INRIX

City of Philadelphia

Digital Right-of-Way and Mobility Improvement Project

December, 2025

INRIX, Inc.

1756 114th Avenue SE, Suite 200

Bellevue, WA 98004

TO: Akshay Malik, Christpher Shelley, City of Philadelphia

FROM: Michael Schwartz

DATE: December 12, 2025

RE: Digital Right-of-Way and Mobility Improvement Project

Background

In 2023, the United States Department of Transportation awarded the City of Philadelphia (PBOT) a $2 million Planning and Prototyping grant as part of their Strengthening Mobility & Revolutionizing Transportation (SMART) grant program. Leveraging these funds, the City set out to test how to build a more granular digital representation of the digital ROW for the purposes of coordination and proper fee assessment.

At the start of the project, the City did not possess or maintain digital curb regulations or curb use data. The City's fee for a street closure permit is charged per lane per foot per unit of time. However, the City did not have the technology to allow residents to request closure at that resolution or spatial specificity.

The City procured services from INRIX to help support some of the outcomes of the project:

- A digital inventory of ROW assets and regulations that is updated in real-time through integrations with other systems across transportation digital infrastructure.
- An open published API that provides real-time information about the ROW including curb access and active street closures.

This memo serves as a summary of the work, data, and tools provided by INRIX during the project along with the lessons learned along the way.

Approach

The City selected INRIX as their software solution provider, with specific responsibilities to provide its Curb Analytics and Road Rules solutions to visualize curb and ROW data. This included existing curb data INRIX had already collected independent of the project. The City also procured data collection and transformation services from separate vendors. INRIX's role was to incorporate that data into its software tools and create a way for the City to update the digital regulations to keep them current with the existing permitting system.

Outcomes

1. Project-wide Curb Data

Through INRIX's Curb Analytics software platform, the City had access to curb data throughout and beyond the project area, including the static inventory of curb use across times of day and days of week (Figure 1). The curb data was available in the CDS API. As part of INRIX's enterprise parking business, a variety of

companies ingest this data, meaning a public-private ecosystem was available out of the box with a shared digital understanding of the physical curb geometries and rules.

