

Please visit the link below
for webinar recording

10/18/2017

MAG Large-Scale Regional Travel Surveys and Bottleneck Survey

<https://connectdot.connectsolutions.com/p7qatvnavw/>

Presentation 1: MAG Regional Household Travel Survey

Presented by:

Vladimir Livshits, Maricopa Association of Governments

Edward Brown, Maricopa Association of Governments

Rachel Copperman, Cambridge Systematics Inc.

Kathryn DeBoer, WestGroup Research

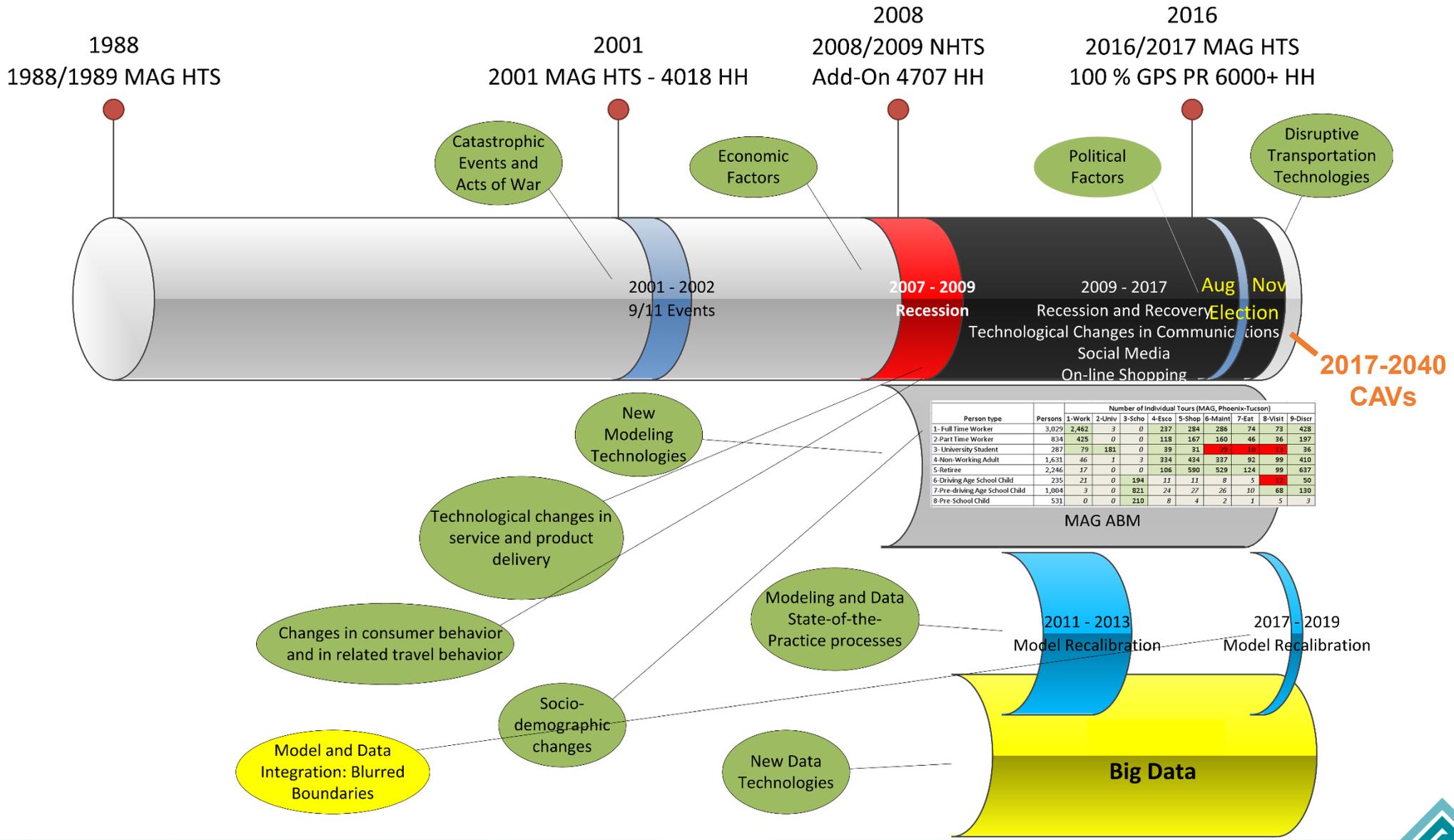
Project Team:



Dr. Ram Pendyala



Travel Survey – Model Update Cycle: *Time for a Different Paradigm?*



Provide updated datasets for the 4-step and Activity-based models.

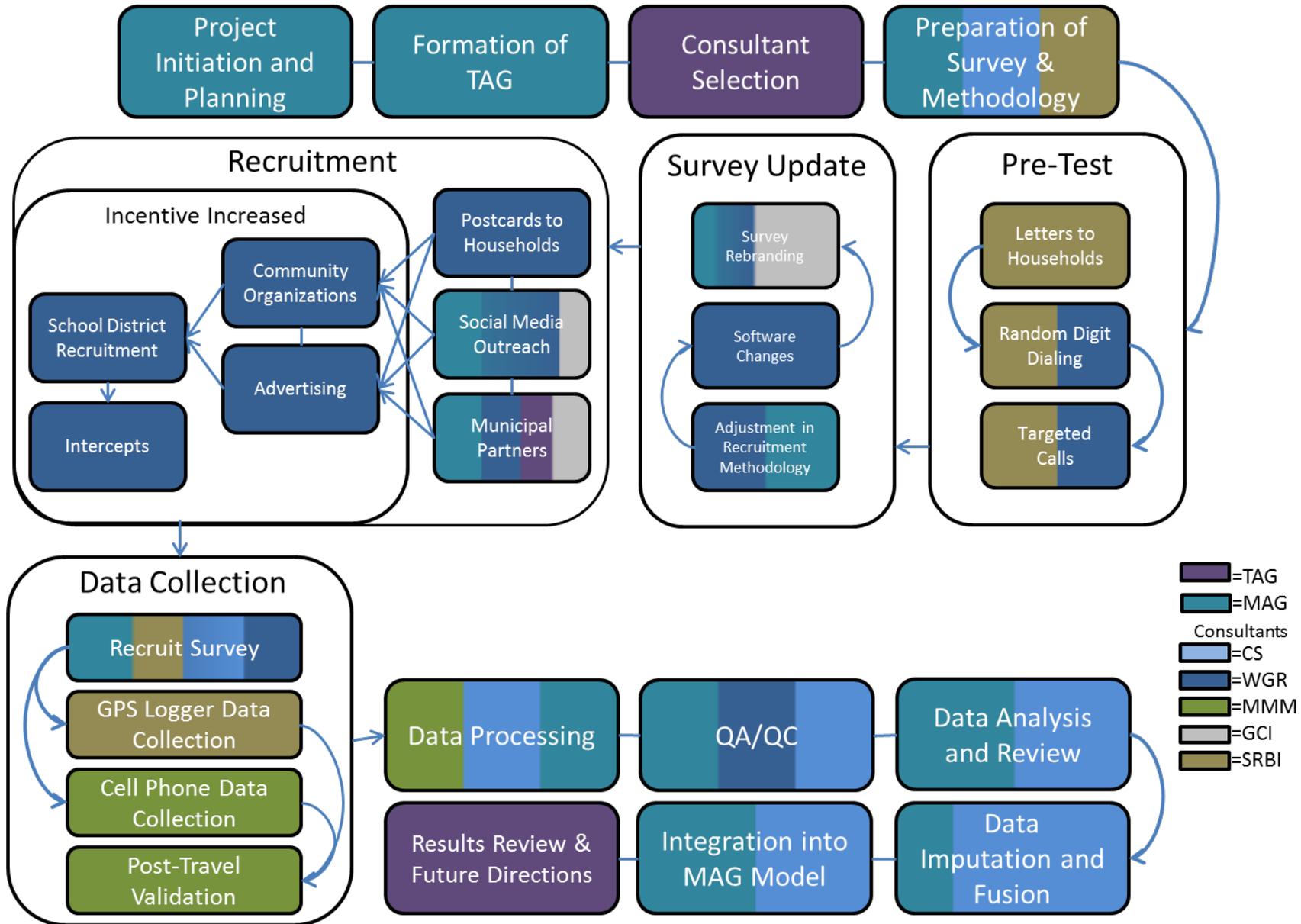
Take advantage of GPS technology to improve data collection.

Purpose

Create a snapshot of household trip linkages and chaining.

Complete and validated household travel for all members of the household.

MAG Household Travel Survey



Sampling Plan

- Special Considerations:
 - Hispanic/Minority
 - Transit Users
 - Zero Car & Auto Deficient
- Data Collected:
 - Minimum of one 24 hour period of travel for all members of the household.
 - Paper diary or online entry for children under the age of 16.

*WHERE DO YOU GO?
HOW DO YOU GET THERE?*

WE'RE CURIOUS BECAUSE...
YOUR travel information is the key to creating a successful transportation network that meets everyone's needs! Whether you commute to work by car or public transit, drive kids to school, travel very little, or bike everywhere - WE NEED YOU!

JOIN THE HOUSEHOLD TRAVEL SURVEY
Answer a few quick questions at **MAGTravelSurvey.org/em**
After answering our survey you will be directed to our mobile app.

\$10
for each person in your household (age 6 and up)!

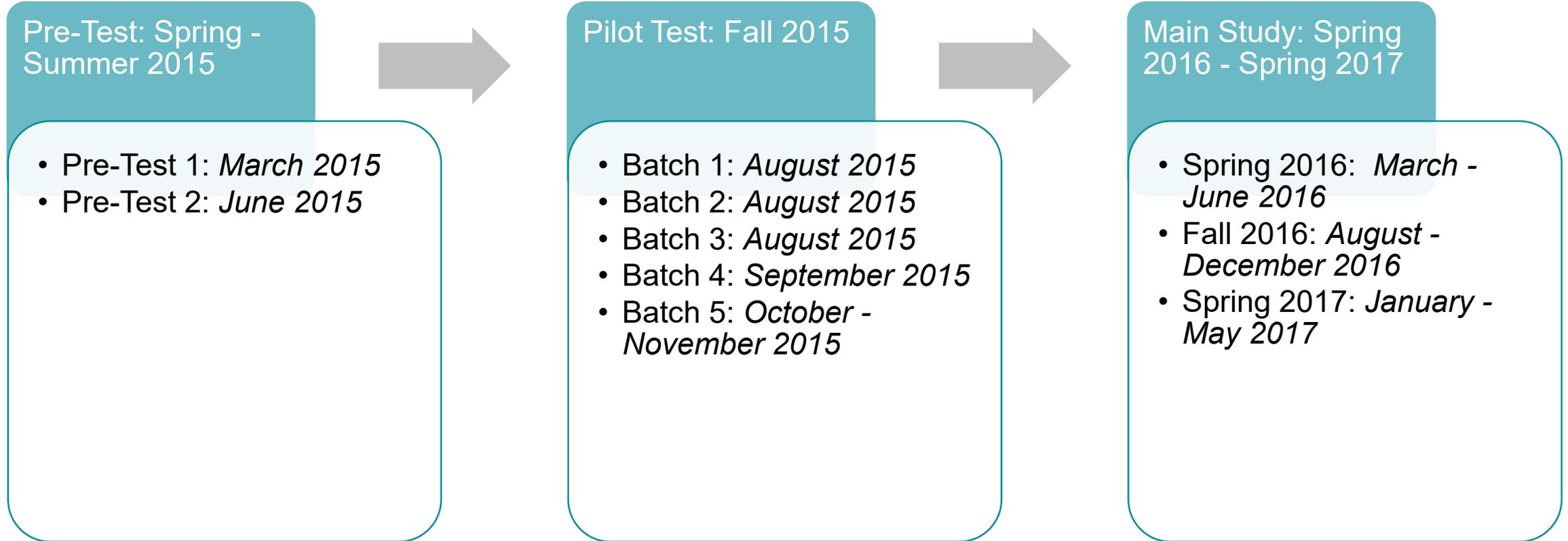
WHO ARE WE?
The Maricopa Association of Governments (MAG) works closely with all the jurisdictions in the Valley to plan and build our regional transportation system, including freeways, streets, bus and rail, bike trails and sidewalks. That's why it is important for us to have the best information possible about what projects are most needed or wanted.



WHERE ARE WE GOING?
MAGTravelSurvey.org

Need more information? Contact us:
MagTravelSurvey@AskArizona.com
602-707-0085

Data Collection Timeline



Project Goal: Collect a robust set of GPS-enabled high-quality household travel surveys backed by exhaustive prompted recall

Closely monitored metrics:

- **Response rates**
- **Survey burden**
- **Costs**

Key to Success: Flexibility, monitoring, and communication

Step 1.

Household member fills out recruit survey



Welcome to the MAG Household Travel Survey

Want to participate?

Start Here!

Already a participant?

Enter your PIN code below to verify your travel:

Verify

Where do you go? How do you get there?

Your travel information is important data we need in order to plan for our region's future transportation needs. Whether you **take public transit to work, drive kids to school, travel very little, or bike everywhere** – your travel information is the key to creating a **useful, convenient transportation network** that meets everyone's needs. The more people who complete the study, the better our results will be. That's why we really need your help!

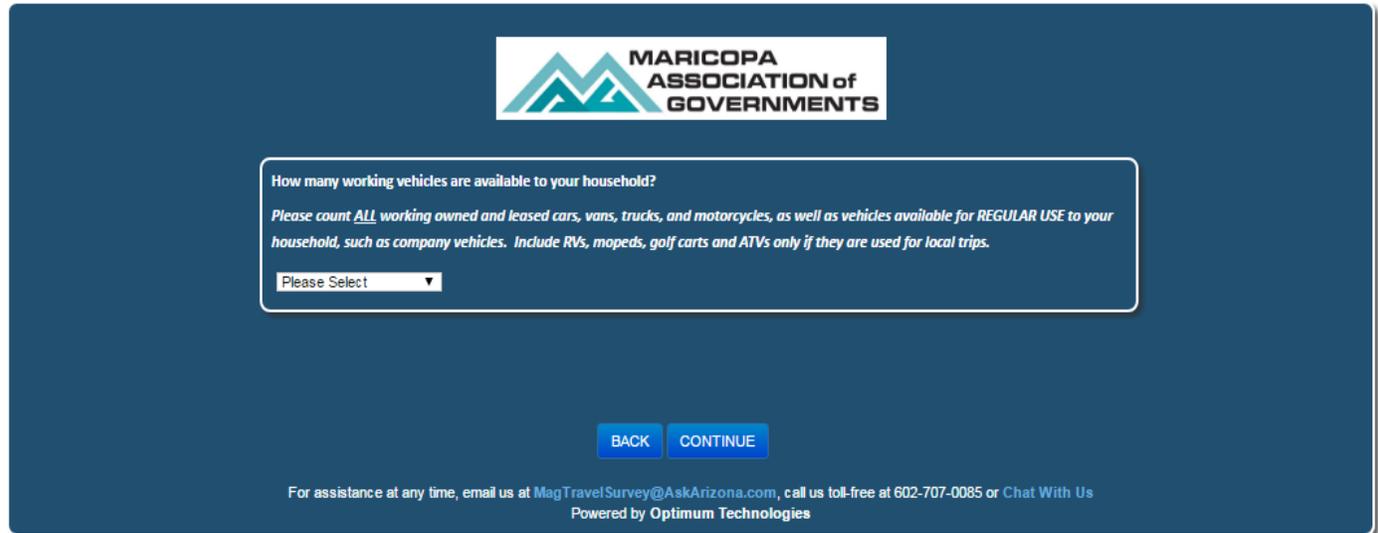
Who are we?

The Maricopa Association of Governments (MAG) develops the plans that pay for and build your transportation system, **including freeways, streets, bus and rail, even bike trails and sidewalks**. That's why it is important for us to have the best information possible about what projects are most needed or wanted. **We've made it easy by creating an app for your smart phone so you can share where you go.**

Get Paid!

You even get paid for your efforts—\$100 for your household!

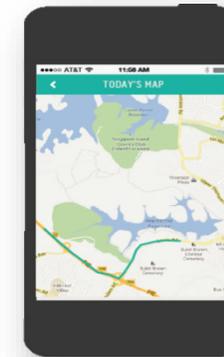
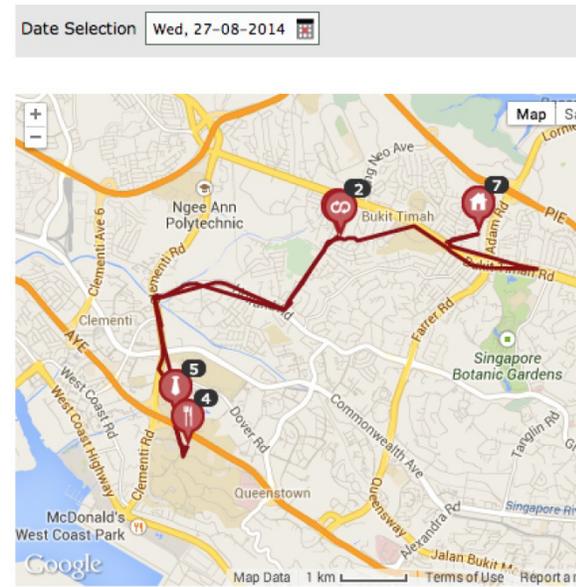
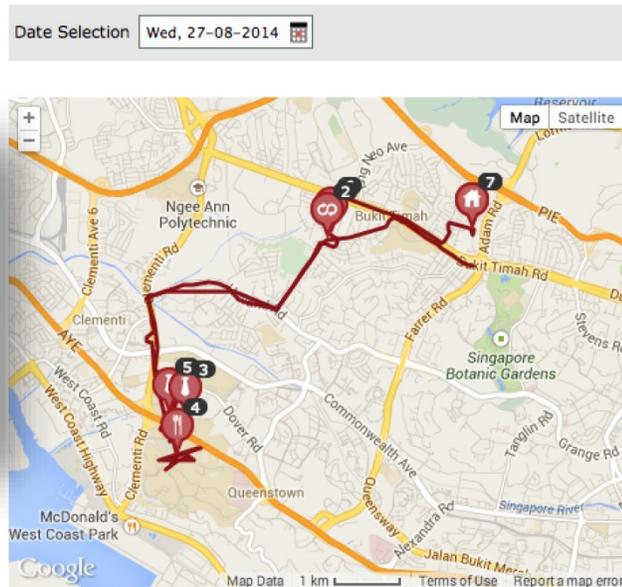
Need help? Lost your PIN? email us at MagTravelSurvey@AskArizona.com, call us toll-free at 602-707-0085 or [Chat With Us](#)



Completed Household Requirement:
Answers must be filled out completely, with a few exceptions

Step 2.

Household members are assigned GPS logger or Smartphone App



Completed Household Requirement:
Two days of GPS data for each person aged 16+

Step 3.

Detailed travel and activity data is validated by household members

Date Selection



All of your travel and activities have been validated.

1	Start 19:04*	Activity Home	✓	Validate
	End 08:26	Travel Car/Van	✓	Validate
2	Start 08:53	Activity Pick Up/Drop Off	✓	Validate
	End 09:04	Travel Car/Van	✓	Validate
3	Start 09:20	Activity Work	✓	Validate
	End 12:10	Travel Foot	✓	Validate
4	Start 12:25	Activity Meal/Eating Break	✓	Validate
	End 13:41	Travel Foot	✓	Validate
5	Start 13:52	Activity Work	✓	Validate
	End 18:00	Travel Car/Van	✓	Validate
6	Start 18:30	Activity Pick Up/Drop Off	✓	Validate
	End 18:58	Travel Car/Van	✓	Validate
7	Start 19:18	Activity Home	✓	Validate
	End 00:05**			

Prompted Recall

Child Diary

MARICOPA ASSOCIATION of GOVERNMENTS

Instructions for On-line Travel Diary

This travel diary is for Child Test.

