

Non-Response Bias in the GSA Carbon Footprint Tool Commuter Survey

Introduction

The GSA Carbon Footprint Tool Commuter Survey has been designed by experts to obtain the most accurate estimates possible for mileage travelled by commuters at government agencies. The questions were developed by the Department of Transportation's Volpe Center to help agencies satisfy the requirements of Executive Order 13514 Section 10; for many agencies, the GSA Carbon Footprint Tool facilitates the process of deploying the survey via email, collecting results, and generating the numbers which must be reported in the Department of Energy (DOE) Federal Energy Management Program (FEMP) Annual Greenhouse Gas and Sustainability Data Report (commonly known as the DOE FEMP workbook).¹ The Commuter Survey relies on the guidance of the Volpe Center's precedents for various assumptions used when analyzing survey response data. These assumptions were developed using guidance from the E.O. 13514 Section 9 working group and were approved by the White House Council on Environmental Quality (CEQ).² This paper discusses the particular assumption that low-emission commuters are more likely than others to respond to the survey. Why is this assumed? Is it a reasonable assumption? How does it affect results, relative to alternate assumptions?

Sampling and Survey Bias

When deploying the Commuter Survey, agencies are provided with two options: send the survey to every single employee, or send it to a randomly-selected statistically-significant sample and extrapolate those results to the entire agency. The statistical concept of sampling relies on two factors: the sample must be randomly selected and representative of the overall population. Selecting a random sample of

¹ The full list of questions, with wording and format preserved, is located in Appendix B.

² A full list of Commuter Survey Assumptions can be found in Appendix C.

the population to survey is straightforward, and in a homogeneous population, randomness and representativeness go hand in hand. To handle heterogeneous populations with distinct groups, some polls use *stratification*, a method where the population is divided into segments and then a sample is randomly selected from each. When requested, the Commuter Survey can be deployed with stratified sampling which samples an agency by bureau (or other components). This ensures that an agency has a large enough sample size to draw conclusions about each of its components.

One of the major issues that any pollster faces is bias: any attribute of the survey which causes the results to be non-random or non-representative of the population. Bias comes in many forms and may throw serious doubt onto the validity of survey data. For example, survey questions themselves can be biased due to imprecise wording, leading questions, or even formatting.³ To ensure valid outcomes, surveys should be written by experienced professionals with the skill required to avoid introducing questionnaire bias. The Commuter Survey was developed by a behavioral psychologist at the DoT Volpe Center; the wording of each question was tested with focus groups and iteratively refined for clarity.

Another common problem is selection bias—“Systematic error due to differences between those selected for a study and those not selected.”⁴ For example, a public opinion poll conducted over the phone systematically ignores segments of people without listed home phone numbers, such as young people or the homeless. Telephone polls suffers from a specific type of selection bias called sampling bias: they may provide accurate statistics for the sample—*American adults with listed home phone numbers*—but those statistics may not be sufficient to make claims about the overall population—*Americans* or *American voters*. The Commuter Survey is sent directly to an entire agency or representative sample via email, a tool shared by all agency employees. No selection bias is introduced by the recipient list. However, not all recipients necessarily take the time to fill out the survey. If the

³ Choi, Bernard C.K, Pak, Anita W.P. “A Catalog of Biases in Questionnaires” *Preventing Chronic Disease* Jan. 2005; 2(1): A13. Published online 2004 December 15. Accessed 17 Jul 2014.

⁴ “Selection Bias” *OxfordReference.com*. Oxford UP, 2014. Web. 17 Jul 2014

segment of the population which responds to the survey has different attributes from the segment which does not respond, the survey results may be affected by *non-response bias*, the chief topic of this paper.

Handling Non-Respondents

If the survey response rate were 100%, the mileage from the Commuter Survey questions could be summed to give the input for the FEMP Annual Greenhouse Gas and Sustainability Data Report.

However, as shown in Table 1, the response rate is closer to 50%, so the commuting information for the rest of the population must be inferred, one way or another.

Survey	GSA 2010	GSA 2012
Agency Population	12486	12310
Survey Recipients	12477	12267
Survey Respondents	7034	6868
Survey Non-Respondents	5443	5399
Response Rate	56.4%	56.0%

Table 1. Response Rates for GSA Commuter Surveys

The most straightforward method for filling in non-response data is direct extrapolation—multiply the average mileage for each respondent by the total number of non-respondents. This method treats each non-responder as an average responder, and therefore makes an implicit claim that an agency employee’s likelihood of answering the survey is independent of her commuting mileage. However experts at the Volpe Center determined that commuters with “green” habits such as walking, biking, or taking public transit, are more likely to respond to a survey about commuting. If this claim is true, then non-response bias is a concern that must be addressed.

