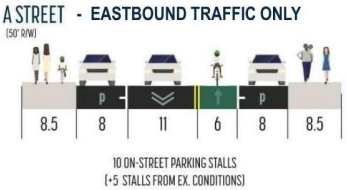
Although contra-flow bike lanes "introduce new design challenges and may create additional conflict points" (NACTO) between people driving and biking they allow direct access to destinations for people biking in both directions. Contra-flow bike lanes typically work best on low-speed, low-volume streets.

To provide enhanced access for people biking on Taylor Avenue and A Street and recognizing that these streets are low-volume, low-speed streets, contra flow bike lanes have been considered as a way to enhance connectivity and decrease the distance and time it takes for people biking to move east and west across the Heights.

Scenario A: One- and Two-Way Streets

This scenario maintains two-way traffic on B and C Streets but changes to one-way traffic on Taylor Avenue and A Street. One-way traffic allows space for space on-street parking on both sides of the street and bike facilities in both directions. On Taylor Avenue and A Street "sharrows" are provided with the direction of vehicle traffic and contra-flow bike lanes against the direction of traffic. On both streets the contra-flow bike lane is located adjacent to on-street parking (angle parking on Taylor Ave and parallel parking on A St). Figure 9 shows the proposed cross sections for each street and a real-world example of a similar street.

Figure 9: Typical cross sections for East/West Streets (looking west) with one- and two-way streets



Contra flow bike lane example with angle parking (Tacoma, WA)

Example of 34' curb to curb width parking both sides

Contra flow bike lane example with parallel parking (Washington DC)

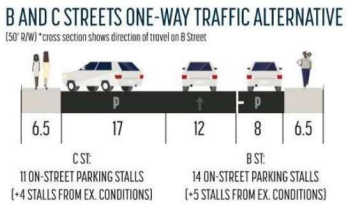
The project team anticipates a combination of one- and two-way streets could be less predictable for people driving, particularly for people who are new to the area.

However, providing on-street parking on both sides of the street in Scenario A could add up to 12 additional parking stalls compared to the existing condition.

Scenario B: One-Way Streets

This alternative scenario provides alternating one-way streets. Because the East/West street intersections are offset along 12th Street the priority for establishing the direction of traffic is to maintain westbound traffic on Taylor Avenue. Similar to Scenario A, each street has parking on both sides of the streets. Similarly, bike facilities on Taylor Avenue and A Street are "sharrows" with the direction or vehicle traffic and contra-flow bike lanes against traffic. Figure 10 shows the proposed cross sections for each street and a real-world example of a similar street.

Figure 10: Typical cross sections for East/West Streets (looking west) with one- and two-way streets



Contra flow bike lane example with angle parking (Tacoma, WA)

Example parking area with parallel and angle parking
(note: example is ~3' wider curb to curb)

Contra flow bike lane example with parallel parking (Washington DC)

Alternating one-way streets are anticipated to be more predictable for people driving. Providing parking on both sides of each street could add up to 15 additional parking stalls compared to the existing condition.

The narrow travel lanes for each scenario, which range from 12'-18' when including the adjacent bike lane, have been reviewed with local fire and emergency response officials. Although the travel lanes are less than the desired 20' width, local emergency response officials understand the project constraints and considerations and take no exceptions to the proposed cross sections included with Scenarios A or B.

Project Team Recommendation – East/West Street Design

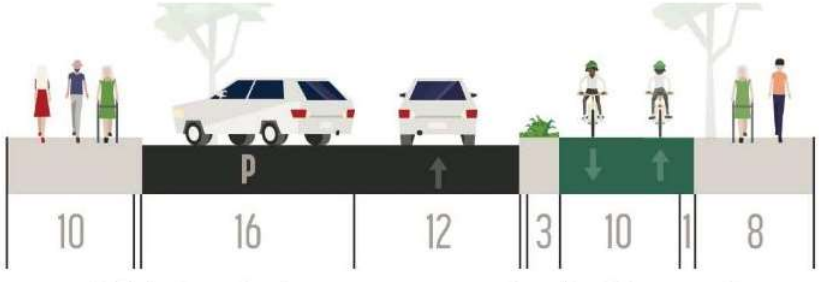
The project team recommends alternating one-way streets for the predictability of one-way streets but recommends modifications to the sections in Scenario B above. To provide more flexibility for a variety of vehicle sizes (e.g., pickup trucks, sprinter vans, etc.) we recommend parallel parking on both sides of the street to provide more flexibility for people parking. If direct access for people biking along Taylor Avenue and A Street are desired a combination of "sharrows" and a contra-flow bike lane are recommended to provide bike direct access for people biking eastbound and westbound.

Design considerations for Streetscape Character on 12th and 13th Streets

12th Street

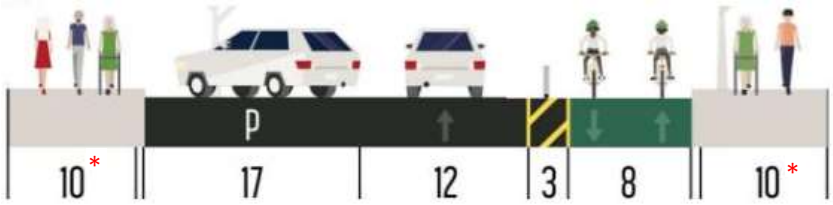
The project team reviewed the typical street cross section developed during Phase 2 for 12th Street (Figure 11) to explore how the allocation of the 60-foot right-of-way best balances access and comfort for all users. This includes people who drive and park to access businesses and people walking and biking through the Heights.

Figure 11: Typical 12th Street cross section developed during Phase 2 (looking north)



As part of this design review, we explored design standards and design guidance for the size of parking stalls (depth and width), the width of a two-way cycle track, the width and type of separation between cycle track and travel lane and the sidewalk, the anticipated use and level of comfort/access that is provided for each user group, and considerations for emergency access, implementation, and maintenance. Based on our review we have developed an updated typical street cross section (Figure 12) that will continue to be refined as we develop the final preferred concept design.

Figure 12: Updated typical 12th Street cross section (looking north)



This cross section increases the depth of the angle parking stall, increases the width of the east sidewalk, decreases the width of the two-way cycle track, and lowers the cycle-track to be at street grade. These refinements are proposed to improve access to parking for people driving, reduce conflicts at intersections for people walking and biking (particularly related to implementing ADA curb ramps at intersections), and to maintain the sidewalk experience for people walking. A key element that is still being explored is the type of delineation to provide separation between the cycle-track and adjacent travel lane; Figure 12 shows a three-foot striped buffer with delineator post. We are continuing to explore how best to provide separation (visual and physical separation if possible) while considering long-term impacts for operations and maintenance of the street throughout the year (e.g., impacts for winter conditions and snow plowing).

*The City should also explore opportunities to pursue additional walkway space by acquiring easement and or right-of-way when possible to incorporate a 12-foot sidewalk zone into the approved cross section. While the refinements above maintain the existing 10' sidewalk zone, 10' is the bare minimum recommended for a street in a central business district context; the ODOT Blueprint for Design

characterizes the urban context along 12th Street as a Central Business District and recommends a 10.5'-20' sidewalk zone (Figure 13).