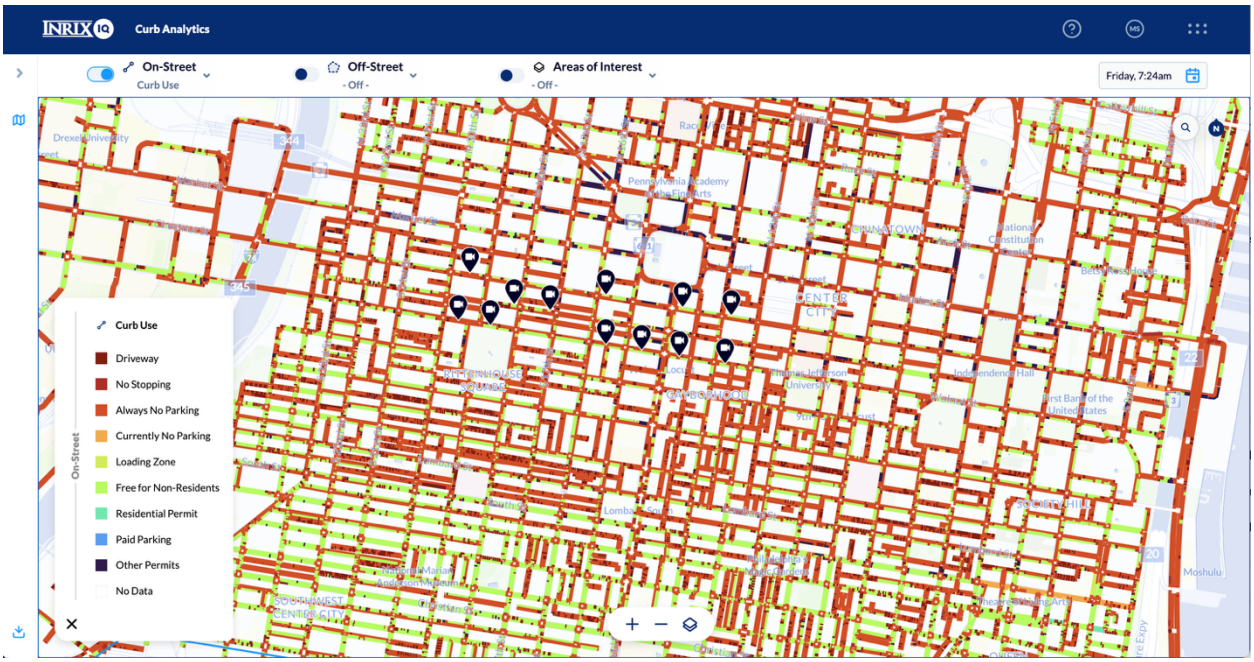

Figure 1: Curb Use data at block level inside the Project Area

The tools also included an estimation of parking availability based on a variety of data sources. Since June 2025, the City also had access to occupancy predictions helping to better understand not just if any space is available, but how many spaces are available (Figures 2 and 3). Finally, in October 2025, the City had access to realtime loading occupancy data via an integration with Automotus via a CDS Events API (Figure 4). The tools were shared with Philadelphia Parking Authority (PPA) staff, helping inform the City and PPA on curb policy and pricing decisions.

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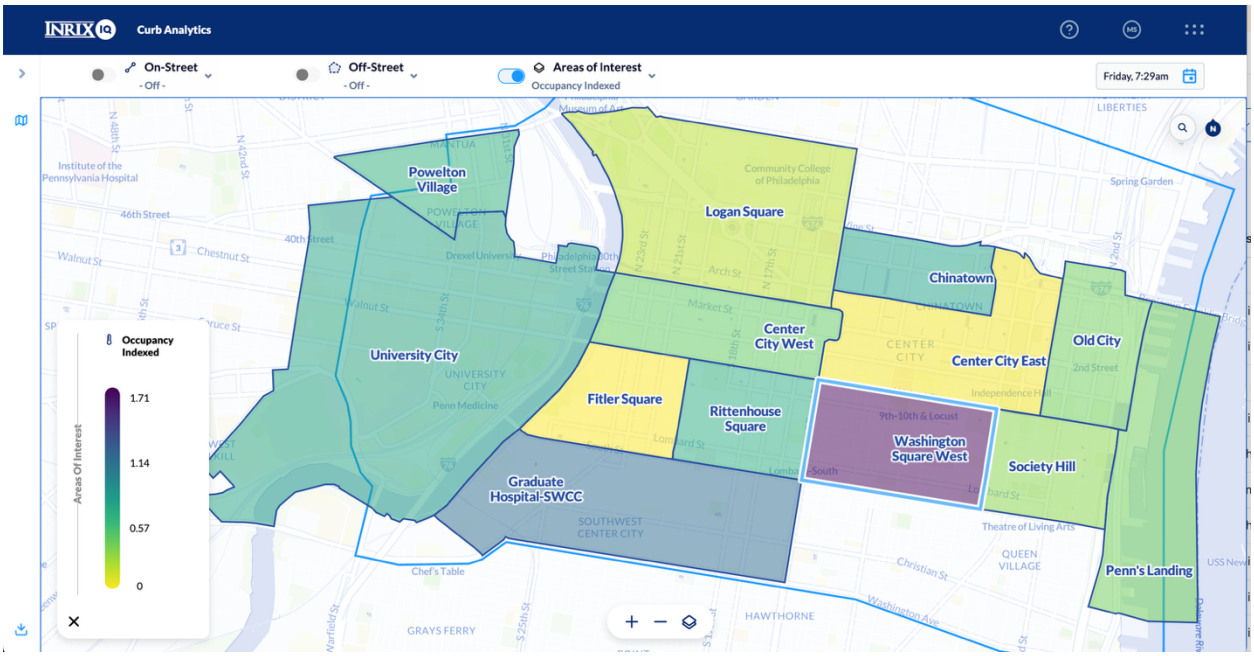