Instead of treating non-respondents as average commuters, the CFT Commuter Survey treats them as average “non-green” commuters. For instance, the average POV-car (personal occupancy vehicle) respondent in the GSA 2012 survey commuted 29.55 miles, so the survey treats the 5,399 non-respondents as if they had responded, answered POV-car, and entered an average of 29.55 miles for

their daily roundtrip commute. This method is intended to account for non-response bias without unduly punishing agencies with low response rates; the next section examines the magnitude of the effects on the GSA reported emissions.

Analysis of Alternatives

GSA survey data from 2010 and 2012 was analyzed to determine the Commuter GHG emissions under each of two assumptions. The results are shown in Table 2, with supporting calculations in Appendix A.

	GSA 2010	GSA 2012
Agency-Wide GHG Emissions, MT CO ₂ e Assume non-respondents drove a POV car an average number of miles	34,752.2	29,696.8
Agency-Wide GHG Emissions, MT CO ₂ e Assume Average of Responders' Commutes	34,151.7	28,247.8
Absolute Difference, MT CO ₂ e	600.5	1,359.0
Percent Difference	1.74%	4.70%

Table 2. Quantitative effect of switching assumptions for both years of GSA survey data

The difference in emissions calculated using each assumption is noticeable but not overwhelming, with a larger difference in 2012. There are many factors that could affect the magnitude of difference; in this case, further analysis identified two factors which appear to have caused the higher difference in 2012: longer average commute distance and lower response rate. The response rate was only lower by about half a percent, but that does mean that data for a few hundred extra employees were inferred by extrapolation. As for commuting distance, 2010 employees who drove POV cars drove about 17% further; that alone would actually make the assumption matter more, because each non-respondents is being treated as if he drove further. However, the 2010 average mileage for low-emissions commuting (rail, bus, carpool, etc.) was 20% higher and so contributed relatively more emissions, mitigating the disparity between the POV car assumption and the average assumption.

A final and very important factor that may affect how the assumptions play out is the mix of transit options taken by respondents. This effect does not show itself in the GSA data because the 2010 and 2012 breakdown is nearly identical, but could be more prominent when comparing across agencies.

For instance, an agency which is highly concentrated in an urban setting is more likely to have a high percentage of low-emission commuting- walking, biking, and mass transit. For such an agency, assuming that non-respondents drove PoV cars instead of an average mix of transit is going to have a large effect on emissions. That fact alone doesn't recommend one method over the other—nonresponse bias is still likely to occur—but it does mean that the ramifications for that agency's GHG reporting are greater. Interestingly, the inverse is also true. In rural locations, employees are considerably more likely to drive POVs to work, meaning that assuming everyone drove a POV vs. assuming the average case is essentially the same. In fact, POV truck mileage counts for nearly 1.5 as much emissions in the FEMP workbook as POV car mileage; an agency with a lot of trucks in the mix can have *slightly lower* emissions reported when the POV car assumption is applied.

Conclusions

The assumptions used to account for nonresponse bias in GSA's CFT Commuter Survey were determined by experts and have a modest effect on reported emissions. The methodology is, if not perfect, defensible and approved by appropriate government entities; there is also some advantage to maintaining a consistent methodology so that previous and future numbers may be compared apples to apples. That being said, the Commuter Survey's only agenda is helping agencies report the most accurate numbers possible. The team welcomes and appreciates feedback and ideas for improvement, on this and any other aspect of the Commuter Survey.

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Appendix A: Example Calculations

This table demonstrates how calculations were performed under each of the following assumptions: all non-respondents behaved as average commuters, and all non-respondents behaved as average POV car commuters.

For the first case, respondent mileage is simply multiplied by 5443/7034 to find non-respondent mileage. For the second case, POV car mileage for non-respondents is assumed to be 5443 * 33.0285 (the average distance driven by POV car commuters in the 2010 GSA commuter survey), and all other methods are assumed to be 0.

To calculate GHG emissions in MT CO₂e, the 2010 DoE FEMP Workbook numbers for Global Warming Potential for CO₂, N₂O, and CH₄ were multiplied by the Emission Factors by each commuting method to generate a single GHG factor. You could also arrive at these numbers by plugging in the “Total Mileage Reported” numbers into Sheet 3.16 SCOPE_3_Commuter_Travel of a 2010 FEMP Workbook.