Figure 13: Excerpt from Table 3-11 from ODOT's Blueprint for Urban Design

Table 3-11: Design Element Recommendations for Traditional Downtown/CBD

Design Element		Guidance
Pedestrian Realm	Frontage Zone	4' to 2'
	Pedestrian Zone	10' to 8'
	Buffer Zone	6' to 0'
	Curb/Gutter[1]	2' to 0.5'

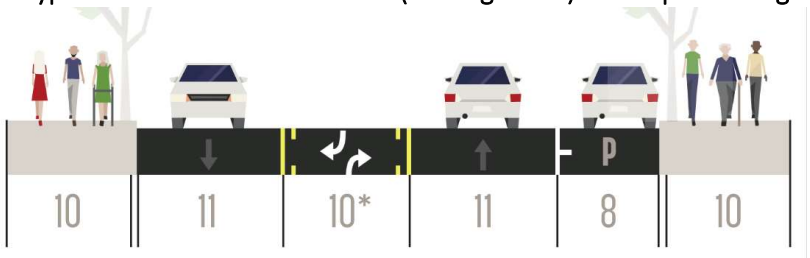
13th Street

Additional studies for the design of 13th Street include:

1. reviewing the typical street cross section developed during Phase 2 to understand how existing constraints might impact future improvements along 13th Street, and
2. exploring ways to mitigate the traffic impacts of a three-lane street cross section design through traffic calming measures.

The typical street cross section developed during Phase 2 (Figure 14) utilized the full 50-foot right-of-way and the five-foot sidewalk and utility easements on each side of the street.

Figure 14: Typical 13th Street cross section (looking south) developed during Phase 2



The existing sidewalk location varies along 13th Street. In some locations the existing sidewalk stops at the limit of the 50-foot right-of-way resulting in a five-foot sidewalk, and in other locations the sidewalk extends into and through the five-foot sidewalk and utility easement providing a 10-foot sidewalk (including curb), see Figure 15. There are also locations where private structures and access ramps that provide access to adjacent buildings are in the five-foot easement (Figure 15). These constraints limit a future sidewalk width if the ramps or structures cannot be easily relocated.

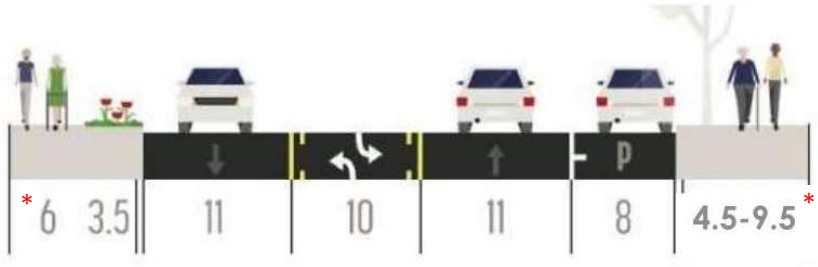
Figure 15: Example of varying sidewalk conditions and constraints along 13th Street

Where these existing constraints prevent the sidewalk from being widened to 10-feet (including curb) the project team recommends the city and agency explore opportunities to require building setbacks or sidewalk easements as properties redevelop so the existing five-foot sidewalk can be widened to 12-feet.

Another challenge for the streetscape environment along 13th Street is the proposed northbound travel lane that will be located next to the sidewalk. On-street parking will be removed, which eliminates the separation between the sidewalk and travel lane and results in a narrower effective sidewalk width and reduced comfort for people walking on the east side of 13th Street.

To help mitigate this condition and to work within the existing right of way the project team acknowledges that the city and agency may be required to narrow the proposed east sidewalk from 10-feet (including curb) to six-feet to provide a landscape buffer between the travel lane and sidewalk (Figure 16); this condition is similar to the existing sidewalk on the north side of May Street between 12th and 13th Streets.

Figure 16: Typical 13th Street cross section (looking south) developed during Phase 2



*Again, the project team recommends the city and agency pursue opportunities to obtain easements or rights-of-way to expand the sidewalk zone from 10' to 12' to accommodate an appropriate buffer and create space for pedestrians along the corridor. Similar to 12th Street, the ODOT Blueprint for Design characterizes the urban context along 13th Street as Central Business District and recommends a 10.5'-20' sidewalk zone.

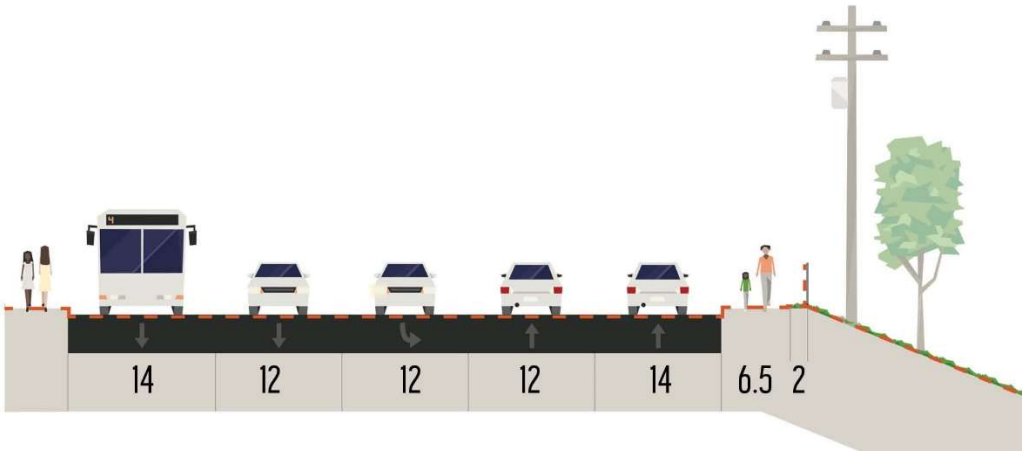
In addition to refinements to the proposed street cross section the project team is identifying opportunities for traffic calming features on 13th Street. Traffic calming features being considered include: curb extensions at intersections where there is on-street parking, medians where they do not conflict with/support future traffic movements (locations are dependent on the circulation of traffic on East/West streets), and pedestrians refuge islands and rectangular rapid flashing beacons (RRFBs) at enhanced East/West crossings at Taylor Avenue and A Street.

Combined these measures should help to slow traffic on 13th Street and improve the streetscape environment for people walking along 13th Street.

Opportunities for a Bicycle Connection to Pacific Avenue

The project team explored opportunities for extending the proposed two-way cycle track south of Belmont Ave along 12th Street to provide a bicycle connection to Pacific Avenue. The existing street cross section south of Nix Drive is shown in Figure 17.