Child's travel information must be entered for the same date that ALL household members have VERIFIED their GPS collected travel.

Adults should fill out diaries for children or fill them out with the child.

Include ALL trips the child made—This includes drive-thrus, quick stops for gas, picking up or dropping off someone, walking the dog, etc. Report all ways the child traveled to a destination.

For example, if they walked to a bus stop and then rode the bus to school:

1. Select "walk" as the type of transportation
2. Answer "Yes" to the question asking if they used a second type of transportation for the trip.
3. Select "Bus" when asked again for transportation type.

Note: If a travel type took place for less than 5 minutes, do not record it.

Need Help? Have Questions?
Contact a Travel Study Coordinator
Helpline: 602-707-0080
Chat with us at MAGTravelSurvey.org
MAGTravelSurvey@ASKArizona.com

For assistance at any time, email us at MagTravelSurvey@AskArizona.com, call us toll-free at 602-707-0085 or Chat With Us
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Completed Household Requirement:
One day of validated travel for each person, aged 5+, on same travel day

Pilot

Recruitment

Traditional recruitment
Multi-level incentive
Minimal help desk

GPS Travel

Option of GPS Logger
or Smartphone

Prompted Recall

User-friendly
interface
Informal assistance



Recruitment

GPS Travel

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**User-friendly
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Informal assistance

Spring 2016

Simplified incentive
**Extensive help
desk**

Assigned GPS Logger
or Smartphone

**Formalized hands-
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Fall 2016

**Convenience
sampling**

Smartphone only

No change

Recruitment

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on personalized
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Fall 2016

**Convenience
sampling**

Smartphone only

No change

Spring 2017

**Targeted sampling
High incentive**

No change

No change



Convenience Sampling

Social Media

Local Champions

Paid Ads



Phoenix Parks
September 8, 2016 · Twitter ·

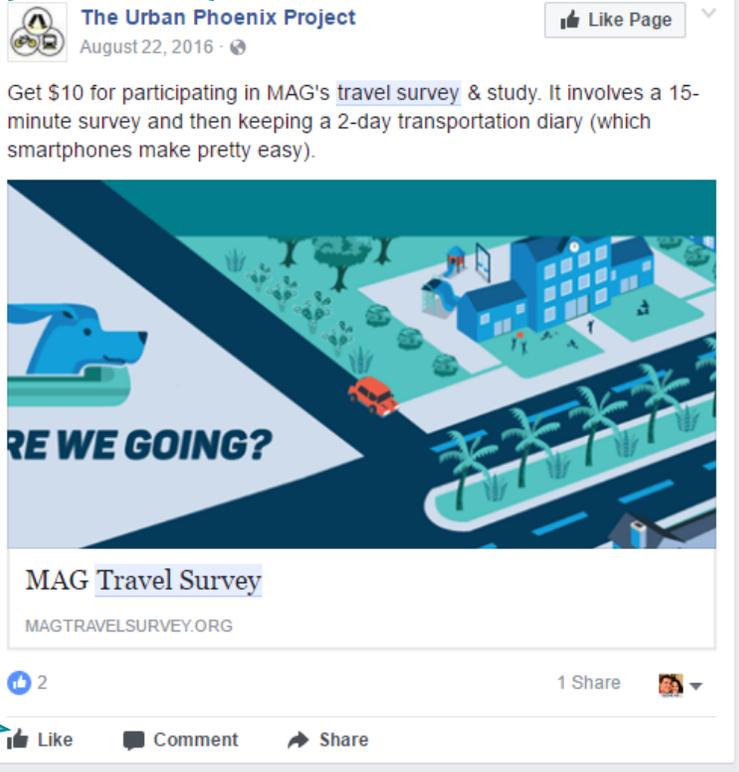
Retweeted MAG (@MAGregion):
Your pets wonder where you go-so do we! Log it & you'll get \$10!
#MAGTravelSurvey <https://t.co/QfGVfjHBej> <https://t.co/KFQd3zEect>



WHERE ARE WE GOING?
MAGTravelSurvey.org

MAG (@MAGregion) posted a photo on Twitter
Get the whole picture - and other photos from MAG
PIC.TWITTER.COM/KFQD3ZEECT

Share



The Urban Phoenix Project
August 22, 2016 ·

Get \$10 for participating in MAG's travel survey & study. It involves a 15-minute survey and then keeping a 2-day transportation diary (which smartphones make pretty easy).

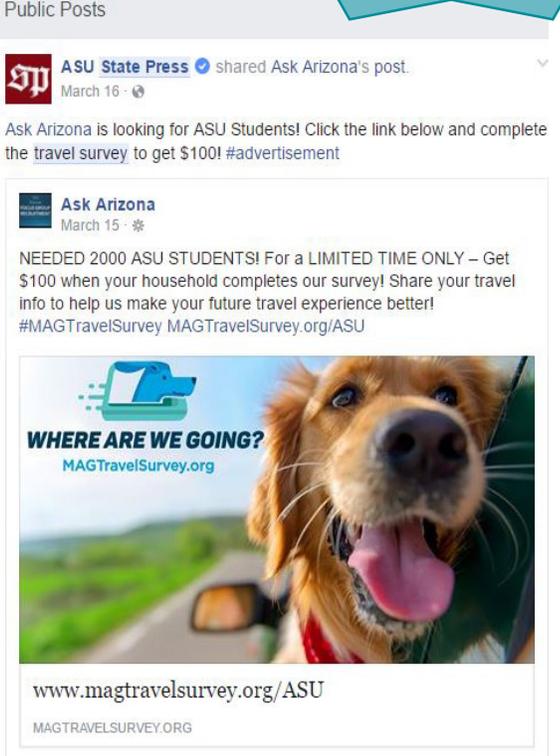


WHERE ARE WE GOING?
MAGTravelSurvey.org

MAG Travel Survey
MAGTRAVELSURVEY.ORG

2 Likes 1 Share

Like Comment Share



Public Posts

ASU State Press shared Ask Arizona's post.
March 16 ·

Ask Arizona is looking for ASU Students! Click the link below and complete the travel survey to get \$100! #advertisement

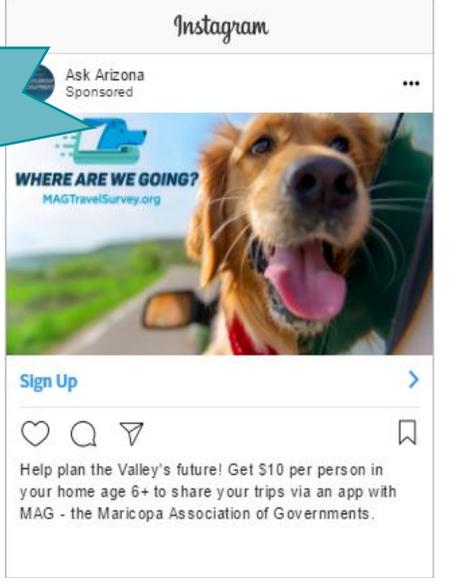
Ask Arizona
March 15 ·

NEEDED 2000 ASU STUDENTS! For a LIMITED TIME ONLY - Get \$100 when your household completes our survey! Share your travel info to help us make your future travel experience better!
#MAGTravelSurvey MAGTravelSurvey.org/ASU



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www.magtravelsurvey.org/ASU
MAGTRAVELSURVEY.ORG



Instagram

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MAGTravelSurvey.org

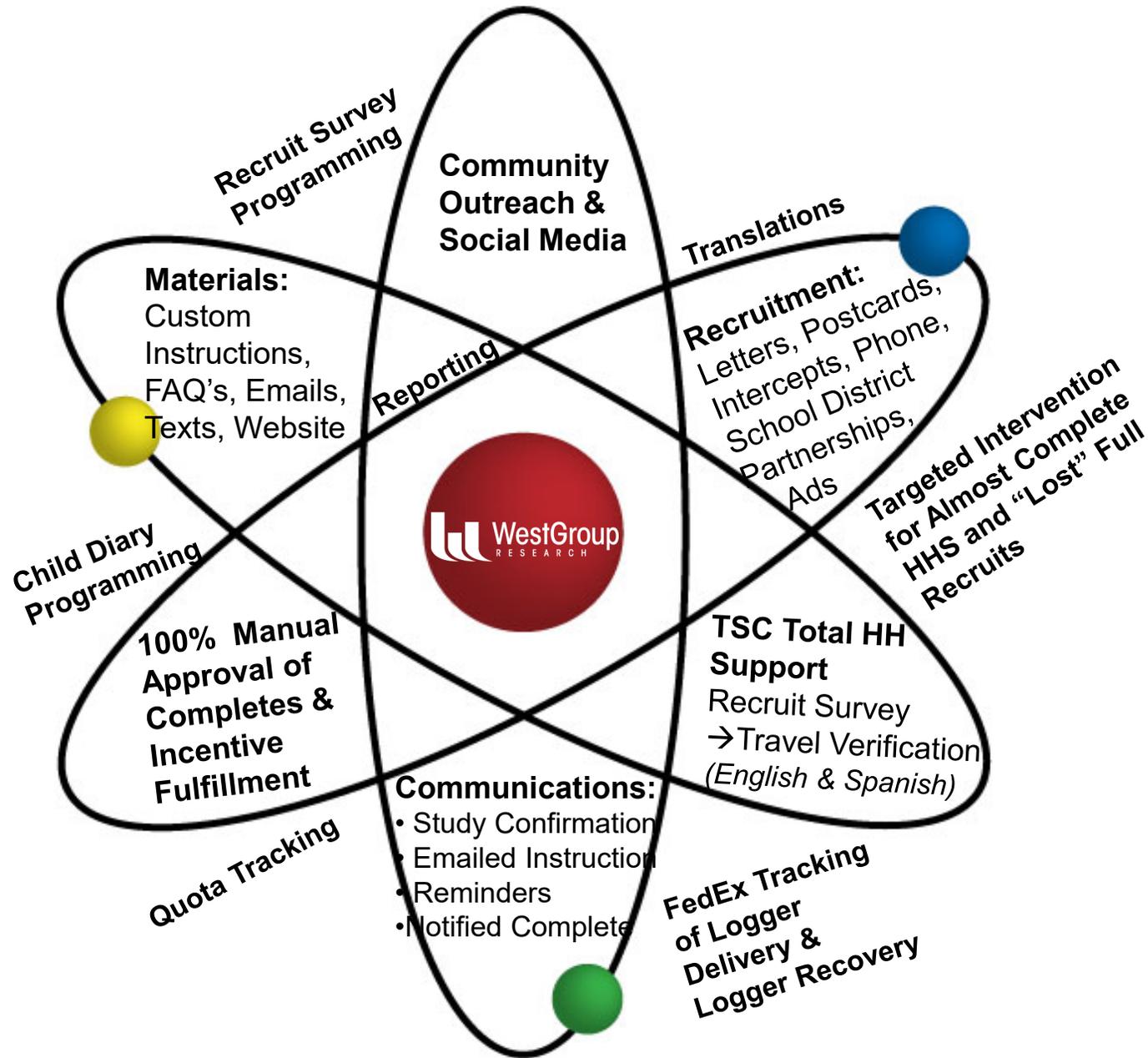
Sign Up

Help plan the Valley's future! Get \$10 per person in your home age 6+ to share your trips via an app with MAG - the Maricopa Association of Governments.

School Districts

In-person Intercepts

E-mails



By The Numbers

10,407 recruited

1560 inbound calls

6,500 emails/chat

**60%
Completion
Rate**

9,600 Outbound calls

**97% with travel
data completed
study**

6,197 raw completes

**3,500
custom text
messages**



Travel Study Coordinators



Integration + Automation = 100% Productivity

WHY:

Complex survey requirements.

WHO:

Customer-focused staff with technical skills.

HOW:

Customized integrated project management software.

Training and Coaching

- Project Orientation
- Data collection
- Verification Process
- Role Playing & Shadowing
- Recording/Auditing

The screenshot displays the MAG website interface. At the top, the logo for the Maricopa Association of Governments is visible, along with navigation links for 'help', 'activity diary', 'frequent places', and 'language'. Below the logo, there is a date selection box set to 'Thu, 05-26-16'. The main content area features a map of the Phoenix area with a green route and numbered stops (1-7). To the right of the map is a table of stops with their start times, durations, and verified status.

Start time	Duration	Stop	Status
12:00 AM*	15 h 21 min	1 South Bala Drive, Tempe	verified
08:16 AM	21 min	Travel	verified
08:37 AM	1 h 11 min	2 East University Drive, Te...	verified
09:48 AM	11 min	Travel	verified
09:59 AM	5 h 8 min	3 South College Avenue, Tem...	verified
03:07 PM	5 min	Travel	verified
03:12 PM	8 min	4 East University Drive, Te...	verified
03:20 PM	7 min	Travel	verified
03:27 PM	2 h 17 min	5 East University Drive, Te...	verified
05:44 PM	21 min	Travel	verified
06:05 PM	1 h 33 min	6 South Bala Drive, Tempe	verified

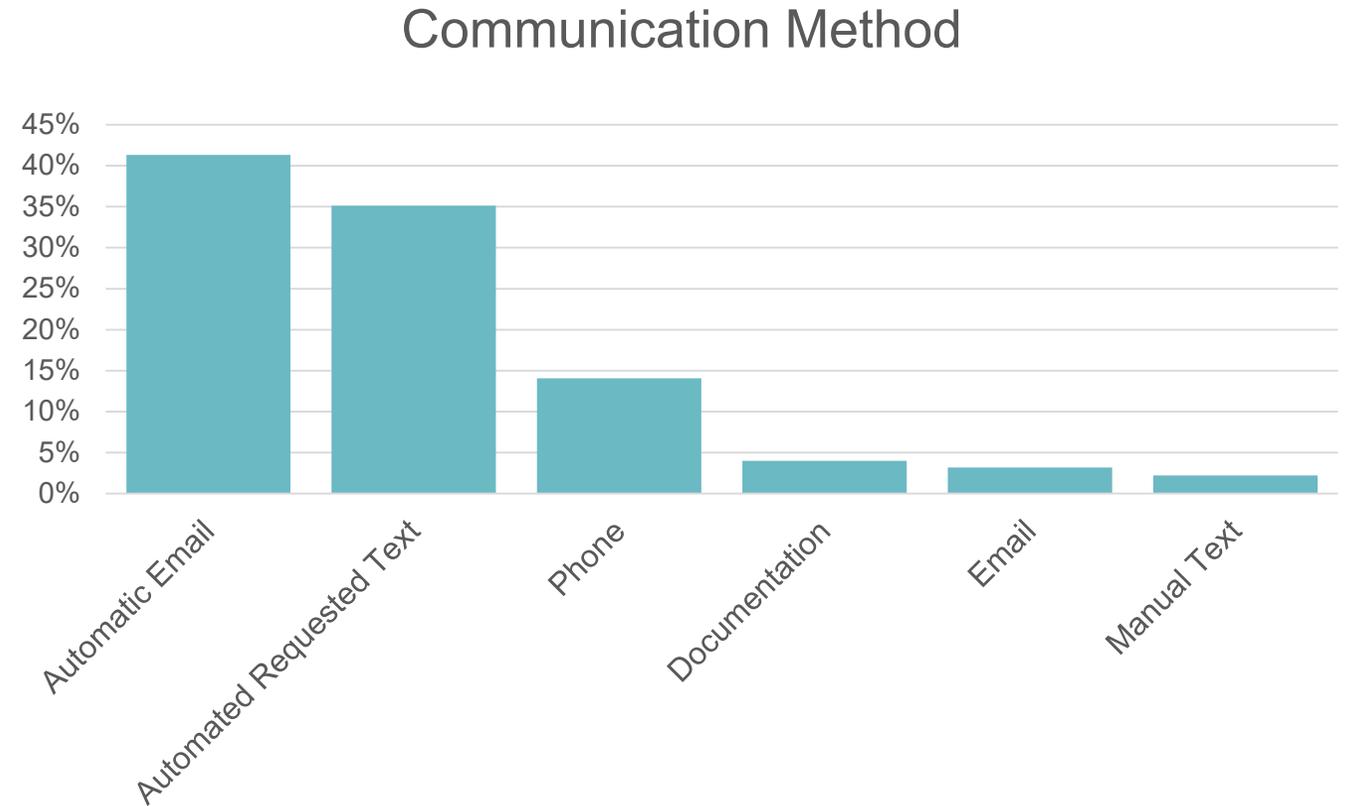


WHERE ARE WE GOING?
MAGTravelSurvey.org



Responsive, Proactive & Positive Communication

- Respond quickly
- Answers on-demand
- Establish rapport
- Mitigate frustration
- Proactive support
- Prompt intervention



Project Management and Automation

- Custom integration with Smartphone Application
- Real-time travel information / household status
- Manage staffing assignments and communication
- Automated status reporting and data transfer
- Perpetual access to status reports and data exports



- ✓ Streamlined project management
- ✓ Real-time project status

Management Dashboard



Search...

- Inbound Text Messages
- Sample Data
- Project Status
- Management Dashboard**
- Communication Follow-up/TSC Assignment

Management Dashboard

Management Dashboard Actions ▾

Status: HHSIZE from to
 From: PReq from to
 To: TSC: Code:

Status: % ASSN: 8/1/2016 to 8/31/2016 | HHSIZE: 0 to 12 | PReq: 0 to 12 | TSC: % | Code: %

Show entries Copy CSV Excel PDF

HHID	LastName	Language	PIN	ASSN	Status	HHSIZE	PReq	CReq	TSC	Code	LetterSendDate	DiaryType	NoticeFlag
50000082	Tyler	1	9YUWFX	08/18/2016	1 READY-0	2	1	1	--	--		1	
	NAME	en-us	X69036	08/09/2016	1 READY-50	3	2	1	--	--		2	
	D	en-us	Z0W8V1	08/18/2016	1 READY-0	2	2	0	--	--		1	
	Brown	en-us	00378B	08/08/2016	1 READY-0	2	2	0	--	--		1	
	IPP	en-us	J468H0	08/08/2016	1 READY-0	3	3	0	--	--		1	
50000170	FAKE NAME	en-us	C3Z61C	08/08/2016	1 READY-0	2	1	1	--	--		1	
50000041	Johnson	2	ABCD41	08/10/2016	1 READY-0	2	2	0	--	--		1	

Household Status



Search...

