

# Cartographer

# cruise

## Course Description:

This course guides introduces Cartographer and the main tasks performed by the Troubleforce Team.

## Learning Objectives:

1. Understand the Cartographer tools and layout
2. Create Avoidance Areas
3. Expire Avoidance Areas
4. Troubleshoot and report mapping issues

## LESSONS

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- Introduction to Cartographer
- Creating an Avoidance Area
- Expiring an Avoidance Area
- Reporting Mapping Issues

# Introduction to Cartographer

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## Prerequisites

Before beginning this course, you should have:

- Access to Cartographer and Starfleet.
- An understanding of Avoidance Areas and their different types.
- Know how to submit a ticket in JIRA.

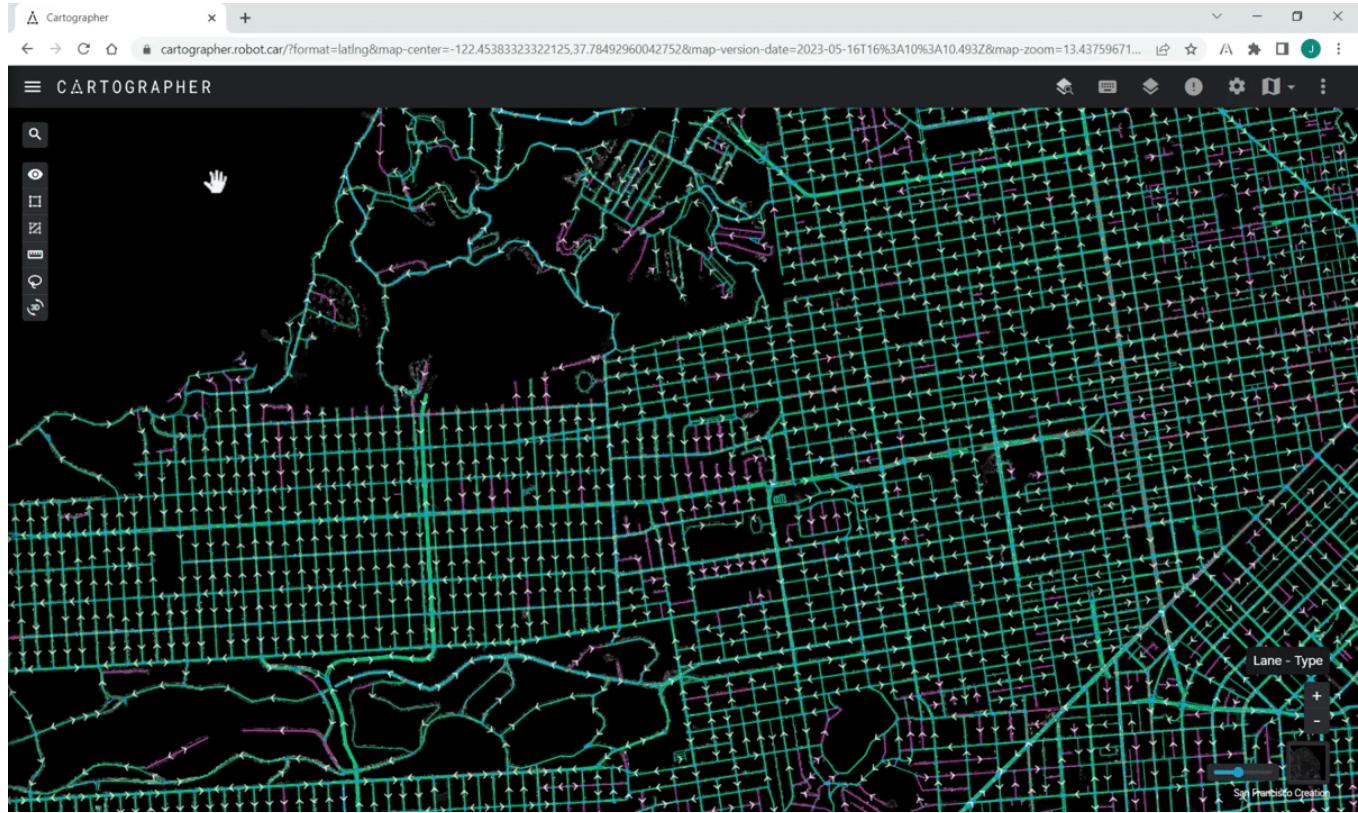


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## Introduction

Cartographer is an internal built tool used to label all the needed features of our map such as lanes, street lights, and signs. It is also used to create and modify Avoidance Areas.

Let's get started with an introduction to the layout. Play the video below. Headphones are recommended.



## Time to Practice

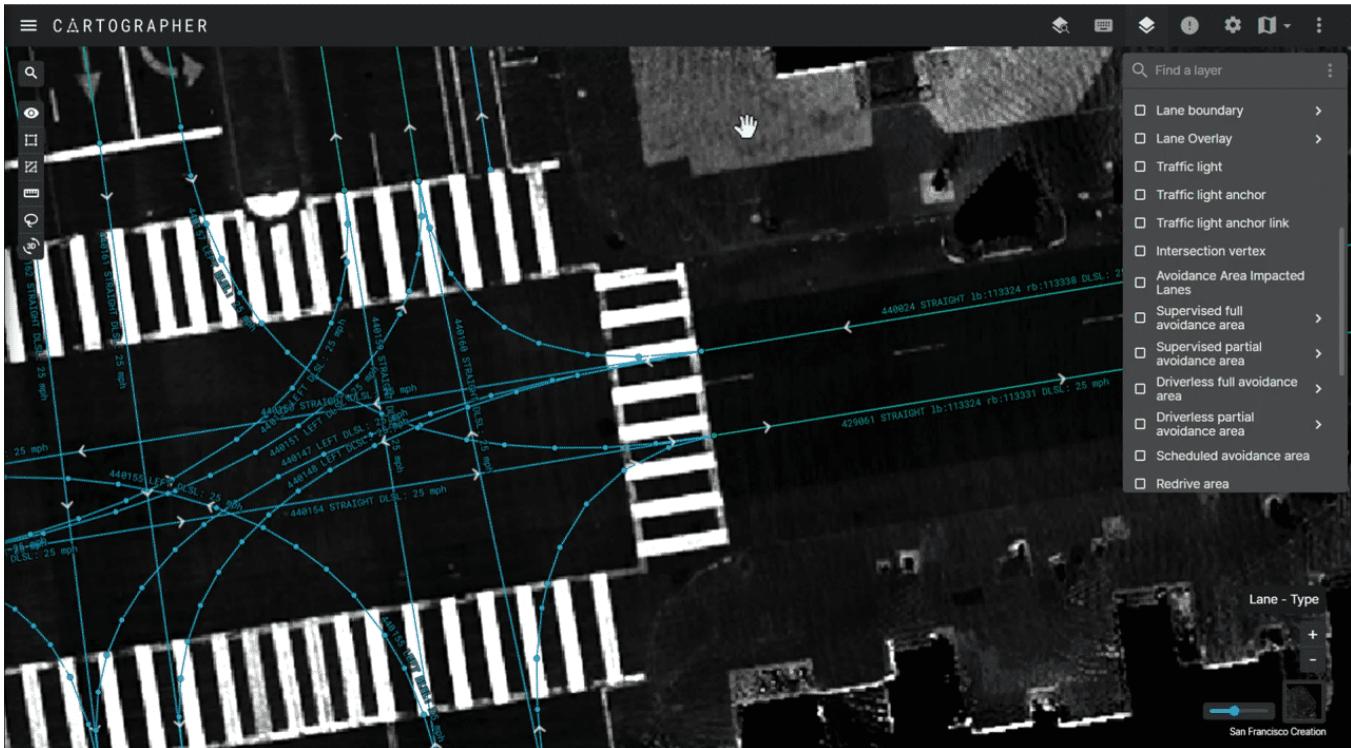
Click this link: [Staging Cartographer](#). This will allow you to practice placing AAs without impacting the actual map.

This course contains several practice items. Watch each video and then perform the practice that follows. It may be helpful to keep this window open on one screen and Cartographer open on another.

## Practice - Change the Map View

1. Set the map view between Street View, Street Map Dark and Intensity.
2. Zoom in and out on each map.

## Identify Each Element



### Practice - Change the City and Find a Sign

1. Click the Map Controls icon (upper right).
2. Set the City to Dubai.
3. Find the traffic sign ID:177

What intersection in Dubai is the traffic sign ID:177 on?

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26a Street and 35 b St.

