



Combining Household Travel Survey Data and Passively Collected Data to Improve the Understanding of Travel Behavior in the Greater Boise, Idaho Region



2021 Treasure Valley Travel Survey

Two primary goals:

- Gain a better understanding of how local roads, highways, bike lanes, sidewalks, and public transportation are being used, and how the organization can improve upon them moving forward.
- To have recent changes like population growth, new transportation options, and increased teleworking frequency have affected the area.

2021 Treasure Valley Travel Survey

An integrated solution:

- Household travel survey
- Analysis of passively collected data
- Transit on-board survey



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Transportation agencies must weigh the strengths and weaknesses of passively collected data

Advantages

- On any given day, it may be possible to observe 10 – 15% of the population and up to 50% of the population over a month.
- It is straightforward to analyze data spanning multiple weeks, months, or years.
- Large samples of data can be collected passively at relatively low cost compared to other methods.

Limitations

- There is no information on the device owner, their travel purpose, the activity they are engaged in, who may be traveling with them, or mode of travel. **These data can be imputed.**
- Excludes travelers without mobile devices or vehicle navigation services.
- Short-distance trips or short-duration activities are under-represented.
- The protection of privacy involves some loss of information.

Household travel survey

SURVEY RECORDS



4,012

HOUSEHOLDS

Unweighted Records



9,066

PERSONS

Unweighted Records



7,753

VEHICLES

Unweighted Records



33,251

TRAVEL DAYS

Unweighted Records



133,511

TRIPS

Unweighted Records



1,804,914

LOCATIONS

Unweighted Records

- Survey fielded from **August 9, 2021, through November 16, 2021.**
- **Smartphone participants completed a 7-day travel diary.**
- **Online and call center participants completed a 1-day travel diary.**
- All children (under age 18) have a complete 1-day travel diary regardless of participation mode that was proxy reported by an adult member of the household.
- Same questionnaire was used for smartphone, online, and call center participants.
- Survey was available in English and Spanish.

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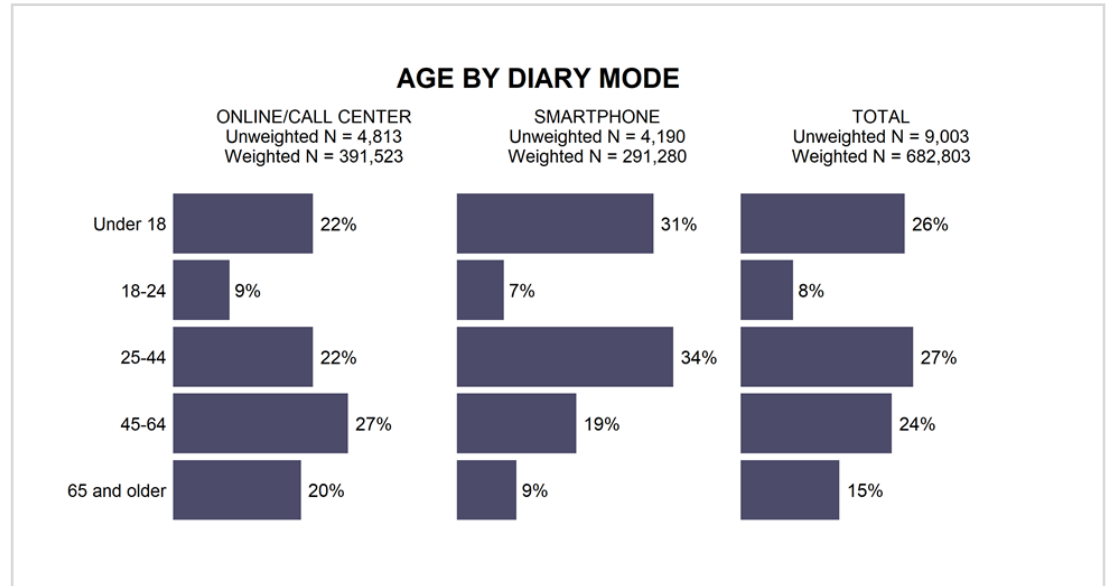
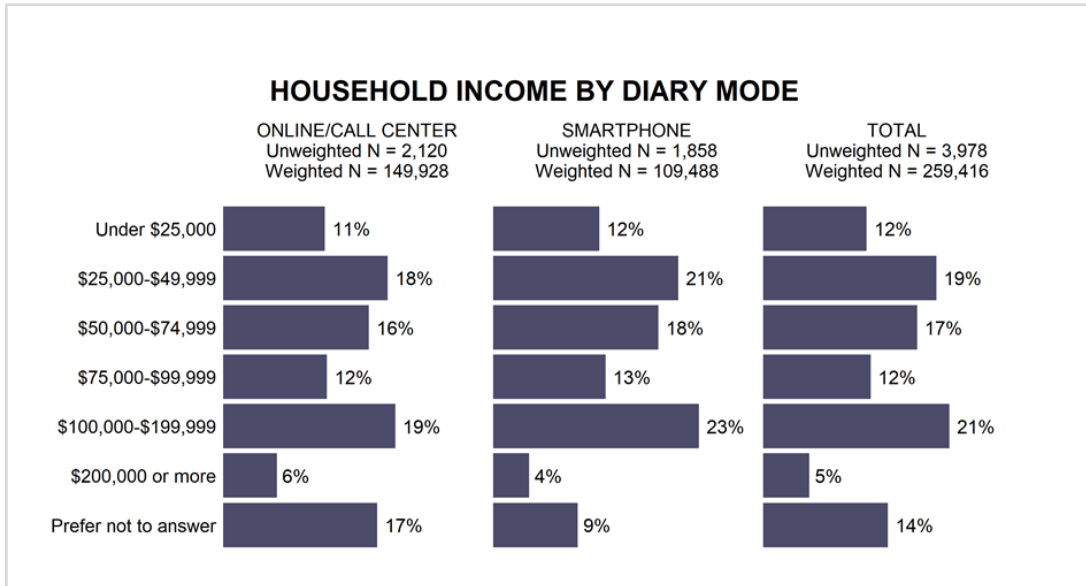