- Inbound Text Messages
- Sample Data
- Project Status
- Management Dashboard
- Communication Follow-up/TSC Assignment

HouseHold Status

HouseHold Status Actions ▾

HHID: 50000802 PrintBatch: __
 Status: 1 READY-0 LetterSendDate: __
 ASSN: 2016-08-18 TrackingNumber: __
 TrackingRequired: 1 FamilyTravelDate1: __
 TrackingReady: 0 FamilyTravelDate2: __
 TrackingActive: 0 Validated Day 1: __
 ChildDiariesRequired: 1 Validated Day 2: __
 ChildDiaries: 1 ReadyPercentage: 0
 PhoneTrackingReq: 1 TrackingPercentage: 0
 PhoneTrackingActive: 0 PhoneReadyPercentage: 0
 LoggersNeeded: 0 ChildDiaryPercentage: __
 LoggersAssigned: 0 TravelServiceRep: __

Payment Date:
 Payment Type:
 Address:

[Household Overview](#) [Log Communication](#) [View Communications](#) [View Tracking Data](#) [View Child Diaries](#) [View Logger Status](#)

Show 10 entries

	HHPERSONID	gender1	age1	agecat1	ASSN	EMAIL	NAME	INAMT	PAC	Cell_Phone	GPS_PERSON	IncentiveAmount	PHONE
	50000801	2	35		08/18/2016	kyler@n	Kelli		9YUWFX1		2	20.00	
	50000802	1	12		08/18/2016	--	Jacob				0		
	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	From <input type="text"/> to <input type="text"/>	<input type="text"/>							

Showing 1 to 2 of 2 entries (filtered from 4,435 total entries)

[Copy](#) [CSV](#) [Excel](#) [PDF](#)

[Previous](#) **1** [Next](#)

Communication

ABILITIES:

- Document all inbound and outbound communications
- Assign follow-up date and time
- Flag household for later review
- Produce reports on types and quantities of communication

Log Communication

Add Communication


MAGTravelSurvey.org

When was the communication made
Ex: 08/05/2016 11:41 AM

How was the communication made?
 Phone Call
 Text Message
 Email
 Chat
 Documentation

Note

Is there a followup date/time?
Ex: 08/05/2016 11:41 AM

Select TSC below.
Unassign

Page 1 of 1

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Presentation 2: **MAG Establishment & Commercial Vehicle Survey**

Presented by:

Vladimir Livshits, Ph.D., MAG

Edward Brown, MAG

Aaron Hekele, ETC Institute

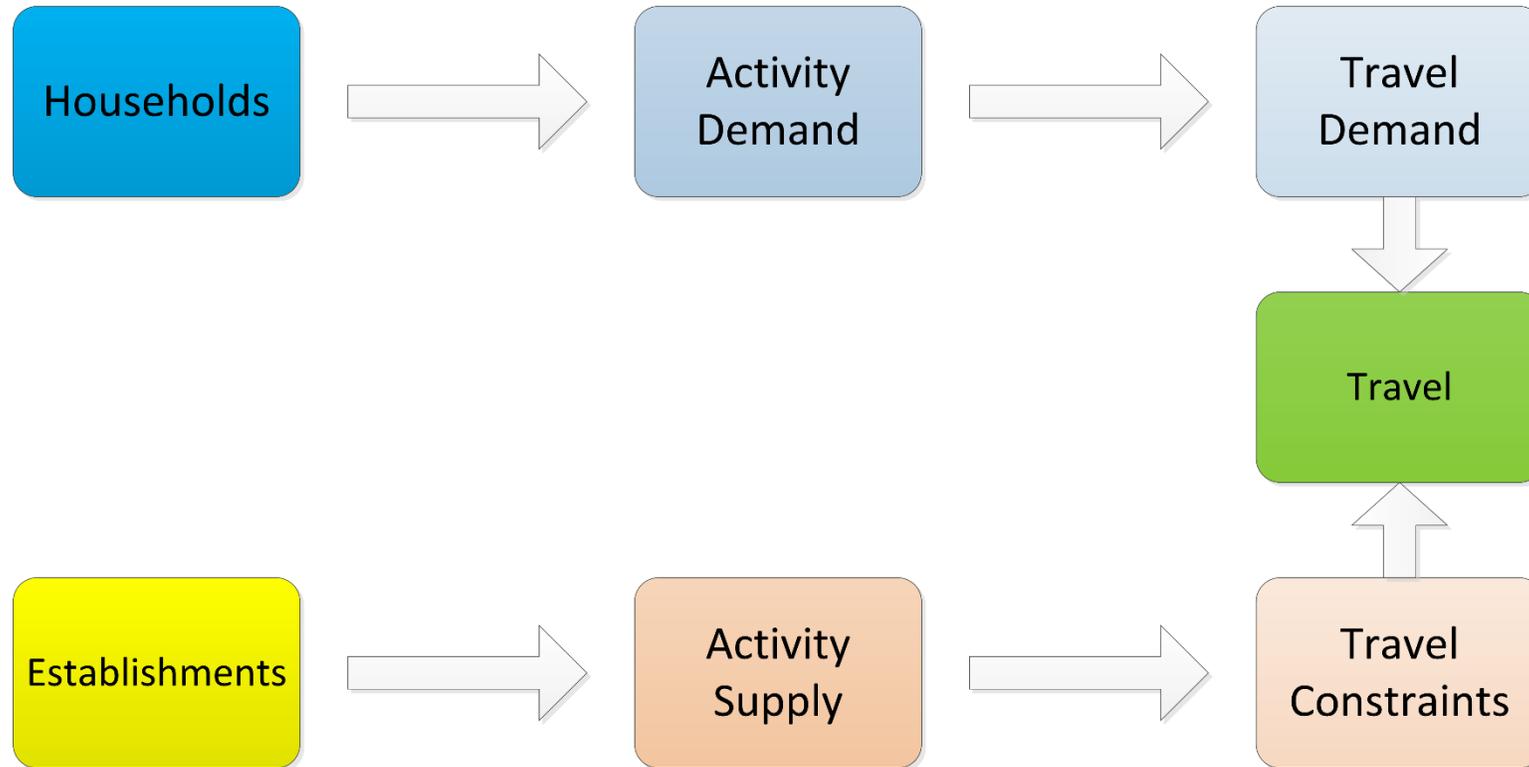
Anurag Komanduri, Cambridge Systematics

Project Team:

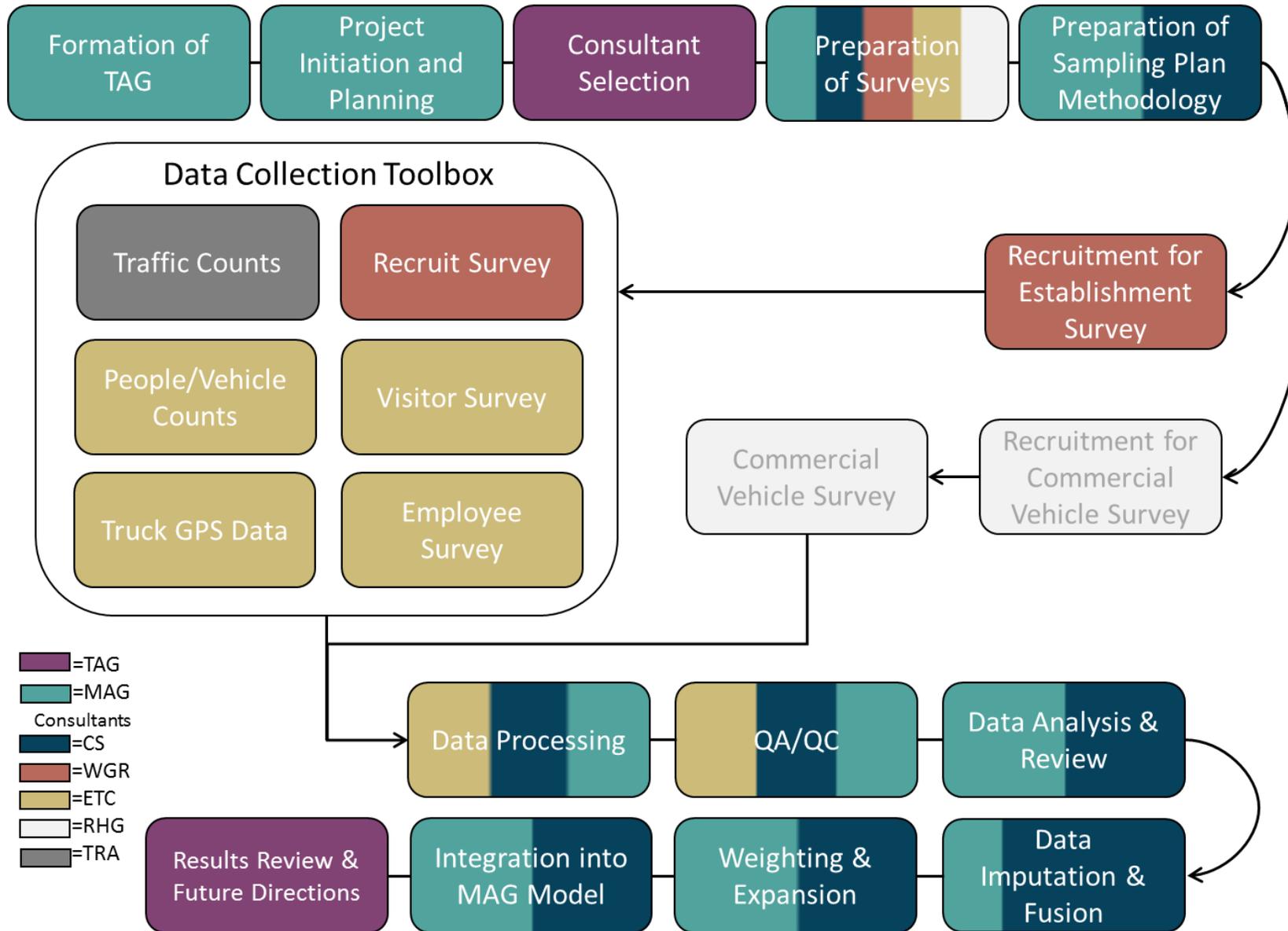


**Traffic Research &
Analysis**

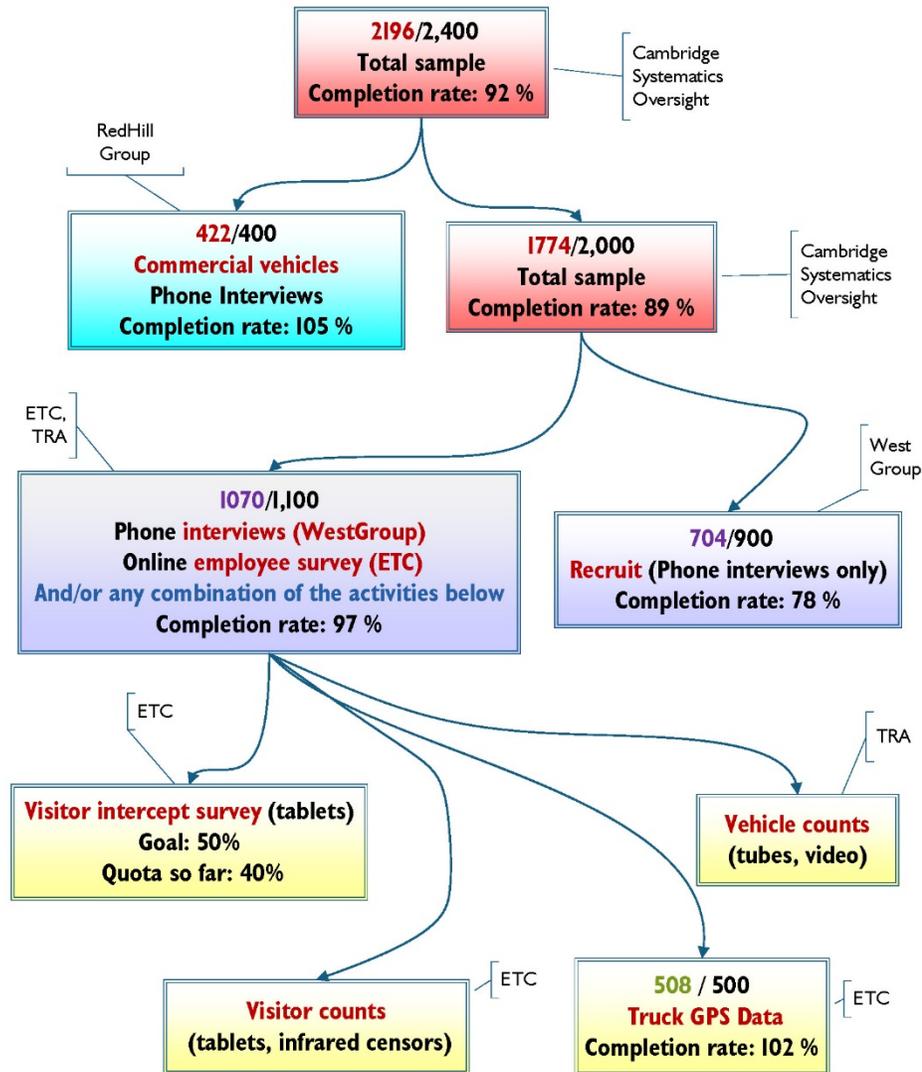
Modeling From Activity Supply Side – Synchronized HTS and ETS



MAG Establishment & Commercial Vehicle Survey



Status of MAG 2016 Establishment Survey Recruited versus Planned Establishments as of 12/8/2016



Recruitment Target & Results

- **Project Goal:** 2,000 Establishments
- **Establishments Recruited:** 2196 Establishments
- **Employee Surveys:** 5,891 from 1,105 Establishments
- **Visitor Surveys:** 5,692 from 550 Establishments
- **GPS Truck Data:** 508 Trucks
- **Commercial Vehicle Survey:** 422 Establishments

Sector	Central		Near		Periphery		150+	
	0-9	10-149	0-9	10-149	0-9	10-149		
Commerce	5%	2%	9%	5%	4%	2%		27%
Edu & Personal	7%	2%	16%	4%	6%	2%		37%
Industrial/Heavy/Construction		4%	6%	2%		4%		16%
Professional services		6%		9%		3%		18%
Total		27%		50%		21%	3%	100%

Survey Fieldwork Procedures

- Pre-implementation phase
 - Training
 - Survey design and technology
- Field implementation phase
 - Data collection and QA/QC
 - Labor intensive
- Back-end cleaning
 - Additional QA/QC and hand over to analysts

Interviewer Training

- Weeklong training
 - Classroom training
 - Field training – pre-pretest
- Training Outline
 - Focus on purpose and need – get staff motivated
 - Describe dos and do nots
 - Prescribe procedures all the way to attire
 - Describe role of supervisors
 - STAY COOL and SAFE at all times.



Interview Approach

- Interview always voluntary
 - Surveys take an average of 3-5 minutes to conduct
 - Record refusals for accurate visitor counting
 - Reach every possible employee/visitor – minimize bias
- Interviewer responsibilities
 - Conduct themselves in a professional manner
 - Enlist the cooperation of respondents
 - Clarify any confusion from respondents
 - Reach out to supervisors when issues arise

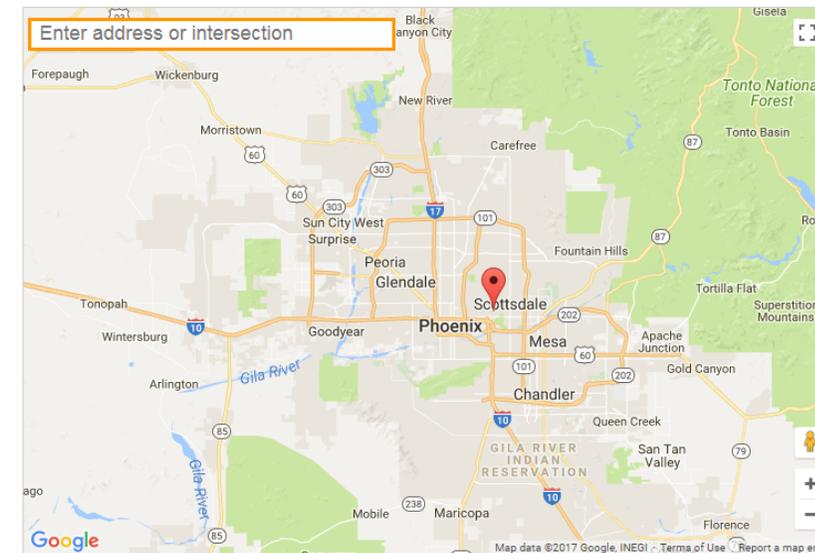
Field Procedures

- Web-based intercept interviews using tablets
 - Real-time geocoding capabilities
 - Real-time dashboards allowed supervisors to QAQC trip
- Types of intercept surveys collected:
 - Visitors
 - Employees
 - Commercial Vehicle/Delivery Drivers
- Surveys from “before” open to “after” close
 - Counts conducted concurrently
 - Ensure visitors/employees are entering target establishment

ORIGIN / TOUR INFORMATION TO SITE

Where is that place located?

Please type the address (e.g. 200 Main St, Phoenix, AZ) or intersection (Broadway Rd & Rural Rd, Tempe, AZ) into the orange Search box in the upper left-hand corner of the map. Then select the correct address from the green box on the right. You can also locate the place directly on the map by moving the red marker.



HOME (Start place of your trip for the day)

-

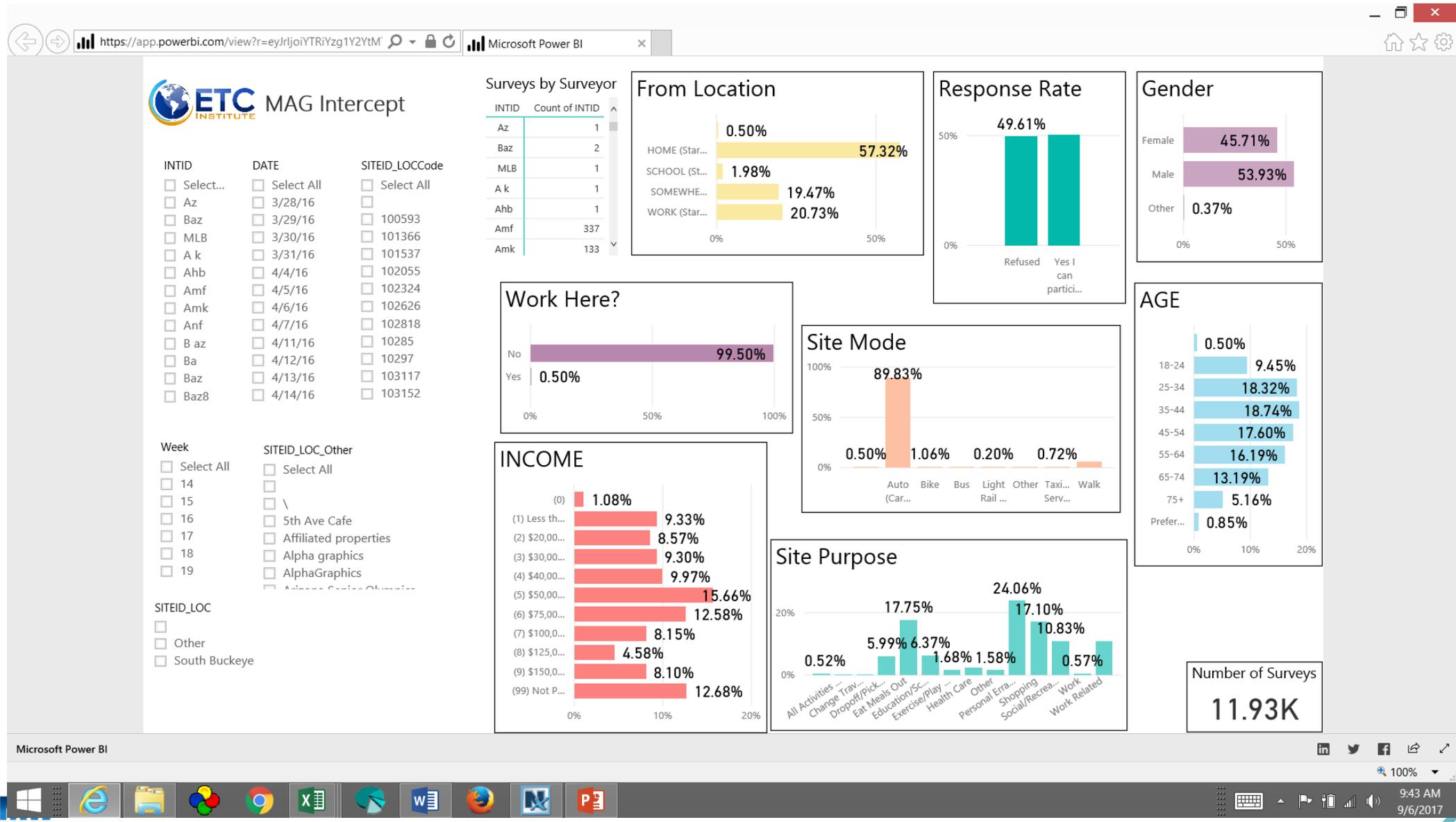
Selected Address
2601-2627 N 53rd Pl, Phoenix, AZ
85008, USA

Is this an intersection ?

