Transit Network Comparisons

Torie Robinson, GIS Analyst

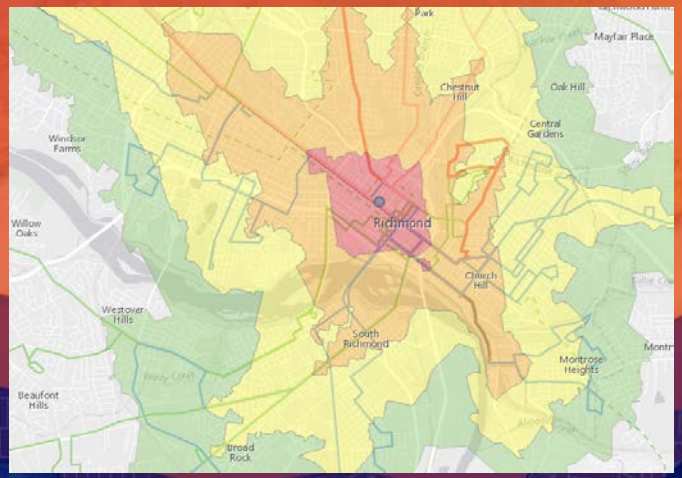
Marshall Ballard, GISP, Senior Transportation Planner, GIS Manager @marsxul

Santa Clara Valley Transportation Authority

Transit Redesign

Bay Area Rapid Transit (BART) to San Jose
Improved bus network to help serve BART
Change service model from schedule based to frequency based
Consultant assistance form Jarrett Walker Associates (JWA)

- **Example from Richmond, VA a JWA project**
- **Michael Baker International was GIS consultant for Richmond solution**

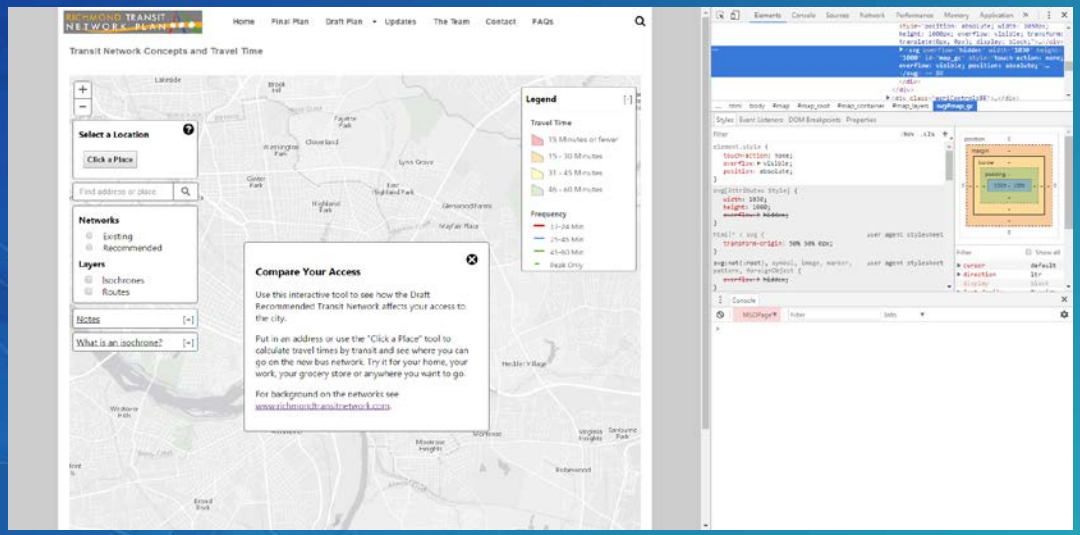


Santa Clara Valley Transportation Authority

The Power of Networking

And the Inspect Tool in Chrome

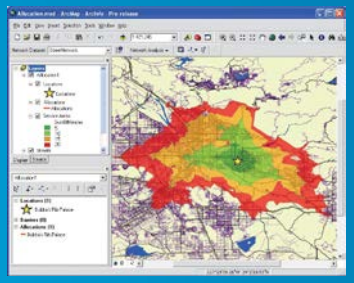
- CalGIS 2016 – Anaheim
  - Met Michael Skowronek from Michael Baker Associates (MBA)
  - Jarret Walker Associates (JWA) sub contracted with MBA for their web tool to evaluate transit redesign
  - VTA Transit planning was going to ask JWA to replicate this for VTA
  - VTA GIS interjected our ability to use the code written by MBA
  - A few phone calls and a methodology for post processing was shared from MBA
    - VTA opted a different process using the tools developed by Melinda Morang at ESRI – thanks Melinda!
  - Thank you to Mike Skowronek of MBA and Scudder Wagg (formerly MBA) now JWA



Santa Clara Valley Transportation Authority

Resources

- TomTom 2015 streets basemap data
- VTA GTFS Data – General Transit Feed Specification
- Regional GTFS Data – BART, CalTrain, Capitol Corridor, Altamont Corridor Express, AC Transit, Santa Cruz Metro, SAMTrans, SFMTA, Caltrain Shuttles
- Open Street Map (OSM) – alternative to TomTom data and leveraged for comparative analysis
- Remix – used to generate next network GTFS
- Software – ArcGIS Network Analyst, ArcGIS API for Javascript, ArcGIS Server Advanced, “Add GTFS to a Network Dataset” toolbox, Open Street Map, Google Map’s Geocoder, ESRI Developers Network (EDN) server, Open Trip Planner Analyst (as an isochrones alternative), Remix, Sublime text editor



