Implicit turn-restrictions

References

Restriction - https://wiki.openstreetmap.org/wiki/Relation:restriction
Implicit restriction - https://wiki.openstreetmap.org/wiki/Relation:restriction#Implicit_restriction

Key Terms

Turn restrictions - turn restrictions at a junction are represented by a relation, within that relation is a set of tags describing the type of turn restriction. Turn restriction relations are not limited to turns, but are also used to indicate if a vehicle will only travel straight through.

Implicit turn restrictions - implicit turn restrictions are turn restrictions that are implied by local laws, safe driving norms, or the real-world physical layout of roads, but are not accompanied by explicit signs.

Overview

Implicit turn restrictions are turn restrictions that are implied by local laws, safe driving norms, or the real-world physical layout of roads, but are not accompanied by explicit signs (posts or road paint). When a junction is missing an implicit turn restriction, a routing engine may direct the driver to make an illegal or dangerous maneuver.

Turn Restriction Tags

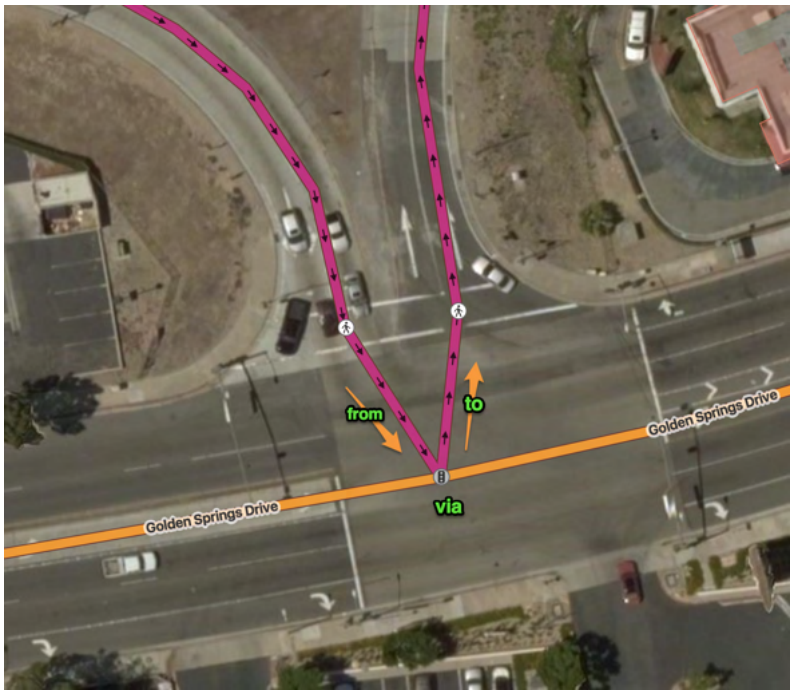
Key	Value	Description
type	restriction	Relation type for restriction relations.
implicit	yes	Extra tag to turn restrictions to differentiate them from explicitly signed restrictions.
restriction	no_right_turn	Restriction where a right turn is not allowed at the junction from the **FROM way** to the **TO way**
restriction	no_left_turn	Restriction where a left turn is not allowed at the junction from the **FROM way** to the **TO way**
restriction	no_u_turn	Restriction where a U-turn is not allowed at the junction from the **FROM way** to the **TO way**

