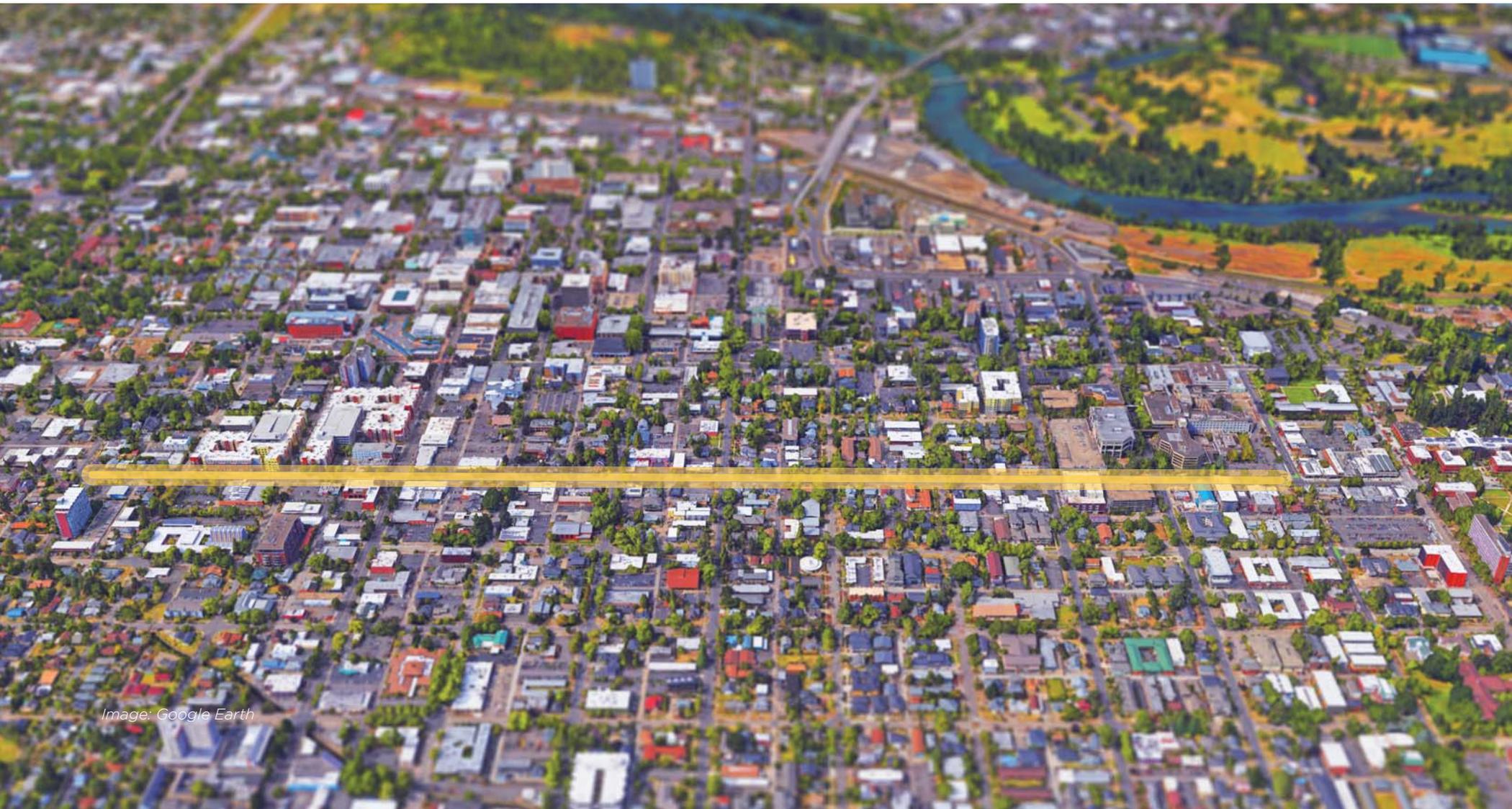


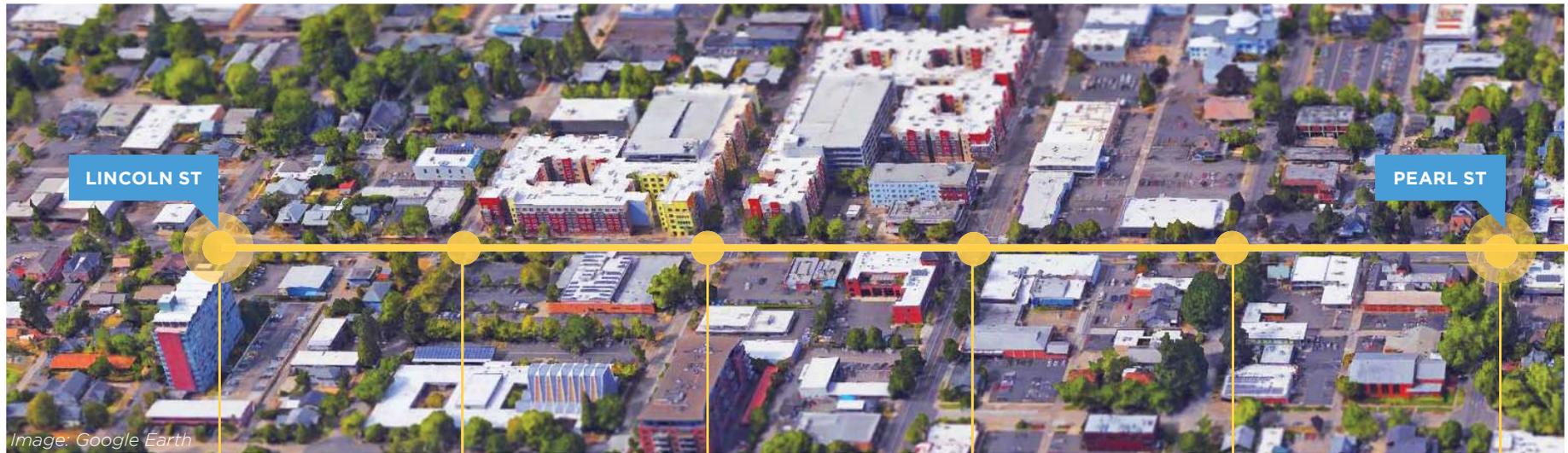


13TH AVENUE

# Protected Bike Lanes

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CROSS STREET:	LINCOLN ST	CHARNELTON ST	OLIVE ST	WILLAMETTE ST	OAK ST	PEARL ST
RECOMMENDED BIKEWAY INTERSECTION TREATMENT:	Protected Intersection Connection	No conflict due to one-way operation. No Right on Red signs.	Permissive Left Turn	Permissive Left Turn	Protected Bike Signal Phase and Left Turn Phase	No conflict due to one-way operation. No Right on Red allowed.
BIKEWAY CIRCULATION:	Close the contraflow turn lane to provide space for stopping, turning, and maneuvering.	Two Stage Turn Box Connections	Bicyclists on Olive can turn from center turn lane, or make a two-stage turn maneuver.	Two Stage Turn Box Connection	No Bikeway Connection	Two Stage Turn Box Connections
CONSIDERATIONS:	Closing the jogged turn lane and south side intersection will have access impacts for nearby residents.		Maintaining separation at the crossing should result in low-speed interactions and provide space for motorists to yield. If left turn volumes are close to or above 100 veh/hr, consider protected signal phasing with a dedicated left turn lane.  Consider providing a leading bicycle interval (LBI) to reduce conflicts in permissive conditions. LBIs are considered experimental by FHWA.	< 100 Left turns/hr are moderate. Cross-section does not easily allow left only lane and two through lanes.  Consider providing a leading bicycle interval to reduce conflicts in permissive conditions. LBIs are considered experimental by FHWA.	> 100 Left turns/hr indicates need to separate signal.  Consider reducing through travel lanes to one at Oak St to allow for greater flexibility in adding dedicated left turn lanes. Perform traffic analysis to calculate turn lane storage length and look at corridor timing to optimize flow. May need to extend cycle lengths.	



Image: Google Earth

HIGH ST	MILL ST	FERRY ST	PATTERSON ST	HILYARD ST	ALDER ST