TOMTOM

ESRI ArcGIS

esri

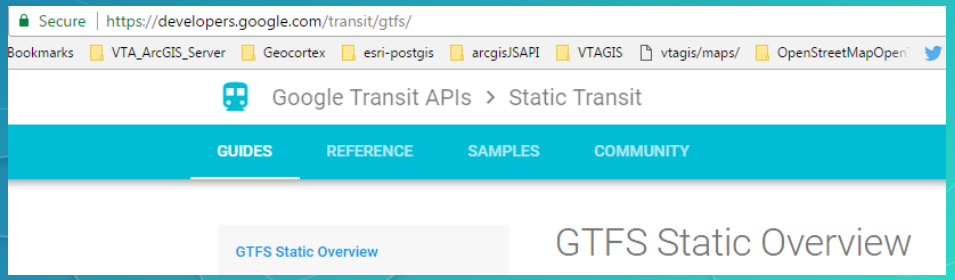
OpenTripPlanner

Google Maps

remix

Add GTFS to a Network Dataset

- GTFS – General Transit Feed Specification
  - https://developers.google.com/transit/gtfs/ Google documentation
  - Transit schedules - https://transitfeeds.com/ or https://transit.land/
- http://gtfs.org/best-practices/ Rocky Mountain Institute
- Data validator – understand any errors in data – you may need to use the InterpolateBlankStopTimes tool to improve your stop times table
- Install the tool AddGTFStoND in ArcGIS
- Great documentation, local html file with detailed instructions
- Run the transit evaluator install.bat
- Consult the troubleshooting guide if you encounter errors.



Where to find these tools

https://github.com/Esri/public-transit-tools

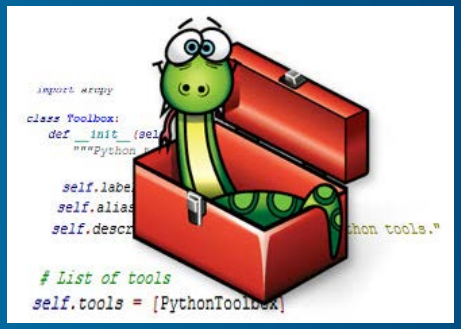
https://github.com/Esri

or

http://transit.melindamorang.com/index.html

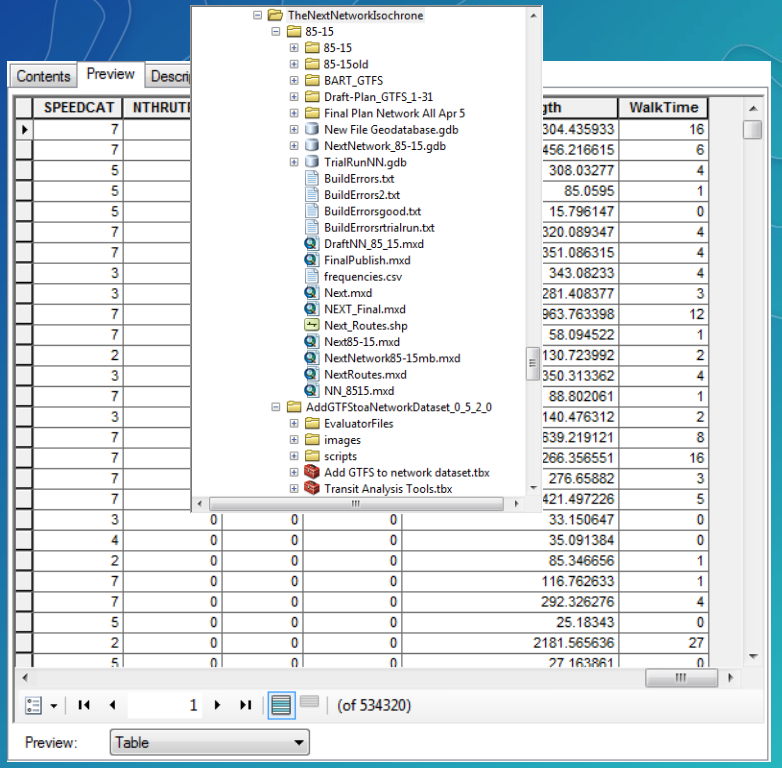
http://arcg.is/2timm2E - great story map about the application of the public transit tools in ArcGIS – Well done Melinda!

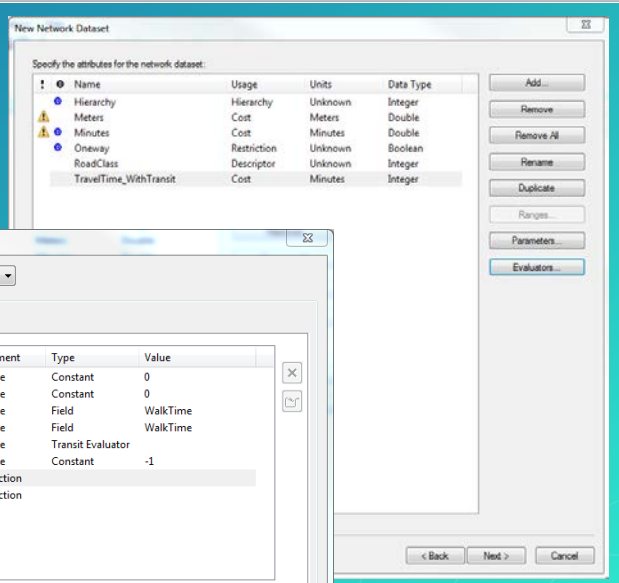
https://github.com/vta - VTA's GitHub repository