Yes **No**

Reset

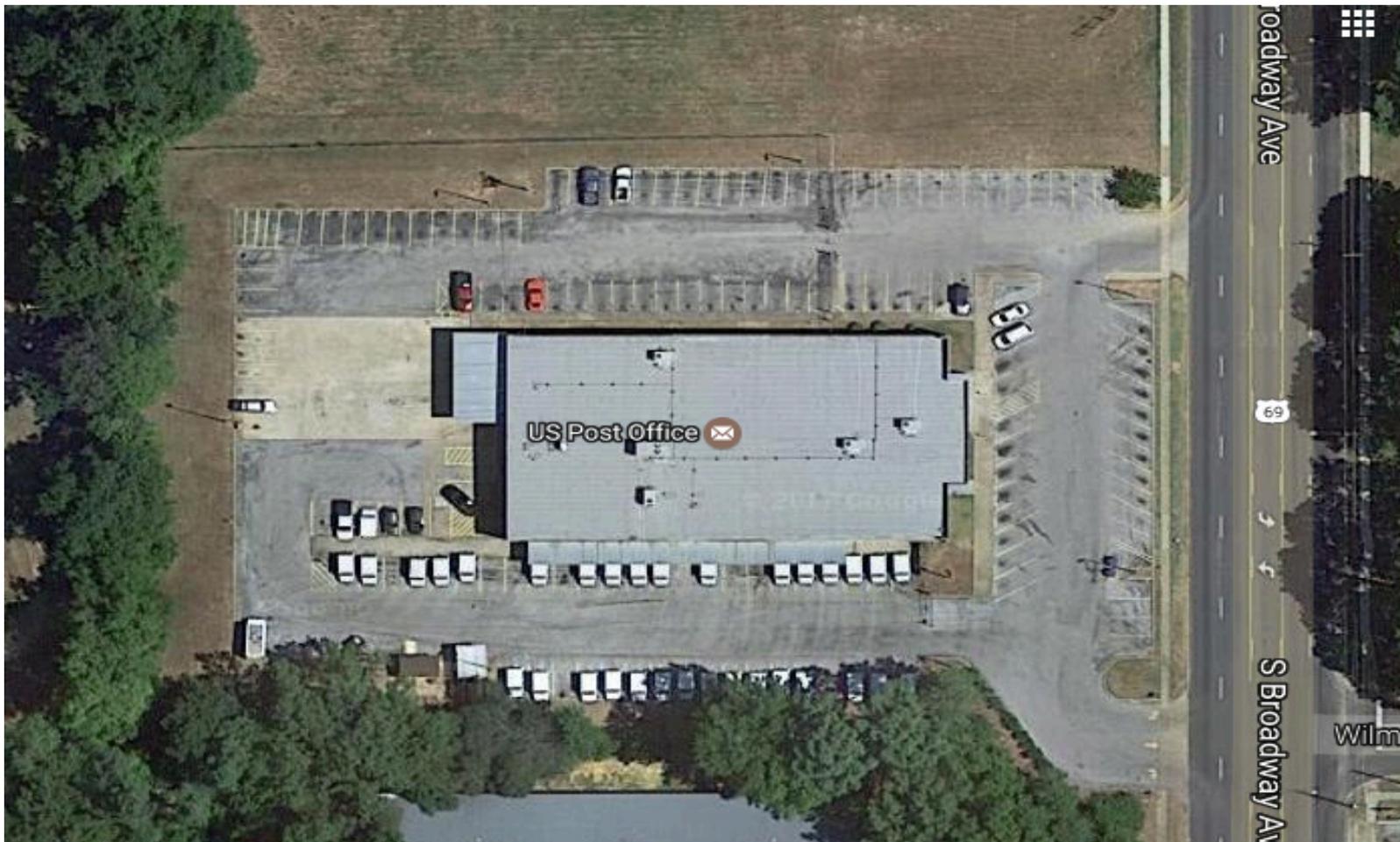
Field Procedures



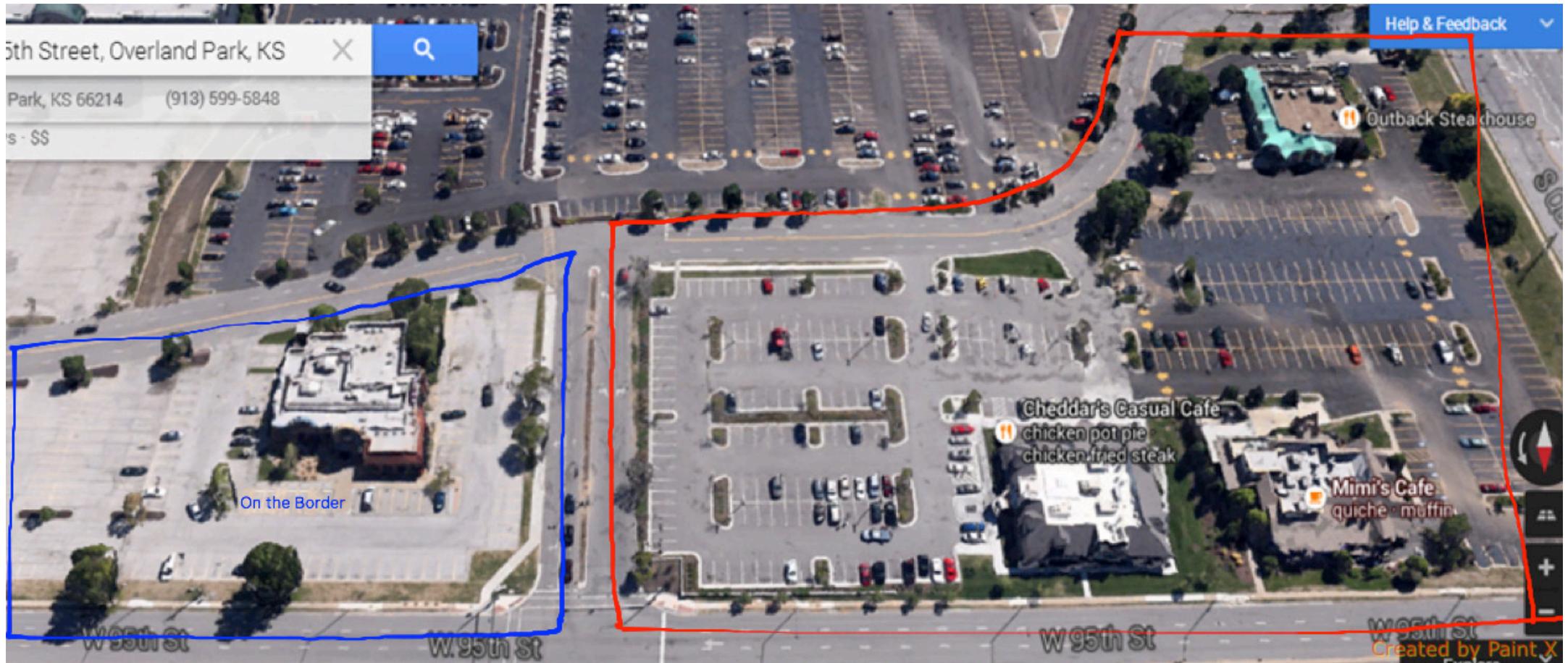
Field Procedures

- Preliminary procedures
 - Count parking spaces + pre-existing cars
 - Confirm functioning equipment
 - All tablets GPS-enabled – location tracked for QA
- In-Field QA – surprise visits by supervisors
 - Video recording at every site
- Post-field debrief
 - Any unusual occurrences
 - Challenges with data completion
 - Hand-over all data products – quick QA/QC
- Customize approach based on site type





Free Standing: The United States Post Office shown above is a free standing site. There are two clearly defined entrances and exits that lead only to the post office and no possibility/likelihood of pedestrian traffic coming from another site.



Non-Free Standing: (In red): Cheddar's Casual Café, Mimi's Café and Outback Steakhouse are ALL non-free standing sites. This is because there is no clearly defined start or end to parking lots between the three sites. Outlined in blue, On the Border, is a free standing site because it has clearly defined entrances/exits to their parking lot that do not serve any other workplace.

Fieldwork Challenges

- Establishments ask why they must participate
- Extremely large survey catchment area
 - Conduct survey by zip to maximize crew efficiency
 - Conduct tracking of completes by geography
- Multiple site types – careful planning required
- Manager shifts change
 - Survey information does not transfer
- Complex sampling targets require monitoring

Establishment Survey Results

Sampling Plan Development

- Driven by modeling needs
- Capture differences in geography
 - Affects mode of access and time-of-day of travel
- Capture differences in industry type
 - Affects visitor types, activity duration, time-of-day
 - Also affects seasonality of travel
- Capture differences in number of employees
 - Surrogate for activity measurement

Sampling Targets

- Recruited Establishments

Sector	Central		Near		Periphery		150+	Total
	0-9	10-149	0-9	10-149	0-9	10-149		
Commerce	94	47	189	96	76	40	50	542
Edu & Personal	145	45	311	75	115	40		731
Industrial/Heavy/Construction	89		120	40	76			325
Professional services	111		172		67			350
Total	531		1,003		414		50	1,998

- Establishments with Visitor/Employee Surveys

Sector	Central		Near		Periphery		150+	Total
	0-9	10-149	0-9	10-149	0-9	10-149		
Commerce	52	26	104	53	42	22	28	298
Edu & Personal	80	25	171	41	63	22		402
Industrial/Heavy/Construction	49		66	22	42			179
Professional services	61		95		37			193
Total	292		552		228		28	1,099



Survey Responses

- Counts + Employee Surveys

Sector	Central		Near		Periphery		150+	Total
	0-9	10-149	0-9	10-149	0-9	10-149		
Commerce	29	14	56	23	33	24	1	180
Edu & Personal	37	17	63	26	30	15	2	190
Industrial/Heavy/Construction	10	13	27	13	9	4	2	78
Professional services	13	18	34	11	22	3	1	102
Total	89	62	180	73	94	46	6	550

- Counts + Employee Surveys + Visitor Surveys or Counts + Truck Diaries

Sector	Central		Near		Periphery		150+	Total
	0-9	10-149	0-9	10-149	0-9	10-149		
Commerce	16	12	46	21	12	8	0	115
Edu & Personal	38	8	111	34	32	12	4	239
Industrial/Heavy/Construction	22	9	27	10	8	4	1	81
Professional services	21	14	57	8	19	1	0	120
Total	97	43	241	73	71	25	5	555

Sampling Adherence

- Survey Targets

Sector	Central		Near		Periphery		150+	Total
	0-9	10-149	0-9	10-149	0-9	10-149		
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Industrial/Heavy/Construction	49		66	22	42			179
Professional services	61		95		37			193
Total	292		552		228		28	1,099

- Actual Completes

Sector	Central		Near		Periphery		150+	Total
	0-9	10-149	0-9	10-149	0-9	10-149		
Commerce	45	26	102	44	45	32	1	295
Edu & Personal	75	25	174	60	62	27	6	429
Industrial/Heavy/Construction	54		54	23	25		3	159
Professional services	66		110		45		1	222
Total	291		567		236		11	1,105

Scale of Survey

- Sample Universe

Sector	Central		Near		Periphery		150+	Total
	0-9	10-149	0-9	10-149	0-9	10-149		
Commerce	5,443	2,370	10,931	4,835	4,490	1,885	380	30,334
Edu & Personal	11,105	2,960	23,770	4,983	9,407	1,997	557	54,779
Industrial/Heavy/Construction	4,542	2,026	9,499	2,491	4,999	735	349	24,641
Professional services	6,622	1,610	11,344	1,589	4,630	392	181	26,368
Total	27,712	8,966	55,544	13,898	23,526	5,009	1,467	136,122

- Sample Used

Sector	Central		Near		Periphery		150+	Total
	0-9	10-149	0-9	10-149	0-9	10-149		
Commerce	5,066	2,317	10,490	4,714	4,283	1,841	337	29,048
Edu & Personal	10,945	2,916	23,440	4,893	9,273	1,973	507	53,947
Industrial/Heavy/Construction	3,699	1,785	8,350	2,118	4,095	569	309	20,925
Professional services	6,429	1,584	11,189	1,549	4,550	378	161	25,840
Total	26,139	8,602	53,469	13,274	22,201	4,761	1,314	129,760

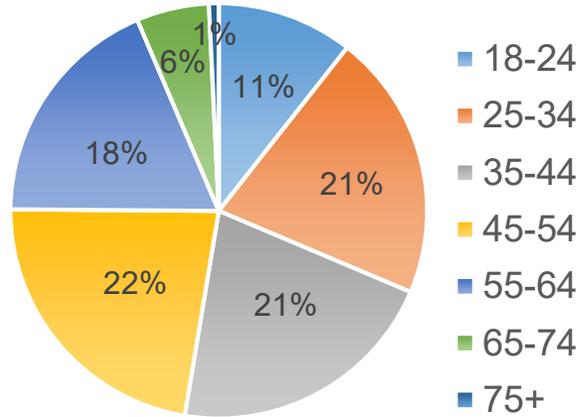
Employee Surveys

Participation Rate	Count of Establishments	# of Surveys	Total # of Employees	Avg. Employee Size
0%*	77	0	671	9
0-10%	31	66	1,185	38
10-20%	63	149	941	15
20-30%	60	399	1,587	26
30-40%	94	647	1,847	20
40-50%	121	403	865	7
50-60%	48	657	1,183	25
60-70%	99	664	1,005	10
70-80%	62	364	480	8
80-90%	48	592	688	14
90-100%	7	161	172	25
100%	392	1,785	1,475	4
Total	1,102	5,887	12,099	11

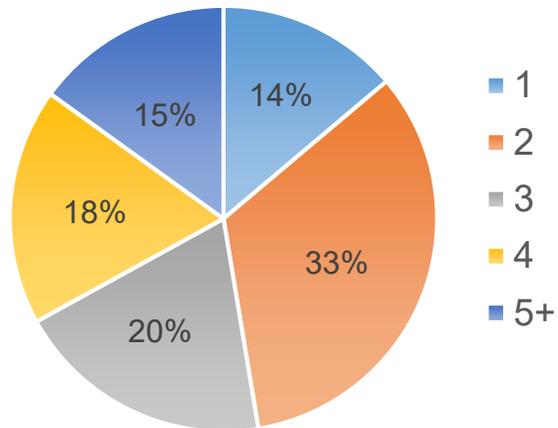
*Establishments with 0% participation are truck GPS only locations