Protected Bicycle Signal Phase, Protected Intersection Geometry	Local roadway crossing	Local roadway crossing	No conflict due to one-way operation. No Right on Red allowed.	Protected Signal Phase with dual right lanes.	Permissive Signal with Protected Intersection Geometry
Protected Intersection geometry allows for natural transitions	No Bikeway Connection	No Bikeway Connection	No bikeway connection accommodations proposed	Two stage turn box connections from Hilyard	Protected Intersection geometry allows for natural transitions.
> 100 Left turns/hr indicates need to separate signal. Will require curb line changes on north side.	Median on local street manages turning speeds	Median on local street manages turning speeds		> 100 Left turns/hr indicates need to separate signal. High numbers of existing left turns indicates potential demand for two turn lanes.  Explore curb modifications to bring the cycle track to the north within existing geometry. This allows for dual left lanes to be maintained which moves more left turning vehicles within the phase.	High bicycle counts and an intersection with the Alder St two-way cycle track indicate benefits of large queuing areas within the protected intersection.  Perform traffic analysis to verify impacts. To accommodate the protected intersection some drainage may need to be relocated if major curb changes are to be implemented.

# E 13th Ave & Lincoln

## EXISTING CONDITIONS



# E 13th Ave & Lincoln

The western end of the protected bike lane must transition contraflow users to a connecting street, and allow bicyclists approaching from the south-side bike lane to the west to transition into the north-side bidirectional protected bike lane.

Closing the existing contraflow turn lane provides space for people biking to turn, stop, and transition to connecting facilities, and provides a natural termination point for the protected bike lane.

Rapid flashing beacons should be used to increase yielding to pedestrians, and may be configured for eastbound bicyclists to use when transitioning into the protected bike lane.

A future protected bike lane on Lincoln St to the north would connect seamlessly to the 13th Ave protected bike lane.

An interim improvement could provide shared lane markings on Lincoln St.