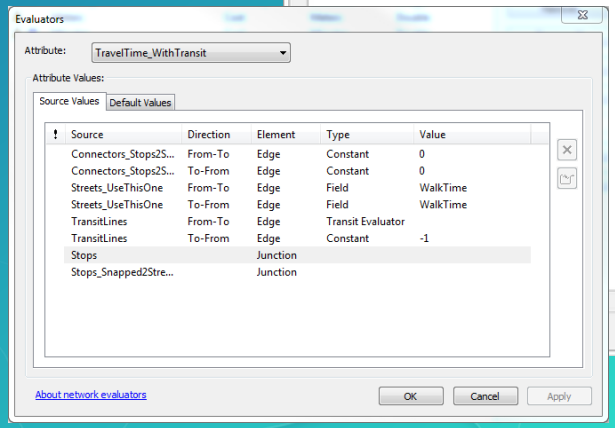


Network Creation

- Create file geodatabase
  - One feature dataset per geodatabase
  - Build network in feature dataset
  - Import road basemap data into feature dataset
  - Create new field in roads called Walktime
  - Use the Evaluator to process the Walktime
  - Generate Transit Lines and Stops – batch with all GTFS files if multiple are needed
  - Generate Stop-Street Connectors – snaps stops to streets – how good is the street network your using?
  - Build the network dataset
    - Using the Travel time With Transit Evaluator set the value of Streets to the field Walktime.