Figure 2: Indexed Occupancy at neighborhood level inside the Project Area

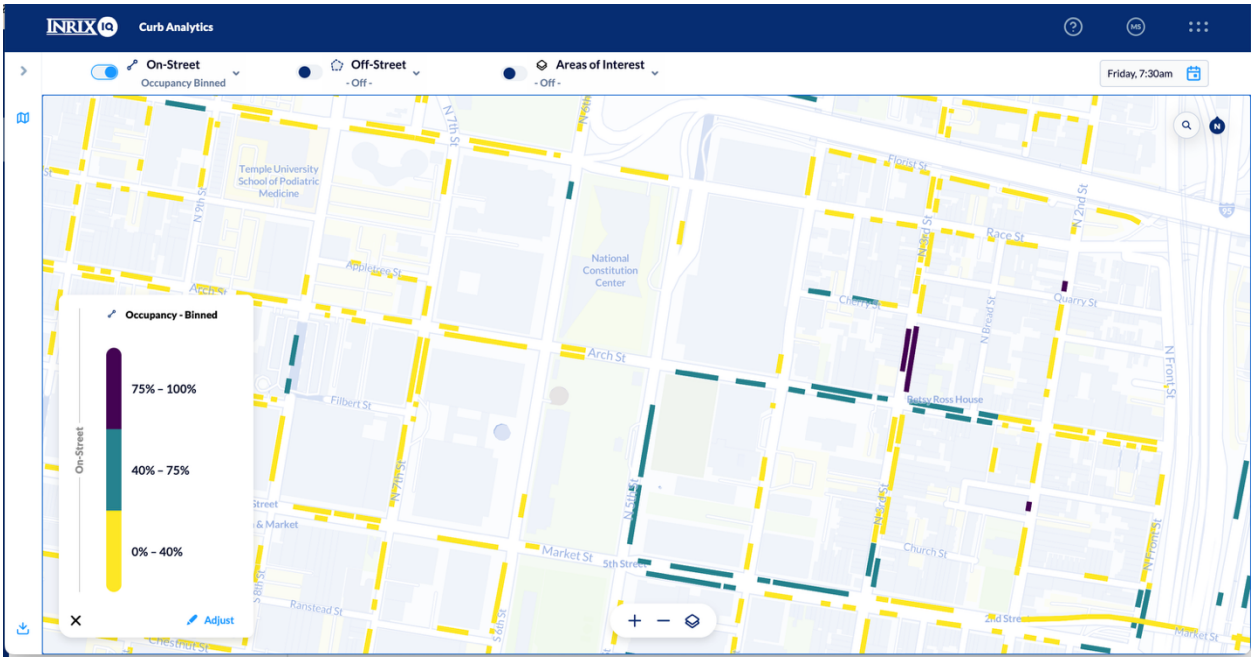

Figure 3: Binned Occupancy at block level inside the Project Area

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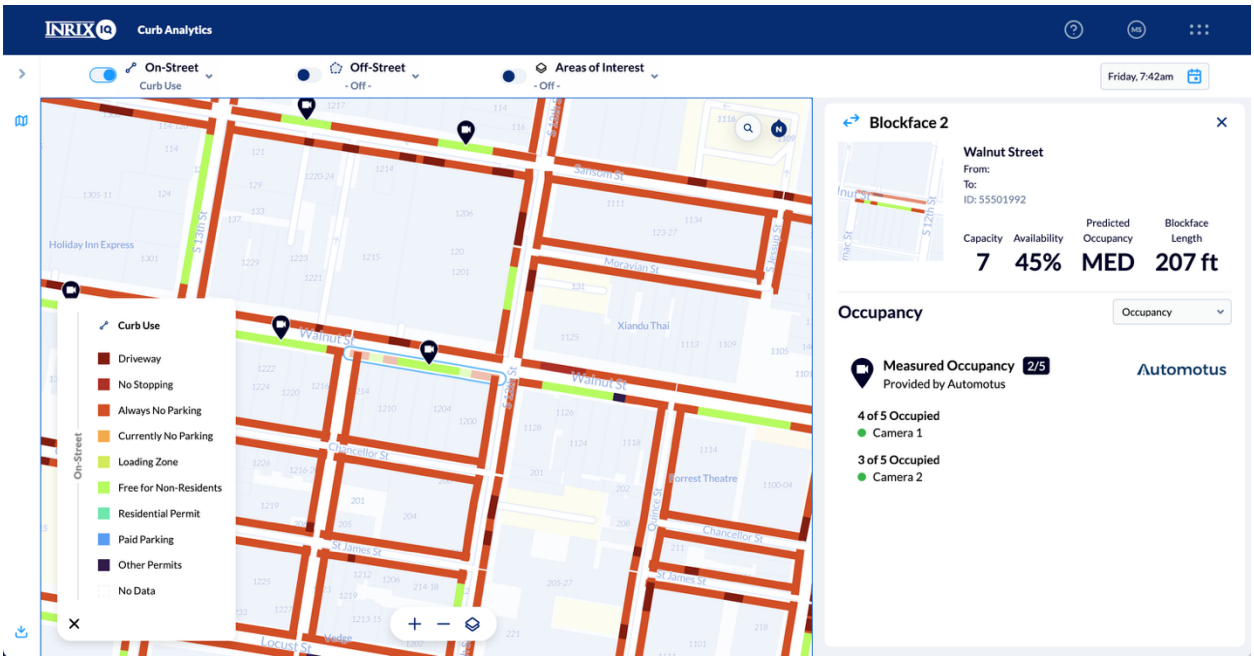

Figure 4: Realtime occupancy provided by camera sensors

2. Road Rules Digital Right of Way Management Tools

One of the project goals was to represent the full Right of Way via an open source API developed in partnership with the Open Mobility Foundation (OMF). The work on the specification was led by Arcadis and the draft was not proposed until fall 2025.

Given the timing and the wish to complete the tooling and allow City stakeholders to understand the value of the approach, the data outside of the curb (already collected by INRIX before the start of the project) was provided to INRIX in an existing schema (Figure 5). This allowed INRIX to represent the features in Road Rules while the development of the final spec was underway.

```
{
 "assetID": "12345",
 "assetName": "Pine st. between S 17th st. and S Chadwick st.",
 "assetType": "road segment",
 "hierarchyLevel": 0,
 "locationReference": {
  "locRefType": "road",
  "roadFeature": "roadway",
  "roadName": "Pine st.",
  "direction": "eastbound",
  "startStreet": "S 17th st.",
  "endStreet": "S 18th st.",
  "start": 0,
  "end": 137,
  "features": {
   "type": "FeatureCollection",
   "features": [
    {
     "type": "Feature",
     "geometry": {
      "type": "LineString",
      "coordinates": [
       [
        -75.169926,
        39.9461713
       ],
       [
        -75.171509,
        39.9463608
       ]
      ]
     }
    }
   ]
  }
 },
 "children": [
  {
   "assetID": "12345_1",
   "assetName": "Pine st. between S 17th st. and S Chadwick st.",
   "assetType": "bike lane",
```


Figure 5: Sample JSON in INRIX Right-of-Way schema

Upon receipt of the data, INRIX built out representation of travel lanes and sidewalks in its Road Rules tools in addition to existing curb rules and consultant collected sidewalk objects (e.g. signs, fire hydrants, poles, etc.) related to policies on the right of way (Figures 6-9). By linking the sidewalk objects to the travel lanes, curbs, and sidewalks, any updates to those objects would allow for there to be relevant updates to the policies and geometries associated with those objects (i.e., semi-automate updating to keep the rules up to date as asset management systems are updated).