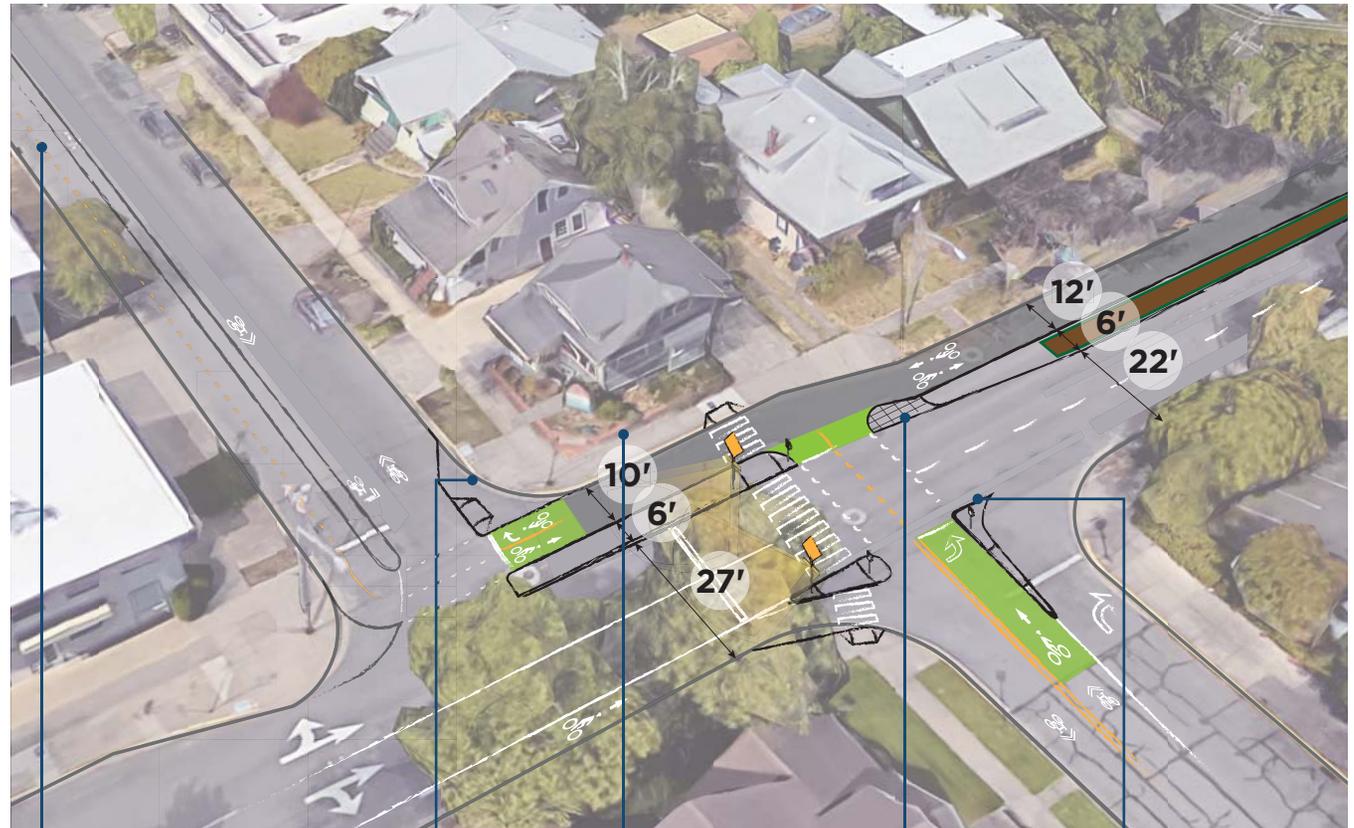


Image: Google Earth

*Future protected bike lane on Lincoln St*

*Natural transition point to Lincoln St. to the north, works well with existing and future configurations.*

*Close the existing contraflow turn lane to allow for bicycle circulation.*

*Driveway access can be preserved with flush median/buffer.*

*Channelizing island creates a protected space for bicyclists transitioning from the right side bike lane to north side protected bike lane. Rapid flash beacons are recommended to promote yielding to people walking and biking.*

# E 13th Ave & Pearl St

## EXISTING CONDITIONS



# E 13th Ave & Pearl St

Connections with painted bike lanes can be difficult to accommodate in an intuitive fashion. At Pearl St. and other intersections where bike lanes cross, two-stage turn boxes should be used to identify locations for people biking to stop when transitioning from one facility to the next.

Turn boxes are placed outside of the path of moving bicyclists, pedestrians and motorists, but their size and location may be limited due to existing sidewalk, curb ramp and crosswalk location.

Protected intersection geometry provides a more intuitive location for people biking to wait, but is likely to require more significant reconstruction of the sidewalk corner.

Consider an implementation approach that provides two-stage turn boxes for bike lane connections in the short term, with upgrades to protected intersection geometry as these corridors are enhanced in the future.