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HTS tells us detailed demographic information

Online and call center participants are more likely to decline reporting household income in comparison to smartphone participants.

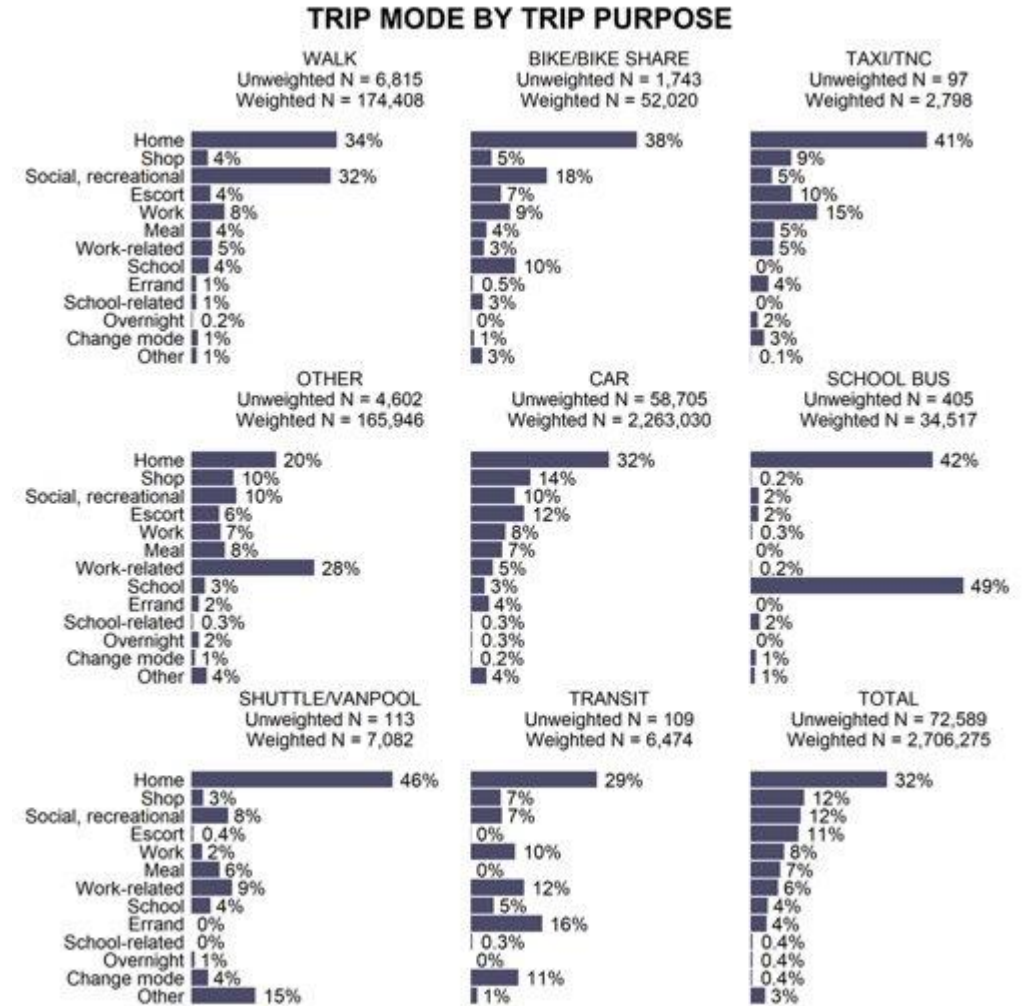
Those age 45 or older participated in the survey online or through the call center more frequently. When the age profile of call center participants alone is compared to online and smartphone the sample tends to include more of the elderly.



**Note these charts represent the weighted shares and thus only include households that were weighted.*

Provides detailed purpose and mode information

- 32% of walk trips have a social or recreational purpose.
- Transit trips are primarily made to go home, for work/work-related purposes, or errands.
- 18% of bike trips are for social/recreational purposes and 13% are made for school/school-related purposes.