Employee Survey Findings

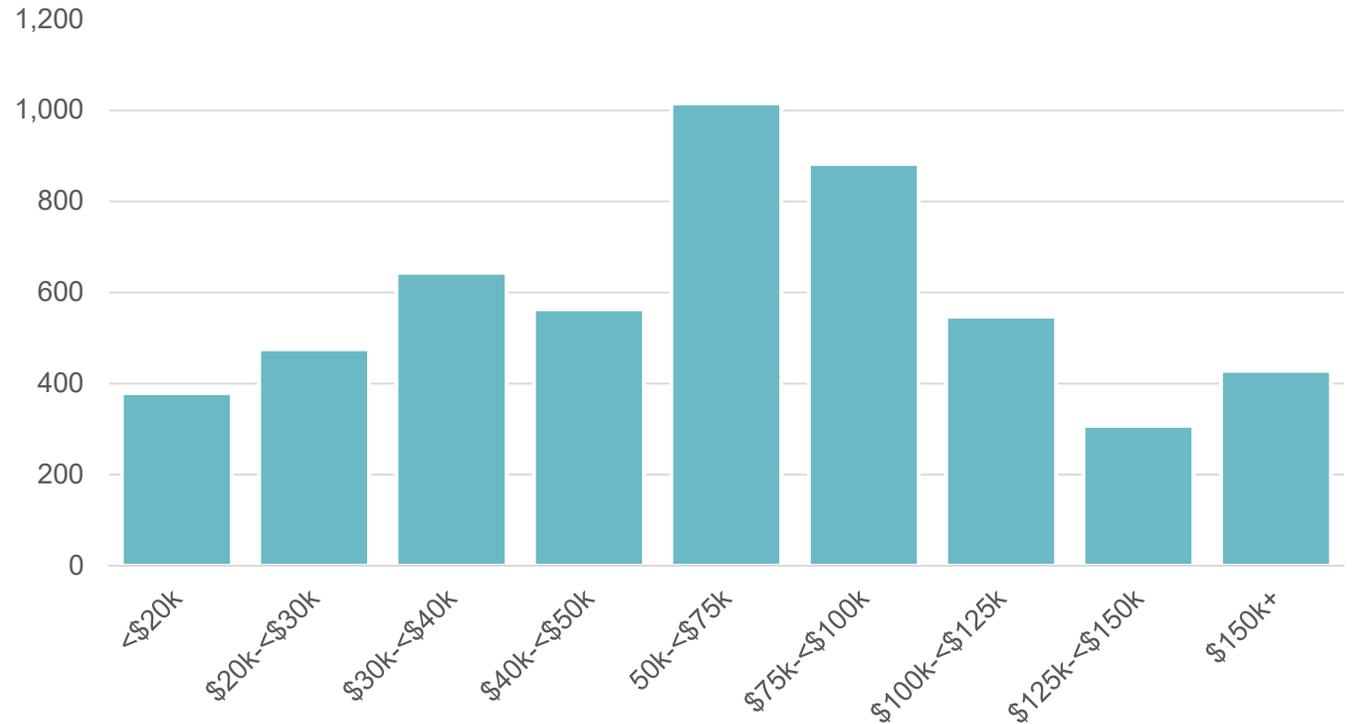
Employee Age



Employee Household Size

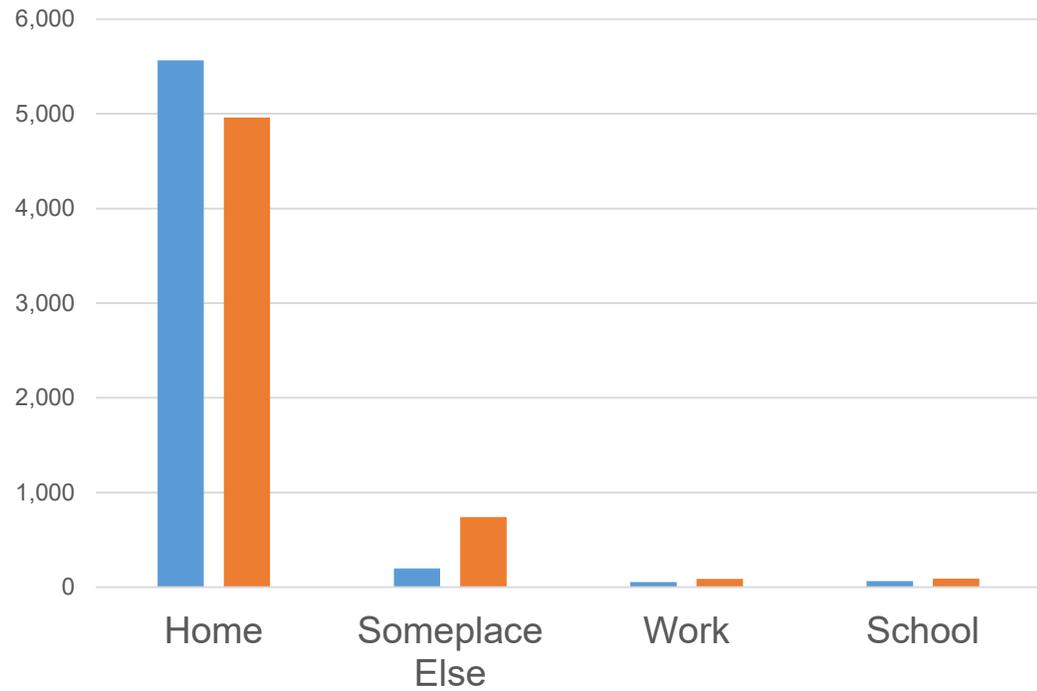


Employee Income Distribution

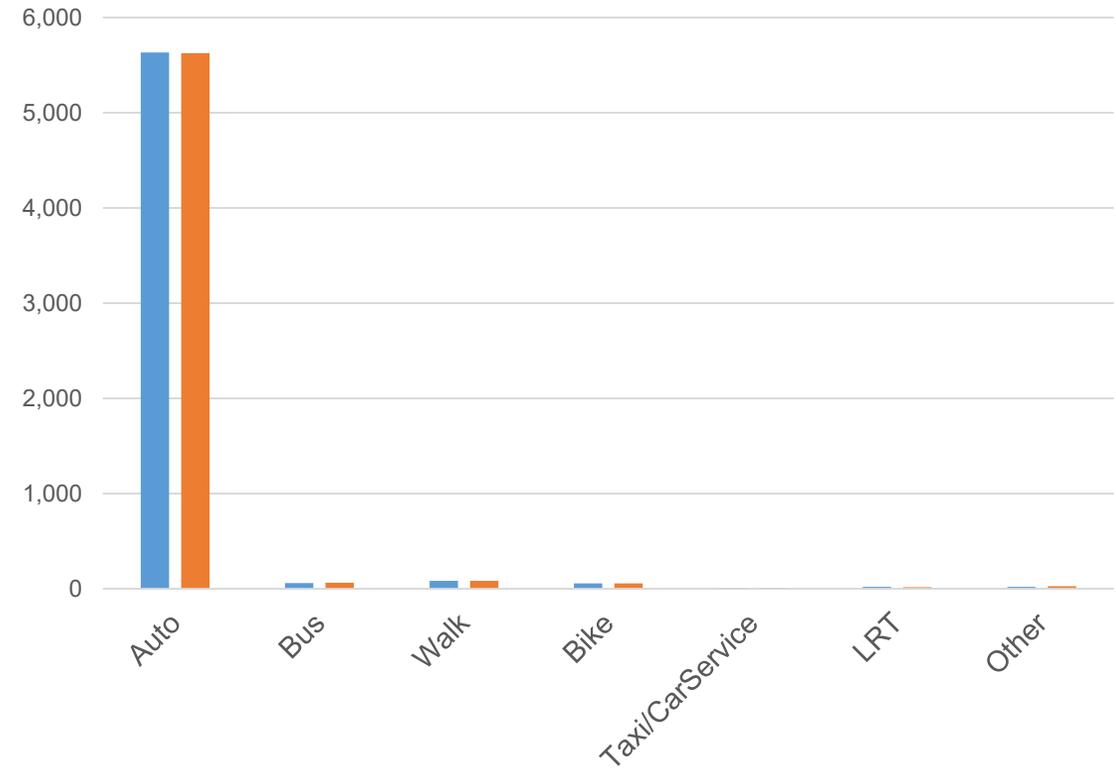


Employee Survey Findings

Non-Work Trip Ends



Mode of Travel



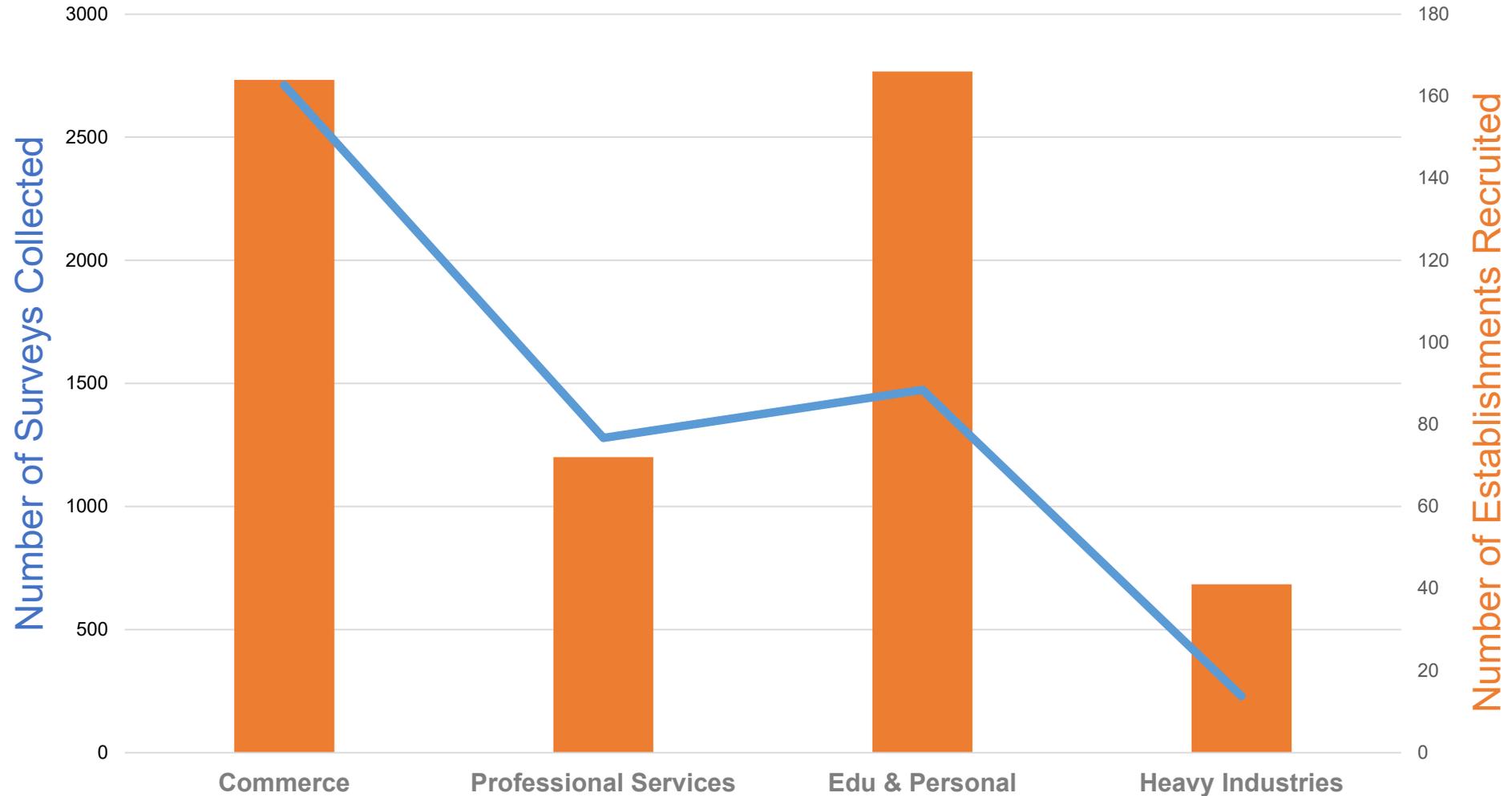
■ To Work ■ From Work

Visitor Surveys

	Participation Rate	Count of Establishments	# of Surveys	Total # of Visitors	Avg. Visitor Size
Basic	0%	555	0	51,330	92
Full	0%*	117	20	3,487	30
	0-10%	95	1,455	34,295	361
	10-20%	95	1,243	8,772	92
	20-30%	77	1,247	5,013	65
	30-40%	52	493	1,444	28
	40-50%	51	573	1,256	25
	50-60%	16	319	581	36
	60-70%	18	111	170	9
	70-80%	9	83	110	12
	80-90%	3	44	52	17
	90-100%	1	13	14	14
	100%	16	91	78	5
Total		550	5,692	106,602	194

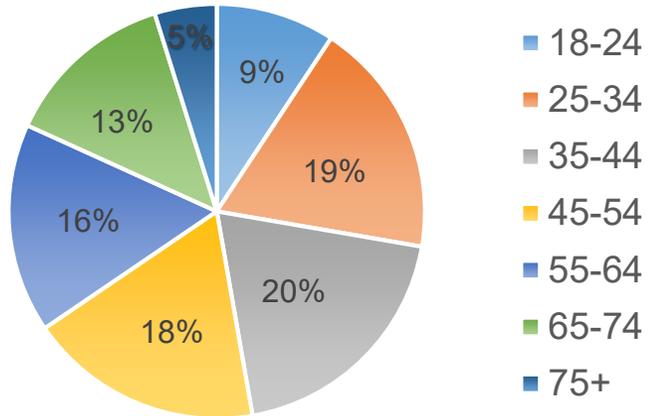
*Establishments with 0% participation are truck GPS only locations

Visitor Survey Findings

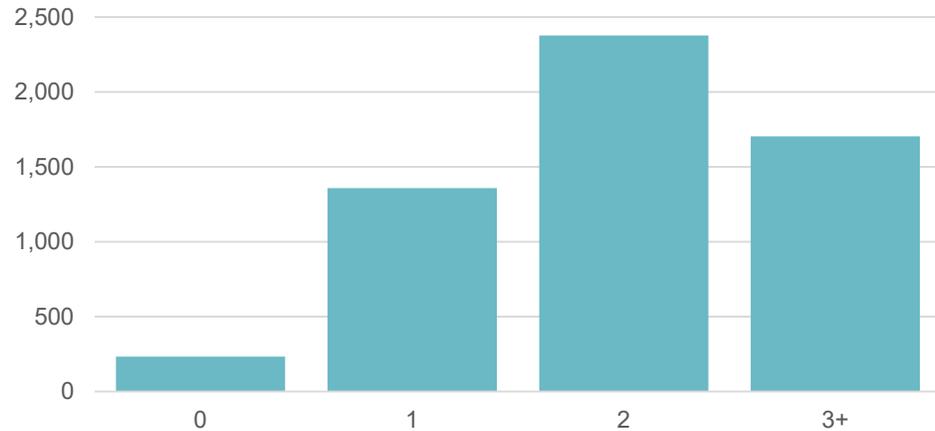


Visitor Survey Findings

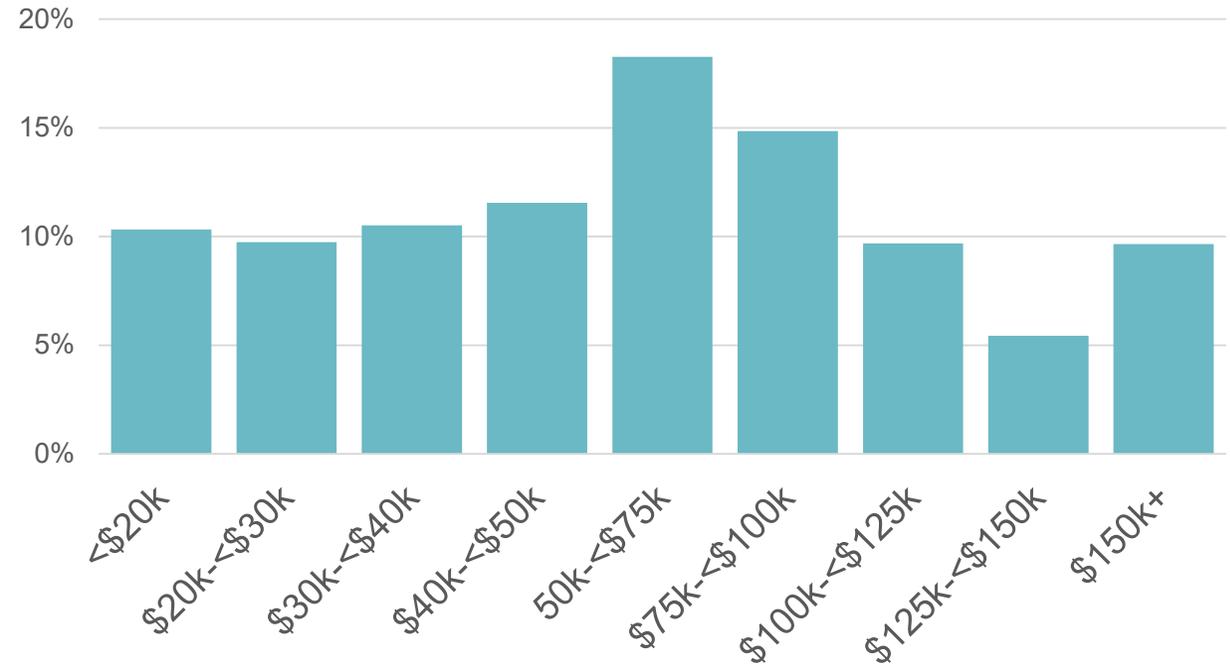
Visitor Age



Visitor Vehicle Ownership



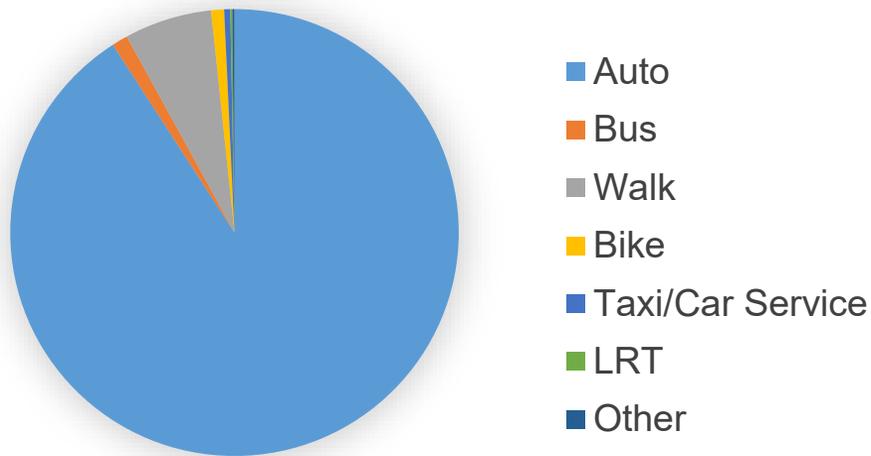
Visitor Income Distribution



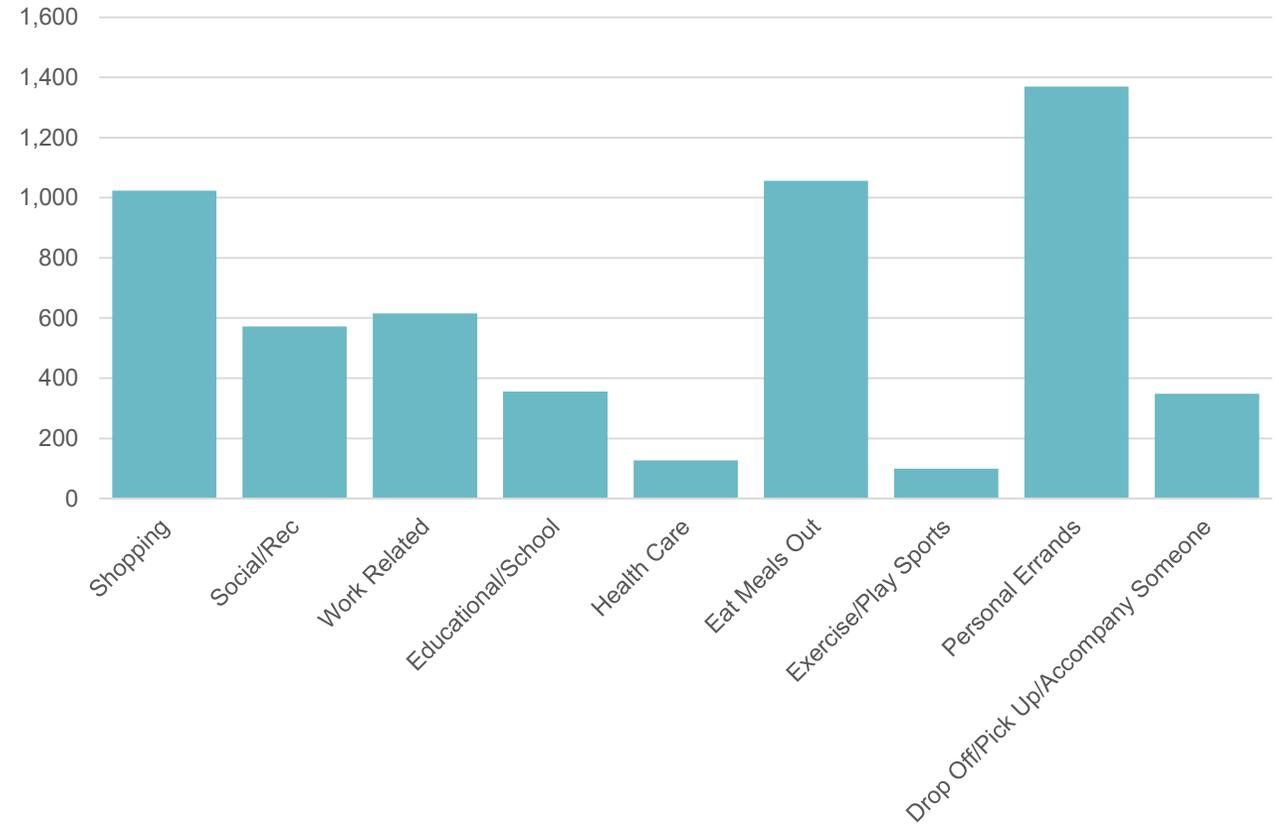
Visitor Survey Findings

Outbound Trips	Inbound Trips			
	0	1	2	3
0	67.90%	11.10%	1.70%	0.20%
1	12.60%	2.70%	0.30%	0.00%
2	2.20%	0.50%	0.00%	0.10%
3	0.50%	0.10%	0.00%	0.00%