Image: Google Earth

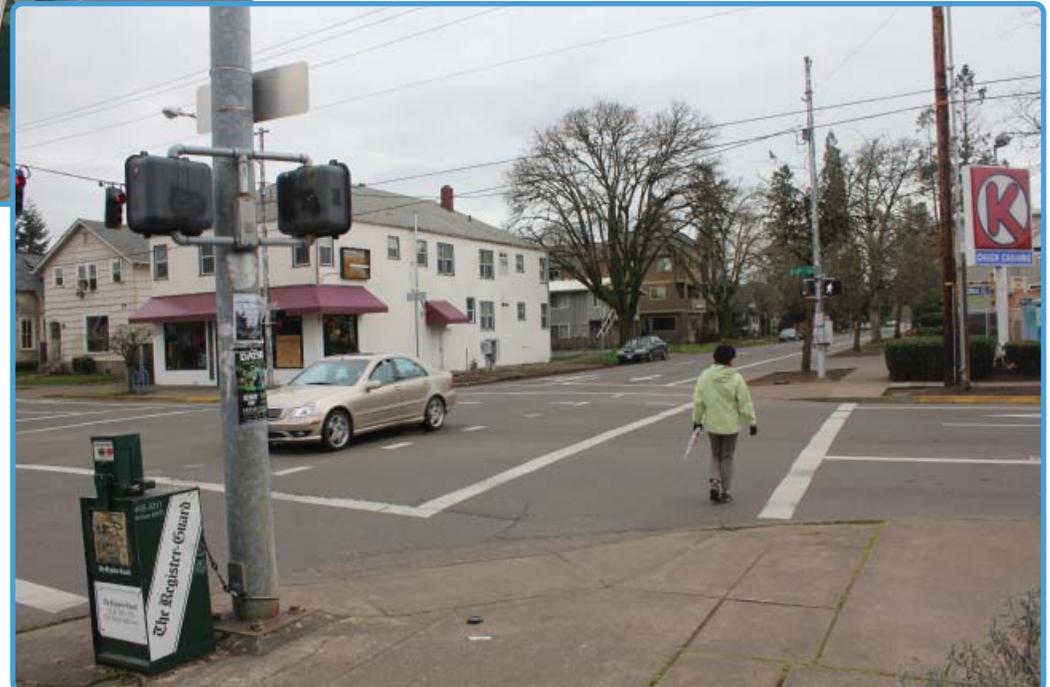
*A subtle bump at driveways promotes yielding to people biking.*

*Two-stage turn boxes for all potential turning movements.*

*A protected intersection design is possible, but requires significant reconstruction of the sidewalk corner*

# E 13th Ave & High St

## EXISTING CONDITIONS



# E 13th Ave & High St

Where two protected bike lanes intersect, protected intersection geometry should be used for increased comfort and safety.

At High St, this may be combined with protected signal phasing to eliminate left turn conflicts.

The corner should be constructed to support a future bidirectional protected bike lane on the West side of High St.

An interim improvement could provide two-stage turn boxes to transition between the protected bike lane and the painted bike lane on High St.