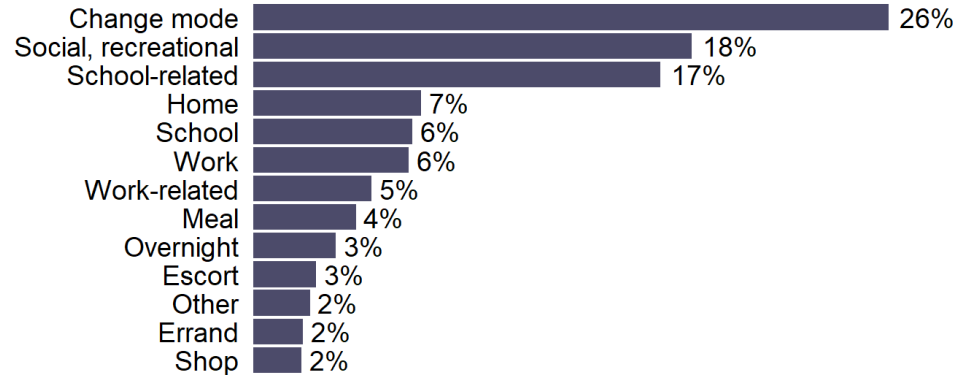


And lets us dig deeper in targeted ways

- A high share of school and school-related trips (23%) as well as social or recreation trips (18%) are made by walking.
- 22% of trips that are less than 1 mile, were walking trips.

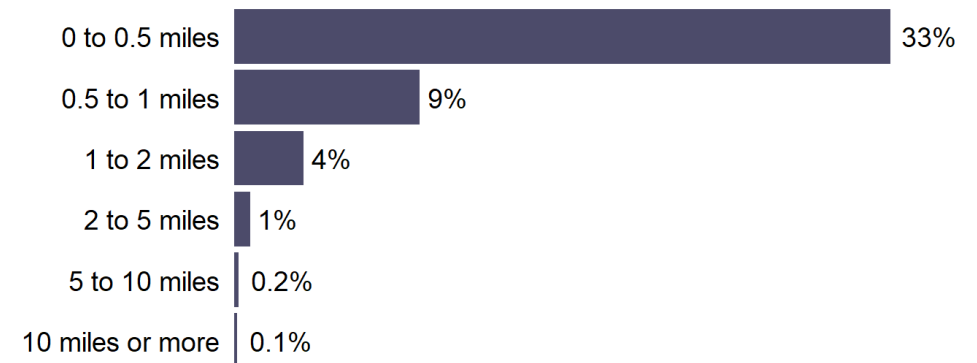
WALKING MODE SHARE BY TRIP PURPOSE

UNWEIGHTED N = 129,573, WEIGHTED N = 2,706,275



WALKING MODE SHARE BY TRIP DISTANCE

UNWEIGHTED N = 129,573, WEIGHTED N = 2,706,275



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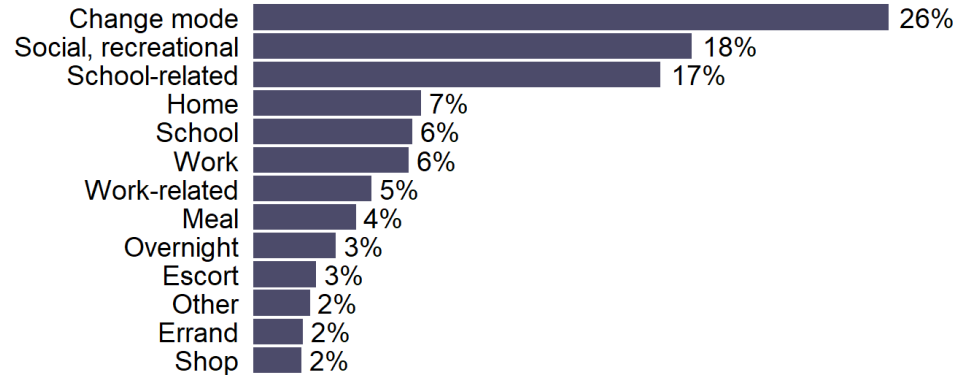
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But, it doesn't tell us anything about visitors

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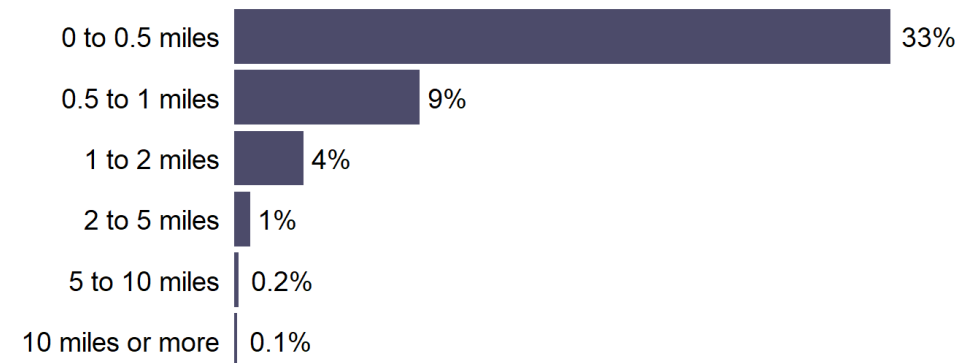
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WALKING MODE SHARE BY TRIP DISTANCE