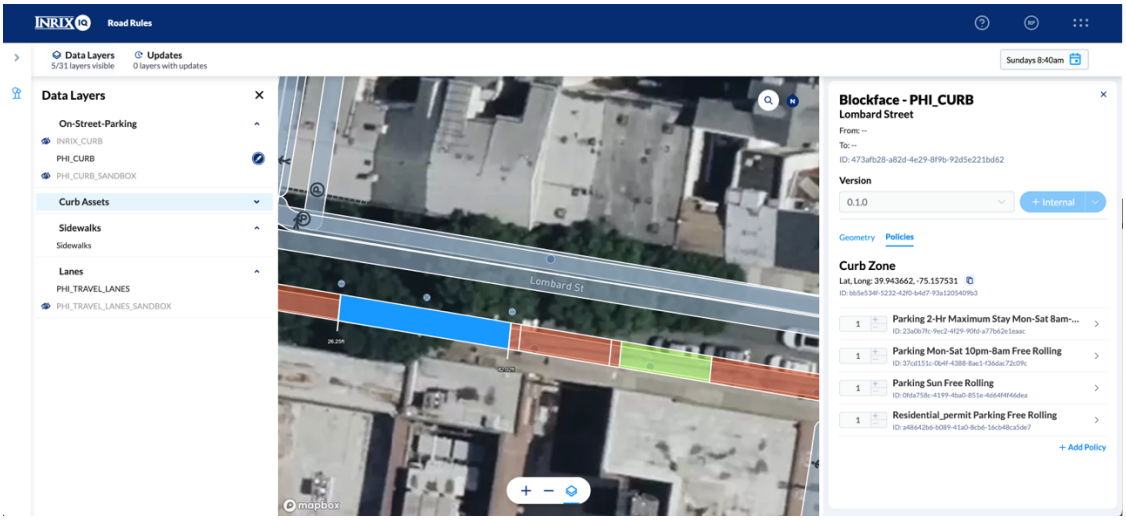

Figure 6: Curb policies in context of travel lanes, sidewalks, signs

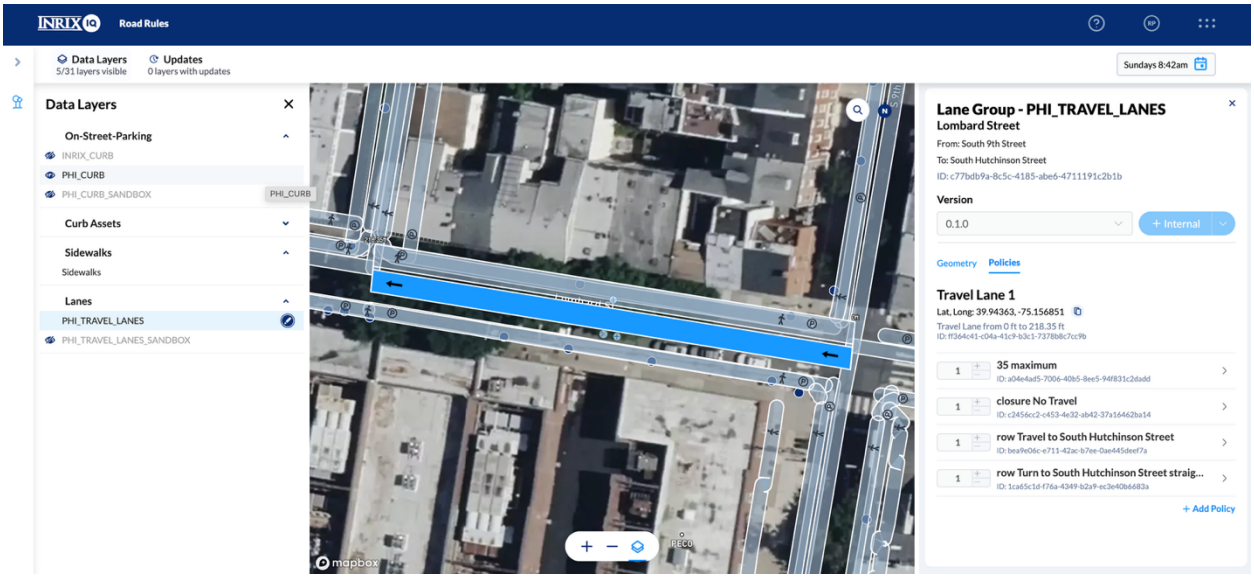

Figure 7: Travel lane policies in context of curb, sidewalks, signs

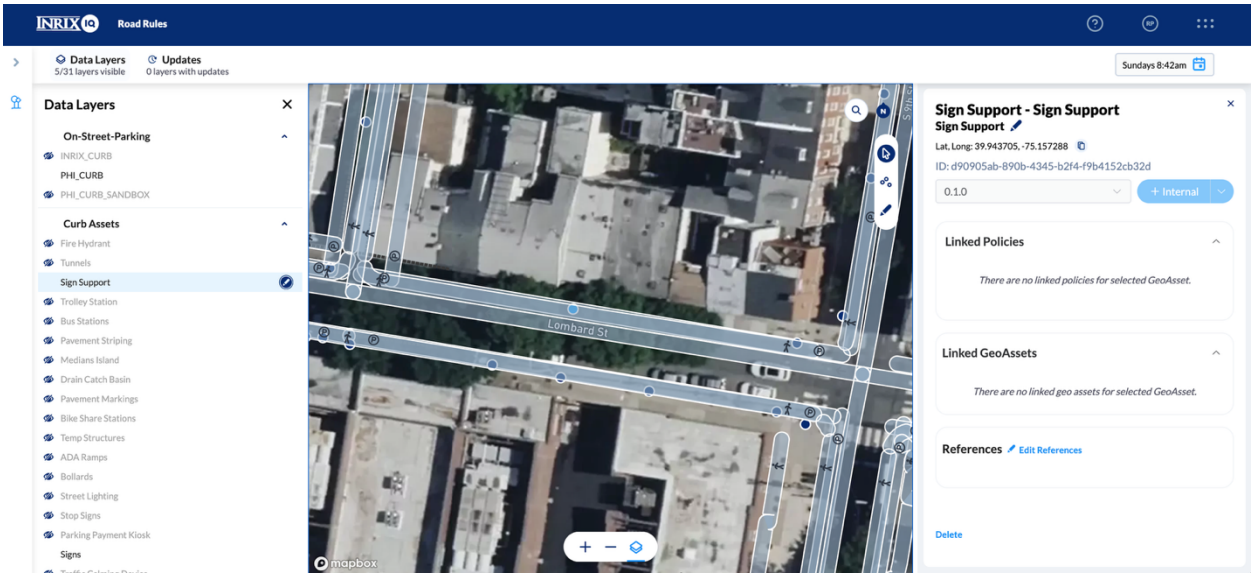

Figure 8: Sign information in context of travel lanes, sidewalks, curbs