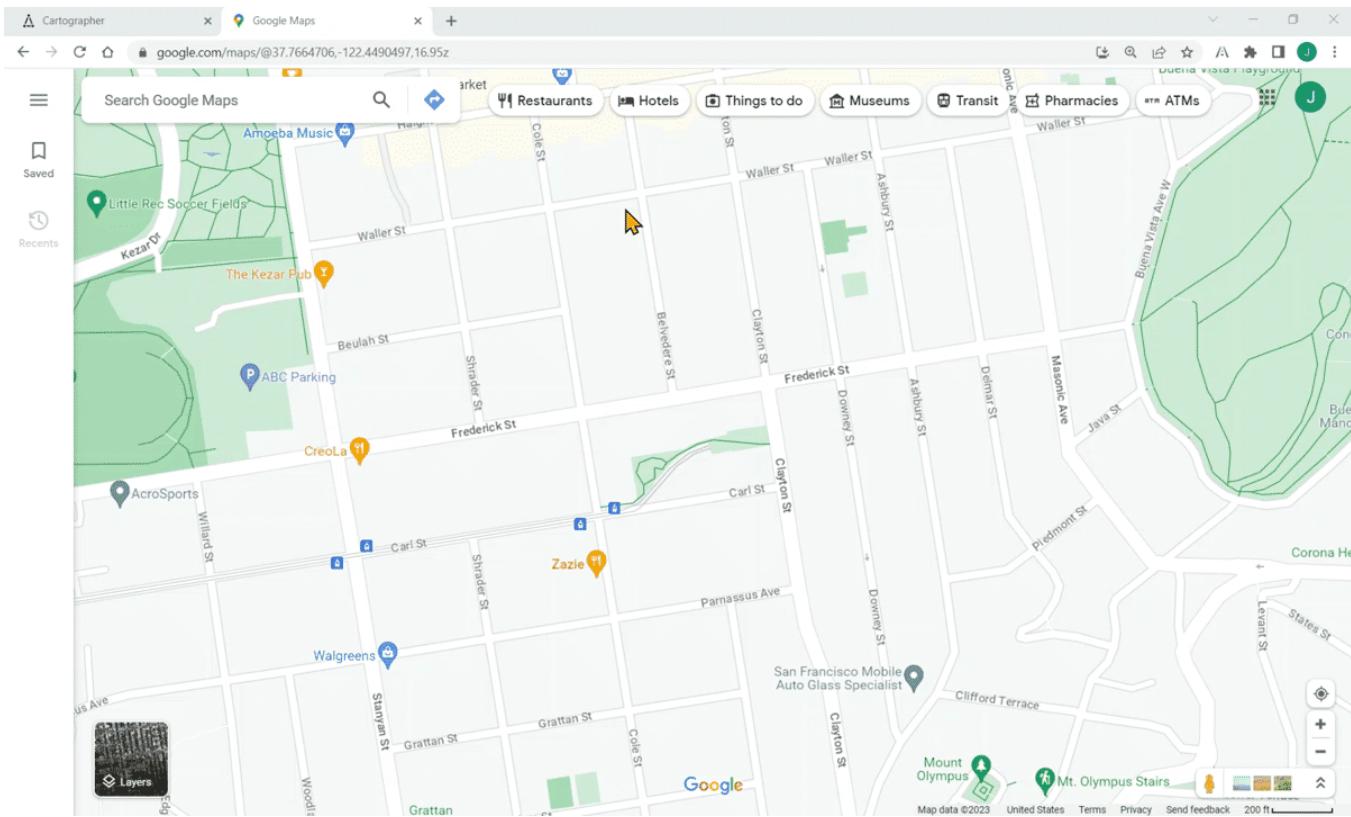


39b St. and 4a Street

SUBMIT

3

**Use Google Maps to Find Longitude and Latitude**



## Practice - Identify an Element

1. Turn on the layer for traffic signs.
2. Find a traffic sign.
3. Copy the identifier and send it to a colleague or your instructor in Slack.
4. Your instructor or colleague should send you one to locate. If not, find sign: 54913.

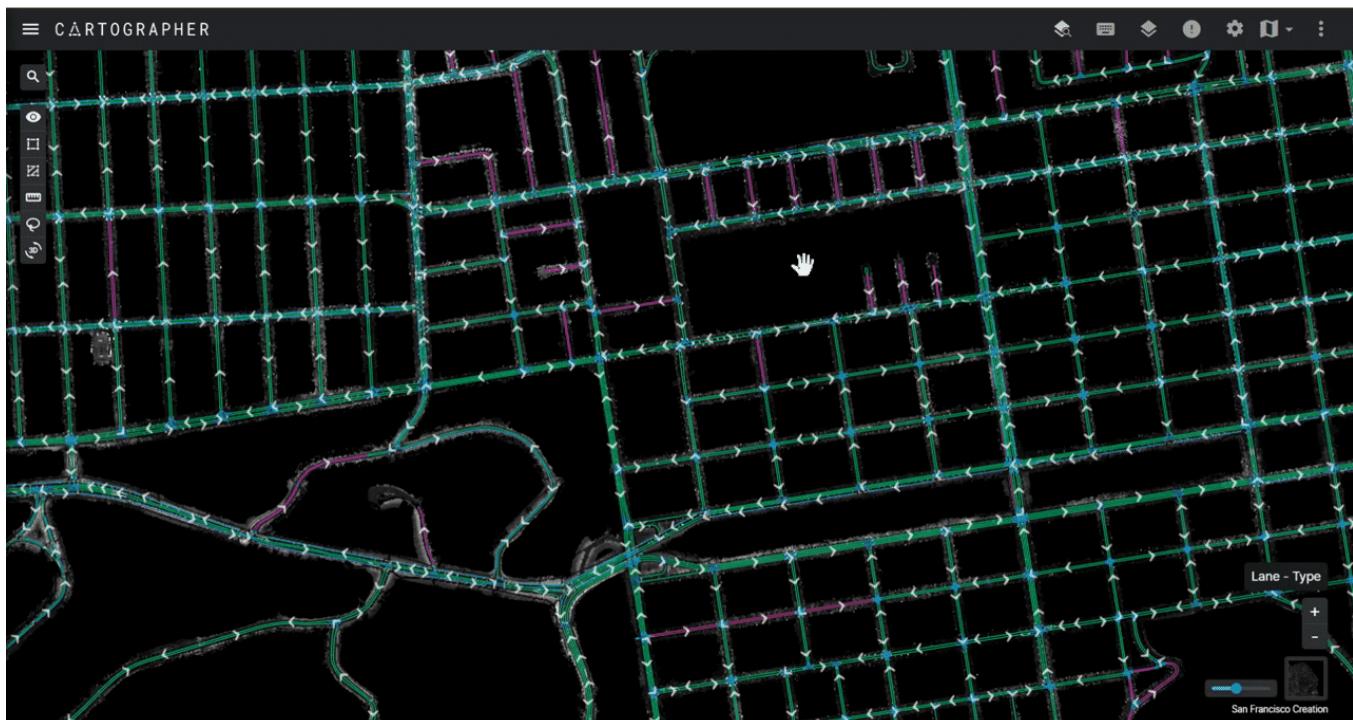
## Practice - Use the Search Feature

1. Click the search icon.
2. Search for the following locations:
  - a. Longitude and latitude: 37.73653805158416, -122.47521169015783