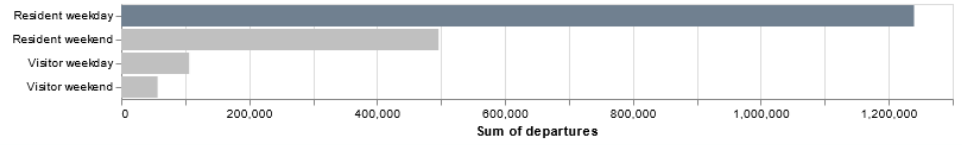
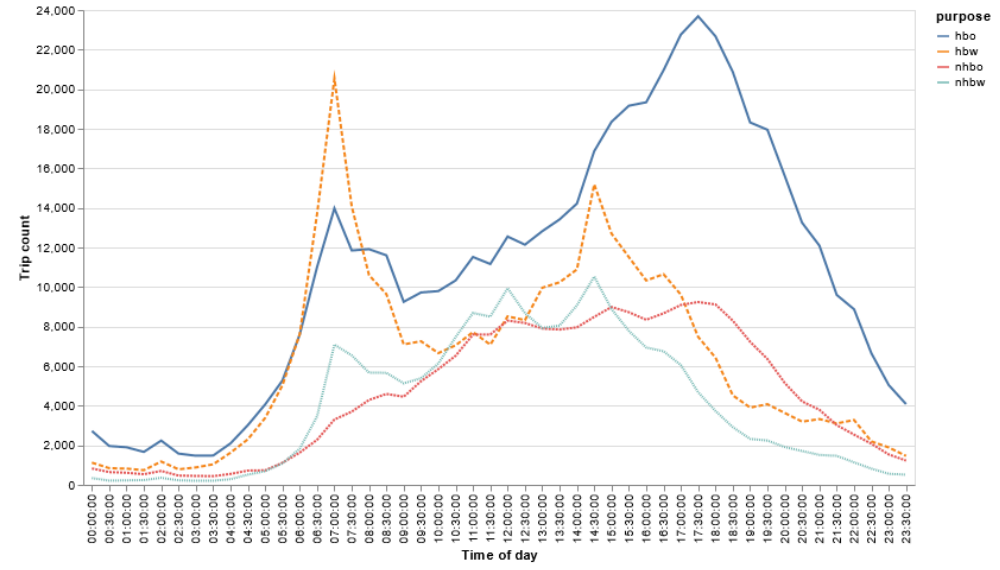
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Passively collected data focused on external travel

OCTOBER 2021

				
29,198	27,245	1,269,738	1,898,715	213,995,335
RESIDENT DEVICES	VISITOR DEVICES	CLUSTERS	TRIPS	SIGHTINGS
<i>Unweighted Records</i>	<i>Unweighted Records</i>	<i>Unweighted Records</i>	<i>Unweighted Records</i>	<i>Unweighted Records</i>



- From location-aware smartphone apps
- Records include only unique device id, timestamp, and location
- rMerge processes via four steps:
 - Prepares and filters data
 - Identifies trips
 - Expands to region
 - Summarized and visualized

Passively collected data focused on external travel



1. Preparing data for billions of location points.



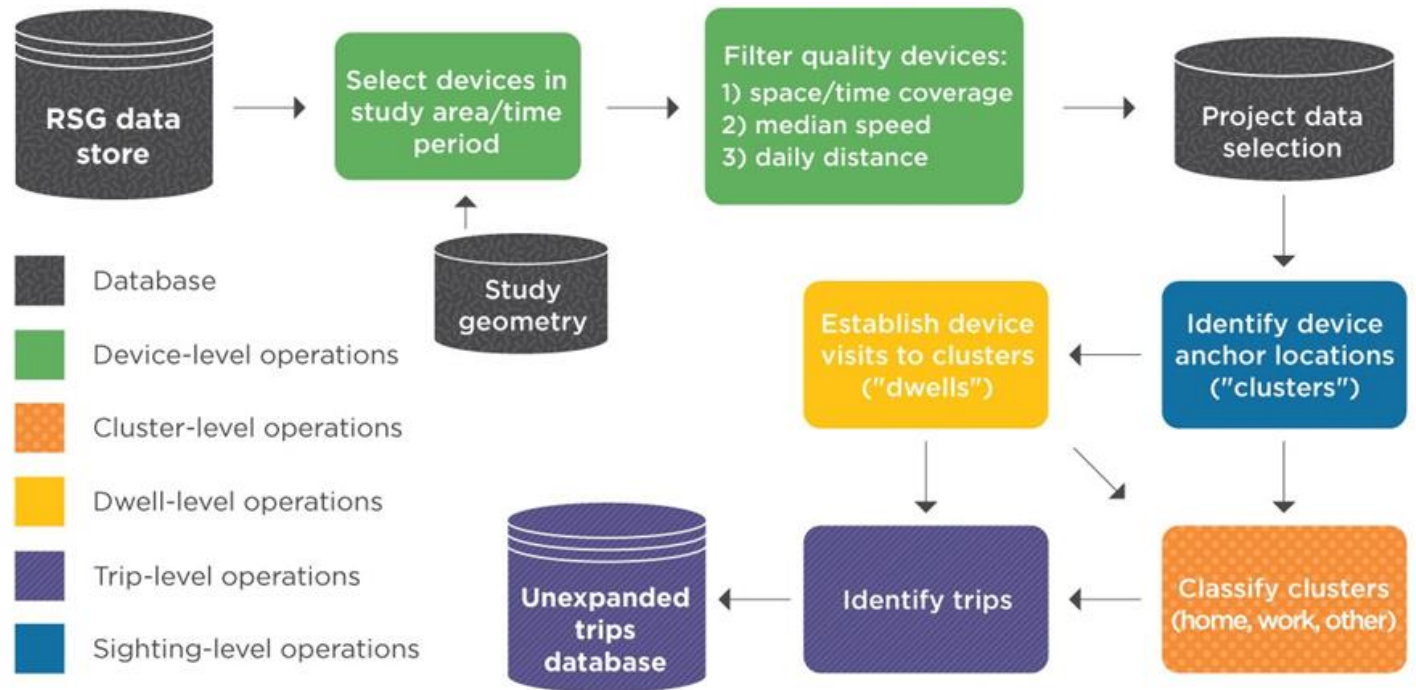
2. Identifying, classifying, and linking stops to create trips.