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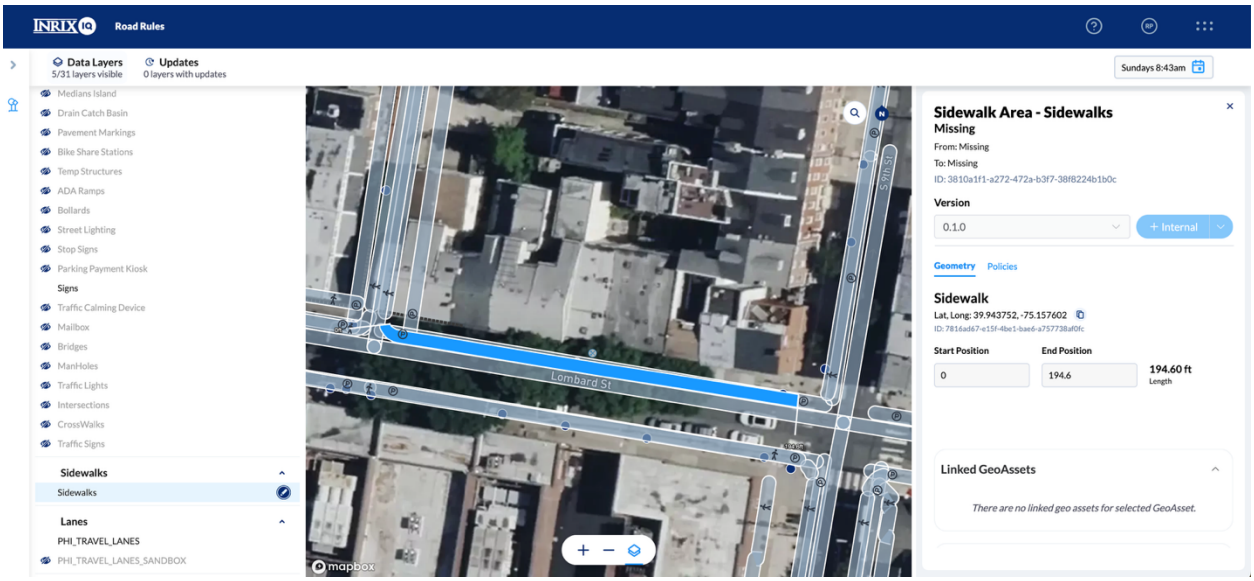

Figure 9: Sidewalk information in context of travel lanes, curbs, and signs

The tools also allowed City staff to edit geoassets (i.e., travel lanes, curb lanes, sidewalks, and sidewalk objects) on each layer to be