b. Address: 333 Brannan St, San Francisco

4

## View Avoidance Areas

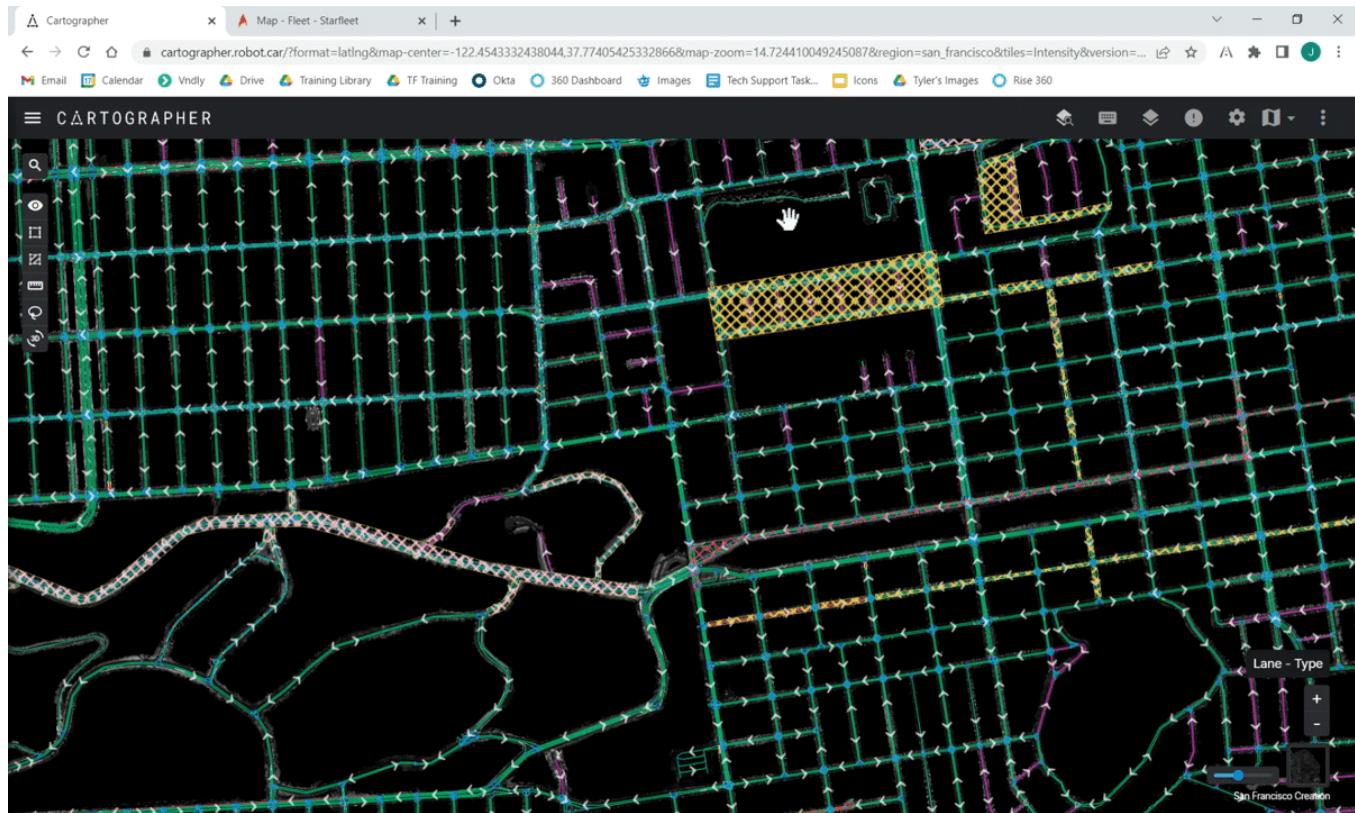


### Practice - View Avoidance Area Layers

Toggle the different Avoidance Areas on and off. You may need to adjust the map to see these features.

5

## AA Prep - Check Vehicles in the Area



### Practice - View Avoidance Area Layers

1. Go to Starfleet > Vehicles.
2. Click several vehicles to identify their status and determine their routes

## Knowledge Check

Let's see what you remember.

How can you find the latitude and longitude of an area?

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Right click on the location in Google Maps.



Toggle the Latitude/Longitude layer in Cartographer

SUBMIT

What should you do if you cannot see an Avoidance Area?

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Zoom out to see the entire service area.



Turn on all Avoidance Area layers.

SUBMIT

Does every item in Cartographer have an ID number?

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Yes



No

SUBMIT

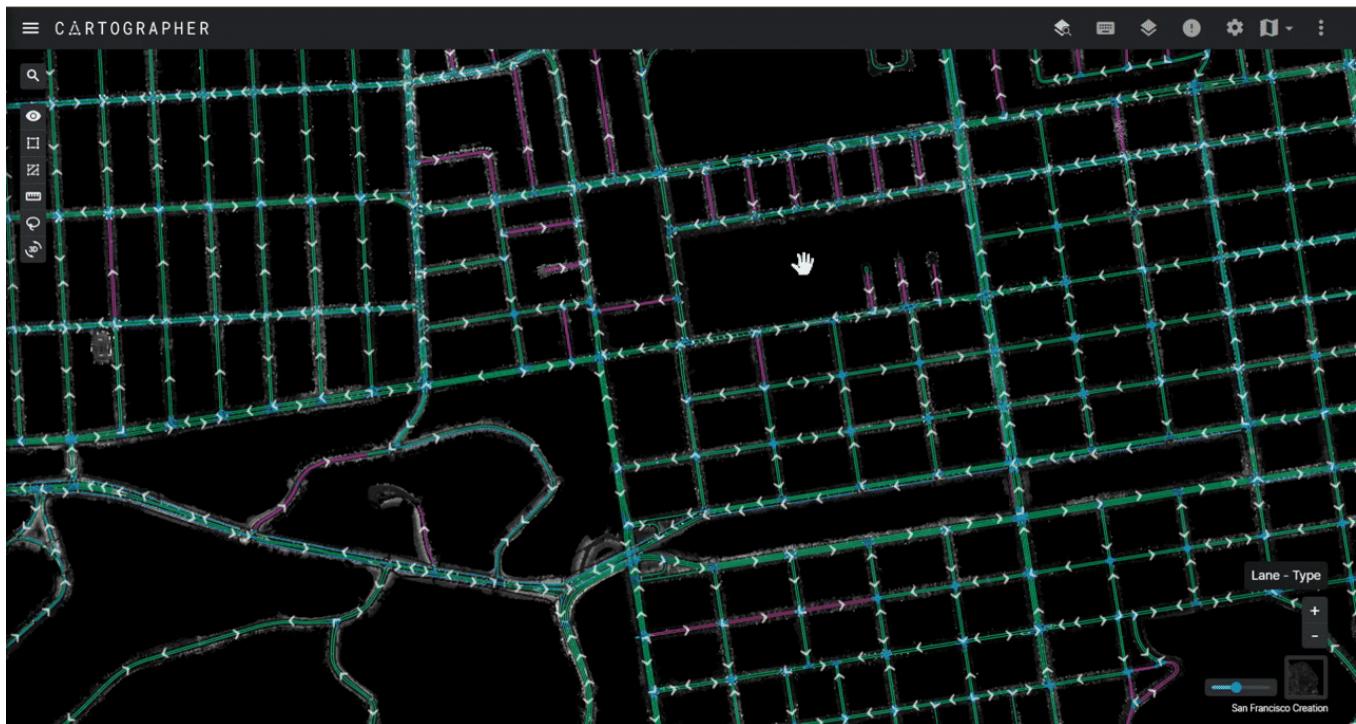
CONTINUE

## Creating an Avoidance Area

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### View Avoidance Areas

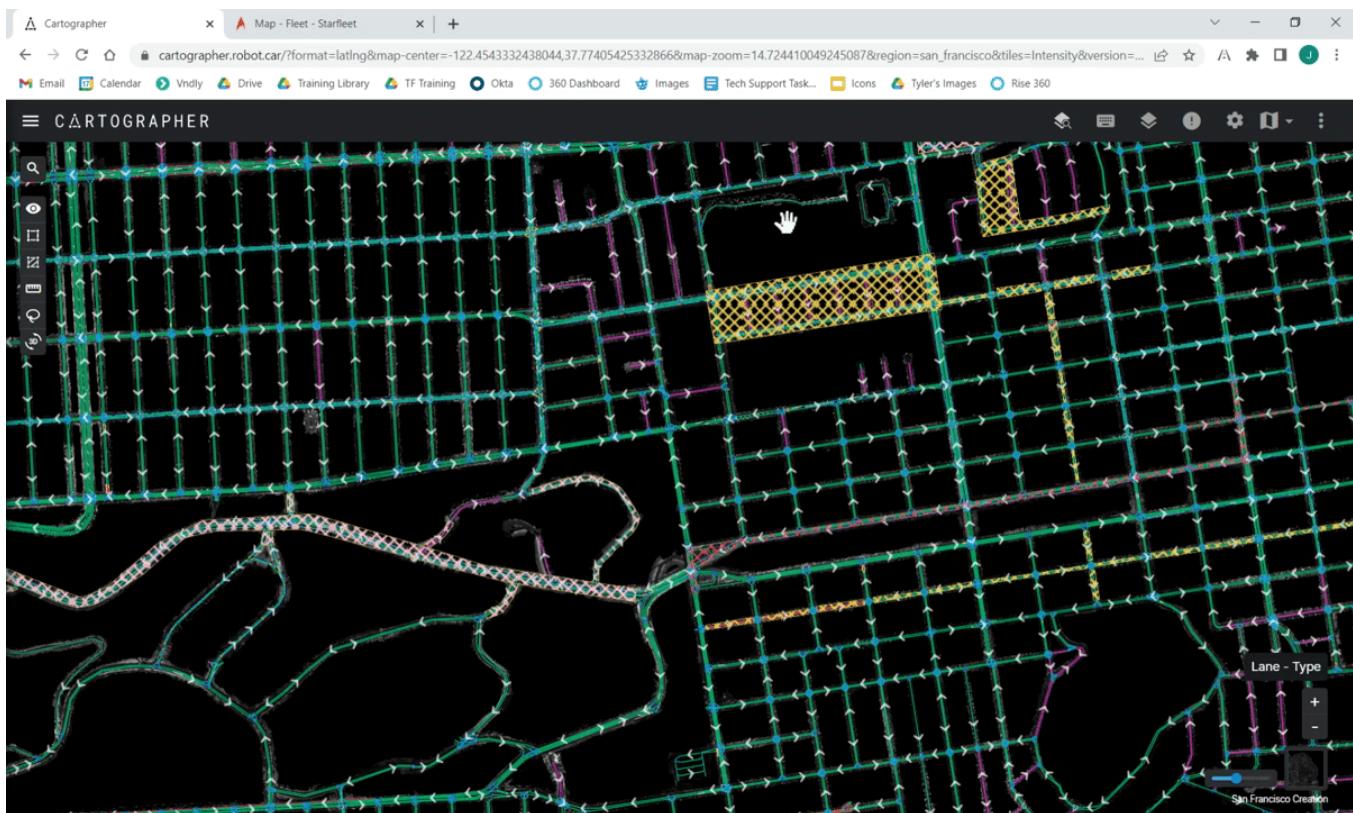


Practice - View Avoidance Area Layers

Toggle the different Avoidance Areas on and off. You may need to adjust the map to see these features.