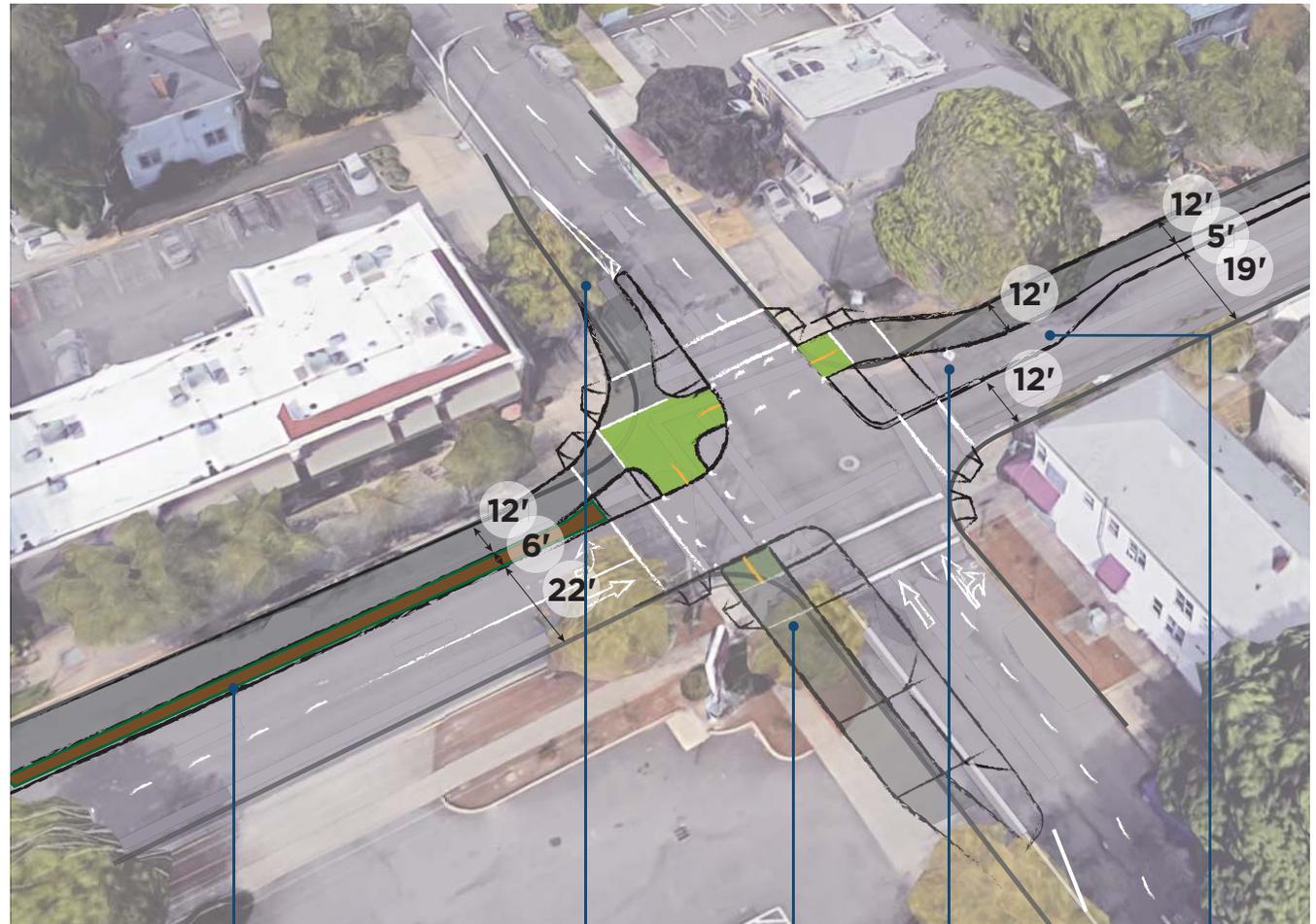


Image: Google Earth

Potential stormwater planter

Construct to support future bikeway on High St.

South side approach into the protected intersection corner may be implemented with the future bikeway

At narrow segments, median islands should be 2-3" tall to allow emergency vehicles to mount curbs if necessary.

Wrap around mature tree.

# E 13th Ave & Ferry St

## EXISTING CONDITIONS



Image: Google Streetview



Image: Google Streetview

# E 13th Ave & Ferry St

Uncontrolled crossings at local streets pose risks to people walking and biking. Bidirectional facilities increase this risk, particularly for bicyclists traveling in the contraflow direction.

Designs aim to slow motorists entering and exiting the street, and to make people walking and biking aware of the potential for conflict.