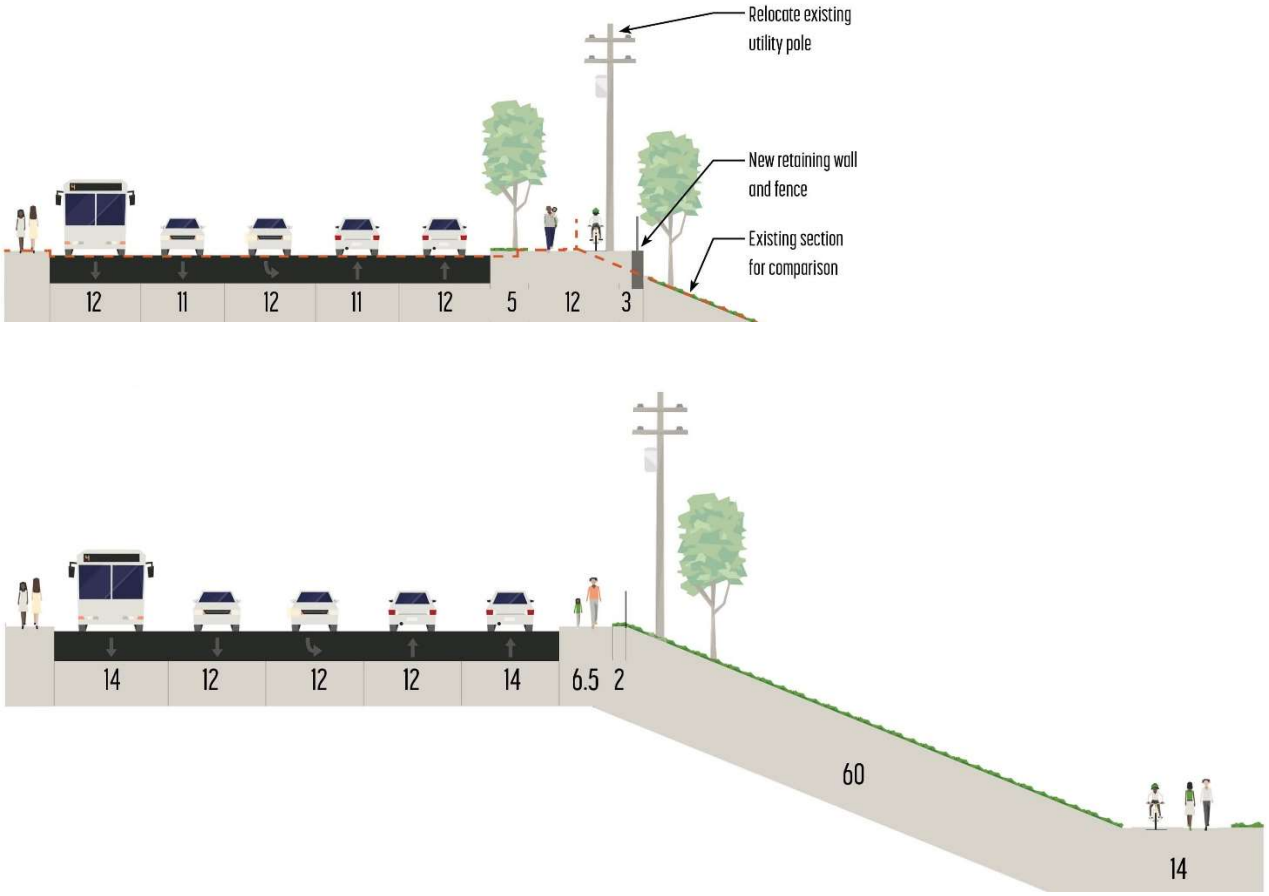
Figure 17: Existing 12th Street cross section south of Nix Dr (looking north)



Given the relatively high-speed, high-volume type street environment along 12th Street the project team only considered scenarios with off-street separated bike facilities. However, rather than continuing a two-way cycle-track the project team explored layouts for a shared use path, which provides a shared space for people walking and biking and takes less space to implement compared to separate, dedicated cycle track and sidewalk facilities.

Based on existing site constraints, including the number and width of travel lanes and slope along the east side of roadway, the project team explored two scenarios for locating the shared use path (Figure 18). One scenario narrows the existing travel lanes and proposes a new retaining wall to widen the existing sidewalk area and provide a shared path alongside the roadway. A second scenario proposes shifting the bike connection away from the roadway, widening the Indian Creek Trail, to provide a bike connection that does not follow the roadway but descends down to Indian Creek and back up 12th Street; this alignment requires path users to descend and climb approximately 30-feet of grade change.

Figure 18: Scenarios of typical cross sections for providing a bicycle south to Pacific Avenue



The project team recommends the first scenario, providing a path alongside the roadway, to provide more direct access for people biking.

With either scenario the city will need to develop a solution that works at the parcel with the Shell gas station and Dutch Bros. Coffee drive-thru. At this parcel it may be necessary to acquire an easement or expand the right-of-way to continue the 12-foot shared use path. A solution will also be needed to provide a safe pathway across the existing driveway.

Coordination with ODOT and further study of this concept is not part of current scope of this project, but will not be necessary at this time to propose the connection be incorporated into the City's TSP.

Heights Parking Summary Update

As the project has progressed, the project team continues to track potential changes to parking in the study area to evaluate impacts for proposed changes and refinements. Parking counts over the past two years have shown that parking in the study area is underutilized even without active management or strategy. The following table summarizes existing and proposed parking scenarios compared to a forecasted demand for a high development growth scenario.

Table 5 provides an updated parking summary for the Heights based on the project team's current recommendations.

Table 5: Parking comparison for existing and future scenarios

	Approx. On-street Parking along 12th and 13th Streets	Approx. On-street District Parking on all E/W streets (parking within one block of 12th and 13th Streets)	Approx. Off-Street Parking [C] (per Sept. 2021 parking study)	Total Parking (on- and off-street)
Existing (2021)	156	148	410	714
2011 TSP Proposed	70	148	410	628
Proposed with current recommendations	80	155	399[A, B]	634
Estimated 2040 Peak Summertime Parking Demand (from 2021 Parking Study)				657

A. This number reflects the loss of 11 parking stalls that could be removed with the acquisition of the private parcel located between Belmont Avenue/12th Street/13th Street.

B. This number does not include impacts to off-street parking at Jackson Park and the hospital as those parking areas were not included in parking study completed during Phase 2.

C. Numbers do not include additional parking constructed as part of private property redevelopment.

Next Steps – Phase 3

Once the URA confirms direction for these additional design studies the project team will begin developing the final preferred concept plan for the study area streets. At the next review meeting the project team will present the final concept plan. The purpose of this review is to present the final concept plan, identify minor refinements that may be needed, and begin discussing potential considerations for developing an implementation plan.

Attached

Appendix A – 13th Street/ May Street Intersection Design Refinement Technical Memo from DKS (Dec 20, 2023)

Appendix B – Belmont Avenue Configuration Options for a Signalized Intersection (Jan 2023)

Appendix C – Design and Layout Considerations for the conceptual double roundabout design developed by the American Structurepoint (Jan 2023)

Appendix D – On-Street Parking Counts

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TECHNICAL MEMORANDUM

DATE: December 20, 2022

TO: Nathan Polanski | MIG

FROM: John Bosket, PE; Kayla Fleskes-Lane, PE | DKS Associates

SUBJECT: Hood River Heights Streetscape Plan – 13th Street/ May Street Intersection Design Refinement

Project #20203-000

This memorandum provides support for design refinement of concepts to improve the intersection on 13th Street at May Street with either a traffic signal or a roundabout, in combination with surrounding improvements to implement Design Concept 3 (Hybrid).