2

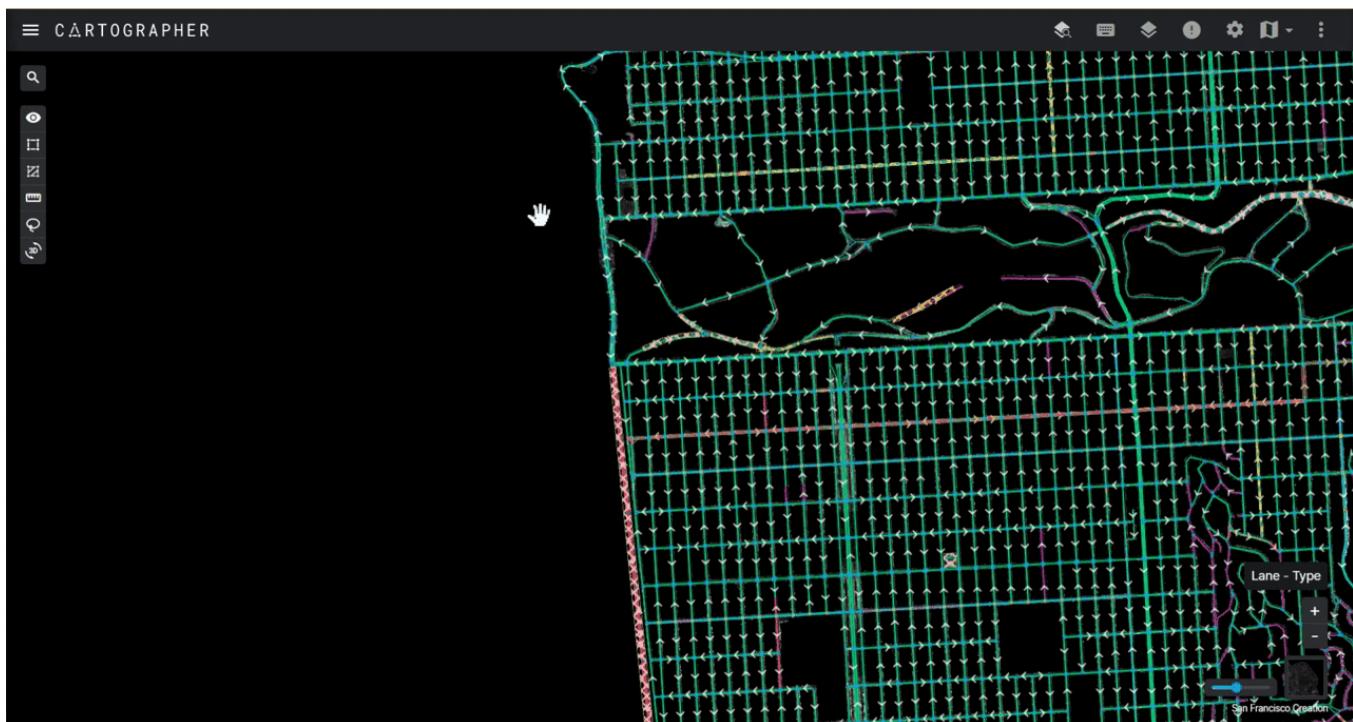
## AA Prep - Check Vehicles in the Area



## Practice - View Avoidance Area Layers

1. Go to Starfleet > Vehicles.
2. Click several vehicles to identify their status and determine their routes

## Draw an Avoidance Area



### Practice - Create an Avoidance Area

1. Select a harmless location (preferably a non-traffic area far away from Cruise operations). When practicing creating AAs, do not set an AA on a route where it may actually impact AV operations.
2. Create an AA using the polygon tool (NOT the Avoidance Area polygon tool)
  - a. Draw an area. Click on the first node set to close the polygon.
  - b. Click Place Emergency Avoidance Areas.

- c. Do not submit the form.
- 3. Delete the polygon.

## Remember these best practices

1. Avoid blocking critical locations
2. Avoid bad sizing that may block lanes. You may be able to close off a turning lane while allowing AVs to continue straight.
3. Avoid placing AA on an active AV and be aware of AVs in the location or that are heading to the location.
4. Be sure to set expiration dates.
5. If you cannot wait for an AV to pass the point, put the AA behind it so that it can route out.

## Complete the JIRA Ticket

A JIRA Ticket is required for each AA. Fill it out using the details below.

**Project:** Map Maintenance.

**Issue Type:** Avoidance Area

Enter the Summary.

## Create Issue

[Configure Fields](#)

All fields marked with an asterisk (\*) are required

Project\*  Map Maintenance (MM)

Issue Type\*  Avoidance Area

[Field Tab\\*](#) [On Road Risk](#) [Community & AVTO](#) [Metrics](#)

Summary\* Avoidance Area for a fire

Reporter\*  Jason Bateman [C]

Start typing to get a list of possible matches.

Component/s Infer NPC Prediction and Interaction ▾  
Maintain AV Localization  
Maintain Sensor Calibration  
Make Lane Changes  
Make Left Turns

Description

Style              

Create another

**Create**

[Cancel](#)

Enter the description in the format:

- Location: (Does not need to be specific, just the street location.)
- Created: (Put the time it will expire.)
- Expiration: (Enter the time that the AA will expire.)
- FEAA ID: (This is the AA in Cartographer. It will appear in the top left.)

Click Submit then copy the ticket link ticket and paste it into the Slack thread.

Create Issue

Configure Fields

Summary\* Avoidance Area set for a fire.

Reporter\* Jason Bateman [C]

Start typing to get a list of possible matches.

Component/s Unknown  
4 Day SLA BL  
Delivery Fault  
Detect Critical Objects  
Drive Comfortably