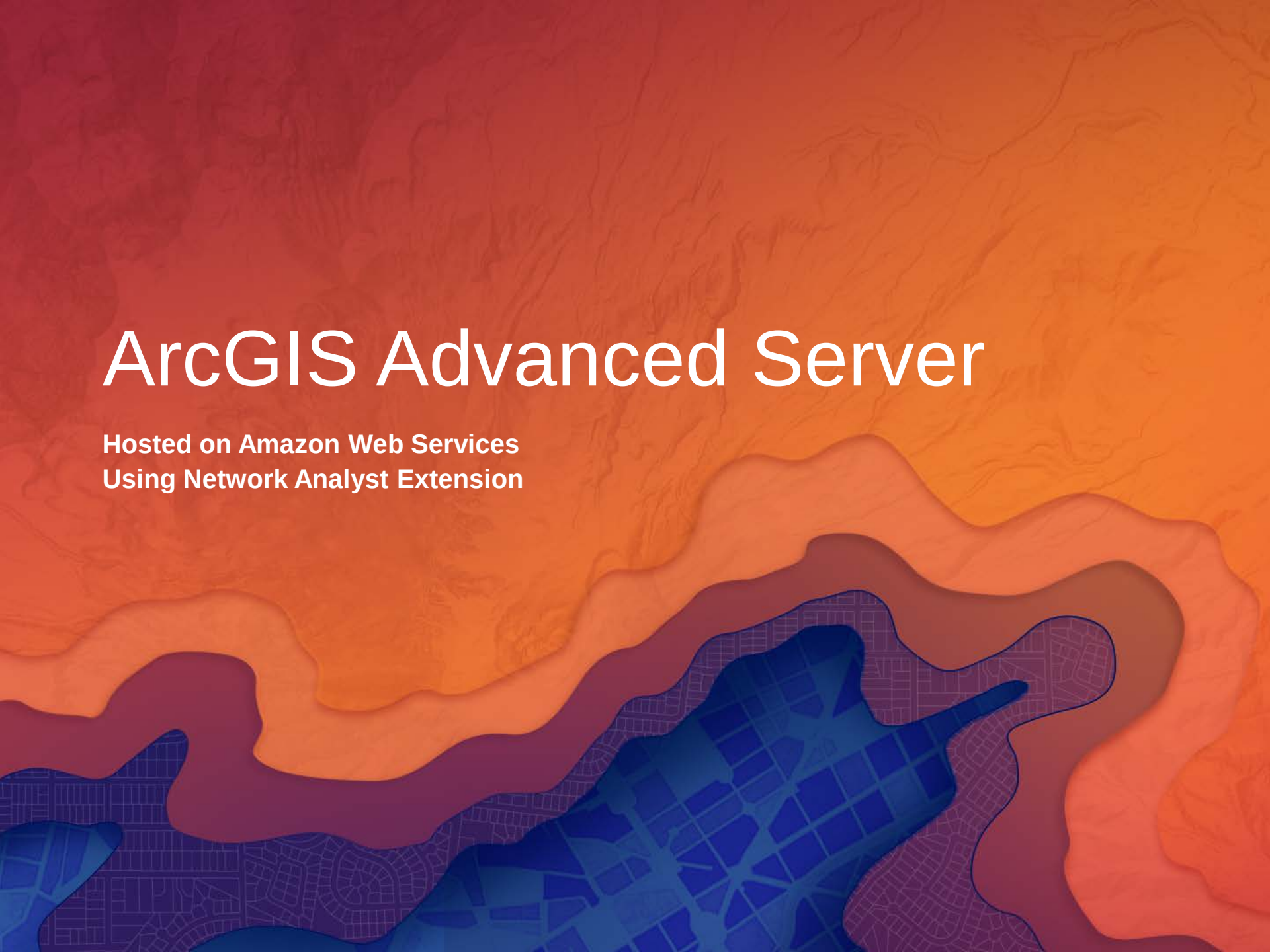






ArcGIS Advanced Server

Hosted on Amazon Web Services
Using Network Analyst Extension

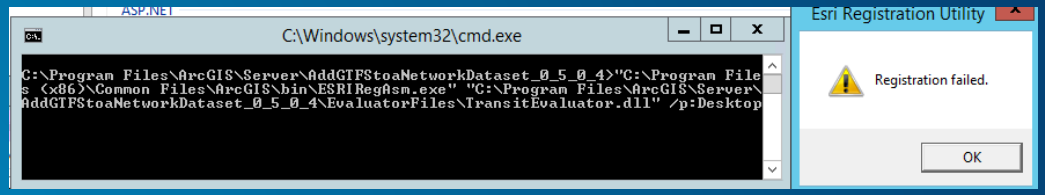


Publish to AWS Server

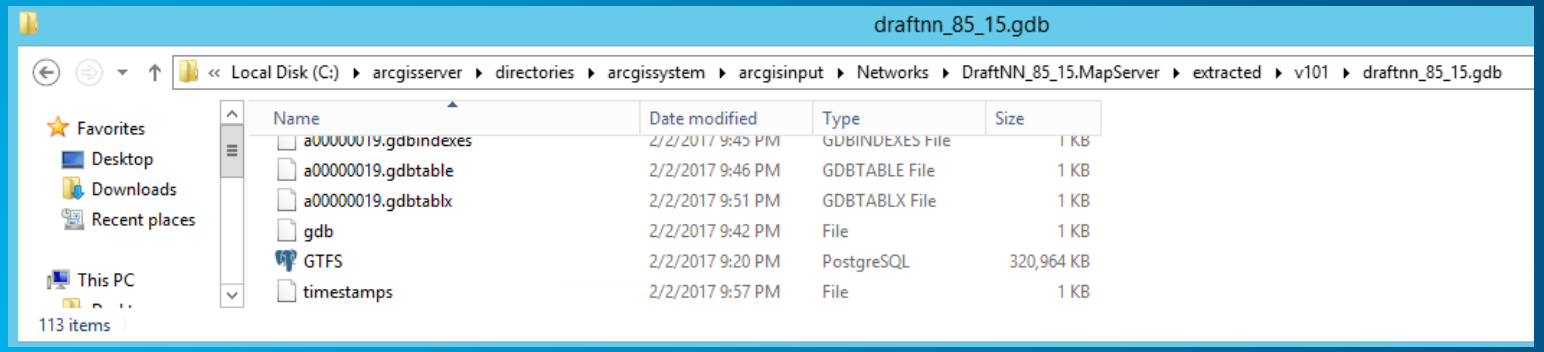
- Reserved space for 30% discount annually on AWS
- Installed ArcGIS Server Advanced on AWS
- Zone – us west 2c
- Use an appropriate naming convention in your AWS dashboard
- Research your instance type needed, t2.xlarge –16GB Mem, 4 vCPU using Burstable Performance Instance to enable performance above baseline if needed
- Security – chained certificate linked to the vta.org domain, pem key – server security, firewall configuration
- URL rewrites from HTTP to HTTPS
- Elastic IP – to maintain DNS e.g. gis.vta.org – maintain connection in GIS Server connection
- Advanced Server not applicable for Linux
- We preferred a non ESRI launch stack

Publishing to ArcGIS Server

- When publishing a network dataset as a service use WGS 1984 – Web Mercator Auxiliary Sphere
- Install Add GTFS to a Network Dataset toolkit on the server
- Register the transit evaluator on the server – install.bat file – error solution is to rewrite the install.bat to direct the evaluator install to the correct location