3. Expanding the region based on trip information and other data sources.



4. Aggregating and visualizing trip data to discover key insights.



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RSG uses a multi-stage expansion process

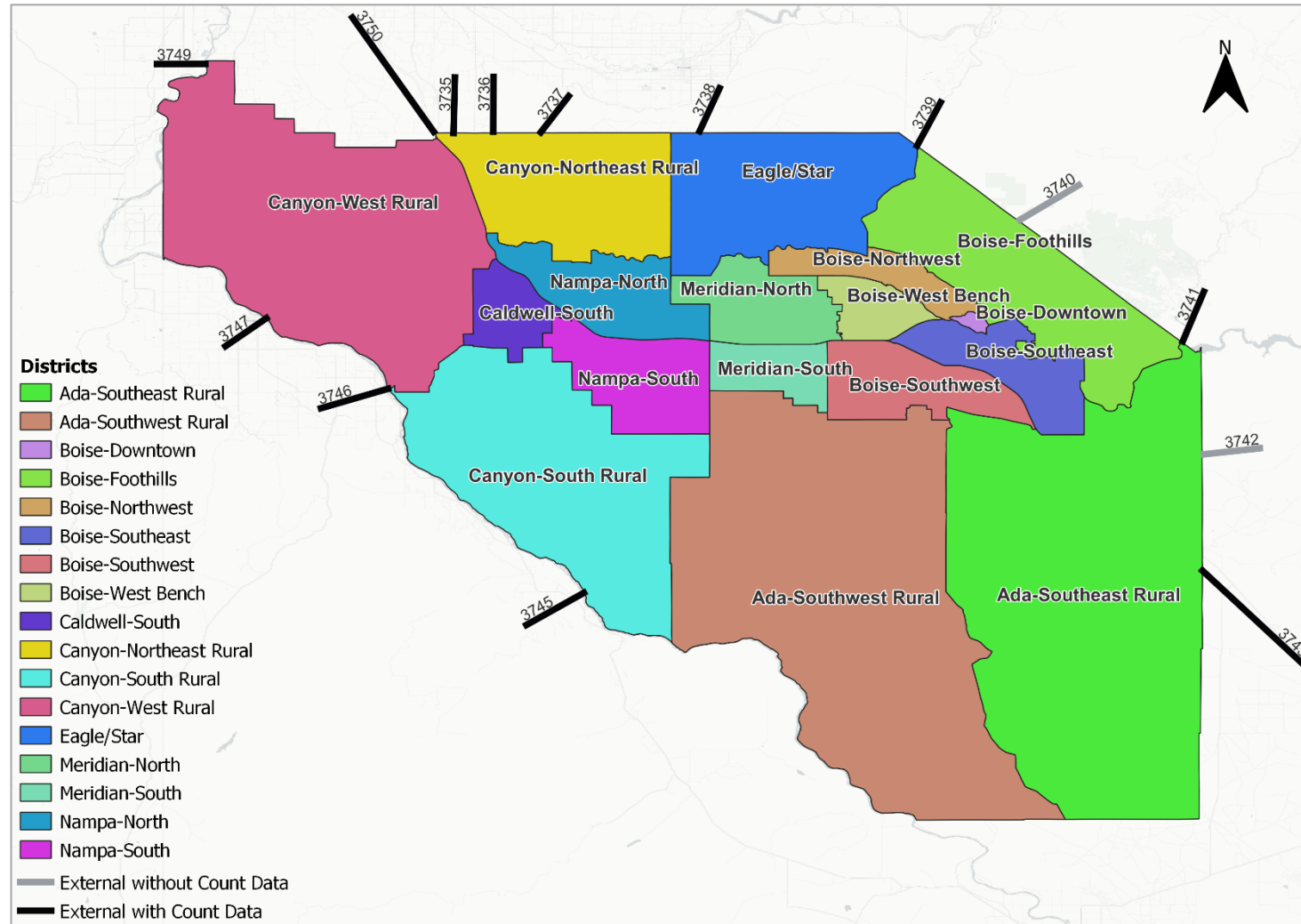
- Demographic

- The number of observed devices residing in a zone or Census block group can be compared with population control totals.
- United States Census population data at the block group level were used to calculate the demographic expansion factors.