able to represent temporary changes and closures (Figure 10).

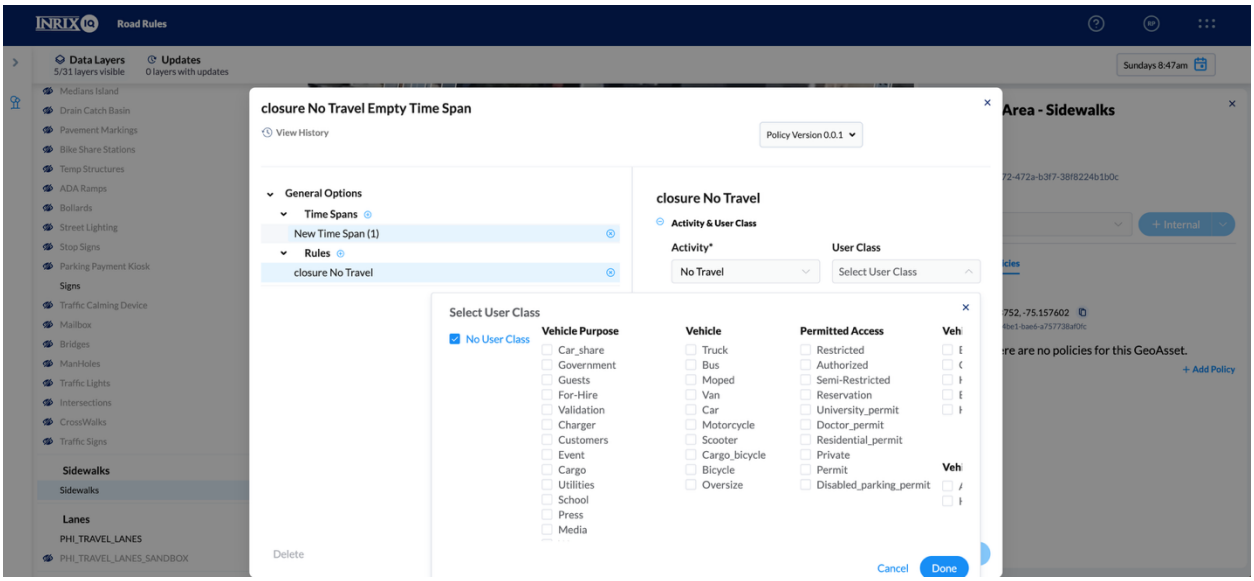

Figure 10: Sidewalk policy editing in Road Rules

The curb data continued to be available via CDS API, but the travel lanes, sidewalks, and sidewalk objects were not available via a public facing API for a few reasons:

1. The data provided by the City's contractor was incomplete. Specifically, the sidewalks were not extracted in a usable format but rather were shown as somewhat incomplete polygons.
2. The Right of Way Data Specification (ROWDS) developed as part of the project required the inclusion of Roadways (the segments of right of way where travel occurs – essentially blocks of sidewalks, travel lanes, and curbs) and Intersections (the meeting point of two or more roadways, and where Roadway segments end or start). Roadways and Intersections were not included in the INRIX schema nor the data delivered by the City's contractor. For this reason, there was no way for INRIX to build an API representing these critical elements.

Learnings and Next Steps

Many of the outcomes sought by the City were achieved during the project. This success highlights the strengths of the approach selected by the City to build upon existing technologies to deliver near term utility for the project with a broader eye to new capabilities that extend beyond the grant timeline. These new tools supported the City in pursuing its new approach to permit business process while providing immediate value in the interim. Some specific learnings include:

- **Play to vendor strengths and build the plane (right of way) while flying (managing) it.** By contracting with INRIX, there was no delay in utilizing data on day one of the contract. Staff was able to not only get the utility of a digitized curb but was also able to play around with what digital management would look like when the full set of tools and data were complete. Similarly, since INRIX already had a previous version of Road Rules, it means that the work to use that software was largely related to updating it to meet the City's use cases rather than starting from scratch.
- **New data specifications will have growing pains.** Given that ROWDS didn't exist at the start of the project, the team was unable to format the data in a way that would ensure the team could build an API against it. Since the data was missing critical fields identified~~s~~ as part of the spec development, it meant the data did not reflect the final recommended format. The flip side of this is that the spec will be able to undergo a critical public commenting and refinement process that will allow the final APIs to reflect a more release-ready version of ROWDS.
- **Strengths and tradeoffs to having multiple vendors.** The City's preferred approach to the project was to have multiple vendors ~~be~~ involved, with one team developing ROWDS and collecting data separate from INRIX's development of software and integration of the data. This prioritized the City's desire to avoid vendor lock-in and promote an ecosystem of companies that could deliver on the longer term vision for managing the ROW. However, it also caused some inefficiencies in the process. In particular, INRIX was not able to manage and QA the data collection to ensure it met the needs of City and goals of the project. In particular, the sidewalk object data was delivered without links to policies/geoasst~~e~~s so was not usable for asset/permit driven updating of the regulations and geometries. Similarly, the sidewalk object data did not include any metadata (e.g., "35mph speed limit", so simple heuristics will not be possible with the current data. Finally, the sidewalk data has significant geometry issues that may require re-collection or heavy refinement in the future. Since INRIX was not able to manage the data collection contractors, it meant that it had to respond to incomplete/unacceptable deliverables after they had already been shipped. This meant the project ran out of time before updates could be made to improve the final deliverable.

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Next Steps

Assuming funding to continue work on the project, there are immediate next steps that, with minimal time, could greatly increase the utility of the final products:

1. Add Roadway and Intersection relationships for all data collected to date. This should be a relatively lower level of effort since the relationship is almost exclusively location based.
2. Update the sidewalk object data to link to curb, travel lane, and sidewalk geoassets. Update the sidewalk objects to include metadata (e.g., what is written on the signs)
3. Explore an emergency responder computer aided dispatch (CAD) feed integration that leverages the geoasset data collected as part of this project. In particular, consider having the temporary policies created through the City's emergency responder CAD API apply to specific asssets/blocks rather than a geofence that does not take into account roadways and relationships to the location of the emergency.