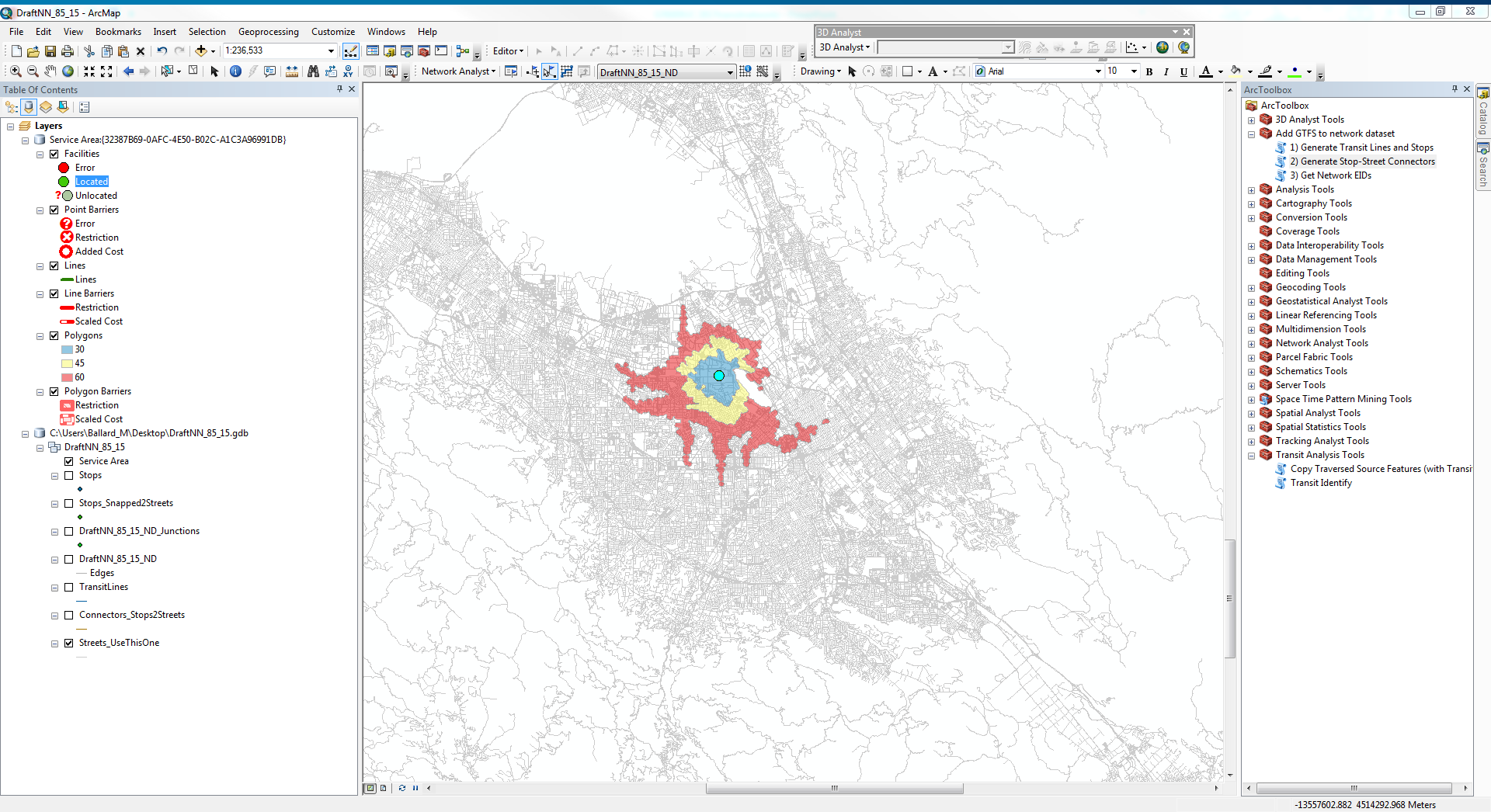


- Copy the SQL database from the geodatabase on your local project to the geodatabase on the server
- This enables the creation of the isochrones using the transit evaluator