- Network

- Assigns demographically expanded trips to the underlying roadway network and compares with target traffic counts.
- COMPASS goal to obtain expanded external trip matrices.
- Iterative proportional fitting (IPF) expansion scales external matrices to target count levels.

Resulting in population-scaled external travel ODs



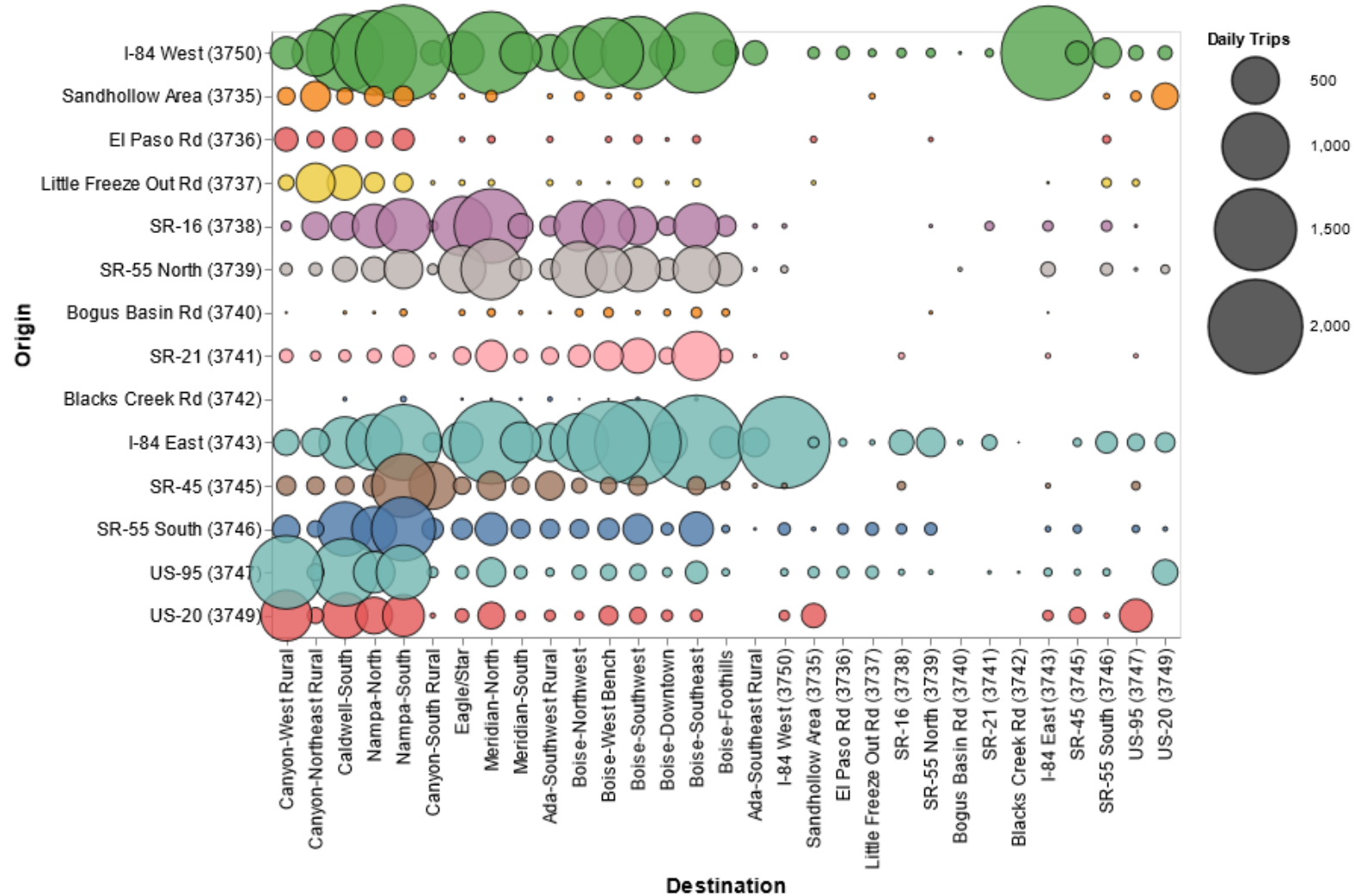
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Resulting in population-scaled external travel ODs