INTERSECTION CONFIGURATION

Figures 1 and 2 show concept drawings of the 13th Street at May Street intersection under traffic signal control and roundabout control[1], respectively. The lane configuration needs were based on forecasted weekday p.m. peak hour traffic volumes for the year 2039, representing summertime conditions. Both drawings assume the surrounding streets have been reconfigured to implement Design Concept 3, which includes converting 13th Street to two-way travel south of May Street and 12th Street to one-way northbound travel south of May Street. This also includes the construction of two-way cycle tracks on the south side of May Street and the east side of 12th Street. There would be no bicycle facilities on 13th Street south of May Street, but it is assumed there would be buffered bike lanes on 13th Street north of May Street as shown in the City's Transportation System Plan (TSP). The left turn lanes under the signalized configuration have been widened to 12 feet in response to comments from ODOT.[2]

[1] The roundabout concept drawing was provided by American Structurepoint, Inc. as part of a May 31, 2022 memorandum to the City of Hood River.

[2] ODOT Concept Review Meeting, August 8, 2022.

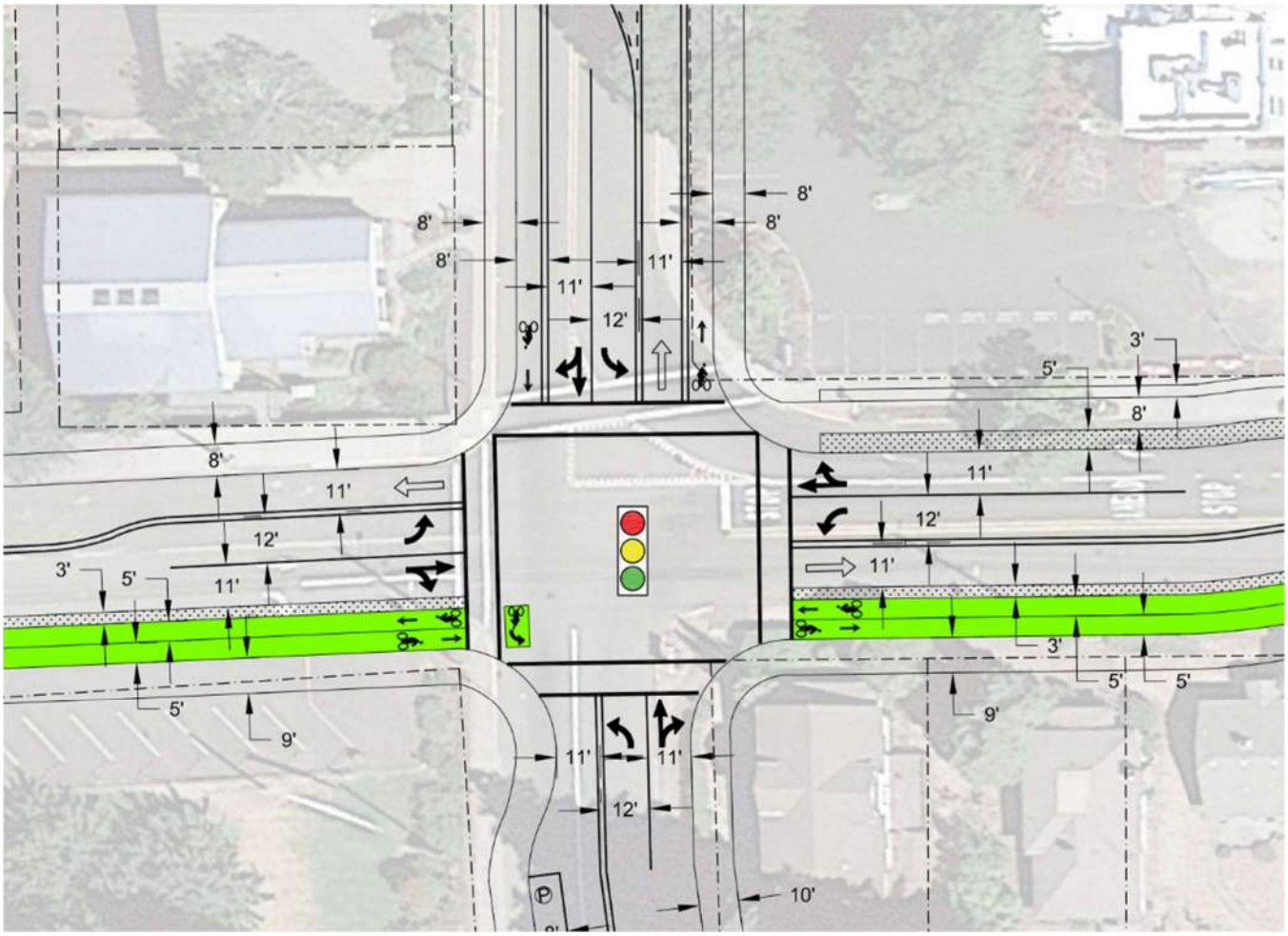

FIGURE 1. 13TH STREET/ MAY STREET SIGNALIZED INTERSECTION CONFIGURATION

Source: DKS Associates

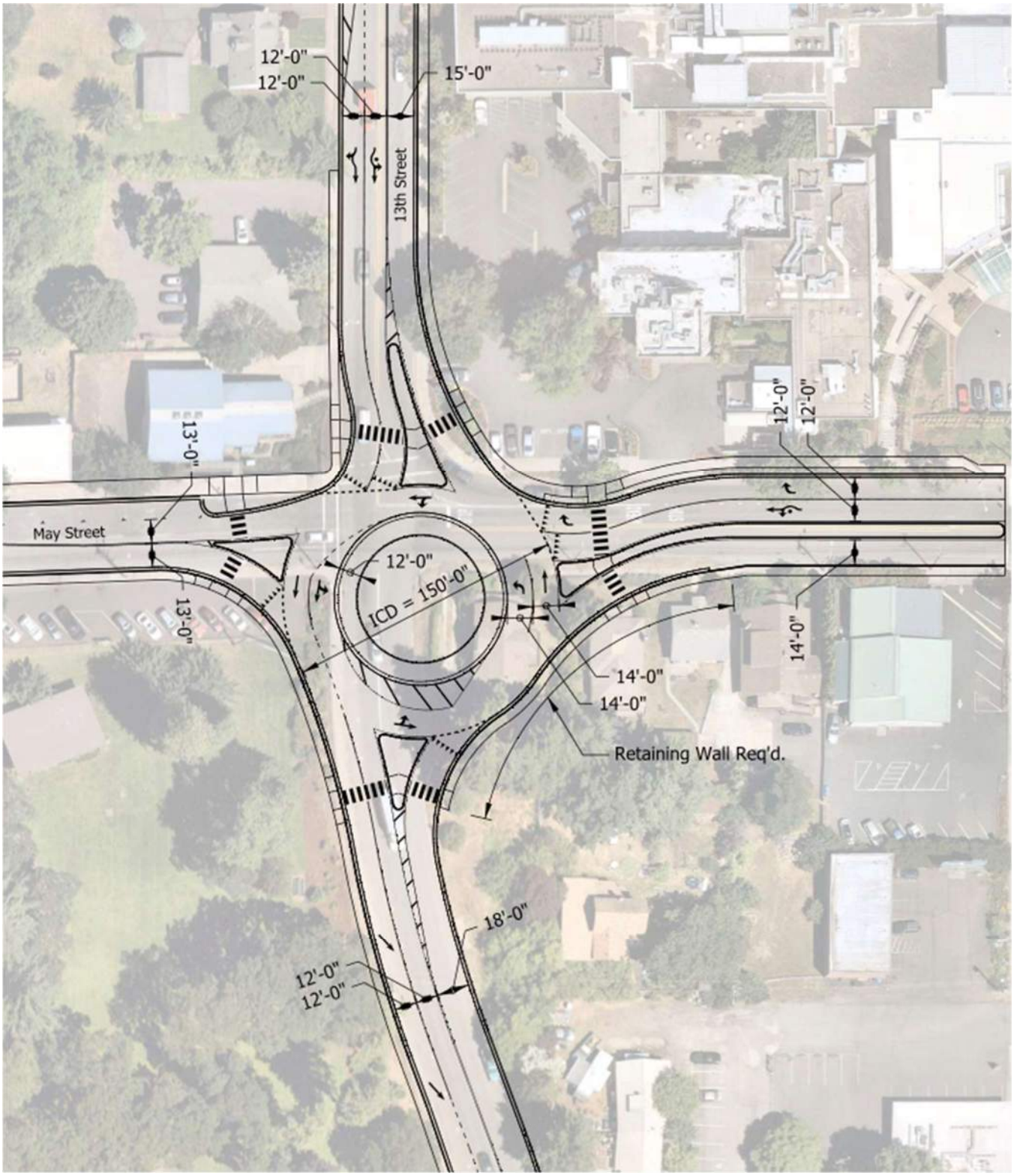

FIGURE 2. 13TH STREET/ MAY STREET ROUNDABOUT INTERSECTION CONFIGURATION

Source: American Structurepoint, Roundabout Peer Review – City of Hood River, Oregon; May 31, 2022

A peer review of the roundabout concept was conducted that yielded the following comments and potential design refinements.

1. There should not be a need for two circulating lanes in the roundabout on the east side (from the northbound entrance to the northbound exit).
2. The westbound through/left entry lane alignment looks off and would guide entering traffic into the island rather than the circulating roadway.
3. The westbound right turn lane should not enter the roundabout circulating roadway.
4. The drawing does not include the desired bicycle facilities and only includes narrow sidewalks on most approaches. In particular, if a two-way cycle track is desired on the south leg, an enhanced crossing should be considered. One option could be a protected intersection design, similar to the roundabout at 9th Street/Wilson Avenue in Bend, Oregon[3].
5. Two-lane entries and exits may need supplemental pedestrian actuated flashing beacons and warning signs for safety (impacts cost but not footprint).
6. Truck turning templates and fastest path analysis should be completed for all approaches.

When comparing the general footprints and potential right-of-way impacts between the two designs, it should be noted that the roundabout concept does not include bicycle facilities on May Street or 13th Street north of May Street, which underrepresents the needed width of those streets. In addition, the City may want to provide an additional 8 feet of width on of 13th Street, south of May Street, to provide on-street parking.

INTERSECTION OPERATIONS

Based on ODOT's preliminary signal warrant form, a traffic signal is likely to be warranted at 13th Street/ May Street in the future. Given that a traffic signal is a potential solution, the prior traffic analysis was refined to better match the current concept. These refinements include:

- an eastbound left turn lane at the intersection to provide greater flexibility for protected pedestrian crossings,
- the removal of any bottleneck at the 13th Street/ Belmont Avenue intersection (which previously influenced signal progression and vehicle queueing at 13th Street/ May Street), and
- enhanced signal coordination between the 12th Street and 13th Street intersections to better mitigate queueing impacts (does not assume the north leg of 12th Street is signalized).