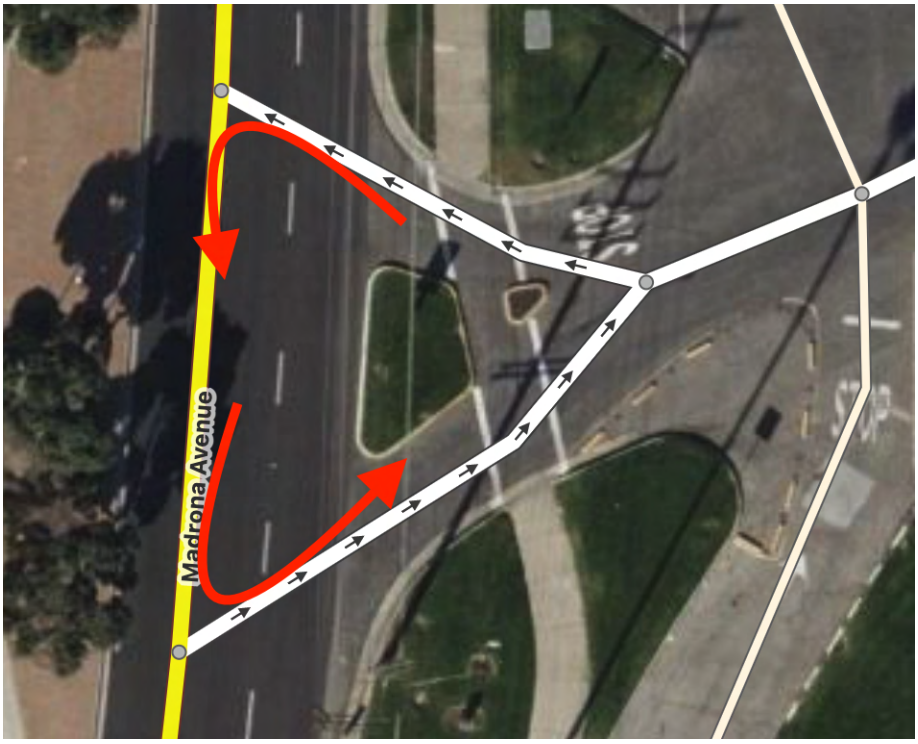
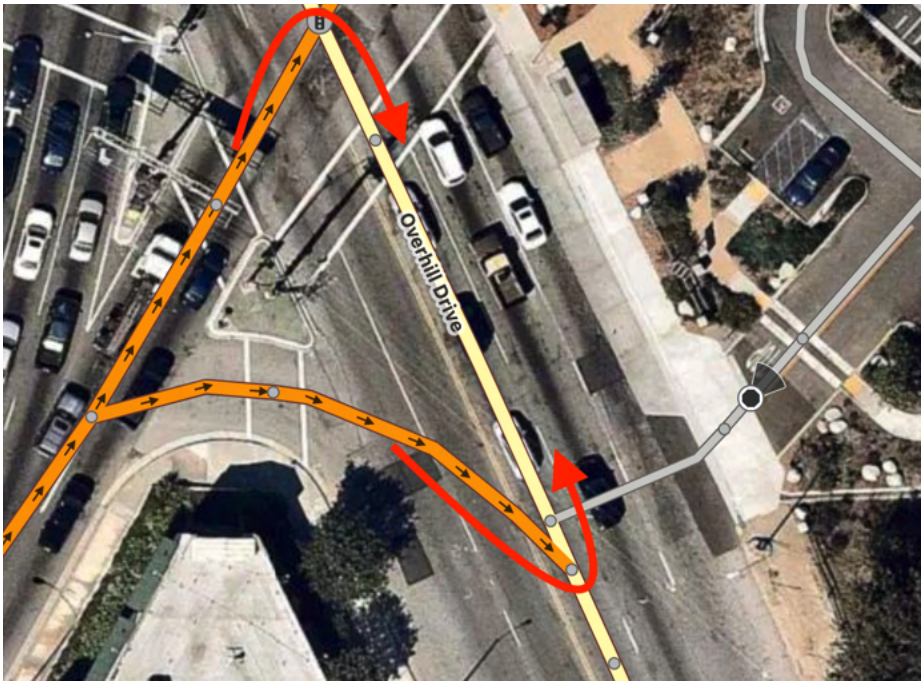
Types of implicit turn-restriction:

Type	Description
Sharp turns between ramps or slip roads	Where highway exit ramps join a road implicit turn restrictions are often needed. Often a highway off-ramp enters a road from one direction, and an on-ramp branches off in the opposite direction at the same spot or very close by. In these situations, it is sometimes logically possible in the road network to navigate from an off-ramp directly onto an opposing on ramp:  A similar situation can occur at the node where slip roads from a dual carriageway intersect a single carriageway:

In these situations a turn-restriction is needed to prevent us from routing from one ramp or slip-road directly onto the other. This maneuver is almost never legal or safe.