Publishing to ArcGIS Server

- Testing the network service prior to publishing to server

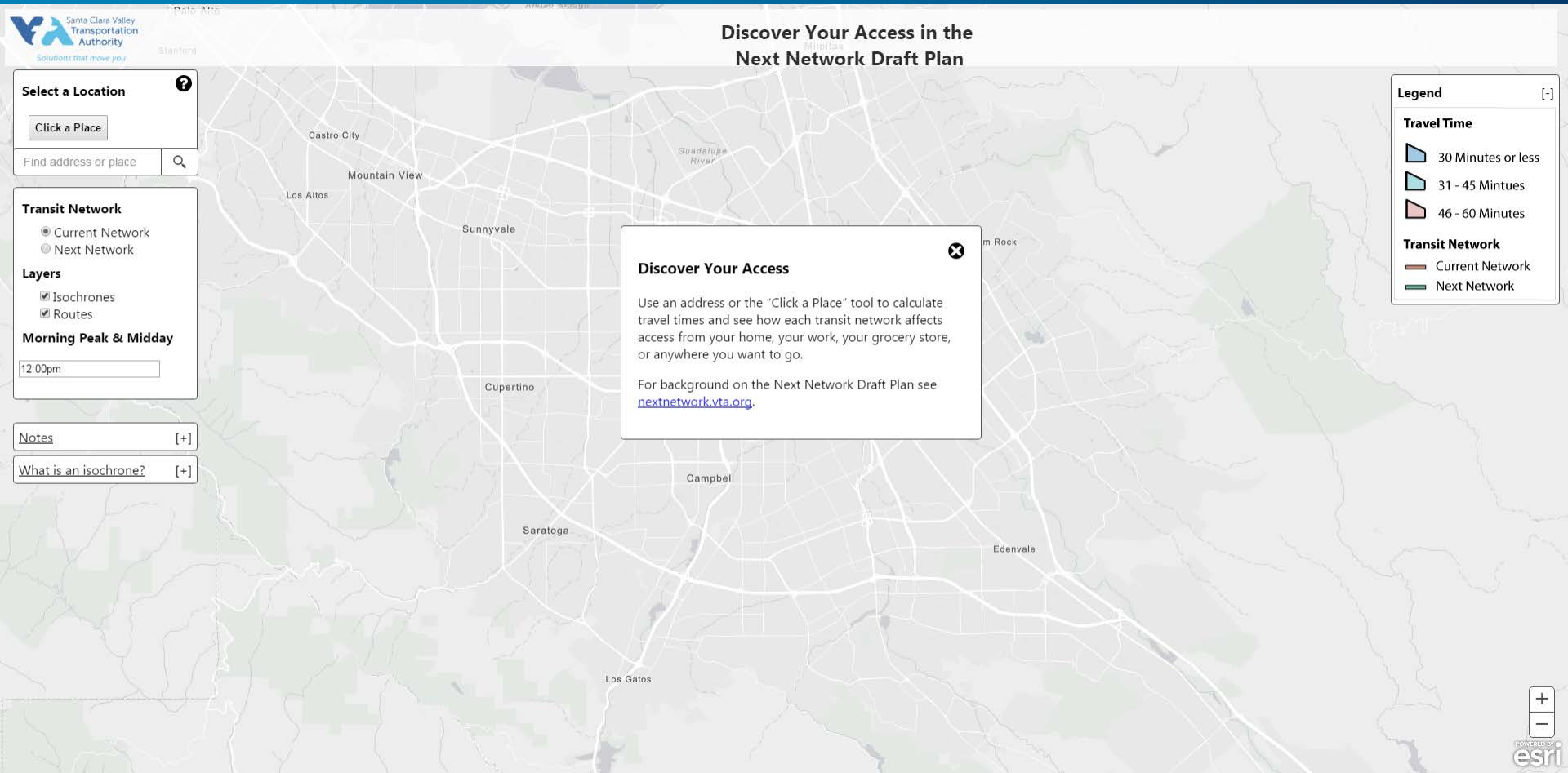


ArcGIS JavaScript API - https://developers.arcgis.com/javascript/

```
<!DOCTYPE html>
<html>
<head>
<script>
  (function(i,s,o,g,r,a,m){i['GoogleAnalyticsObject']=r;i[r]=i[r]||function(){
  (i[r].q=i[r].q||[]).push(arguments)},i[r].l=1*new Date();a=s.createElement(o),
  m=s.getElementsByTagName(o)[0];a.async=1;a.src=g;m.parentNode.insertBefore(a,m)
  })(window,document,'script','https://www.google-analytics.com/analytics.js','ga');

  ga('create', 'UA-44426936-7', 'auto');
  ga('send', 'pageview');

  ga('create', 'UA-67389535-2', 'auto');
  ga('send', 'pageview');

</script>
  <meta http-equiv="Content-Type" content="text/html; charset=utf-8">

  <meta name="viewport" content="width=device-width, initial-scale=1, maximum-scale=
1,user-scalable=no">
<!-- Reguried by bootstrap! -->
```

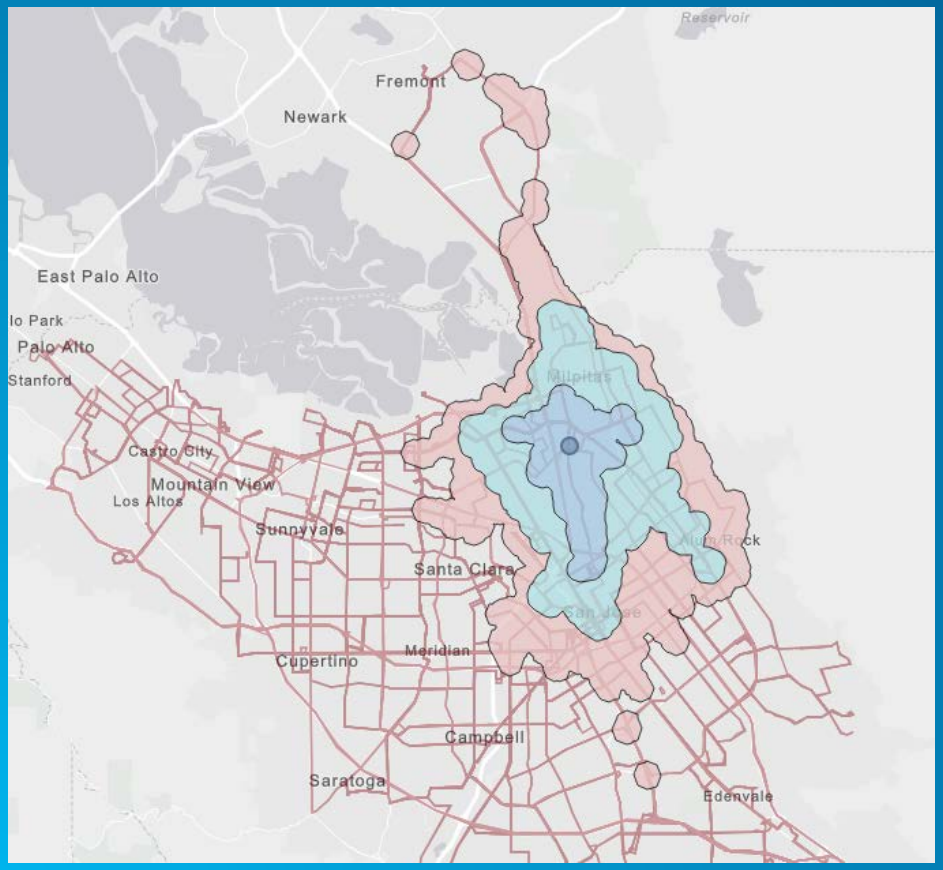
ArcGIS JavaScript API - https://gis.vta.org/discoveraccess/