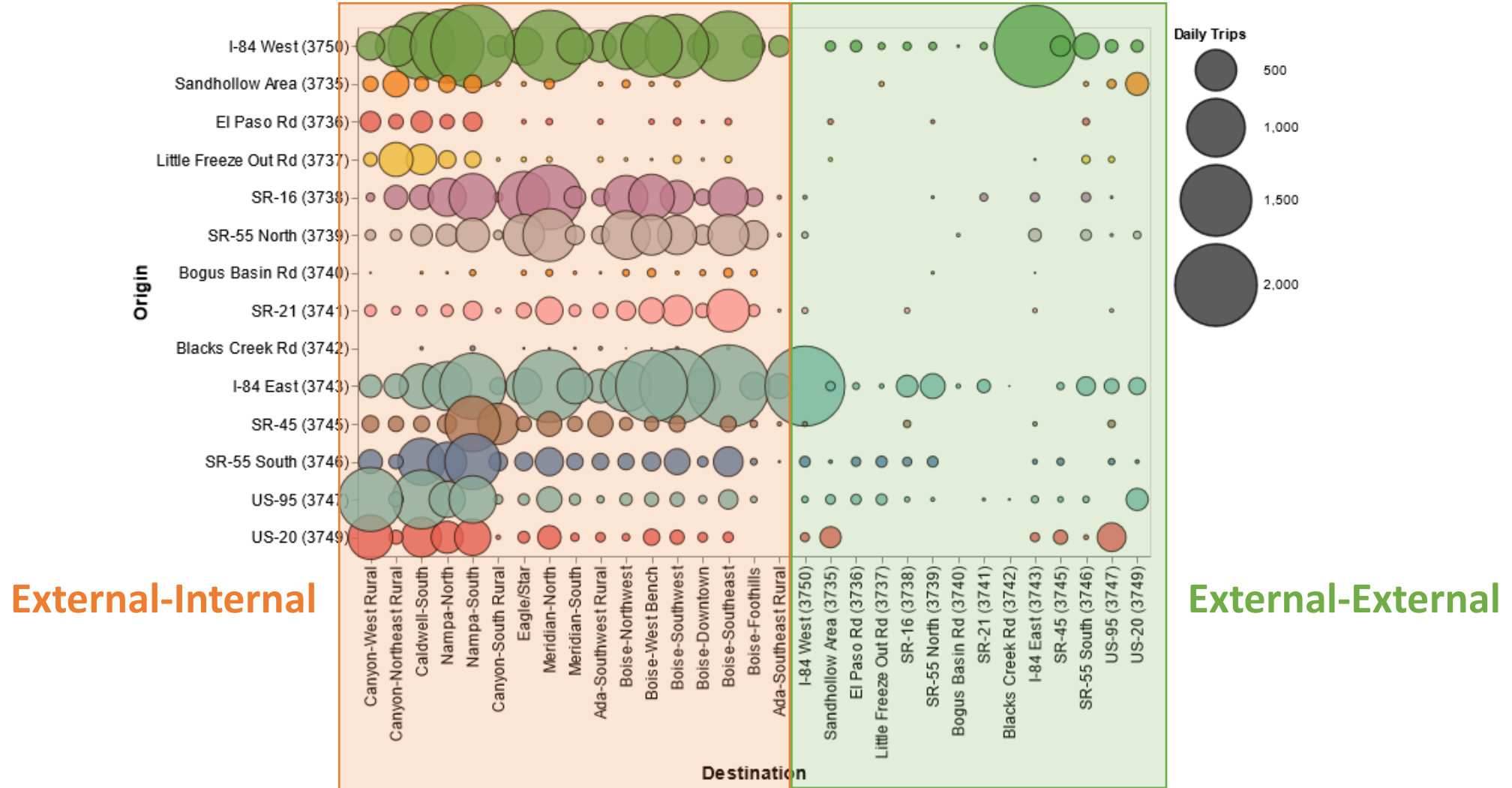
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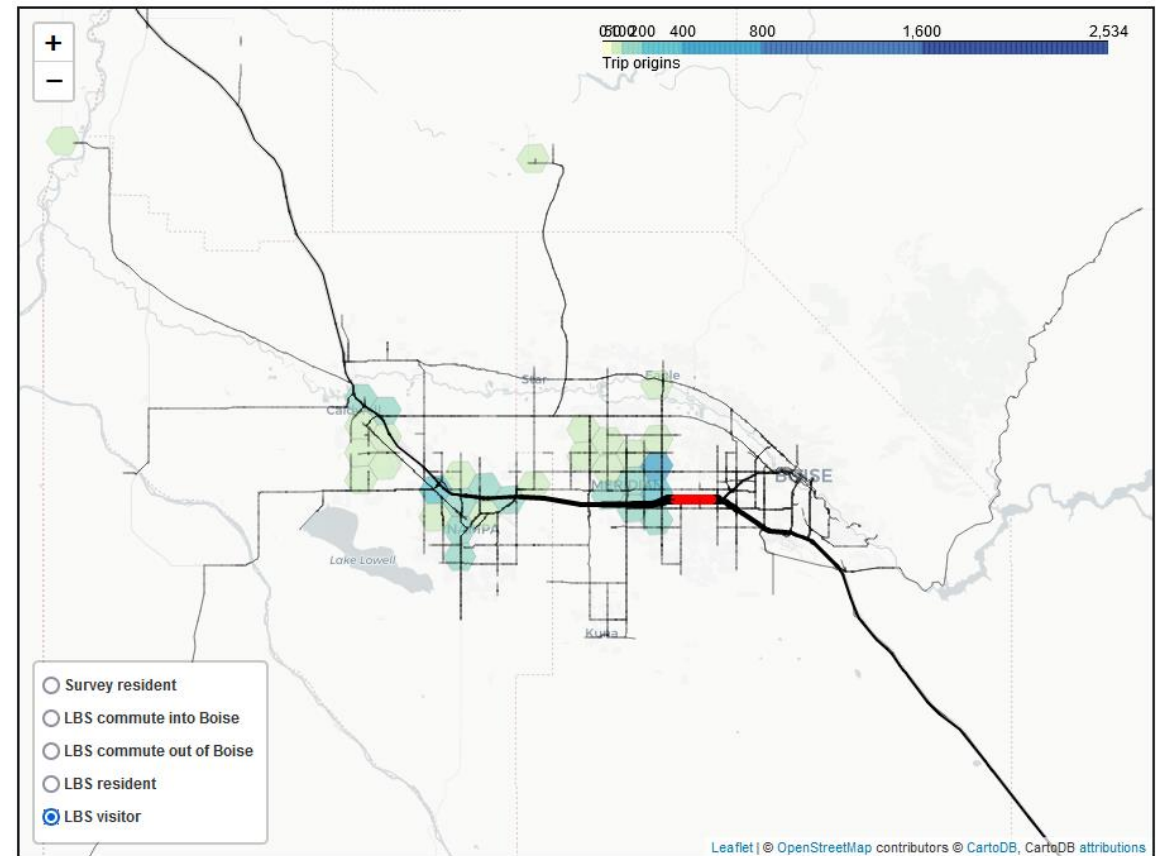
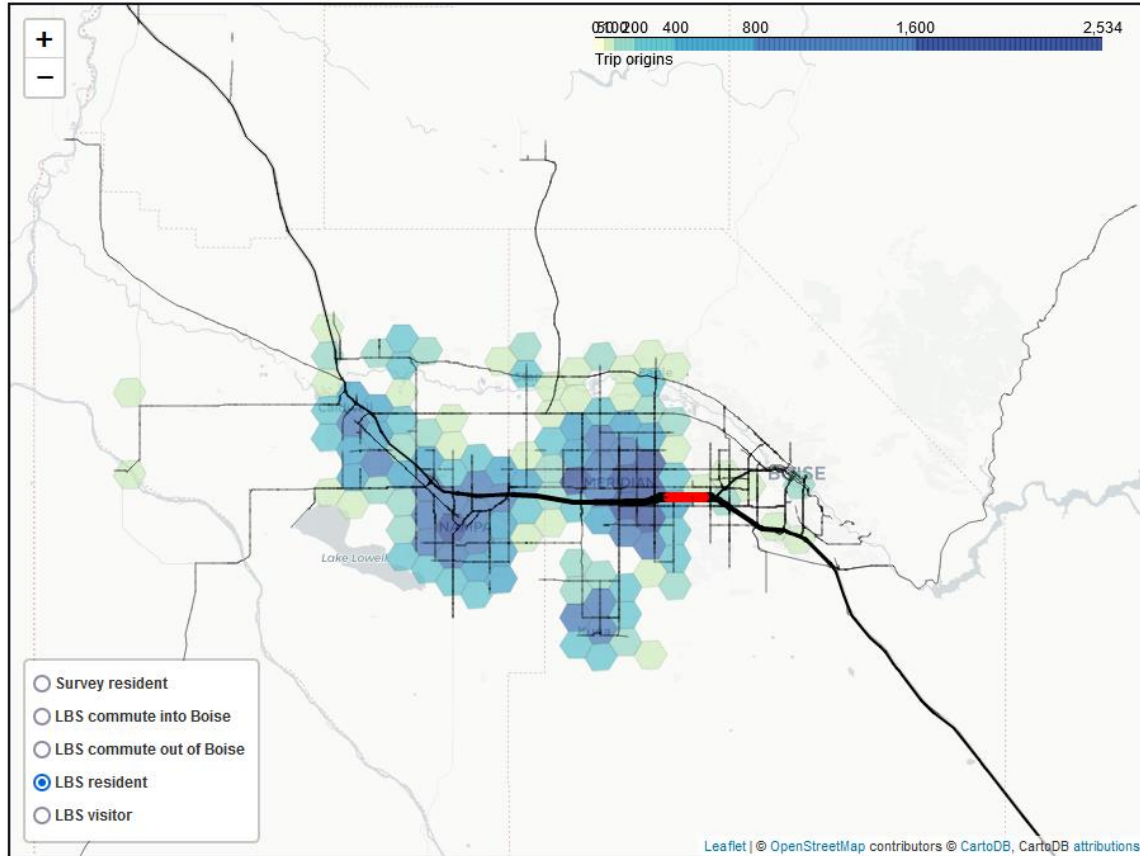
Resulting in population-scaled external travel ODs



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Trip origins/destinations from passively collected data compared across external markets



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A framework for combining travel surveys and passively collected data

- rMove and rMerge for the Treasure Valley Travel Survey helped COMPASS increase the depth and breadth of data collected.
 - rMove survey data provides an incredible level of detail on travel behavior
 - rMerge passively collected data provides a sample orders of magnitude larger than rMove
- So what's our role? **Recognize** that each have their own strengths and weaknesses—and **help agencies navigate** these strengths and weaknesses

Future research can explore fusing survey and passive data more fully

- Visitor surveys and contemporaneous rMerge passively collected data analysis
 - Potential to understand visitor demographics in conjunction with their travel patterns with larger location sample
- Additional regional household travel surveys (rMove) with concurrent passively collected analysis
 - Survey and LBS can provide reciprocal quality assurance
 - Potential to increase the location sample for the survey



the science of **insight**



Ted Mansfield, PhD
Senior Consultant
theodore.mansfield@rsginc.com

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