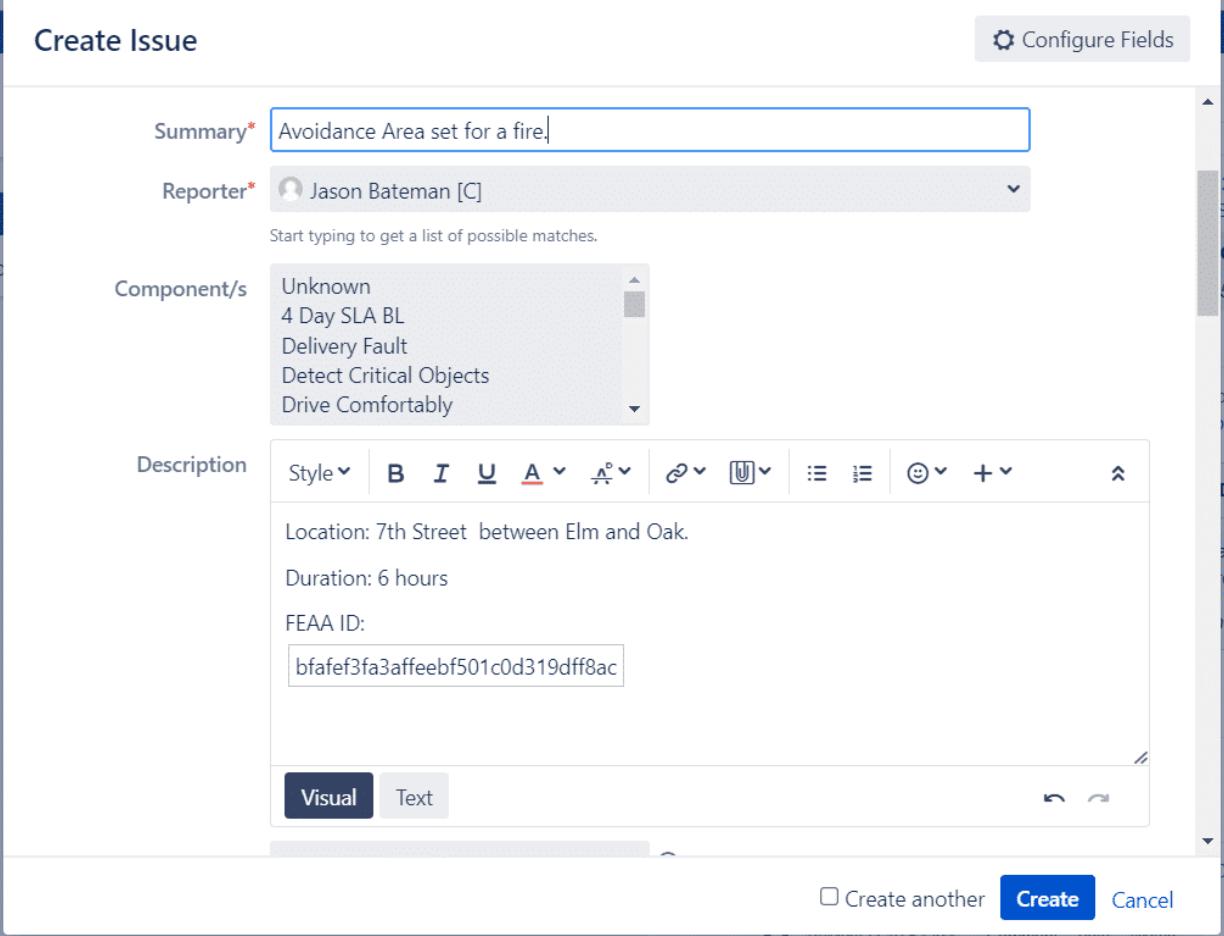
Description

Style **I** **U** **A** **A<sup>o</sup>** **C<sup>o</sup>** **U<sup>o</sup>** **E<sup>o</sup>** **E<sup>o</sup>** **+** **^**

Location: 7th Street between Elm and Oak.  
Duration: 6 hours  
FEAA ID:  
bfafef3fa3affeebf501c0d319dff8ac

Visual Text

Create another **Create** Cancel



## Knowledge Check

Let's see what you remember.

What will happen if an AV is in an Avoidance Area when it is placed?

It will reroute.

It will enter recovery mode.



It will pull over.

SUBMIT

You must place an AA immediately, but there is an AV in the area. What should you do?

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Place the AA behind the AV.



Inform the FSC that the AV will go into recovery mode.



Wait until it has passed.

SUBMIT

**CONTINUE**

# E x p i r i n g a n A v o i d a n c e A r e a

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## W h e n D o e s T r o u b l e f o r c e R e v i e w a n d E x p i r e A A s ?

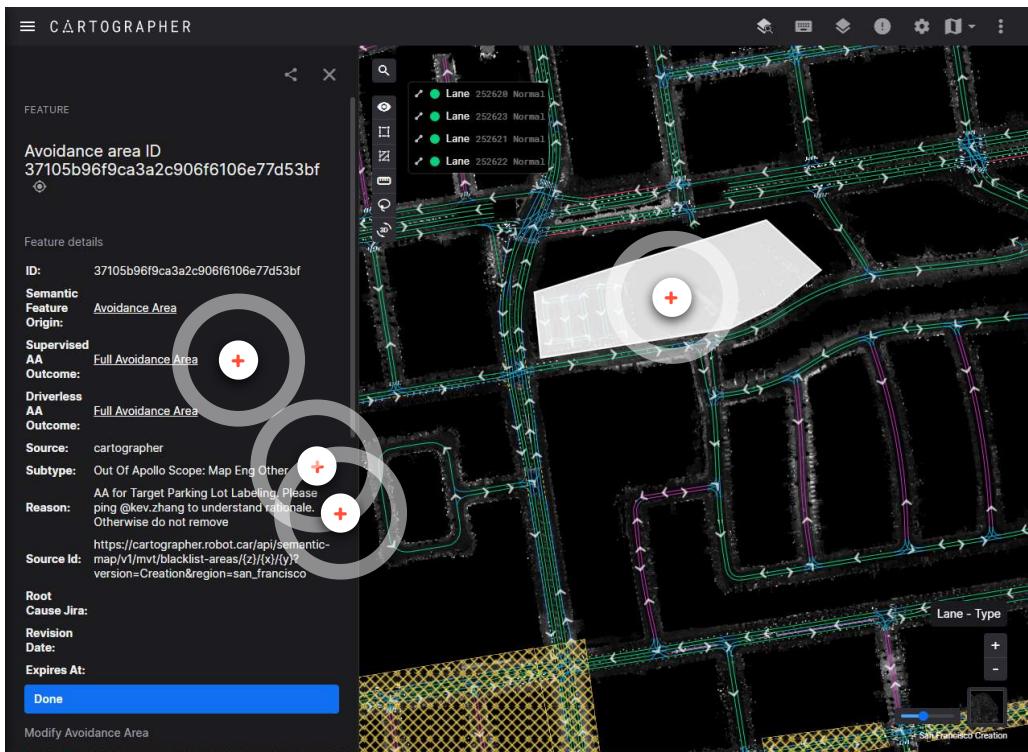
This is a special process for Troubleforce. Troubleforce does not normally manage the placement and removal of avoidance areas - only a select few (temporary, event, and emergency AAs).

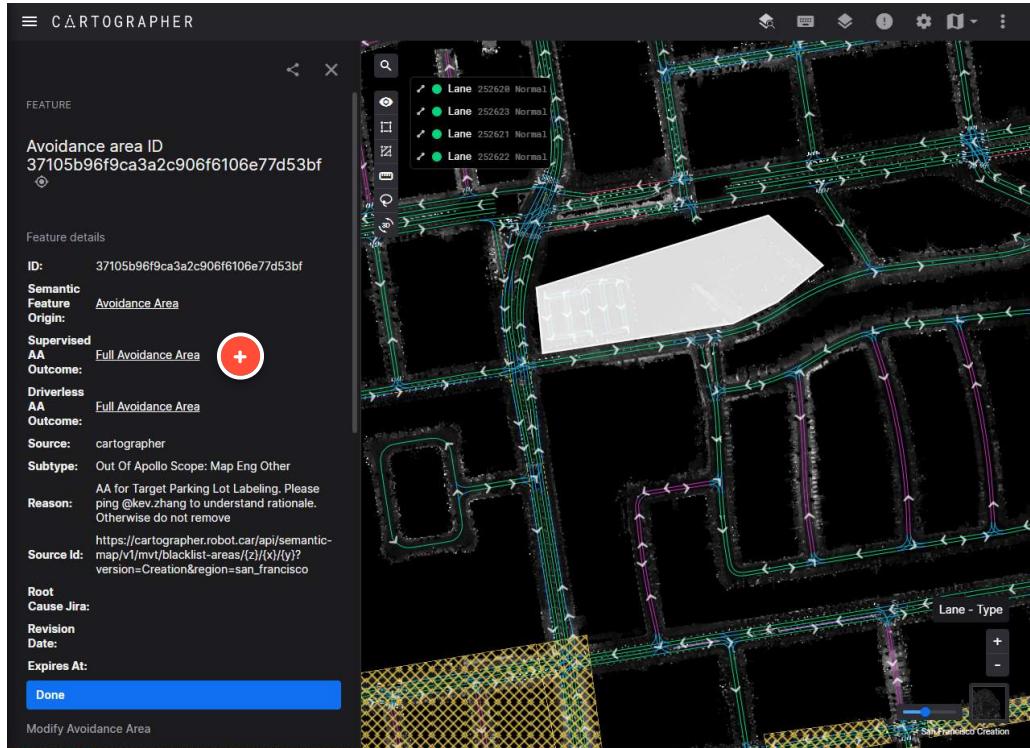
When there is a pressing business need, Troubleforce is empowered to respond, review, and potentially expire AAs. This may be for situations such as:

1. A Cruise Facility is cut off, which impedes AV launch/retrieval operations
2. A Brittle Area (few methods to get in and out) of the map is cut off, which prevents AVs from serving customers in the cut off area

## U n d e r s t a n d A v o i d a n c e A r e a s

If you select an AA, it will display the feature properties. Click the icons below to learn about each item.