- Testing JavaScript code
- Updates and changes with transit planning team

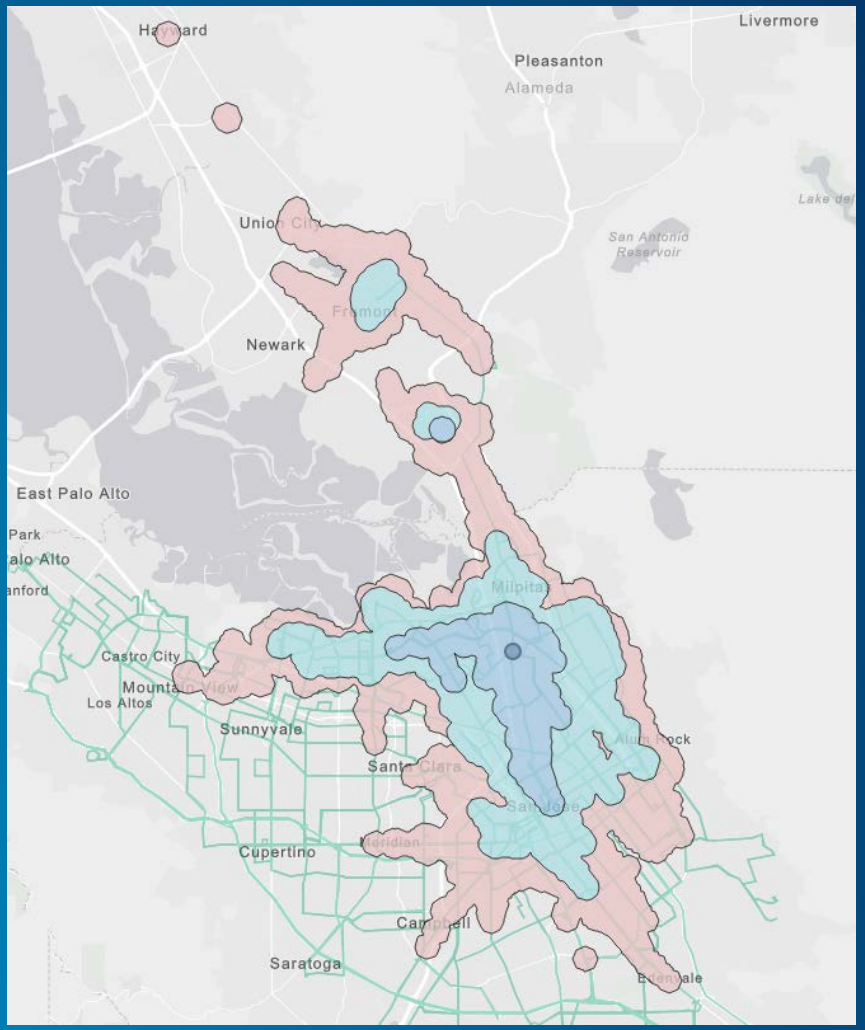


ArcGIS JavaScript API - https://gis.vta.org/discoveraccess/

Current Network

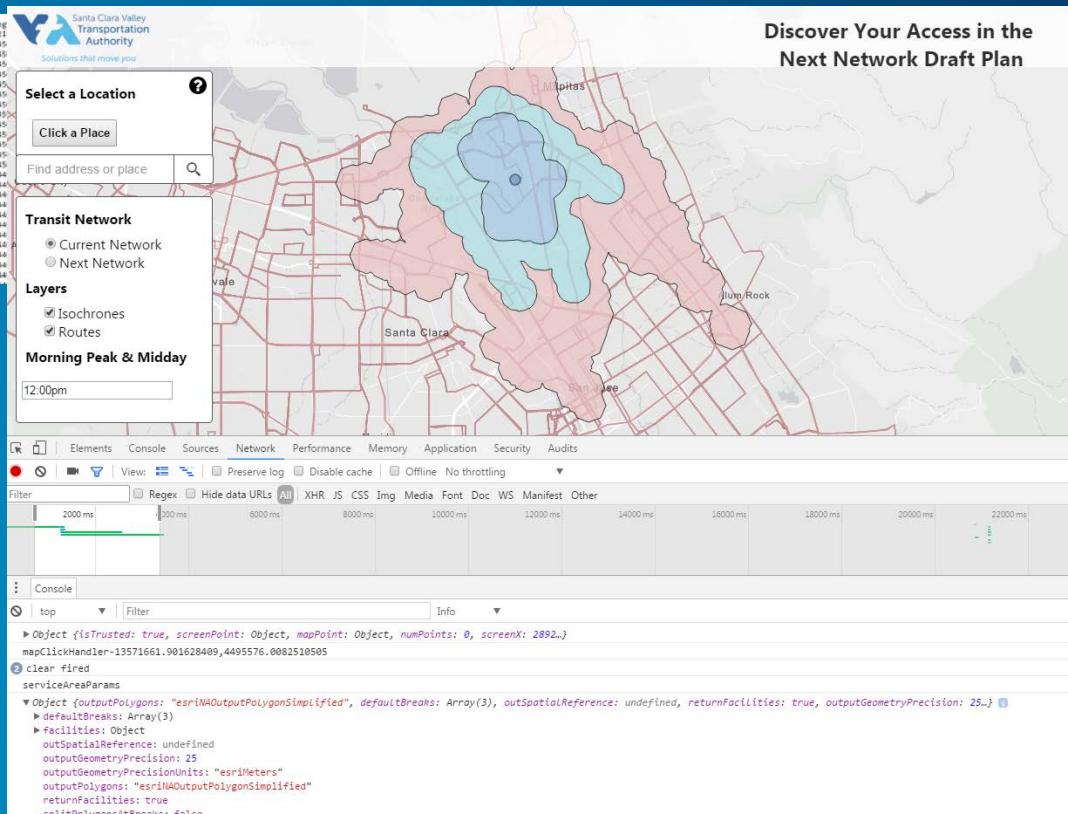


Next Network



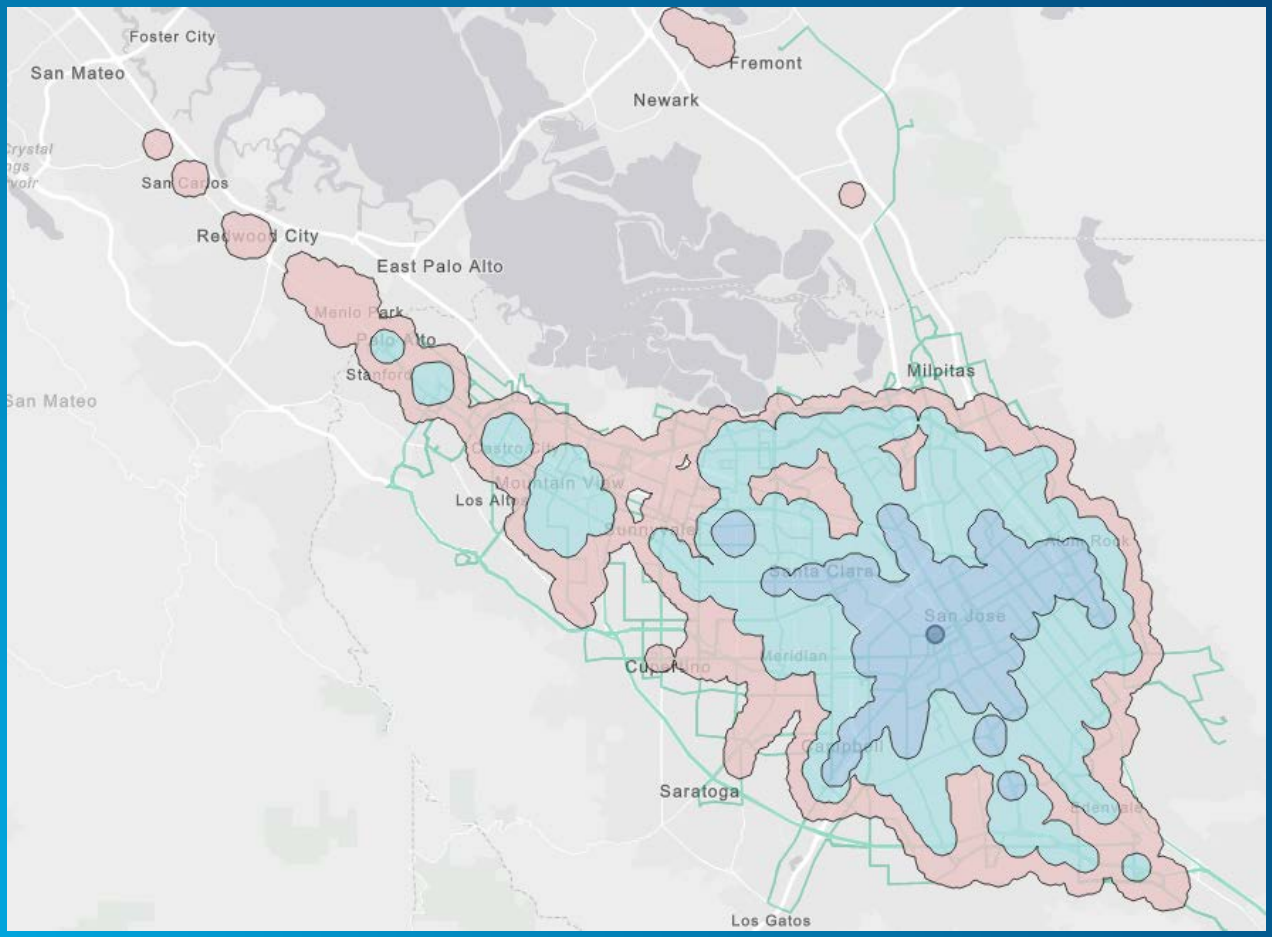
ArcGIS JavaScript API

- **Troubleshooting:**
  - **Inspect tool in Chrome**
  - **Copy network results**
  - **Paste results and run Solve in Rest**
  - **Paste results in Json into web browser or HTML to solve service area screen**



Successful Outreach and Board adoption

- **New service will begin in coordination with BART opening**



Questions / Preguntas?

Torie Robinson, GIS Analyst
Marshall Ballard, GISP, Senior Transportation Planner, GIS Manager @marsxul

Special Thanks to Vivek Bansal - GIS Programmer, Krystal Phaneuf - GIS Specialist, Adam Burger – Transit Planner, Jay Tyree - Transit Planner

Santa Clara Valley Transportation Authority