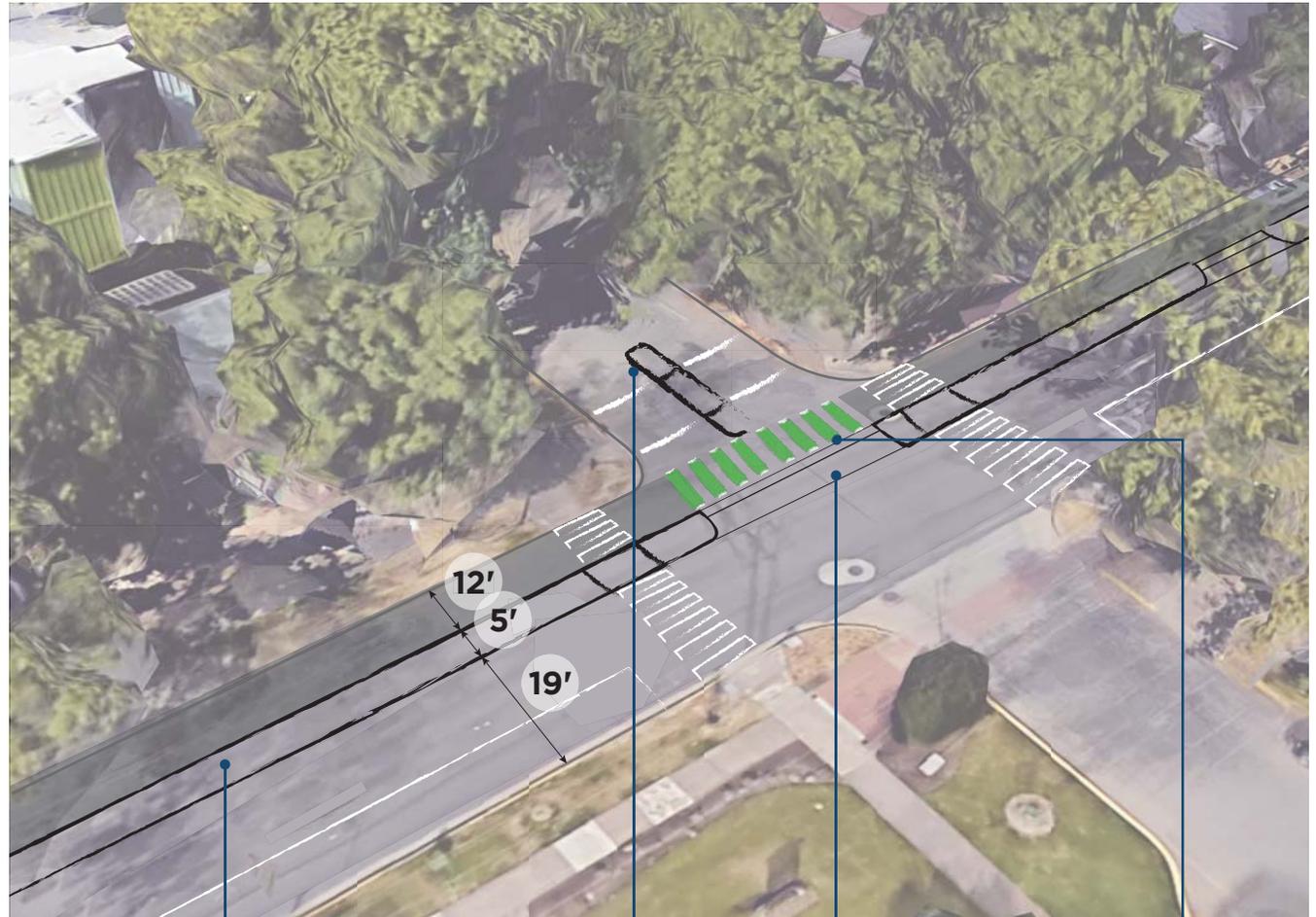


Image: Google Earth

*At narrow segments, median islands should be 2-3" tall to allow emergency vehicles to mount curbs if necessary.*

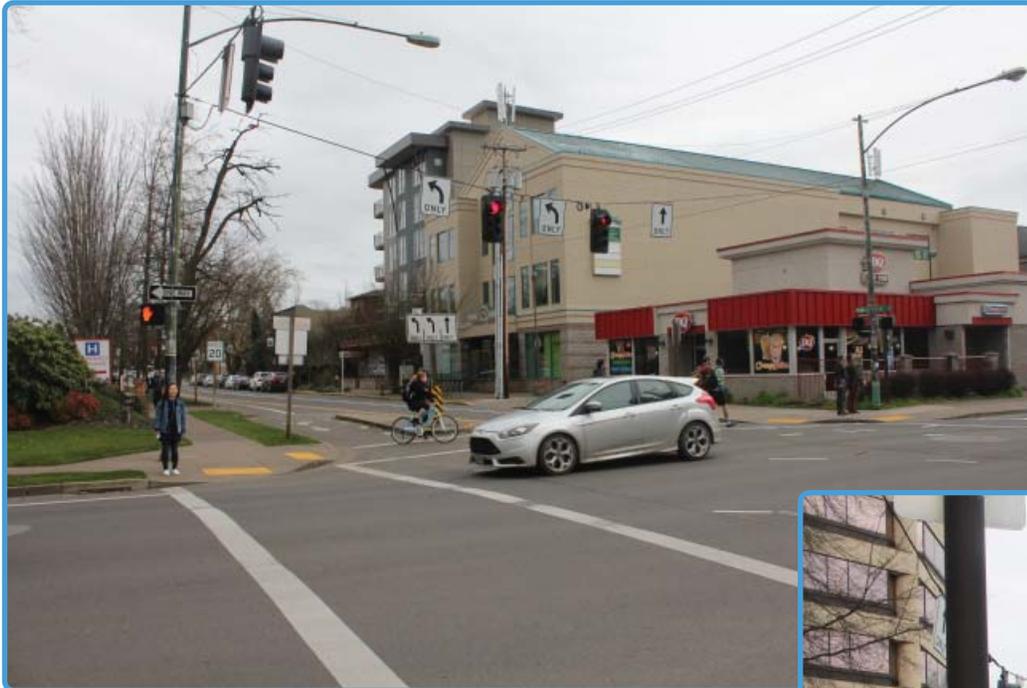
*Median islands channelize motorists turning to and from 13th Ave.*

*Minor speed hump provides tactile indication to motorists crossing the protected bike lane.*

*Broken green crossings indicate permissive turning conflicts*

# E 13th Ave & Hilyard St

## EXISTING CONDITIONS



# E 13th Ave & Hilyard St

To accommodate large numbers of left turns the current cycle length is likely inadequate to provide time for through bikes and left turning vehicles. Explore curb line modifications to laterally shift the protected bike lane to the north to allow for dual left lanes to be maintained which will move more left turning vehicles within the phase.

If intersection delay for left turning vehicles is acceptable, providing only one left turn lane will allow the bikeway to run in the existing street cross section.