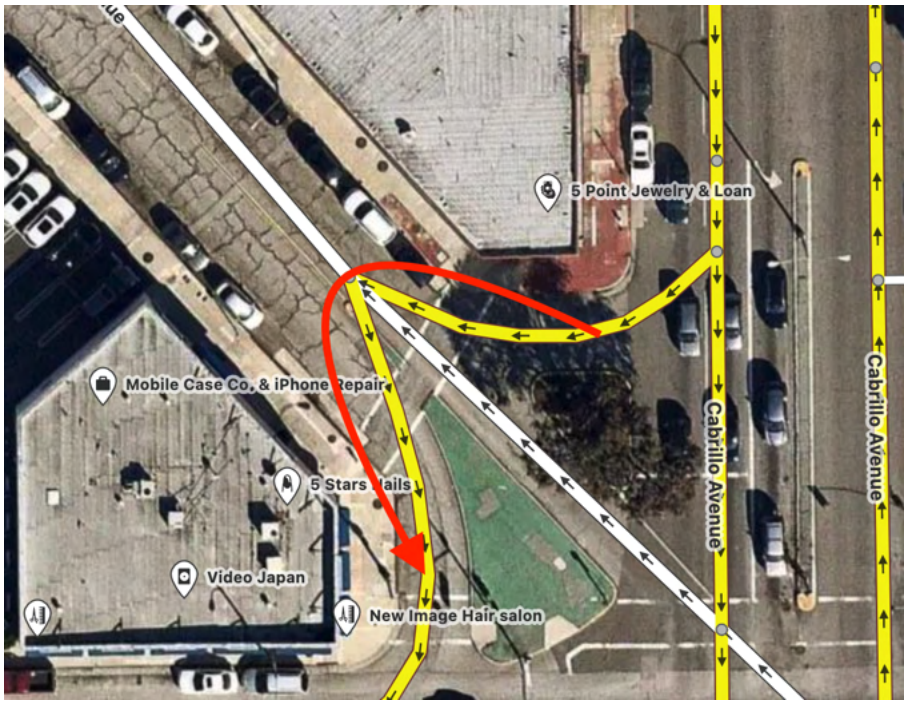
Here's another example, where the highway off-ramp and the on-ramp meet the road from the same direction.