In addition, the community identified a two-way cycle track as the preferred bicycle treatment on May Street, pending feasibility. To implement a two-way cycle track on the south side of May Street, bicycle-specific signal phasing and some right turn on red restrictions would be required at 13th Street/ May Street. Therefore, the intersection was tested with and without that phasing.

Based on these refinements, Table 1 compares the level of service (LOS), delay, and volume-to-capacity (v/c) ratio between TSP Build conditions (maintaining one-way traffic on 13th Street), a

[3] https://www.youtube.com/watch?v=sCa5VpenG5Y

refined traffic signal, and a roundabout at 13th Street/ May Street. As listed in the table, the roundabout is expected to operate with similar levels of delay as the TSP Build alternative. Both of the signalized alternatives are expected to operate with more delay than the TSP Build alternative. With the additional delay associated with some right turn on red restrictions and exclusive bicycle phasing, the signal with the two-way cycle track is expected to have insufficient capacity to meet demand, with nearly 80 seconds of average vehicle delay.

TABLE 1. REFINED INTERSECTION OPERATIONS RESULTS AT 13TH STREET/ MAY STREET (2039 WEEKDAY PM PEAK HOUR)

SCENARIO [A]	LOS	DELAY (SEC)	V/C
TSP BUILD	C	31	0.96
SIGNAL (WITHOUT TWO-WAY CYCLE TRACK)	D	44	0.94 [B]
SIGNAL (WITH TWO-WAY CYCLE TRACK)	E	80	**1.03**
ROUNDABOUT	C	18 [C]	0.86

Bold and red indicates a "failing" condition, which could be a v/c ratio of 1.0 or greater or a LOS F.

For signalized intersections, results are shown for the overall intersection. For roundabouts, delay and LOS are shown for the overall intersection while the v/c ratio is shown for the worst approach.

[A] Signal with two-way cycle track results reported using HCM 2000 methodology, otherwise results reported using HCM 6th edition methodology. Note that roundabout results reported by American Structurepoint utilize the Sidra methodology, which is less conservative and generally shows less delay compared to HCM 6th edition methodology.

[B] Note that the signal results show more delay than prior Design Concept 3 analysis due to changes in left turn signal phasing and cycle length at the intersection with the refined design.

[C] Note that delay at the roundabout does not take into account delay associated with an enhanced cycle track crossing (such as the use of a rectangular rapid-flashing beacon) on the south leg.

The following summarizes the expected vehicle queuing impacts with the refined concepts:

- Without the two-way cycle track, long queues are expected in the northbound and southbound directions under signal control.
  - Southbound queues are expected to extend to approximately State Street.
  - Northbound queues are expected to extend to approximately A Street.
- With the two-way cycle track, even longer queues are expected in the northbound and southbound directions under signal control.
  - Southbound queues spillback beyond Oak Street, causing long queues on Oak Street.
  - Northbound queues spillback beyond Belmont Street.
  - This results in approximately 75 percent more system-wide delay than the scenario without the two-way cycle track.
- Queueing at the roundabout is expected to be significantly lower than the signalized alternatives.

- Southbound queues are expected to extend approximately 100 feet.
- Northbound queues are expected to extend approximately 200 feet.

Beyond intersection operations and queuing, it should be noted that the southbound approach to the intersection requires climbing a steep grade (approximately 6 percent). This is typically approaching the maximum grade that can be accommodated at a roundabout. Today, the southbound approach is uncontrolled, so during icy conditions vehicles (and heavy trucks in particular) do not have to stop on the hill unless there is a pedestrian crossing.