Mode of Travel on From Trip

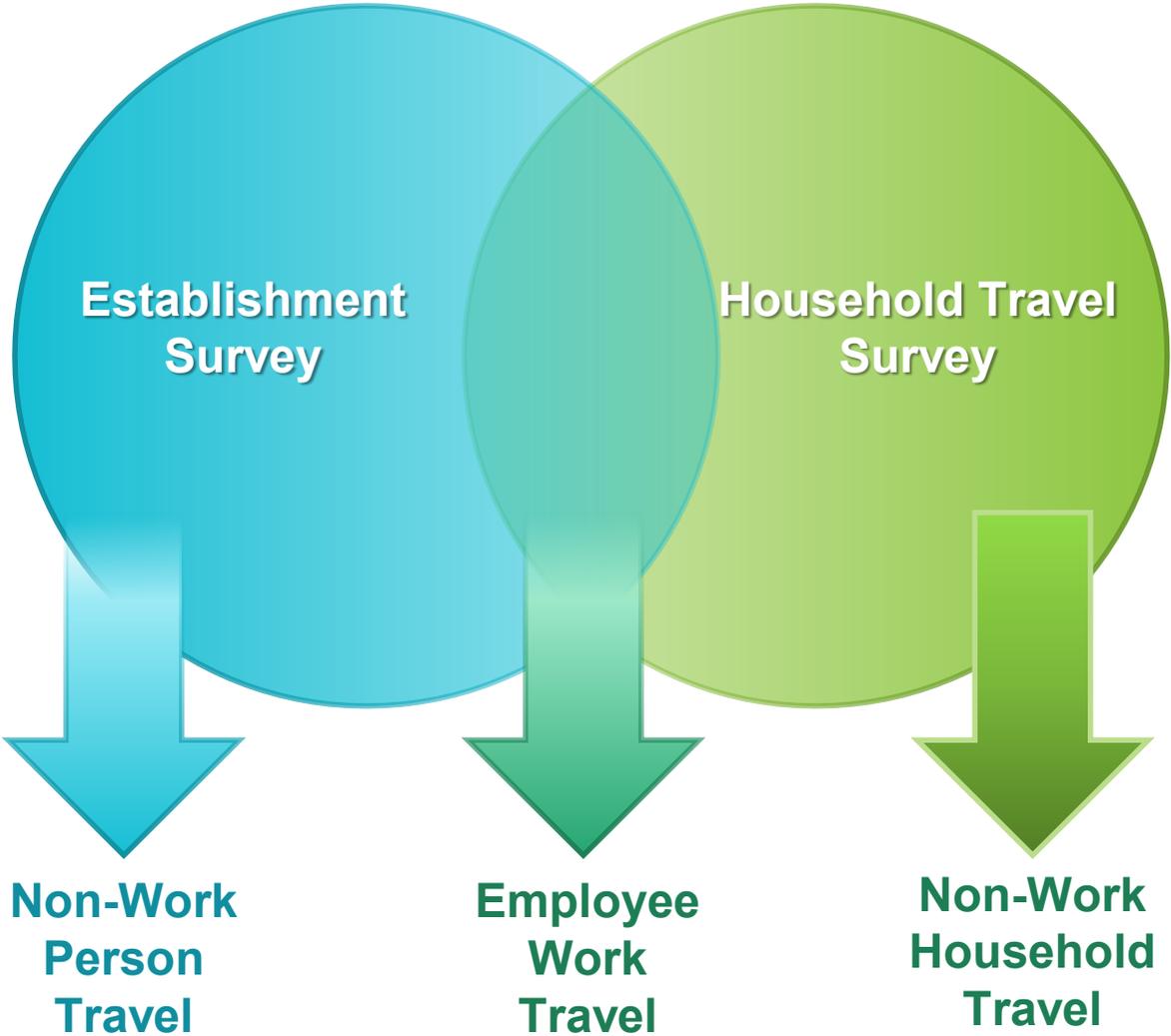


Visitor Travel Purpose



Data Fusion

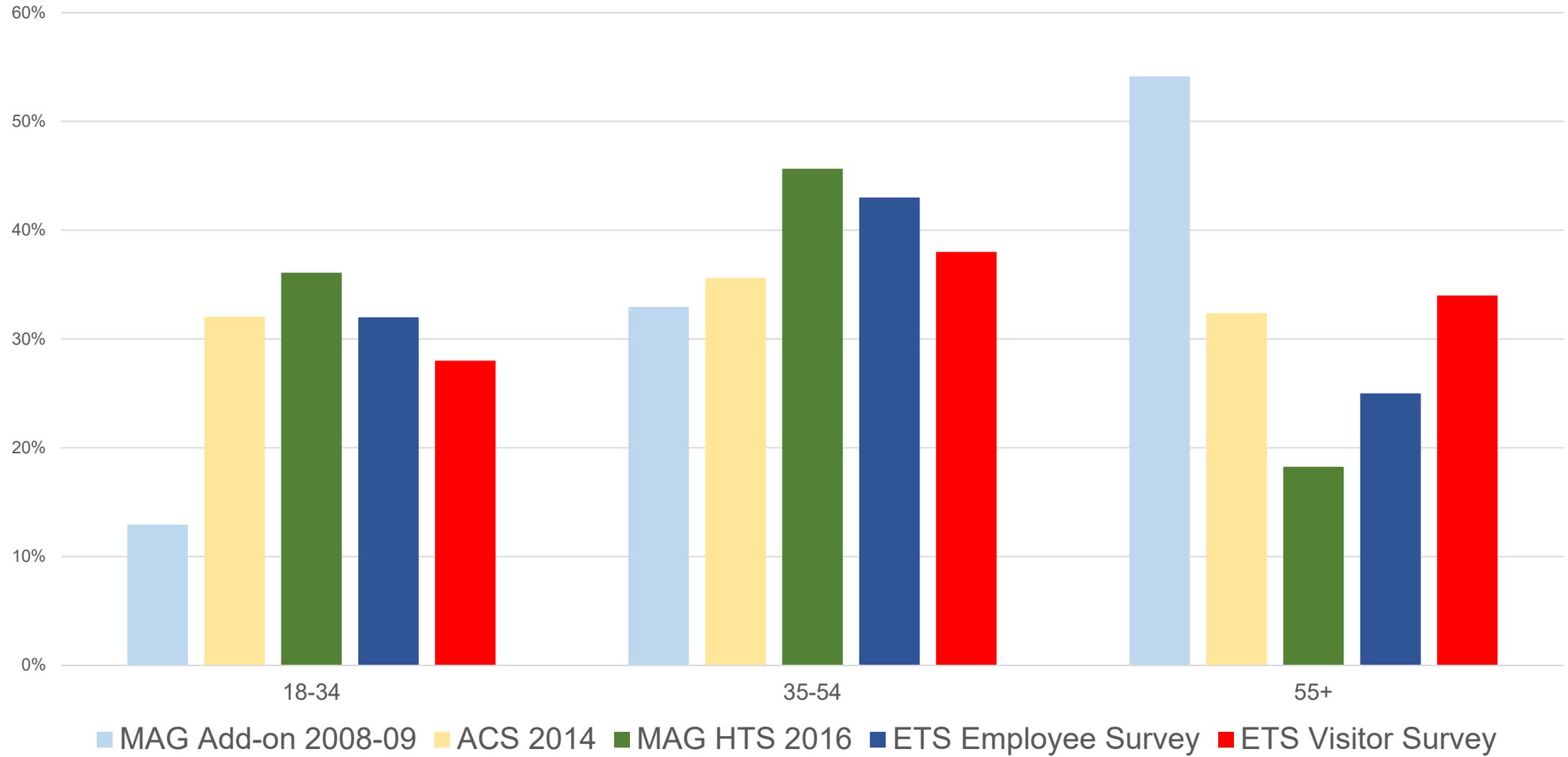
Maximize Use of Data Collected



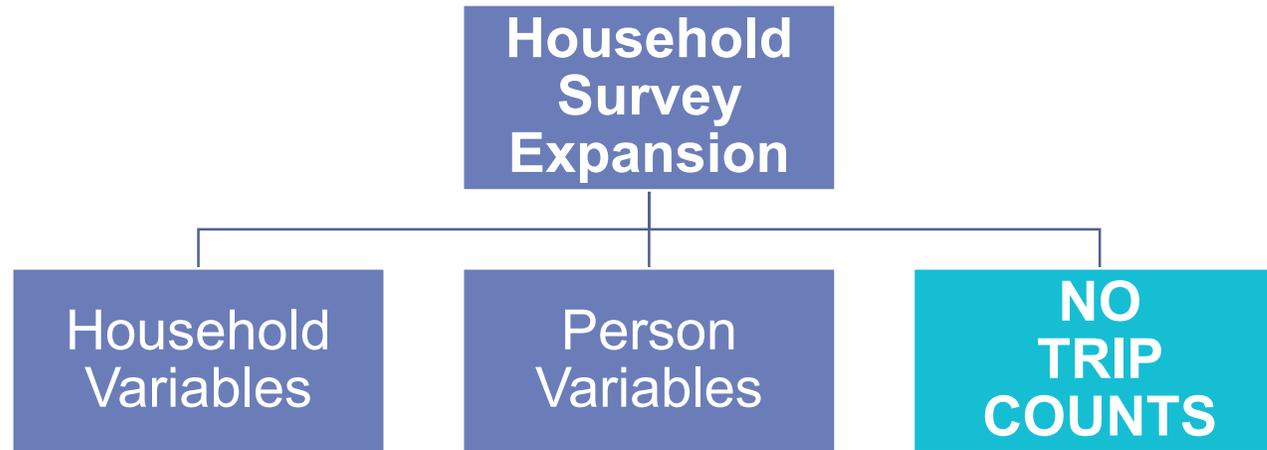
Fusion Opportunities & Value

- Unique data collection effort – all major surveys from the same timeframe
- Independent estimates of non-home activities
 - Are the activity rates same for both surveys?
 - Scale surveys to provide consistent estimates
- Comparison across multiple dimensions
 - Commute trips by geography by ToD
 - Modal choices by geography and travel purpose
 - Trip length distributions by establishment type

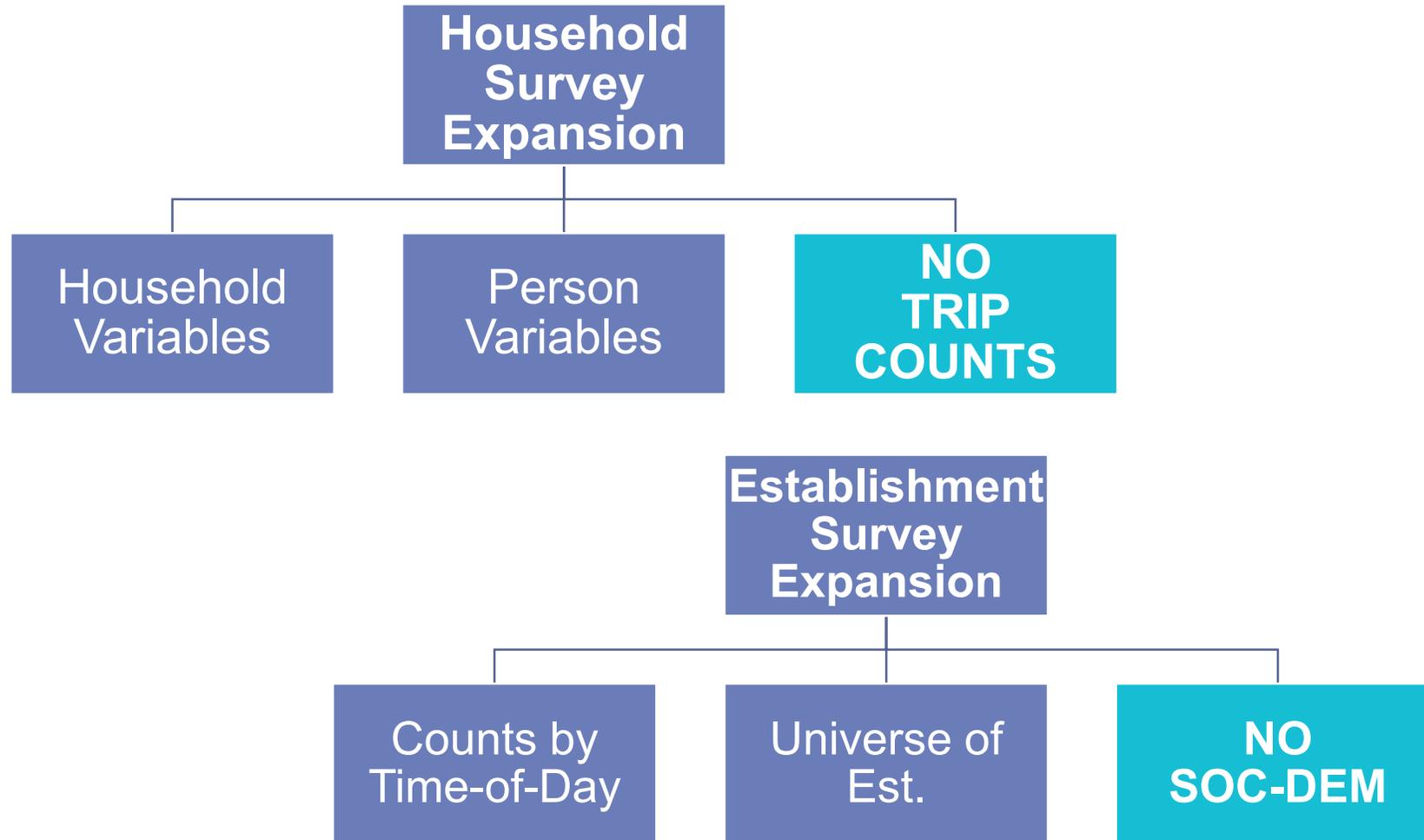
Age (Excluding 17 or Younger)



Survey Expansion



Survey Expansion



Commercial Vehicle Survey

Commercial Vehicle Survey

Phone-based Survey

- Logistics operators, or shipping managers to be interviewed

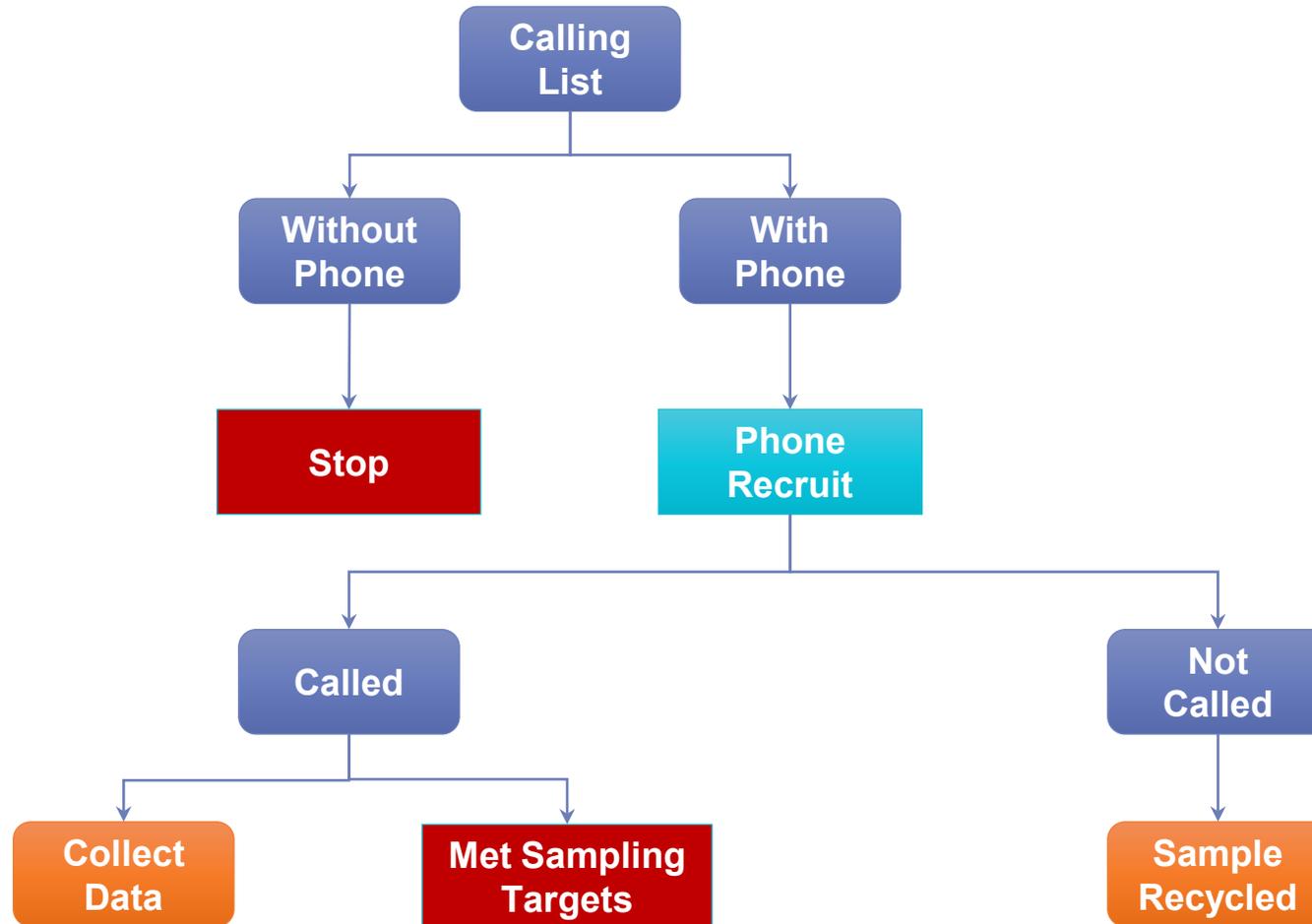
Screeners

- Firms who own and lease trucks, receive truck deliveries
- Firms who don't get any deliveries – TERMINATE

Data to collect

- IB/OB trucks by size
- Deliveries from/to which type
- Commodity type
- Trip lengths, External

Commercial Vehicle Survey



Presentation 3: MAG Bottleneck Study

Presented by:

Wang Zhang

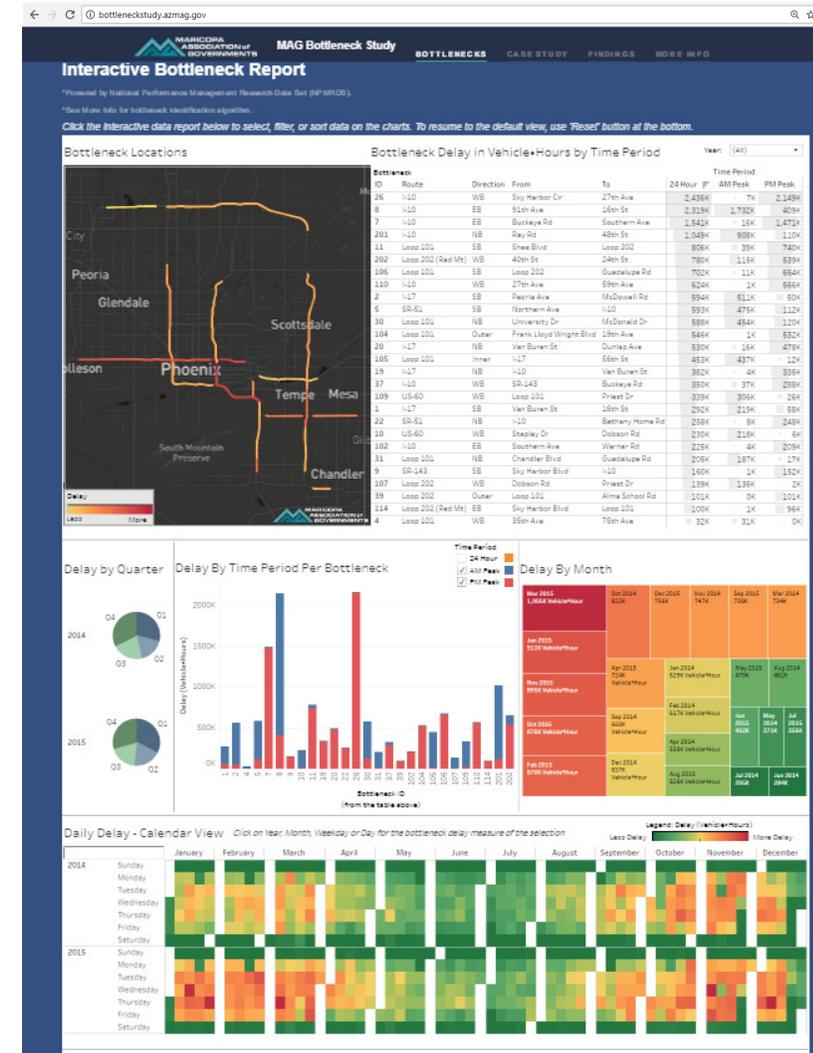
Maricopa Association of Governments

Project Team:



Outline

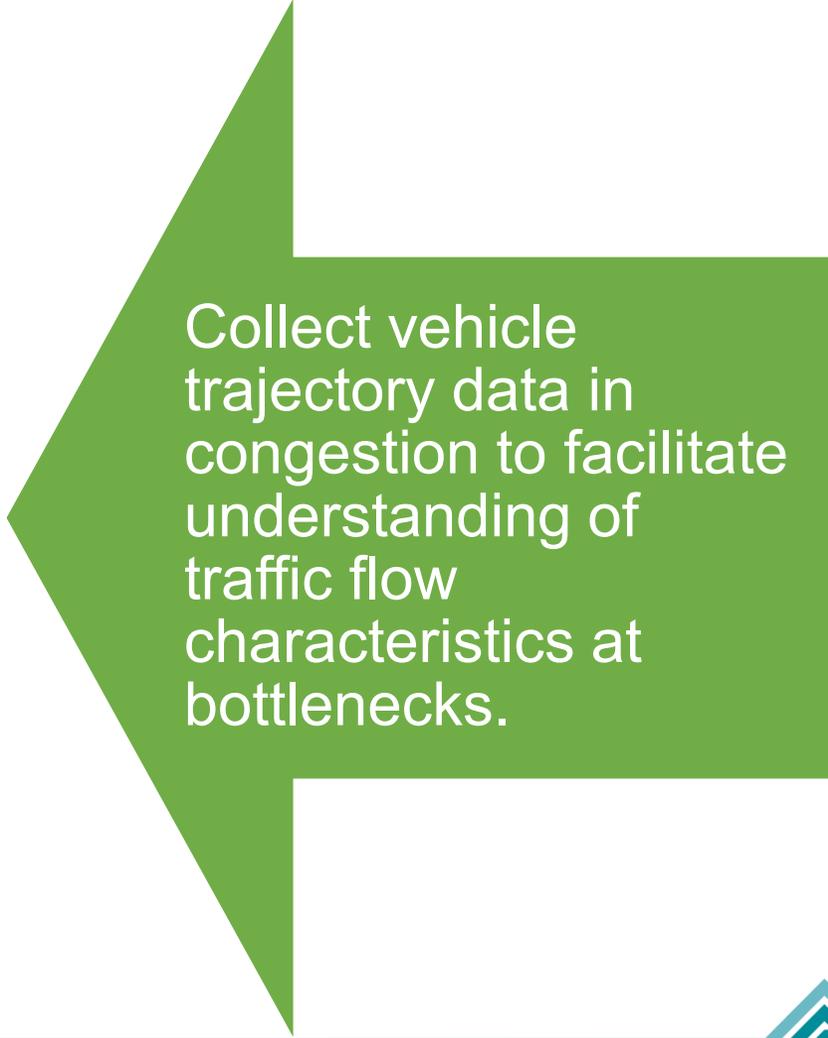
- Introduction
- Data Collection (Vehicle Trajectory)
- Data Analytics and Visualization (Web Demo)
- Future Work



Introduction - Objectives

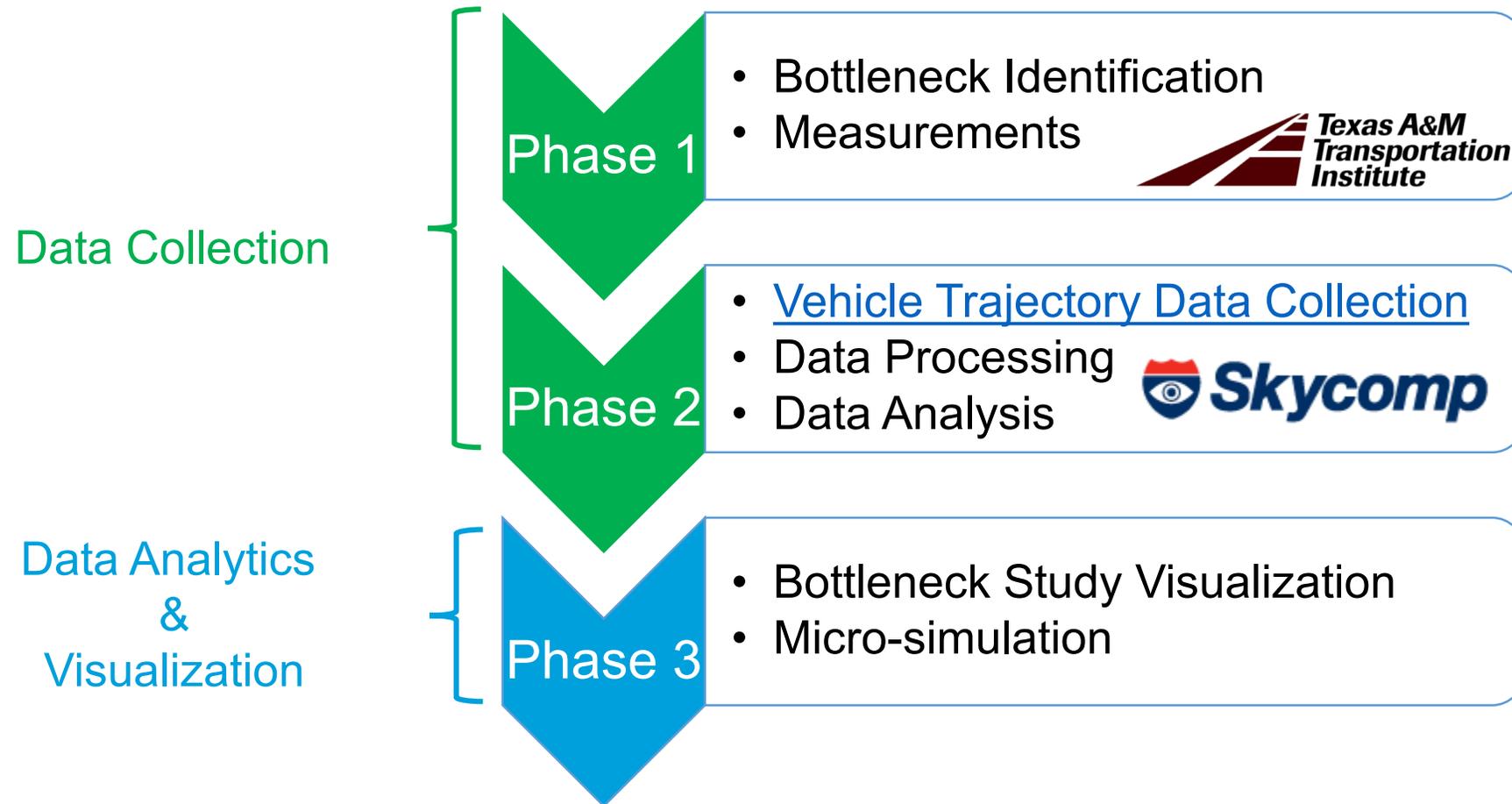


Collect and acquire necessary datasets to establish congestion measurement on all bottlenecks.



Collect vehicle trajectory data in congestion to facilitate understanding of traffic flow characteristics at bottlenecks.

Introduction - Study Phases



Phase 1 – Bottleneck Identification & Measurements



Freeway bottlenecks identification

- Based on NPMRDS data and TMC network

ID	Route	Direction	From	To	JK Hour P	JK Peak	JK Peak
1	101	SB	101st Ave	101st Ave	11:00-12:00	100	100
2	101	SB	101st Ave	101st Ave	16:00-17:00	100	100
3	101	SB	101st Ave	101st Ave	17:00-18:00	100	100
4	101	SB	101st Ave	101st Ave	18:00-19:00	100	100
5	101	SB	101st Ave	101st Ave	19:00-20:00	100	100
6	101	SB	101st Ave	101st Ave	20:00-21:00	100	100
7	101	SB	101st Ave	101st Ave	21:00-22:00	100	100
8	101	SB	101st Ave	101st Ave	22:00-23:00	100	100
9	101	SB	101st Ave	101st Ave	23:00-24:00	100	100
10	101	SB	101st Ave	101st Ave	00:00-01:00	100	100
11	101	SB	101st Ave	101st Ave	01:00-02:00	100	100
12	101	SB	101st Ave	101st Ave	02:00-03:00	100	100
13	101	SB	101st Ave	101st Ave	03:00-04:00	100	100
14	101	SB	101st Ave	101st Ave	04:00-05:00	100	100
15	101	SB	101st Ave	101st Ave	05:00-06:00	100	100
16	101	SB	101st Ave	101st Ave	06:00-07:00	100	100
17	101	SB	101st Ave	101st Ave	07:00-08:00	100	100
18	101	SB	101st Ave	101st Ave	08:00-09:00	100	100
19	101	SB	101st Ave	101st Ave	09:00-10:00	100	100
20	101	SB	101st Ave	101st Ave	10:00-11:00	100	100

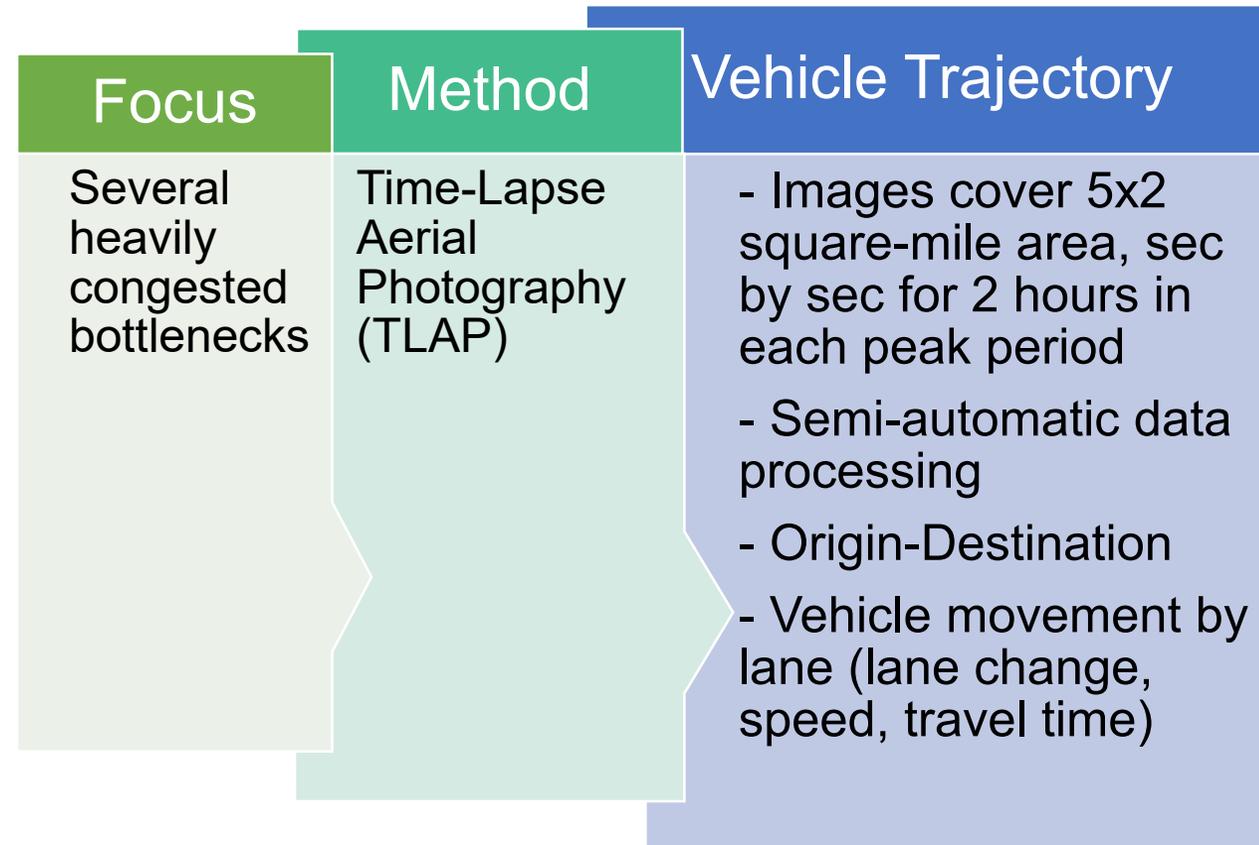
Measurements/Analysis for 2014-2016, for each calendar day

Month	2014	2015	2016
Jan	1,100K	1,150K	1,200K
Feb	1,150K	1,200K	1,250K
Mar	1,200K	1,250K	1,300K
Apr	1,250K	1,300K	1,350K
May	1,300K	1,350K	1,400K
Jun	1,350K	1,400K	1,450K
Jul	1,400K	1,450K	1,500K
Aug	1,450K	1,500K	1,550K
Sep	1,500K	1,550K	1,600K
Oct	1,550K	1,600K	1,650K
Nov	1,600K	1,650K	1,700K
Dec	1,650K	1,700K	1,750K

Ranking bottlenecks by congestion measure and by peak period

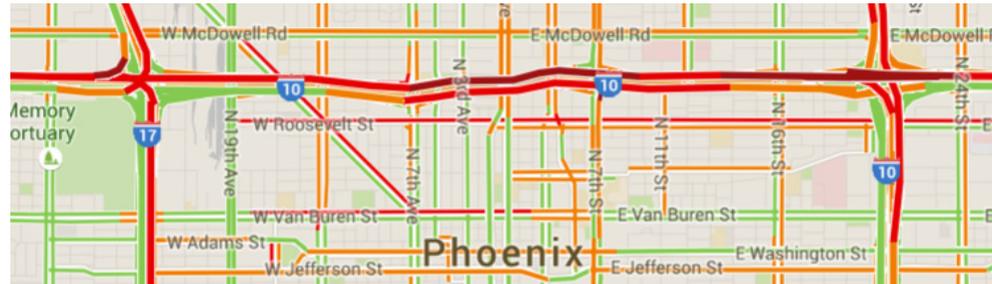
- Vehicle delay, traveler delay, truck delay, duration of congestion, congestion's spatial and temporal percentage by time...etc.

Phase 2 – Vehicle Trajectory Data Collection/Data Processing/Data Analysis



Phase 2 - TLAP Survey Planning

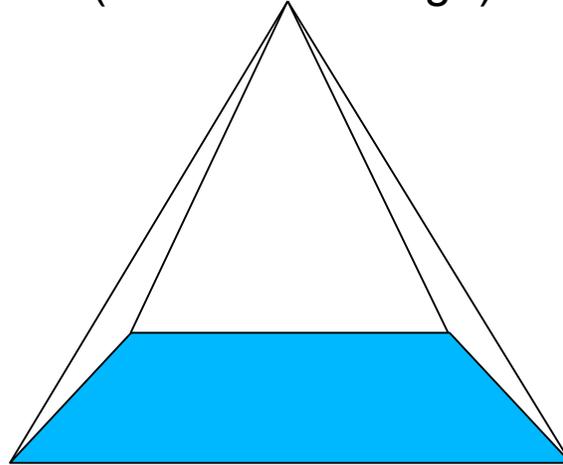
- A five-mile section of I-10 at Phoenix downtown, features top 3 bottlenecks in the region.



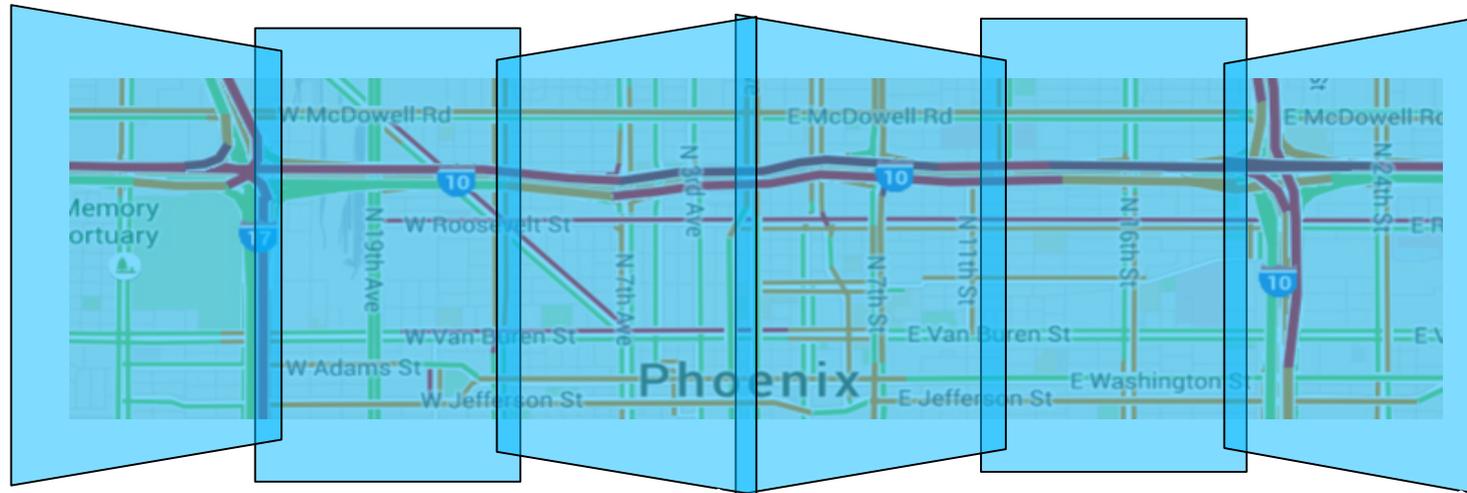
- TLAP surveys scheduled for a midweek period in October 2014 for an expected "normal" seasonal conditions.
 - October: the peak traffic season and the least chance of rain/cloud in Phoenix
 - Two surveys per peak period were conducted in case potential incidents that might occur.
 - Use NPMRDS historical travel time data as reference, on October 15th and 16th, two AM peaks from 06:30 to 08:30 & two PM peaks from 15:45 to 17:45 were selected.