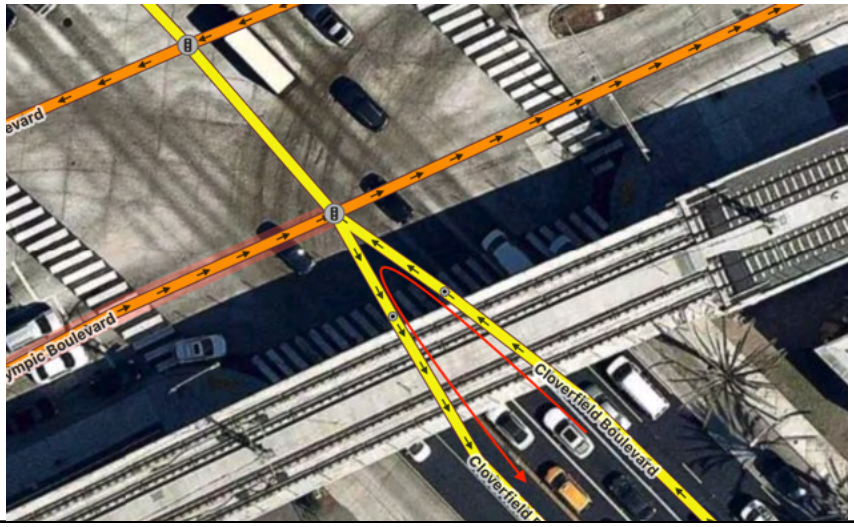


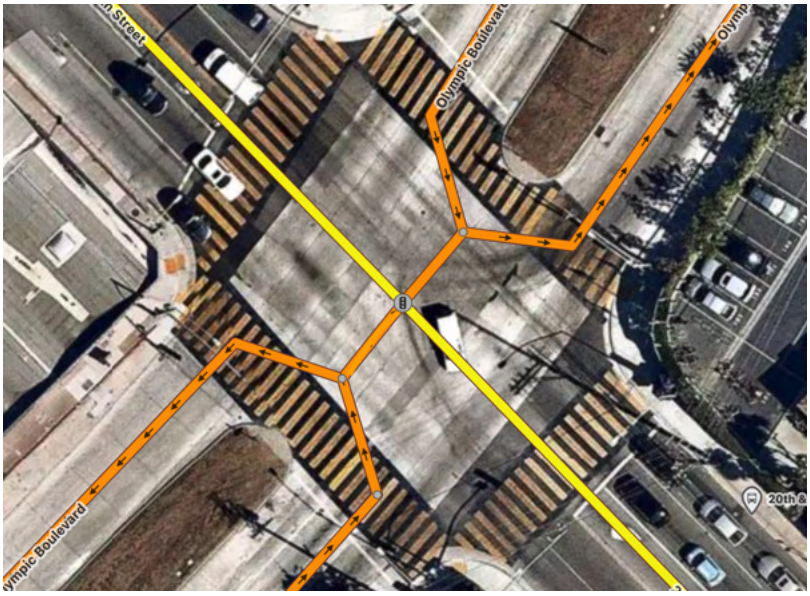
Sharp turns against the grain of a slip road	Where a slip road leaves or meets a main road, you will usually need to add up to two turn restrictions. The first restriction is from the slip road to the main road to prevent the sharp turn counter to the intended use of the slip road – for example, a left from a right-hand-turn slip road.  

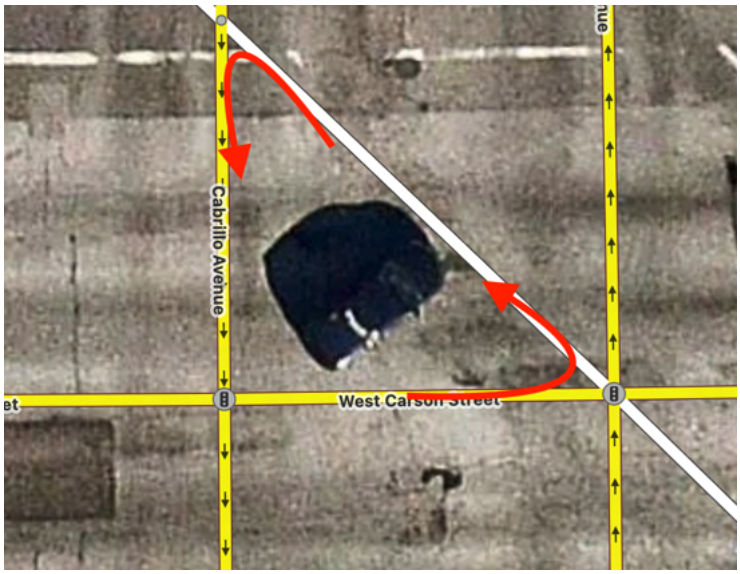
The second restriction is from the main road to the slip road to prevent the sharp turn against the intended direction of the slip road – for example, driving past an intersection, and then taking a sharp left/U-turn onto a slip road intended for use from the opposite direction:

These are a little tricky, make sure you understand both restrictions in the images below.