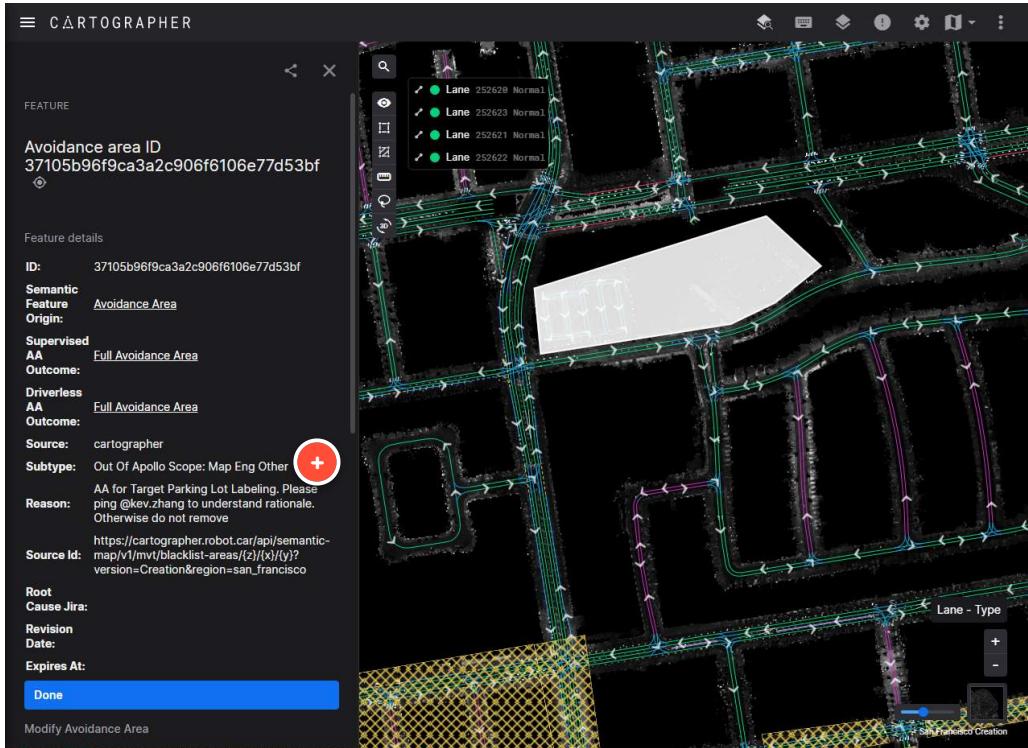
## Type of AA

Avoidance Areas affect either Supervised (AVTO present) or Driverless (AVTO not present).

Avoidance Areas can be of three types:

- Full Avoidance Area (FAA) - All lanes touching the AA are unroutable
- Partial Avoidance Area (PAA) - All lanes touching the AA have a high routing cost applied
- No Avoidance Area (NAA) - Lanes are unaffected

For Troubleforce, the type of AA to respond to is Driverless Full Avoidance Areas. These are the AAs that can cause facility or routable graph outages.



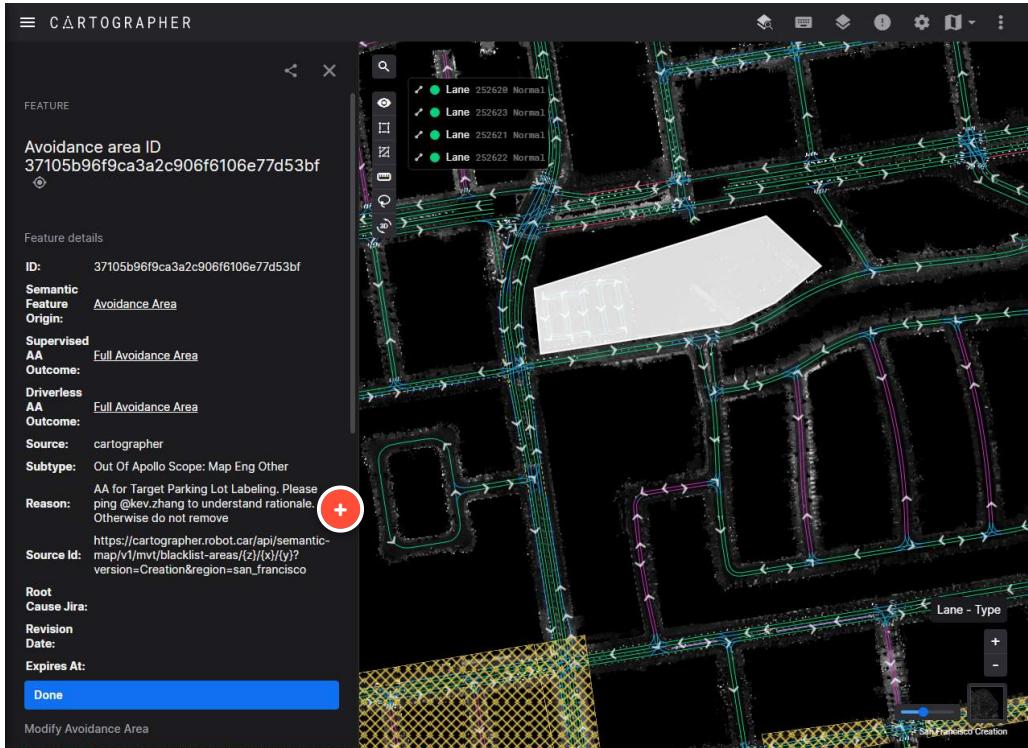
## Subtype

Subtypes help us understand which Cruise team is responsible for addressing the root cause of the Avoidance Area. They are broken into several major categories:

- AV Eng - AV system issues and edge cases, where code changes to AV behaviors are required
- Map Update - Map is incorrect or out of date, and needs an update
- Out of Apollo Scope - An unsupported type of maneuver, such as a heavy railroad crossing
- Temporary - Events and other more short-term incidents

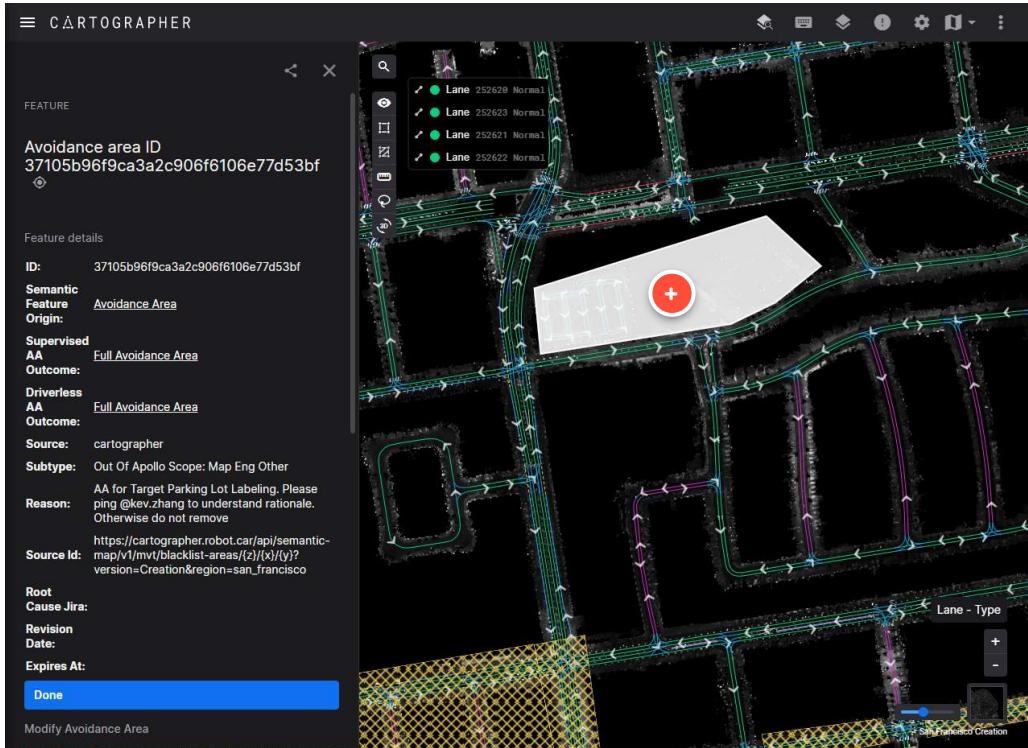
AV Eng, Map Update, and Temporary Avoidance Areas can potentially be expired by Troubleforce. These are also important to understand the underlying risk of the AA. Look at the subtype to get a general sense.

For example, Perception, Prediction, or Planning subtypes are typically more severe



## Reason

This is a free text field that gives more context about the AA. Usually whoever placed the AA will place the rationale in this field.



## AA Geometry

The geometry of the avoidance area is important because of the lanes that will be exposed if the AA is removed. Removal of large AAs covering hundreds of lanes is much riskier than small AAs on single lanes.