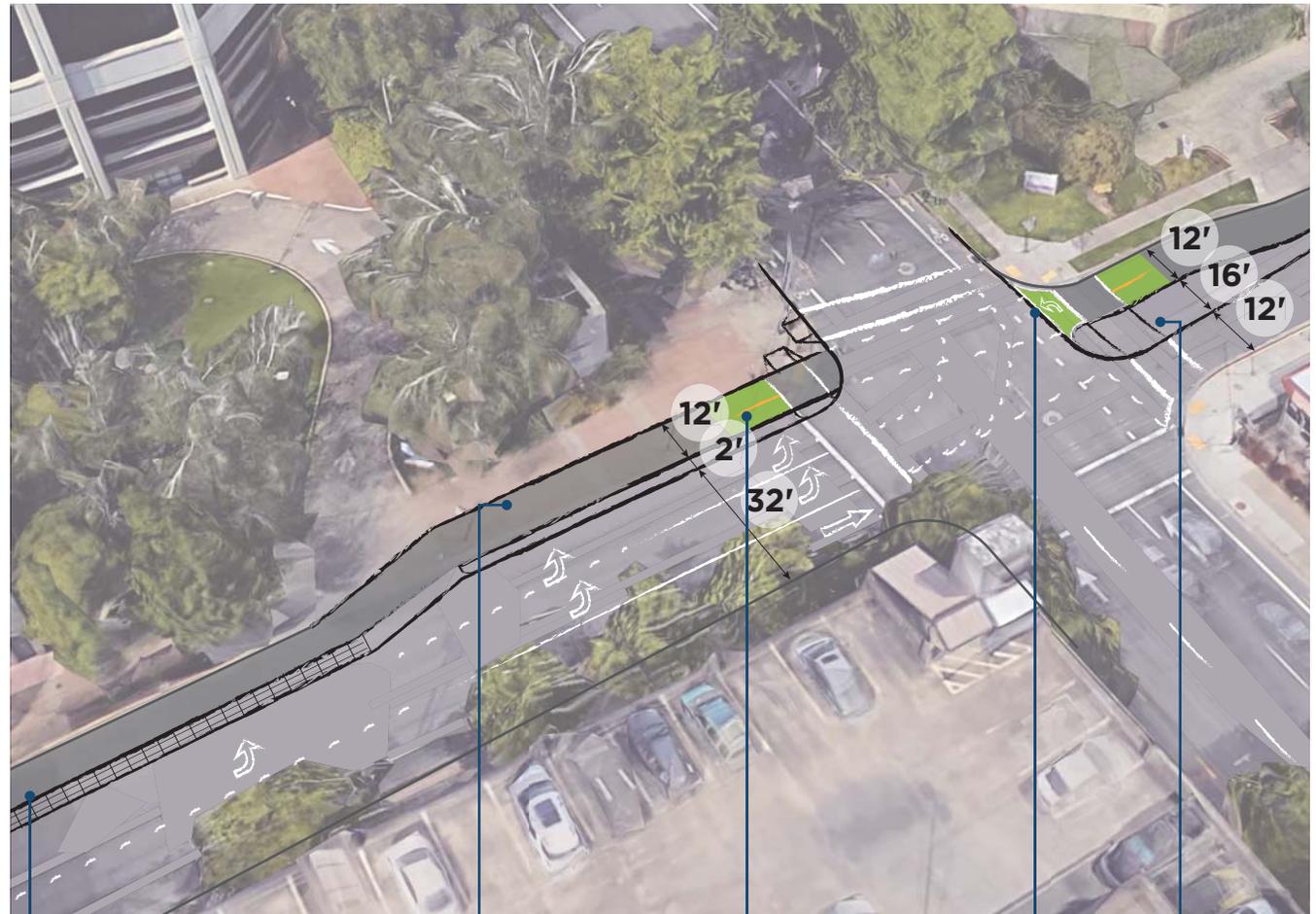


Image: Google Earth

*Flush median/  
buffer at key  
locations to support  
emergency vehicle  
access.*

*If dual turn lanes are  
desired, adjustment of  
the sidewalk curb will be  
necessary.*

*Solid green coloring  
indicates to people  
biking where to wait  
at a red signal.*

*Two-stage turn  
box to connect  
to bike lanes*

*At narrow segments,  
median islands should  
be 2-3" tall to allow  
emergency vehicles  
to mount curbs if  
necessary.*

# E 13th Ave & Alder

## EXISTING CONDITIONS



# E 13th Ave & Alder

The most important intersection on the corridor is the intersection with the existing bidirectional bike lane on Alder St.

The design here must allow high volumes of bicyclists to intuitively circulate between bikeways, while maintaining orderly interactions with people walking, biking, and driving.

The eastern corners and curb extension can be preserved with no modifications.

Toward Kincaid St, eastbound bicyclists transition into a dashed, advisory lane condition, sharing the travel lane with motor vehicles.