TLAP (2 helicopters, 6 cameras)

(Hover 1 mile high)



Width up to 1.75 miles



up to
1.25
miles

up to 3 miles

up to 3 miles

Actual photo-board consisted with 6 images



West Helicopter



East Helicopter

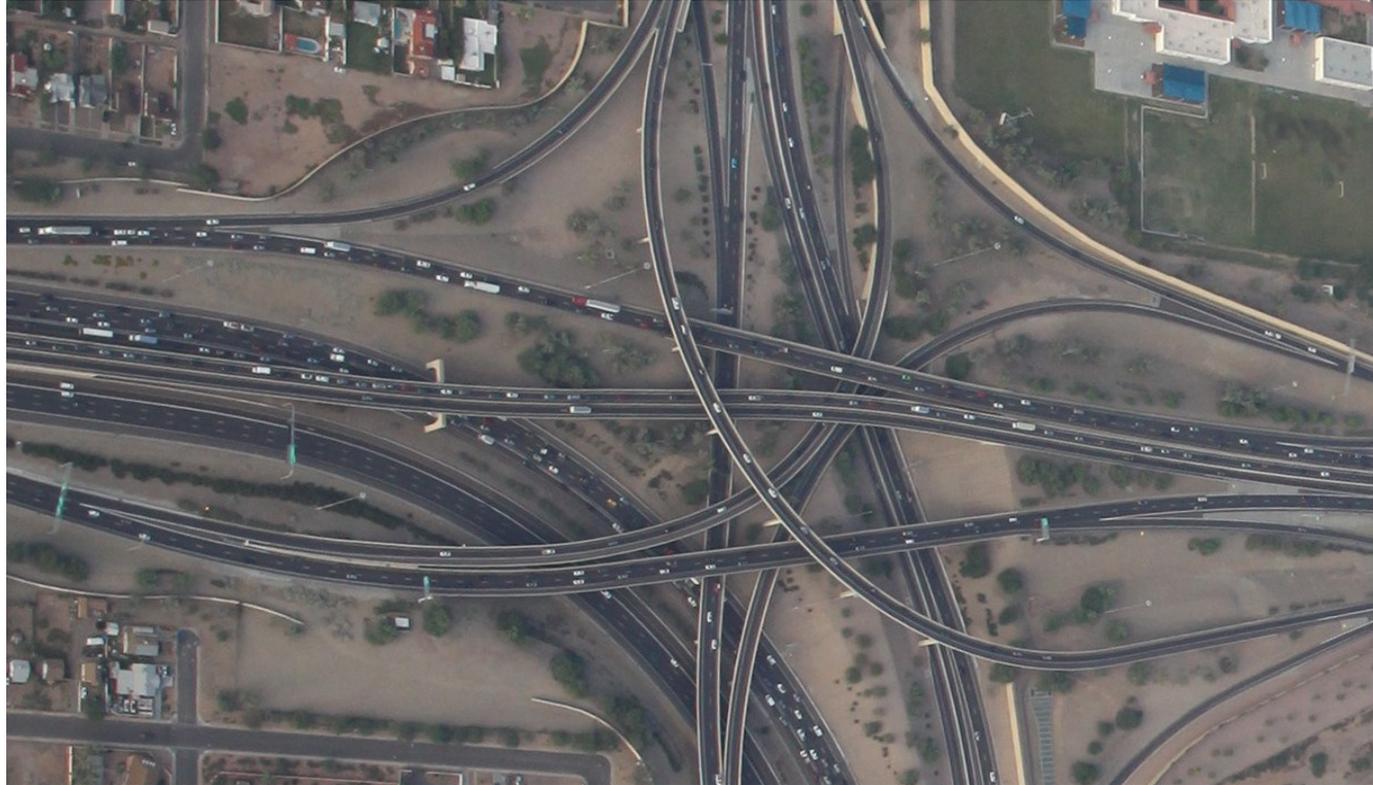


Survey Images – Full Resolution Detail



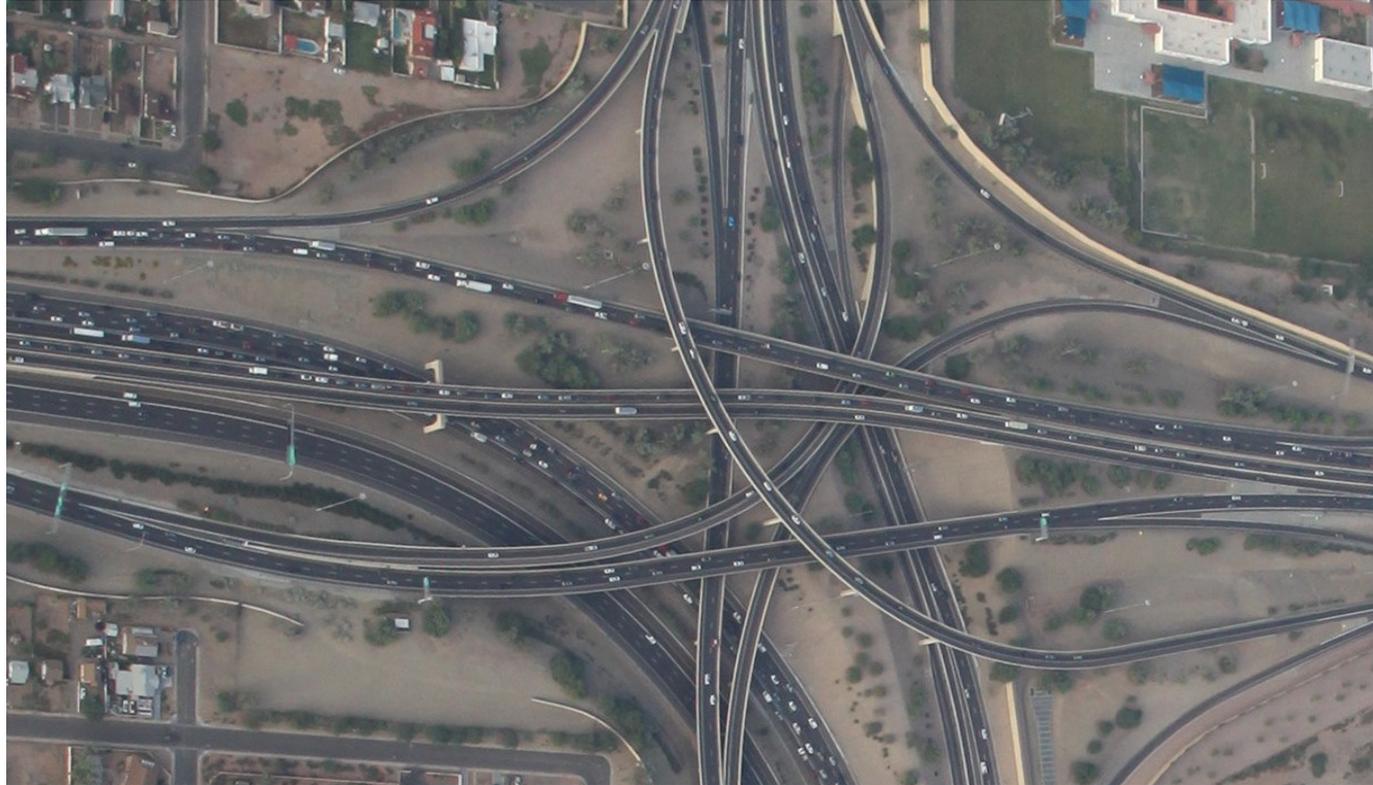
1/4

Survey Images – Full Resolution Detail



2/4

Survey Images – Full Resolution Detail



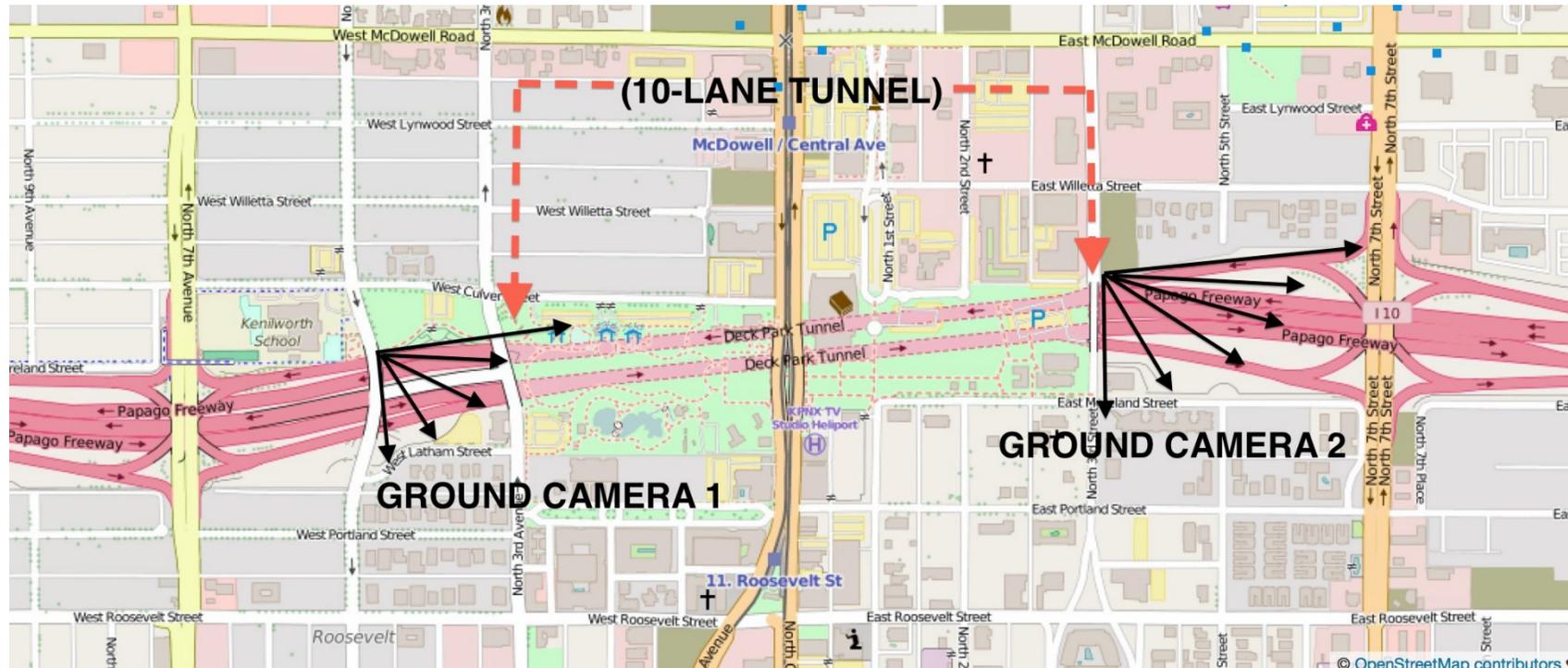
3/4

Survey Images – Full Resolution Detail

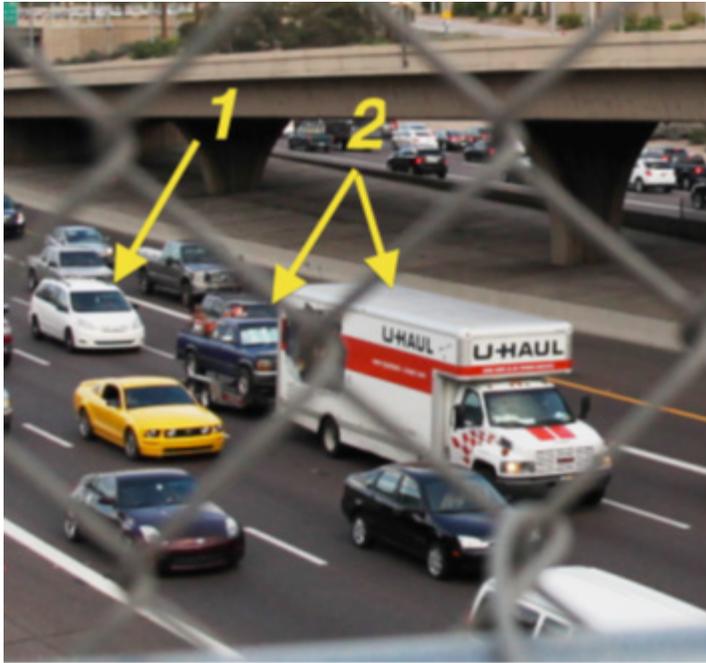


4/4

Phase 2 - Ground cameras for I-10 tunnel matching



Phase 2 - Re-identifying vehicles after exiting tunnel:



At tunnel entrance

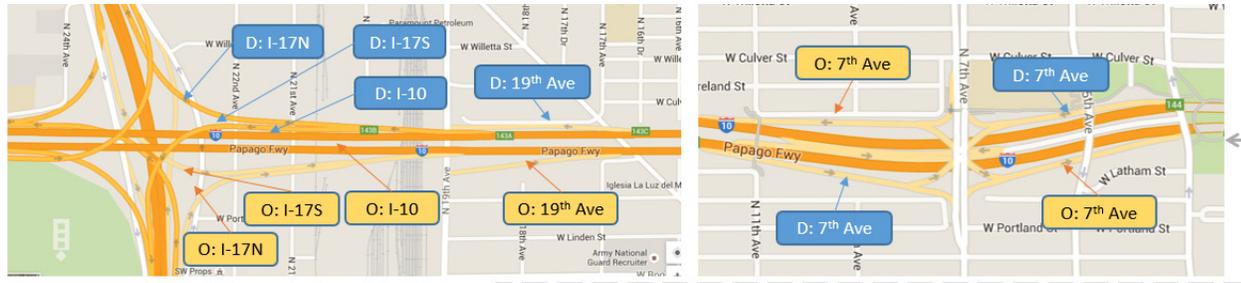


>> Few minutes later >>



At tunnel exit

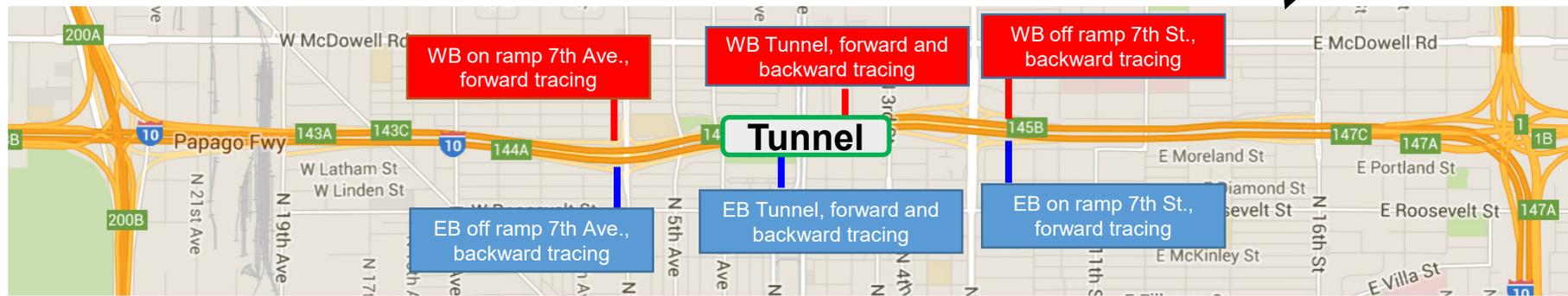
Phase 2 - Data Extraction & Analysis - Design Assignment Lines for Tracing



12 origins (yellow) and 12 destinations (blue) plus 10 HOV entrances/exits



Six assignment lines (AL) defined to effectively contain and sample all Os/Ds



Phase 2 - Determine Sampling Rate

AL	PM		Site (WB)	max dist	avg dist	Speed	avg	15-min	freq.	samples	travel	trace	DL (hr)	Conf. Level	Margin of Error - MOE (%)
	Start	End		to trace	to trace		vol	time (min)			time (min)				
1	3:45	4:00	Tunnel	3.7	2.6	22	7.0	1691	8%	0	7.0	27.8	0		
1	4:00	4:15	Tunnel	3.7	2.6	21	7.5	1705	8%	136	7.5	30.1	68	95%	8.1
1	4:15	4:30	Tunnel	3.7	2.6	18	8.6	1485	8%	119	8.6	34.3	68	95%	8.6
1	4:30	4:45	Tunnel	3.7	2.6	12	13.1	1273	8%	102	13.1	52.3	89	95%	9.3
1	4:45	5:00	Tunnel	3.7	2.6	8	19.4	1009	8%	81	19.4	77.7	105	95%	10.5
1	5:00	5:15	Tunnel	3.7	2.6	10	15.4	1206	8%	96	15.4	61.5	99	95%	9.6
1	5:15	5:30	Tunnel	3.7	2.6	14	11.0	1229	8%	98	11.0	44.1	72	95%	9.5
1	5:30	5:45	Tunnel	3.7	2.6	10	15.0	1147	8%	0	15.0	60.2	0		
2	3:45	4:00	off ramp 7thst	1.2	0.8	22	2.3	340	14%	0	2.3	9.0	0		
2	4:00	4:15	off ramp 7thst	1.2	0.8	21	2.4	341	14%	48	2.4	9.8	8	95%	13.1
2	4:15	4:30	off ramp 7thst	1.2	0.8	18	2.8	362	14%	51	2.8	11.1	9	95%	12.7
2	4:30	4:45	off ramp 7thst	1.2	0.8	12	4.2	359	14%	50	4.2	17.0	14	95%	12.7
2	4:45	5:00	off ramp 7thst	1.2	0.8	8	6.3	388	14%	54	6.3	25.2	23	95%	12.5
2	5:00	5:15	off ramp 7thst	1.2	0.8	10	5.0	378	14%	53	5.0	19.9	18	95%	12.5
2	5:15	5:30	off ramp 7thst	1.2	0.8	14	3.6	369	14%	52	3.6	14.3	12	95%	12.5
2	5:30	5:45	off ramp 7thst	1.2	0.8	10	4.9	398	14%	0	4.9	19.5	0		
3	3:45	4:00	on ramp 7thave	0.9	0.6	22	1.7	305	14%	0	1.7	6.8	0	95%	
3	4:00	4:15	on ramp 7thave	0.9	0.6	21	1.8	322	14%	45	1.8	7.3	5	95%	13.6
3	4:15	4:30	on ramp 7thave	0.9	0.6	18	2.1	352	14%	49	2.1	8.3	7	95%	13.0
3	4:30	4:45	on ramp 7thave	0.9	0.6	12	3.2	337	14%	47	3.2	12.7	10	95%	13.3
3	4:45	5:00	on ramp 7thave	0.9	0.6	8	4.7	325	14%	46	4.7	18.9	14	95%	13.3
3	5:00	5:15	on ramp 7thave	0.9	0.6	10	3.7	335	14%	47	3.7	15.0	12	95%	13.3
3	5:15	5:30	on ramp 7thave	0.9	0.6	14	2.7	334	14%	47	2.7	10.7	8	95%	13.3
3	5:30	5:45	on ramp 7thave	0.9	0.6	10	3.7	321	14%	0	3.7	14.6	0		

A tool was developed to decide sampling rate for each AL by time interval that would optimize confidence levels without exceeding the overall labor budget.

Simultaneous traffic volume/speed data in this area known.

In this case, an average sample rate of 10% would meet a goal of 95% confidence level with 10% margin of error.

Phase 2 - Summary on Vehicle Tracing

Vehicle Sampling

Vehicle matching at two sides of tunnel (for tunnel ALs);

Samples evenly pulled from each lane

Samples selected according to vehicle type percentage: largely PC and SUV, also pickup, medium truck and heavy truck

Avoid bus, RV and motorcycle

Traced Vehicle Composition:

Vehicle Color	Percentage
Biege	2%
Black	1%
Blue	4%
Gray	2%
Green	2%
Orange	1%
Red	11%
Silver	6%
White	67%
Yellow	4%

Vehicle Type	Percentage
Heavy Truck	5%
Light Truck/Pick-up	12%
Medium Truck	5%
PC	65%
SUV	12%
Commercial Van	1%

Vehicle Tracing

Backward or forward tracing

95% success rate

White cars frequently seen, but not always easy to trace (due to platooning)

Trace (from easy to hard):

<< Heavy truck, medium truck
 << yellow green white car
 << blue red car
 << black gray car

Tracing time = 3.5 x actual travel time

Data such as O-D, travel time, and lane change frequency are obtained

Phase 3 – Bottleneck Study Visualization and Micro-simulation

- Build visualization tools to summarize phase 1 and phase 2 work
- A visual analytic tool to present bottleneck information on:
 - congestion measures, travel patterns, trending, and congestion causes.

<http://bottleneckstudy.azmag.gov/>
(web demo)

Phase 3 – Bottleneck Study Visualization and Micro-simulation

- Fully calibrated with vehicle trajectory data from the field.



Future Work

- Keep updating the website on regular basis.
- Develop new components:
 - Reliability measures
 - Truck/freight measures
 - Arterial bottleneck measures
 - Economic impact measures
 - New visualization tools

Questions and Comments



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 - Shuyao Hong (shong@azmag.gov)

- Contacts of consultant teams:



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- Shawn Turner (shawn-turner@tamu.edu)