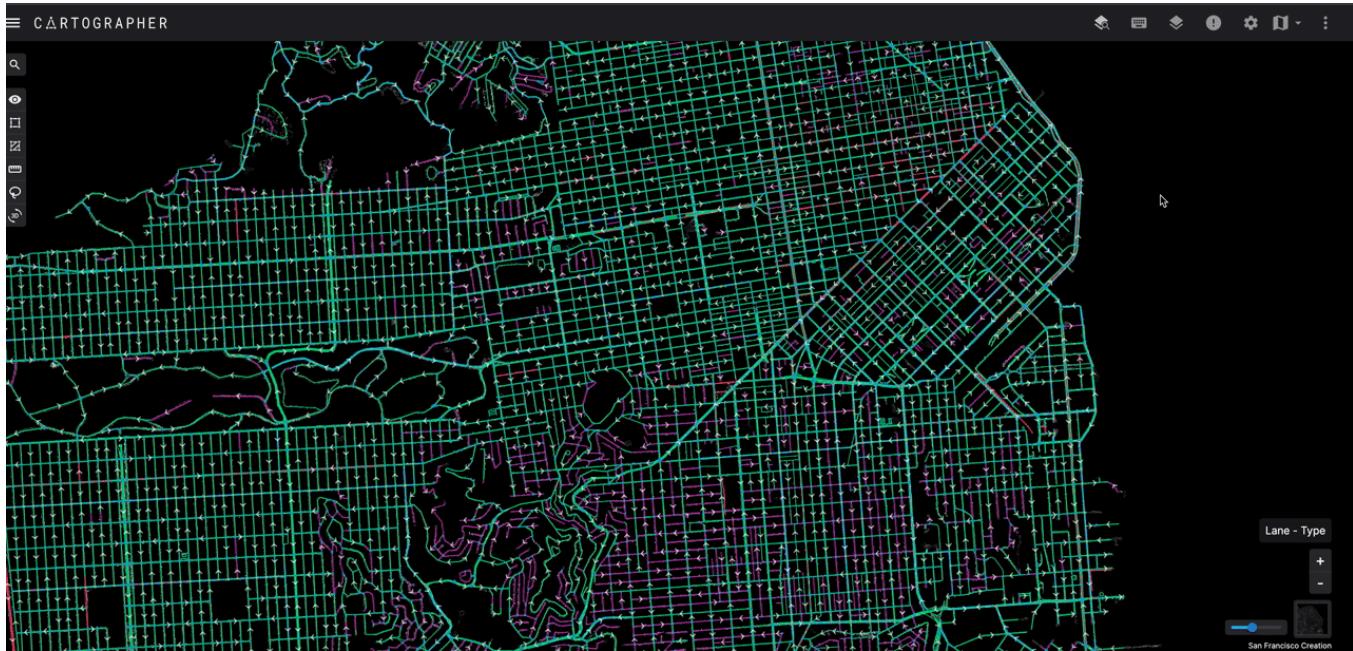
## What to do when an Avoidance Area is escalated?

When an avoidance area is escalated and needs review to potentially expire, you should:

1. Find the offending Avoidance Area
2. Evaluate why the AA was placed and determine the risk of expiring AA. Be sure to ask what will happen if this AA is removed? Will AV's enter dangerous situations?
3. Based on the expected risk, either expire or escalate

Expire	Escalate
<p>Follow the normal process to expire the AA. Only do this for Avoidance Areas that have no explanation or don't seem to be justified.</p> <p>Since this is an exceptional process, apply common sense when evaluating if an AA should be expired or not. You should not assume that all AAs can be expired. Expirations should be justified.</p>	<p>For Avoidance Areas that involve some level of risk, escalation to accountable stakeholders is required.</p> <p>There are two individuals empowered to accept risks and make the decision to expire the AA: The GM of the relevant market or the senior Duty Manager of the OCC.</p> <p>Troubleforce's role is to help assess the risk, but the risk owner is liable for any/all risk. Expire the AA only if the decision is made to accept the risk.</p>

View this video for a more thorough look at what is required.



## Knowledge Check

Let's see what you remember.

When finalizing an AA expiration, should you use the **Remove Feature** button.

Yes

No

SUBMIT

During a review, you learn that an AA is in place to block vehicles from entering onramps to a highway. What is the best option?

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- Expire the AA.
- Escalate and leave AA in place.

SUBMIT

What does an AA Subtype indicate?

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- The team that is responsible for addressing the root cause.
- Whether it is full or partial.
- Whether Driverless, Supervised, or both are blocked from the area.

SUBMIT

CONTINUE

# Reporting Mapping Issues

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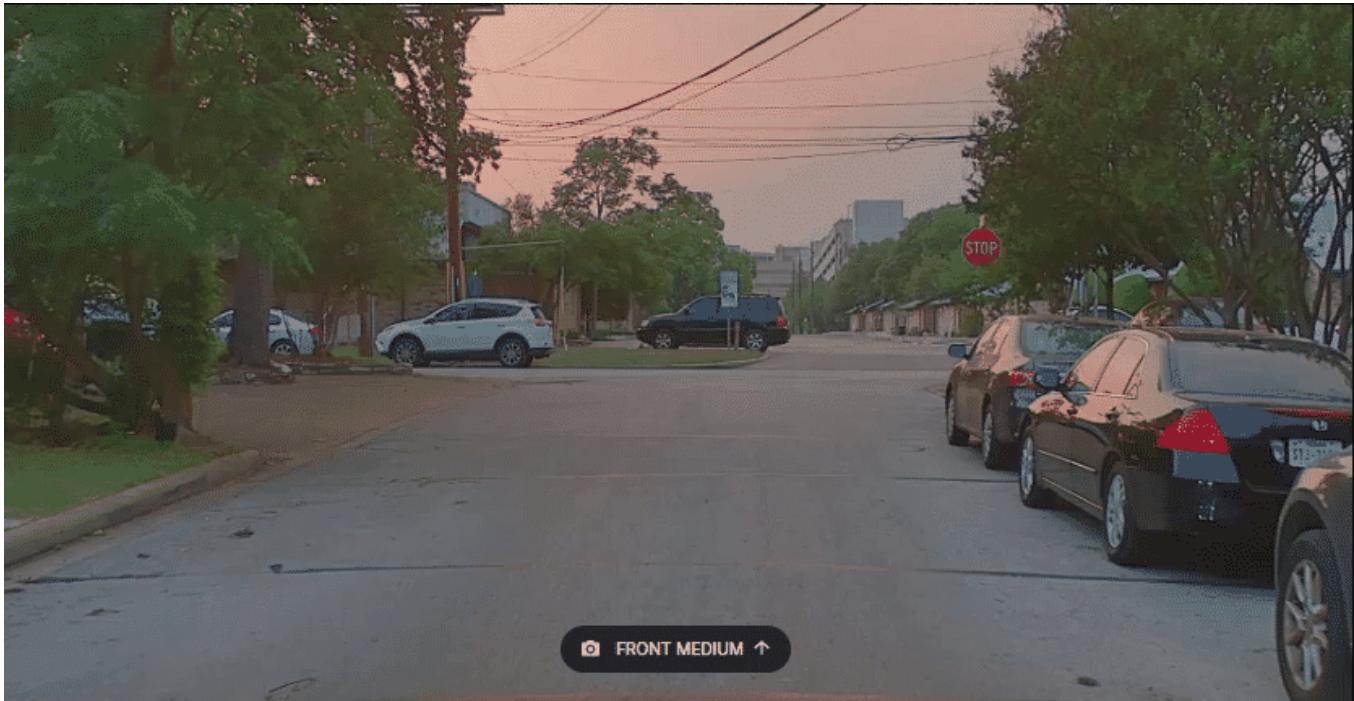
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## What are Mapping Issues?

The mapping team has tremendous responsibility identifying everything on a map. The lights, the lanes, the signs. Still there are instances when our maps are off and need to be corrected. Common mapping issues include:

- Incorrect traffic lights
- Missing stop signs
- Speed limit changes
- Unmapped school zones
- New paint/lanes/speed bumps

Watch the video below. Do you know what the problem is?



## Why didn't the AV stop?

A Troubleforce Expert researched the issue and discovered that the stop sign was incorrectly mapped as a yield sign.

Screenshot of the Cruise Jira interface showing an issue titled "Request Avoidance Area: Section 10735".