Single/dual carriageway transitions	**In general, U-turns are allowed on dual carriageways. However, things get a little tricky when dual carriageways transition to single carriageways. See all examples below.**
Transitions elsewhere than an intersection	Sometimes a dual carriageway transitions to a single carriageway because without a real intersection – the road is simply narrowing. In these cases a routing engine will interpret the node as an intersection and allow U-turns. We need to override that behavior by mapping a no-u-turn restriction at the intersection. 
Transitions at an intersection	In contrast, where a dual carriageway becomes a single carriageway at an intersection with other roads, it is treated just like any other dual carriageway intersection. In these cases, no implicit turn restriction is needed. 

“Sausage Roads”	Sometimes, dual carriageway intersections are modeled like “sausage links”, meaning a mapper has collapsed the road down to a single link at each intersection. This looks like a dual-carriageway to single-carriageway transition, but really nothing has changed. Before remodeling:  We should remodel these as proper dual-carriageway intersections. After remodeling: 

	Once the road has been remodeled, apply turn restrictions for highway ramps and slip roads as normal.
Complex intersections and micro-loops	Where multiple dual carriageways, ramps, slip roads, and/or single carriageways join, the complex network of crossing ways can create unpredictable routes. For example, “micro-loops” can enable unintended U-turn options:  When working with an intersection like this, keep a close eye on all possible maneuvers at each node, and see if each should be permitted or restricted. Test your work in the routing engine to make sure it behaves as you expect, and don’t hesitate to ask for a second set of eyes.

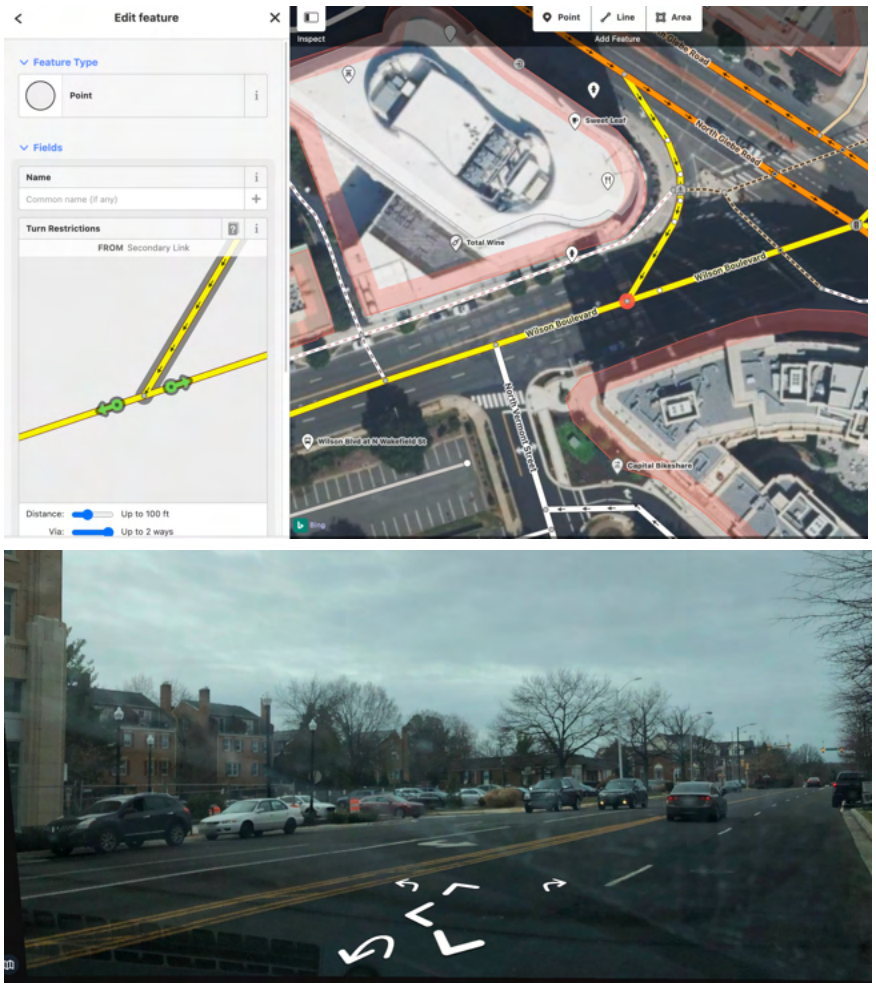
Curation algorithm:

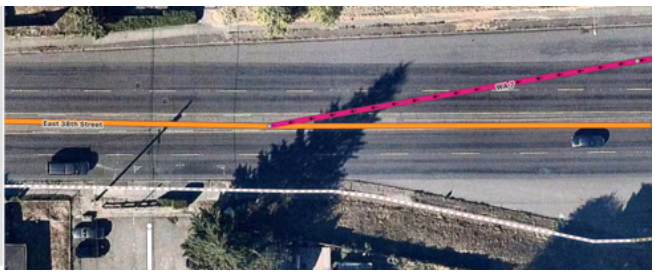
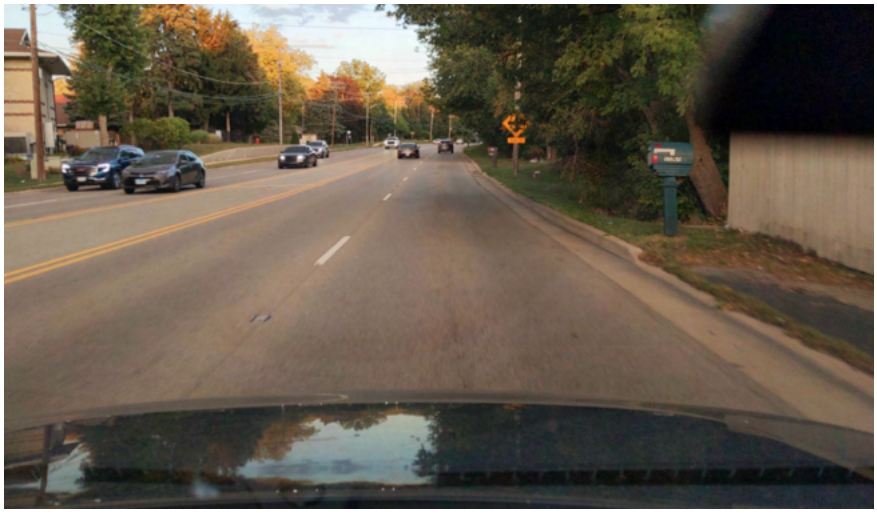
Mapping implicit turn restrictions is the same as adding a regular turn-restriction with one addition: we add an extra **`implicit`**=`yes` tag to implicit turn restrictions to differentiate them from explicitly signed restrictions.

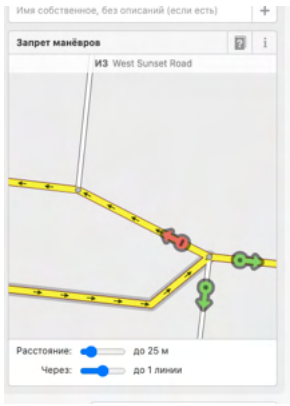
Just as for regular turn restrictions, there are situations where implicit turn restrictions can be added as either `no` or `only` restrictions. In these circumstances, feel free to use whichever approach you find most clear.

	
Add a `no_u_turn` via the node between `from` and `to` ramps	Add `only_straight_on` via the node.

Examples

Ticket	Images
https://jira.lyft.net/browse/NAVIR-23039	

https://jira.lyft.net/browse/NAVIR-16970	  
https://jira.lyft.net/browse/NAVIR-22304	  

https://jira.lyft.net/browse/NAVIR-27875	  
https://jira.lyft.net/browse/NAVIR-24119