While roundabout queues are generally rolling queues that would allow vehicles to continue forward momentum, a traffic signal would require vehicles to come to a complete stop. Without the two-way cycle track, it is expected that any given southbound through vehicle would have approximately a 95 percent chance of having to stop at the signal. With the two-way cycle track, the southbound approach is over capacity so it is likely that during peak hours, all southbound through vehicles would be required to come to a stop at the traffic signal. It should be noted that pedestrian crossings and bicyclist crossings on the cycle track may require vehicles to stop with the roundabout concept as well.

While the roundabout with an added westbound right turn lane and dual southbound through lanes is expected to perform well with future traffic volumes, single lane roundabouts generally perform better with respect to safety compared to dual lane approaches and exits at roundabouts. Consideration could be given to designing the intersection as a single lane roundabout in the near term with the intent to widen to a dual lane roundabout in the long term, pending an analysis of interim year (i.e. between today and year 2039) traffic operations.

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BELMONT AVENUE CONFIGURATION OPTIONS

Consider options for signalizing the 13th Street/ Belmont Avenue to achieve the following objectives:

- Manage congestion to keep motor vehicle delay within reasonable limits for the Heights (e.g., v/c < 1.0)
- Manage southbound vehicle queues on 13th Street from the Belmont Avenue intersection to keep them from reaching May Street and interfering with intersection operations.
- Minimize roadway widening needs and provide low-stress walking and biking street crossing opportunities.
- Maintain accessibility of businesses.
- Maintain accessibility of surrounding neighborhoods.
- Protect the future function of A Street west of the Heights as a neighborhood greenway.

OPTION 1 – ONE-WAY EASTBOUND

Description:

- Convert Belmont Avenue to one-way eastbound.
- Convert A Street to one-way westbound.

Opportunities:

- Eliminating westbound traffic simplifies signal operation.
- Provides a turnaround at the south end of the Heights to proceed northbound on 12th Street, making businesses on 12th Street between Belmont Avenue and Wilson Street accessible.
- Queues expected back to Taylor Avenue but not May Street.

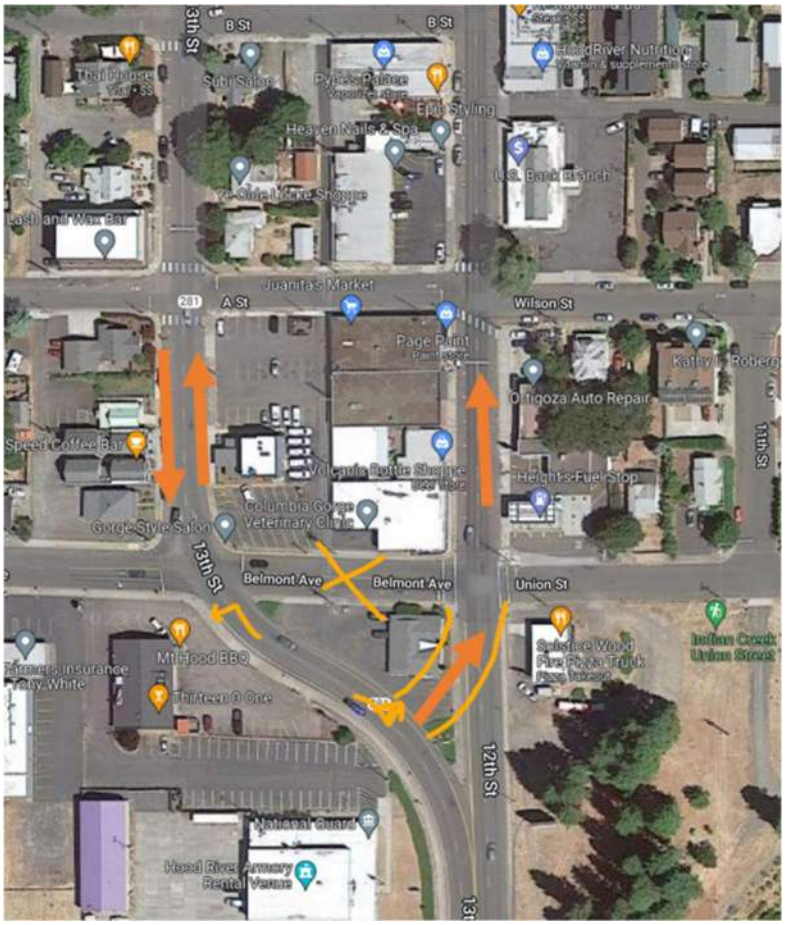
Constraints:

- Limited flexibility for one-way street configuration between 12th Street and 13th Street (sets orientation for other one-way streets).
- Union Street to Belmont Avenue west trips must route around Wilson Street and A Street.

OPTION 2 – CLOSE BELMONT

Description:

- Close Belmont Avenue between 12th Street and 13th Street.
- Realign 12th Street as one-way T-intersection (assumed unsignalized).



Opportunities:

- Eliminating the east approach and relocating the southbound left turn significantly simplifies signal operation.
- Queues expected back to Taylor Avenue but not May Street.
- Flexibility for one-way street configuration between 12th Street and 13th Street (A Street could be eastbound or westbound only).
- Opportunity for re-envisioning of public space with vacation of Belmont Avenue between 12th Street and 13th Street and property acquisition.
- Slows northbound traffic on 12th Street before entering the Heights.
- Provides a turnaround at the south end of the Heights to proceed northbound on 12th Street, making businesses on 12th Street between Belmont Avenue and Wilson Street accessible.

Constraints:

- Property impact with realignment.
- Limited queue storage for back-to-back left turn lanes on 13th Street between Belmont Avenue and 12th Street.
- Union Street to Belmont Avenue west trips must route around Wilson Street and A Street.

OPTION 3 – WIDEN 13TH STREET FOR TWO SOUTHBOUND THROUGH LANES

Description:

- Remove parking and widen 13th Street between A Street and southern end of existing couplet to allow for two southbound lanes, a left turn lane and a northbound lane (four-lane cross section instead of three-lane).

Opportunities:

- Significantly mitigates queueing concerns (queues approximately to B Street).
- Flexibility for one-way street configuration between 12th Street and 13th Street (A Street could be eastbound or westbound only).
- Two-way traffic can be maintained on Belmont Avenue between 13th Street and 12th Street.
- Provides a turnaround at the south end of the Heights to proceed northbound on 12th Street, making businesses on 12th Street between Belmont Avenue and Wilson Street accessible.

Constraints:

- Requires removal of parking between A Street and Belmont.
- Requires significant street widening.
- Creates a wide crossing for people walking and biking.

OPTION 4 – ONE-WAY WESTBOUND

Description:

- Convert Belmont Avenue to one-way westbound.
- Convert A Street to one-way eastbound.
- Close the northbound left turn at 13th Avenue/Belmont Avenue (served by westbound Belmont Avenue instead).
- Realign 12th Street as one-way T-intersection.

Opportunities:

- Eliminating eastbound traffic and the northbound left turn simplifies signal operation.
- Maintains westbound access from Union Street.
- Provides a turnaround at the south end of the Heights to proceed northbound on 12th Street, making businesses on 12th Street between Belmont Avenue and Wilson Street accessible.
- Slows northbound traffic on 12th Street before entering the Heights.