**Details:**

- Type: Avoidance Area Request
- Priority: Low
- Component/s: None
- Labels: request aa
- Region: ATX
- Drives Link: <https://starfleet.robotcar/issues/occurrences/5e7e8a86-2b72-4d19-9663-d4e865a3a8b0>
- Action Needed (Supervised): Full AA
- Avoidance Area: Map Update - High Res Data Needed - Traffic Control
- Taxonomy:
- Map Issue Type: Map Issue - Labeling Error
- Project ID: 20230425-000352 [Austin] Request Avoidance Area
- Avoidance Area ID: 52a51698-10b9-4464-8219-367717d6dfe3
- Avoidance Area Count: 1
- Action Needed (Driverless): Full AA
- Task ID: 33cbcda-124a-4019-b111-3c507e7d41ef

**Description:**

<https://cartographer.robotcar/tasks/33cbcda-124a-4019-b111-3c507e7d41ef>

**Notes:**

- [erich.sabo@getcruise.com] Crosswalk Traffic Lights not mapped. AV ignored flashing red light above crosswalk. Appears to be traffic light type 61 - Lane IDs: 165746, 165747, 165745, 165744 and Map Feature 24325

**People:**

- Assignee: Unassigned
- Reporter: Carto Workflow Jira SVC [IT-72273]
- Original Requestor: Erich Sabo [C]
- Votes: 0 Vote for this issue
- Watchers: 3 Start watching this issue

**Dates:**

- Created: 24/Apr/23 5:03 PM
- Updated: 25/Apr/23 2:06 AM
- Resolved: 25/Apr/23 2:06 AM

**Development:**

Jira is having difficulty contacting the applications that supply development status information. If this condition persists, please contact your Jira administrators.

**Agile:**

[View on Board](#)

Issues are reported in JIRA so that the mapping team can correct the issue.

In this example, a crosswalk traffic light was not marked correctly.

## How do you solve mapping issues?

When there is an issue, it is up to the Troubleforce team to identify the issue within Cartographer and report it to the mapping team.

First you will need to identify the location. This may be done by watching the video of the drive and identifying the streets. What you do next will depend on the type of issue.

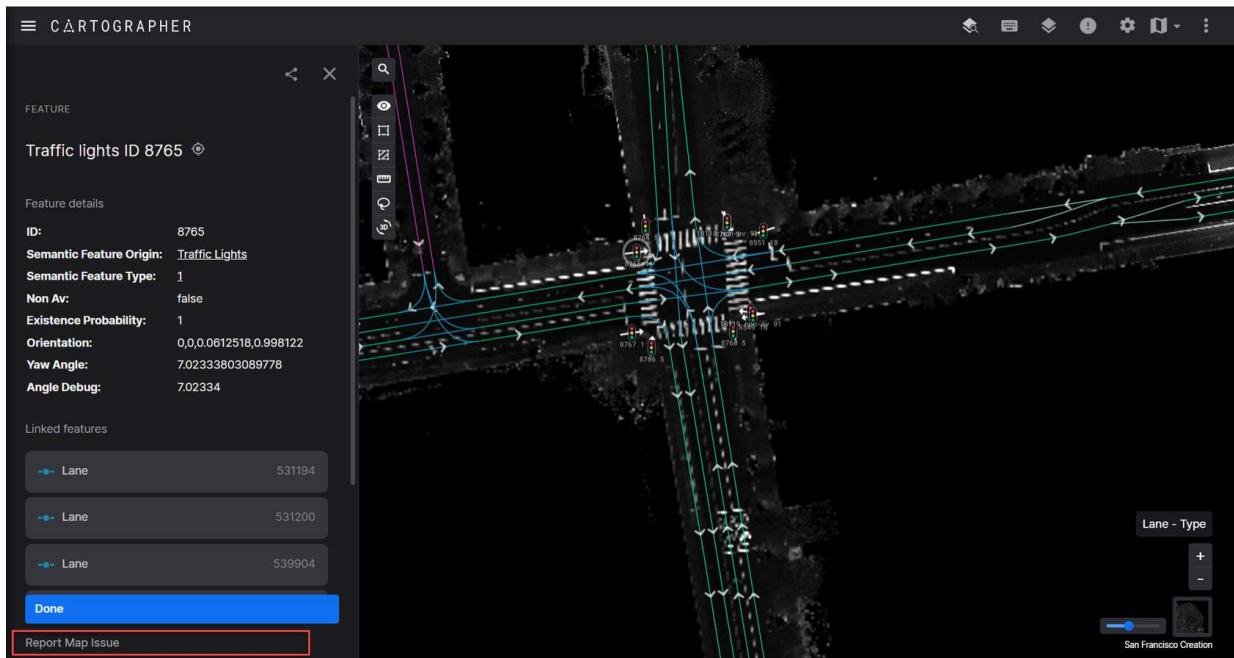
The screenshot shows a web browser window with the URL [wiki.robotcar/display/AVTs/Expert+Resources+-+AVBE](https://wiki.robotcar.display/AVTs/Expert+Resources+-+AVBE). The page title is "Expert Resources - AVBE". The left sidebar includes links for "AV Trainers", "Pages", "Blog", "Terms", and "Calendars". The main content area has a heading "Resources" and several sections:

- Training Materials**: Includes "Troubleforce AVBE Onboarding" and "Helpful References" (Acronym List).
- Policies and Procedures**: Includes "AVBE Playbook" which describes the responsibilities and processes for data curation, drafting, and the overall process of compiling Anecdotal Behavior Reports on Roadtest and Release.
- External Documents**: Includes "AVBE Google Dashboard" which is described as a dashboard full of AVBE resources.
- Mapping Resources**: This section is highlighted with a red border and contains the following items:
  - Do Not Stop Areas**: Describes areas where road paint or signs instruct drivers to Keep Clear or Do Not Stop. It states that Do Not Stop areas should exist only within the driveable area and should not extend past.
  - Avoidance Area Request Guidance for Ops**: Describes Emergency AA placement.
  - PagerDuty Escalation SOP**: Document outlining the PagerDuty escalation pipeline.
  - Troubleforce Safety**: Please utilize this checklist when
  - Intersection Lanes**: Intersection lanes provide different

## Mapping Resources

Go to the [Expert Resources - AVBE](#) located on Confluence. There is a column for Mapping Resources that lists mapping issues. Use these pages as references.

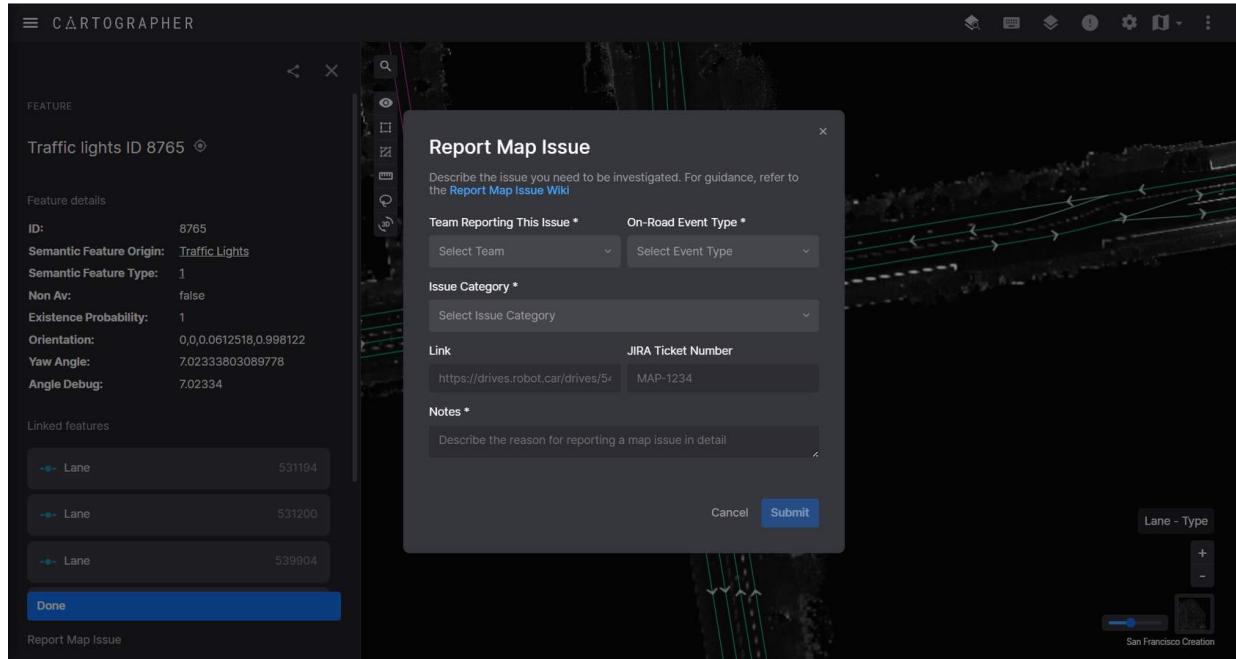
There is too much information here to memorize. However, it would be worth your while to familiarize yourself



## Select the Item

Next, you will select the item in Cartographer that needs to be updated. This will display the feature dialogue box.

At the bottom, select the **Report Map Issue** button.



## Submit the Report Map Issue form

Much of this form will be auto-populated, but you will need to create a JIRA ticket and provide the link to the Drive.

In Cartographer, find Traffic light ID:19700. Does this light contain arrows?



No



Yes

SUBMIT