Example calculations are shown for the first row. The same methods were applied to each other row, as well as the 2012 data, to arrive at the results summarized in Table 2.

Respondent Data		Assume Non-Respondents are Average Commuters			Assume Non-Respondents are Average POV Car Commuters		
DoE FEMP Commuting Category	Mileage of 7034 Respondents	Mileage assumed for 5443 Non-respondents	Total Mileage Reported	GHG Emissions Reported (MT CO ₂ e)	Mileage assumed for 5443 Non-respondents	Total Mileage Reported	GHG Emissions Reported (MT CO ₂ e)
POV Passenger Car	117,766	117,766 * (5443/7034) = 91,129	117,766 + 91,129 = 208,895	208,895 * 0.08615133 = 17,997	33.0285 * 5443 = 179,774	117,766 + 179,774 = 297,540	297,540 * 0.08615133 = 25,633
POV SUV or Truck (Gasoline)	24,414	18,892	43,306	5,322	-	24,414	3,000
POV SUV or Truck (Diesel)	1,562	1,209	2,771	358	-	1,562	202
Motorcycle	2,054	1,590	3,644	143	-	2,054	81
Car Pool	24,042	18,604	42,645	1,837	-	24,042	1,036
Van Pool	14,678	11,358	26,036	800	-	14,678	451
Bus	36,703	28,401	65,104	1,605	-	36,703	905
Metro / Transit Rail	44,478	34,417	78,895	2,971	-	44,478	1,675
Commuter Rail	41,222	31,898	73,121	2,899	-	41,222	1,634
Intercity Rail	2,604	2,015	4,620	197	-	2,604	111
Walking and/or Bicycling	1,634	1,264	2,898	-	-	1,634	-
Other	2,125	1,645	3,770	-	-	2,125	-
Total	313,282	242,422	555,704	34,127	179,774	493,056	34,727

Table 3. Extrapolation methods applied to GSA 2010 data

Appendix B: Commuter Survey Questions

GSA/Volpe Advanced Methodology Commuter Survey: Intro Page



GSA Carbon Footprint Tool

Welcome to the Employee Survey

This employee commuter survey was developed through a collaboration between GSA and the Department of Transportation's Volpe Center. This survey collects employee commuting data for your organization in order to calculate indirect emissions from employee commuting. The results of this survey will allow your organization to analyze cause and effect relationships of different commuting scenarios.

The employee survey supports browsers Internet Explorer 7 and Mozilla Firefox 3 and above.

Enter your survey code here to begin:

Start

GSA/Volpe Advanced Methodology Commuter Survey: Page 1 (Q1-Q3)



Page 1 of 9 - Operating Administration & Workplace Information

1. Please select your operating administration or office:

Please enter your organization code or other office identification code used by your agency. If you are not sure what to enter in this field, please leave it blank.

2. What is the five-digit zip code at your primary duty station? (e.g., 20590, 02142)

3. What is your employment status?

- Federal Government Employee
- Federal Government on-site Contractor
- Other (e.g., contractor not working within a Federally operated building)

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GSA/Volpe Advanced Methodology Commuter Survey: Page 2 (Q4-Q6)



Page 2 of 9 - Commuting Methods of Transportation

4. How did you travel TO WORK each day during a TYPICAL week? If you select "N/A" for transportation method, select "N/A" for # Miles.

	1st Method of Transportation	# Miles	2nd Method of Transportation (optional)	# Miles	3rd Method of Transportation (optional)	# Miles
Monday	Car (drove alone) <input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Tuesday	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Wednesday	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Thursday	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Friday	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

If "other" selected, please indicate method of transportation:

5. What is the average total number of people in the Carpool/Vanpool you selected above, including yourself? (Select "N/A" if not applicable.)

6. Did you use the same method(s) of transportation indicated above to commute FROM WORK at the end of your workdays? (If you answer "Yes", you will skip the next section. This may conclude your survey.)

- Yes
- No

GSA/Volpe Advanced Methodology Commuter Survey: Page 3 (Q7-Q8)

Page 3 of 9 - Commuting Methods of Transportation continued

7. How did you travel FROM WORK each day during a TYPICAL week? If you select "N/A" for transportation method, select "N/A" for # Miles.