Constraints:

- Queueing spills back to May Street and increases risk of westbound queues on Belmont Avenue blocking 12th Street (this is the worst option from a congestion standpoint).
- Westbound lefts challenging to make at 13th Street/ Belmont Avenue due to intersection geometry, could limit connectivity.
- Property impact with realignment.
- Limited flexibility for one-way street configuration between 12th Street and 13th Street (sets orientation for other one-way streets).

Table 1: 13th Street/ Belmont Avenue Intersection Congestion

OPTION	CYCLE LENGTH	LOS	DELAY (SEC)	V/C
OPTION 1 – ONE-WAY EB	100s	C	20	0.98
OPTION 2 – CLOSE BELMONT	110s	B	17	0.83
OPTION 3 – TWO LANES SB	120s	B	18	0.92
OPTION 4 – ONE-WAY WB [A]	140s	D	39	0.92

Analysis represents year 2039 weekday PM peak hour in the summer

[A] Based on HCM 2000

Table 2: 13th Street/ Belmont Avenue Vehicle Queue Lengths

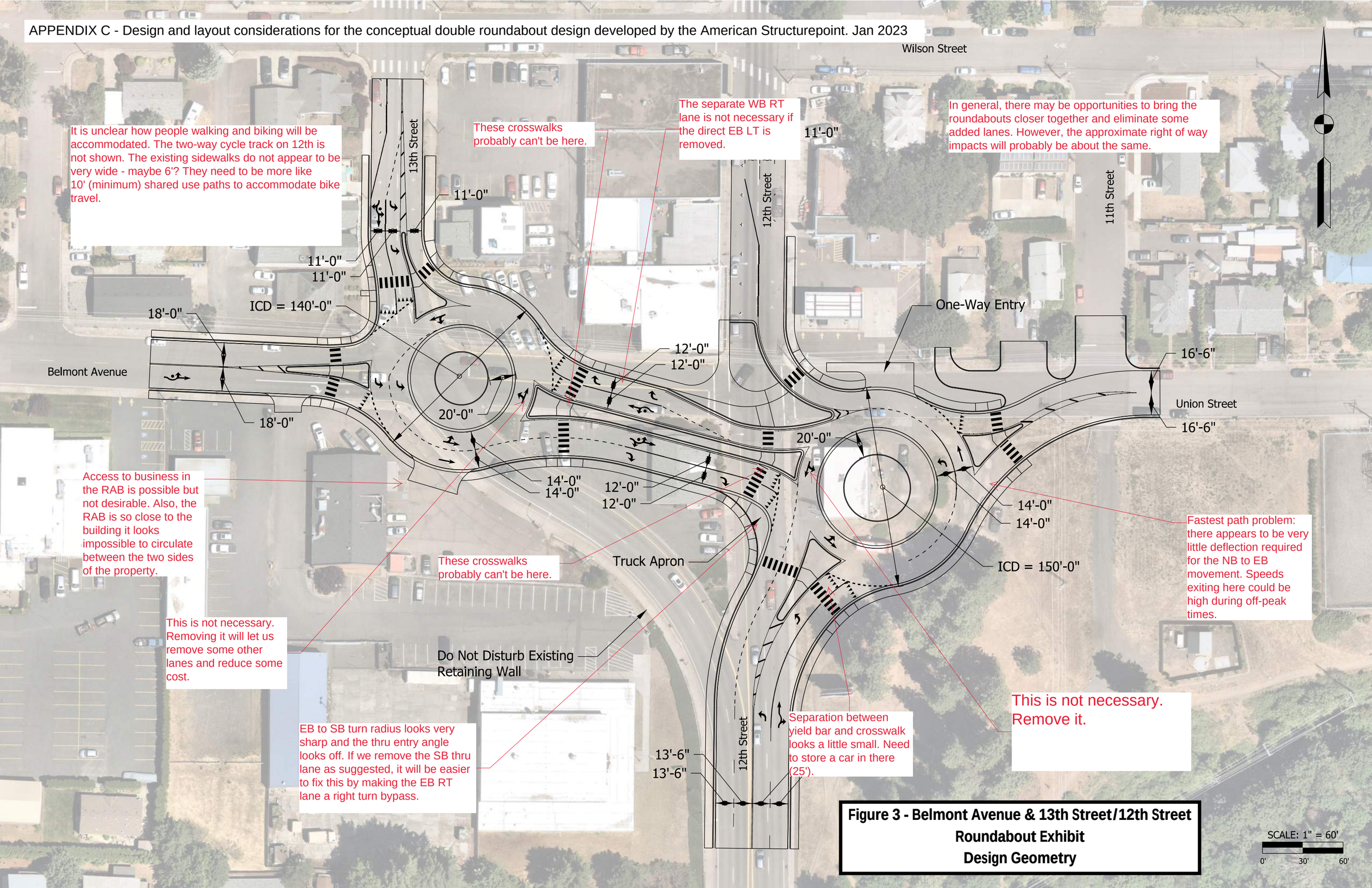
OPTION	HCM CALCULATED QUEUE LENGTH	
	Southbound	Northbound
OPTION 1 – ONE-WAY EB	1000’	650’
OPTION 2 – CLOSE BELMONT	1125’	450’
OPTION 3 – TWO LANES SB	375’	650’
OPTION 4 – ONE-WAY WB	1375’	850’

Analysis represents year 2039 weekday PM peak hour in the summer

*To the south: Nix Dr – 600’; Pacific Ave – 1100’,

*To the north: B Street 450’; Taylor Ave – 1000’; May St - 1400’

APPENDIX C - Design and layout considerations for the conceptual double roundabout design developed by the American Structurepoint. Jan 2023



It is unclear how people walking and biking will be accommodated. The two-way cycle track on 12th is not shown. The existing sidewalks do not appear to be very wide - maybe 6'? They need to be more like 10' (minimum) shared use paths to accommodate bike travel.

These crosswalks probably can't be here.

The separate WB RT lane is not necessary if the direct EB LT is removed.

In general, there may be opportunities to bring the roundabouts closer together and eliminate some added lanes. However, the approximate right of way impacts will probably be about the same.

Access to business in the RAB is possible but not desirable. Also, the RAB is so close to the building it looks impossible to circulate between the two sides of the property.

These crosswalks probably can't be here.

Fastest path problem: there appears to be very little deflection required for the NB to EB movement. Speeds exiting here could be high during off-peak times.

This is not necessary. Removing it will let us remove some other lanes and reduce some cost.

EB to SB turn radius looks very sharp and the thru entry angle looks off. If we remove the SB thru lane as suggested, it will be easier to fix this by making the EB RT lane a right turn bypass.

Separation between yield bar and crosswalk looks a little small. Need to store a car in there (25').

This is not necessary. Remove it.