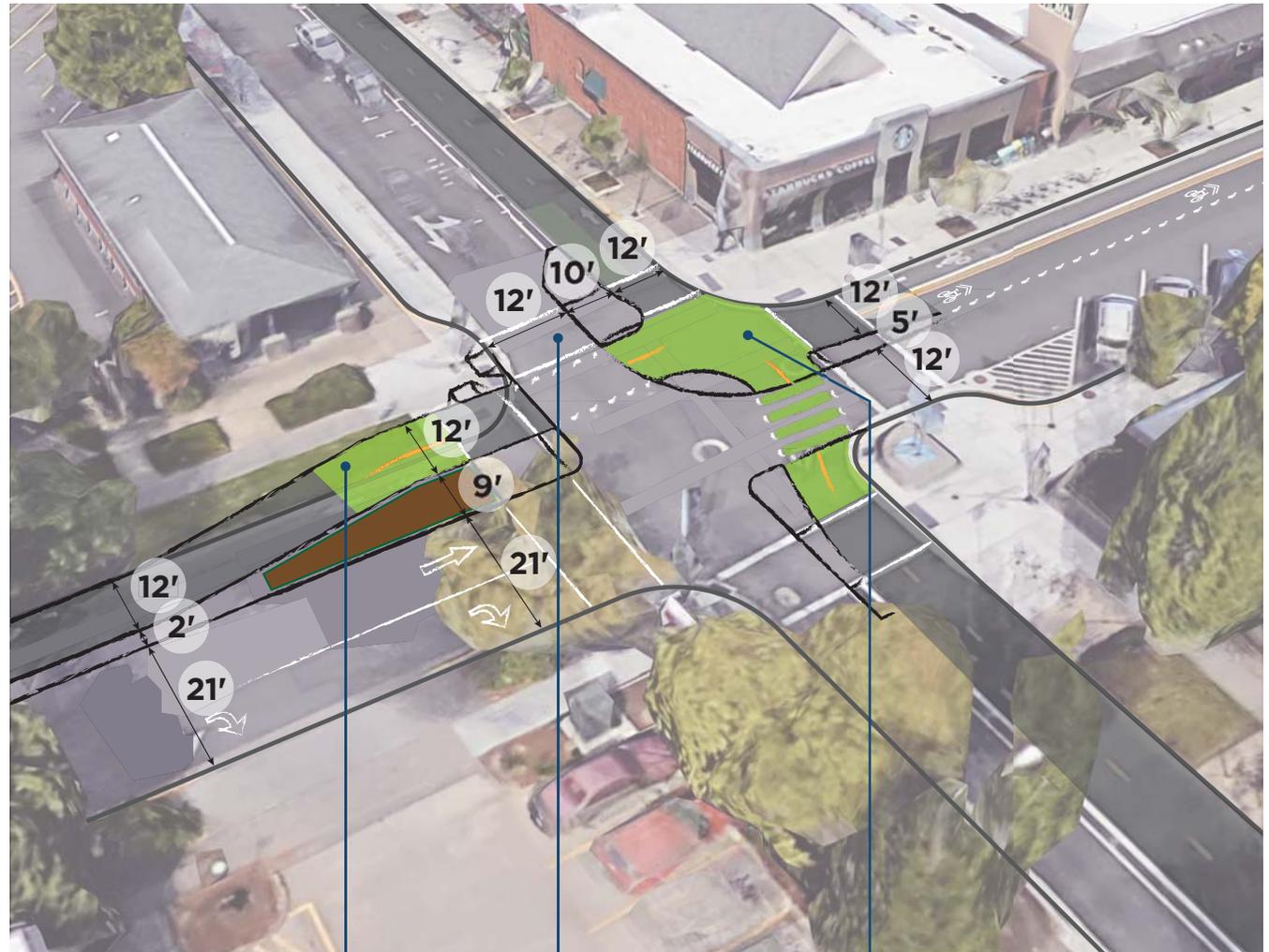


Image: Google Earth

Modify the NE corner to laterally shift the bikeway.

At narrow segments, median islands should be 2-3" tall to allow emergency vehicles to mount curbs if necessary.

Large waiting areas are important to accommodate high bicycle volumes.

# Separation Options

## PAINT AND POSTS \$40,000-\$80,000/Mile



Buffer markings and flexible delineators create a separated space at a low cost.

### APPLICATION

Best for interim implementation of bikeways. The low cost design can be deployed rapidly, and can respond quickly to design changes.

Works well as Phase 1 prior to permanent installation.

### CONSIDERATIONS

Poor durability and compromised aesthetics make this design unsuitable for long-term installation.

### Recommended Option

## MEDIAN SEPARATION \$250,000-\$600,000 / Mile



Concrete dividing medians offer strong, permanent separation.

### APPLICATION

Works well for long term permanent installation. Well suited for wide bikeways where proper maintenance can be assured.

### CONSIDERATIONS

Median construction types vary by cost and aesthetics. All constructed medians provide a strong sense of security, and long-term durability.

Use of bicycle friendly curb design consisting of a beveled or low curb to reduce opportunity to hit with pedals is important to minimize impacts to people biking.

## RAISED AND SEPARATED \$3,000,000-\$8,000,000 / Mile



### APPLICATION

A reconstructed edge of the roadway can be raised close to sidewalk level, incorporated with planted or separated medians.

### CONSIDERATIONS

Requires significant roadway reconstruction, but allows for the highest quality materials and a higher quality experience in terms of maximizing operating space increased comfort and increased safety.

# Median Separation

Median separation of the bike lane can provide a high quality experience without requiring extensive reconstruction of the roadway.

- The edge of the median closest to bicyclists should use **bicycle-friendly curbs** to maximize the effective operating space of the protected bike lane. Curbs 2.75" inches or shorter are considered bicycle friendly because they don't interfere with standard pedal heights.
- In areas along the bikeway where existing ponding occurs, **catch basins** should be relocated to collect roadway stormwater at the median curb.
- **Decorative pavers or city-salvaged cobble** may be used in the median for aesthetic interest.
- Where width permits, the median may be used as a **planting area** to potentially capture and treat storm water. Landscaping would enhance placemaking and increase comfort for people on the sidewalk and the separated bikeway by providing a larger buffer from traffic.



Median separation in Amsterdam