	1st Method of Transportation	# Miles	2nd Method of Transportation (optional)	# Miles	3rd Method of Transportation (optional)	# Miles
Monday	Car (drove alone) <input type="text"/>	N/A <input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Tuesday	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Wednesday	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Thursday	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Friday	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

If "other" selected, please indicate method of transportation:

8. What is the average total number of people in the Carpool/Vanpool you selected above, including yourself? (Select "N/A" if not applicable.)

GSA/Volpe Advanced Methodology Commuter Survey: Page 4 (Q9-Q12)



Page 4 of 9 - Additional Questions Page 1

9. Thinking about last year, what would you say is your PRIMARY commuting method?

- Car (drove alone)
- Truck/SUV/Van (drove alone)
- Motorcycle
- Carpool/Vanpool
- Bicycle
- Walk
- Transit bus
- Transit rail (e.g. subway)
- Commuter rail (e.g. regional)
- Intercity rail (e.g. Amtrak)
- Other (e.g. telework full-time)

If "other" selected, please indicate commuting method:

10. How often do you typically spend a full workday teleworking?

- Five times a week
- Four times a week
- Three times a week
- Twice a week
- Once a week
- Once or twice a month
- Less than once a month
- I did not telework because I must be physically present on the job (e.g., Law Enforcement)
- I did not telework because I have technical issues (e.g., connectivity problems) that prevented me from teleworking
- I did not telework because I was not allowed to, even though I have the kind of job where I can telework
- I did not telework because I chose not to telework

11. Think about how you felt during your commute over the TYPICAL WEEK. How much did you feel the following while commuting?

Relaxed	<input checked="" type="radio"/> Not at all	<input type="radio"/> Slightly	<input type="radio"/> Moderately	<input type="radio"/> Very	<input type="radio"/> Extremely	<input type="radio"/> N/A
Annoyed	<input type="radio"/> Not at all	<input checked="" type="radio"/> Slightly	<input type="radio"/> Moderately	<input type="radio"/> Very	<input type="radio"/> Extremely	<input type="radio"/> N/A
Tense	<input type="radio"/> Not at all	<input type="radio"/> Slightly	<input checked="" type="radio"/> Moderately	<input type="radio"/> Very	<input type="radio"/> Extremely	<input type="radio"/> N/A
Angry	<input type="radio"/> Not at all	<input type="radio"/> Slightly	<input type="radio"/> Moderately	<input checked="" type="radio"/> Very	<input type="radio"/> Extremely	<input type="radio"/> N/A
Calm	<input type="radio"/> Not at all	<input type="radio"/> Slightly	<input type="radio"/> Moderately	<input type="radio"/> Very	<input checked="" type="radio"/> Extremely	<input type="radio"/> N/A
Stressed	<input type="radio"/> Not at all	<input type="radio"/> Slightly	<input type="radio"/> Moderately	<input type="radio"/> Very	<input type="radio"/> Extremely	<input checked="" type="radio"/> N/A

12. What time did you ARRIVE at and LEAVE work each day during a TYPICAL WEEK?

	ARRIVE AT WORK	LEAVE WORK
Monday	Before 6:00AM	Before 3:00PM
Tuesday	N/A	N/A
Wednesday	N/A	N/A
Thursday	N/A	N/A
Friday	N/A	N/A

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GSA/Volpe Advanced Methodology Commuter Survey: Page 5 (Q13-Q16)

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13. Please estimate your commute time TO WORK under the following conditions: (Full-time teleworkers, enter 0.)

Minutes commuting TO WORK on a GOOD day?

minutes

Minutes commuting TO WORK on an AVERAGE day?

minutes

Minutes commuting TO WORK on a BAD day?

minutes

14. Please estimate your commute time TO HOME under the following conditions: (Full-time teleworkers, enter 0.)

Minutes commuting TO HOME on a GOOD day?

minutes

Minutes commuting TO HOME on an AVERAGE day?

minutes

Minutes commuting TO HOME on a BAD day?

minutes

15. What would you consider to be a REASONABLE number of minutes to spend commuting one-way on a regular basis?

minutes

16. What is the MAXIMUM number of minutes you would be willing to spend commuting one-way on a regular basis?

minutes

GSA/Volpe Advanced Methodology Commuter Survey: Page 6 (Q17-Q20)



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17. Overall, how satisfied are you with the following?