Figure 3 - Belmont Avenue & 13th Street/12th Street Roundabout Exhibit
Design Geometry

EXISTING

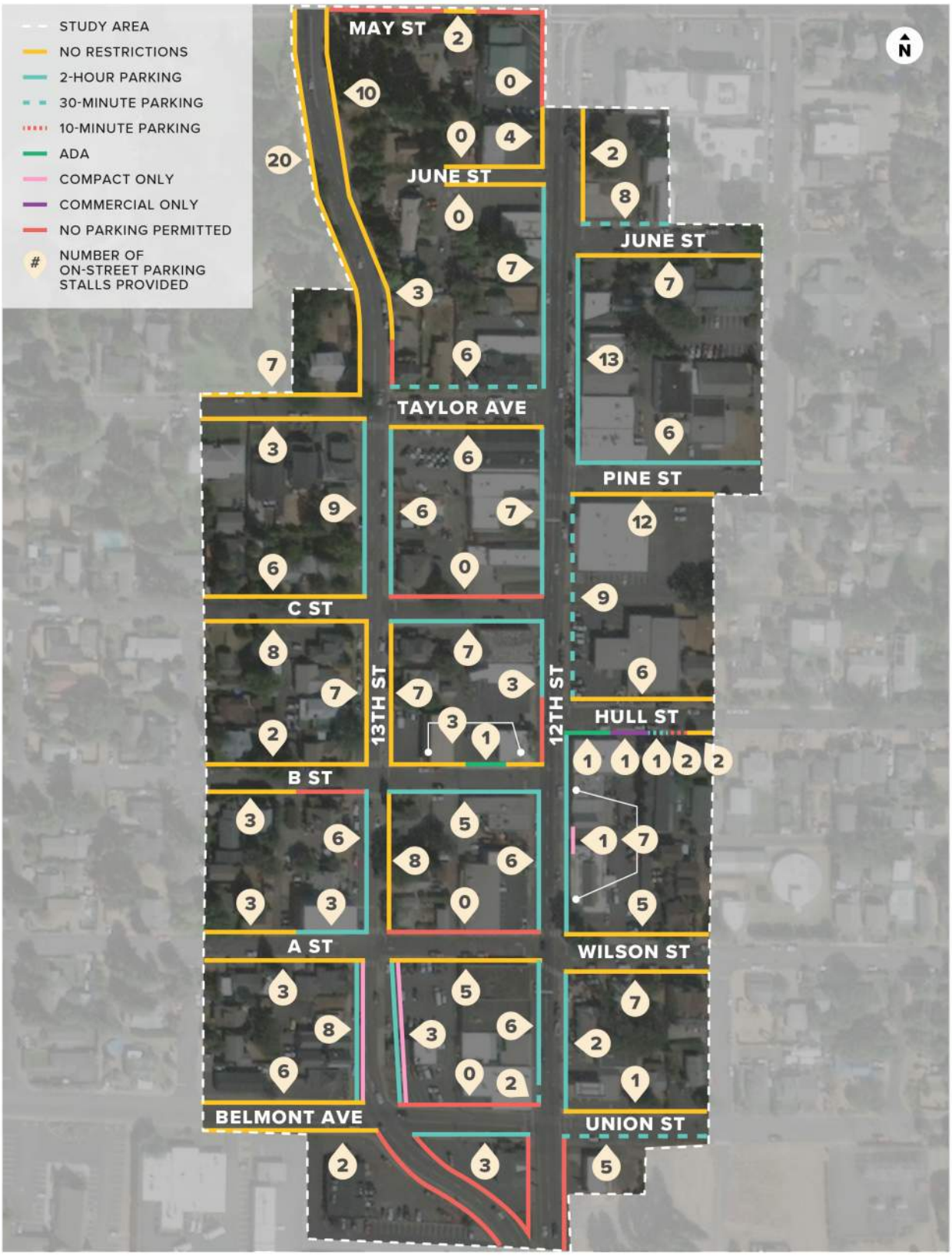


Figure 1: On-Street Parking Locations and Restrictions from November 2021 Parking Study by DKS

PROPOSED

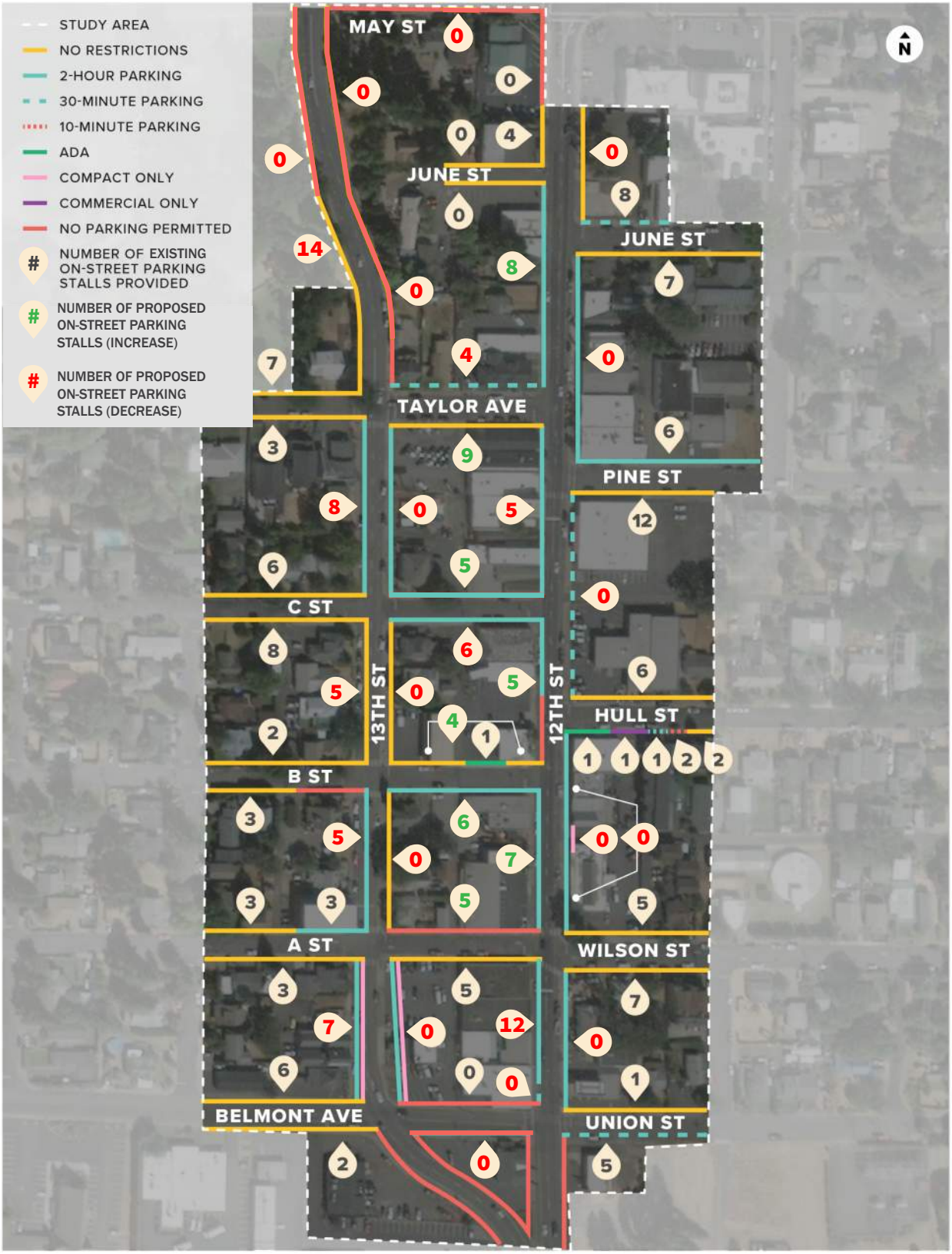


Figure 2: Planning level estimate for potential future on-street parking for recommended design (as of design studies completed March 2023)