- Your commute to work Very dissatisfied Somewhat dissatisfied Neither satisfied nor dissatisfied Somewhat satisfied Very satisfied N/A
- Your commute to home Very dissatisfied Somewhat dissatisfied Neither satisfied nor dissatisfied Somewhat satisfied Very satisfied N/A
- Your agency's telework program Very dissatisfied Somewhat dissatisfied Neither satisfied nor dissatisfied Somewhat satisfied Very satisfied N/A
- Your agency's alternative work schedule (AWS) program Very dissatisfied Somewhat dissatisfied Neither satisfied nor dissatisfied Somewhat satisfied Very satisfied N/A

18. Would you consider commuting to work using the following forms of transportation?

- Carpool or vanpool Already using this mode Yes, I would consider it I might consider it No, I would not consider it Not applicable to me
- Public transit bus Already using this mode Yes, I would consider it I might consider it No, I would not consider it Not applicable to me
- Public transit rail Already using this mode Yes, I would consider it I might consider it No, I would not consider it Not applicable to me
- Commuter rail Already using this mode Yes, I would consider it I might consider it No, I would not consider it Not applicable to me
- Walk Already using this mode Yes, I would consider it I might consider it No, I would not consider it Not applicable to me
- Bicycle Already using this mode Yes, I would consider it I might consider it No, I would not consider it Not applicable to me

19. Do you use any of the following commuting and work scheduling options that may be offered by your employer?

- Flexible work hours (Flextime) Use Do Not Use Not Offered at Worksite
- Compressed work week (AWS) Use Do Not Use Not Offered at Worksite
- Transit benefit program Use Do Not Use Not Offered at Worksite
- Emergency ride home program Use Do Not Use Not Offered at Worksite
- Parking benefit Use Do Not Use Not Offered at Worksite
- Preferred parking for carpools/vanpools Use Do Not Use Not Offered at Worksite
- Electric vehicle charging station Use Do Not Use Not Offered at Worksite
- Bike commuter benefit program Use Do Not Use Not Offered at Worksite
- Covered and secure bike storage Use Do Not Use Not Offered at Worksite
- Showers for walkers and bikers Use Do Not Use Not Offered at Worksite

20. What is the 5-digit zip code where you live? (e.g. 02134, 02142)

GSA/Volpe Advanced Methodology Commuter Survey: Page 7 (Q21-Q24)

 **GSA Carbon Footprint Tool**

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21. On average, how many hours do you work per week?

22. What is your age? (please select appropriate range)

23. What is your gender?
 Male
 Female

24. How many years have you worked for this agency? (please select appropriate range)

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GSA/Volpe Advanced Methodology Commuter Survey: Page 8 (Q25-Q28)

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25. How many years have you lived at your current residence? (please select appropriate range)

6-10 years

26. What is the estimated distance between your home and the nearest public transit station or bus stop?

- Less than 0.25 mile
- 0.25 to 0.5 mile
- 0.5 to 1 mile
- 1 mile to 1.5 miles
- 1.5 miles to 2 miles
- More than 2 miles
- Don't know or not sure

27. Specify the type of vehicle you drive to work (including a vehicle you use in a carpool/vanpool). Select "N/A" if not applicable.

YEAR MAKE VEHICLE FUEL TYPE

Vehicle Type

Please type the model of your vehicle (optional)

28. Is there any information you would like to add about your commute that was not addressed in this survey?

GSA/Volpe Advanced Methodology Commuter Survey: Page 9 (Q29-Q31)



Page 9 of 9 - Final Page: Click FINISH to Submit Responses

29. Were the survey questions clear?

- Yes. I understood all of the questions without any problems.
- Yes, but a few of the questions were confusing.
- No.

30. Did you experience any technical problems while taking this survey?

- Survey site was slow to load some/all questions
- I was unable to connect to the survey on my first try
- My survey link did not work
- I had another technical problem not addressed here
- I did not have any technical problems

31. How was your overall experience with this survey?

- Favorable. I did not experience any problems.
- Neutral. I had a few problems with the survey, but no major problems.
- Unfavorable. I had significant problems with the survey.

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Finish

Appendix C: Commuter Survey Calculations and Assumptions

Assumptions:

Question #4/#7 Assumptions:

- When user selects “<1” for “# Miles”, the calculations assume 0 miles.
- When user selects “201+” for “# Miles”, the calculations assume 201 miles.
- When user selects “N/A” for “# Miles”, the calculations assume 0 miles.

Question #5/#8 Assumptions:

- When user selects “14+” for total number of people in Carpool/Vanpool, the calculations assume 14.
- Based on the user’s selection for Question #5, the calculations make the following adjustments:
 - If user selects “N/A” people, the calculations change all “Carpool/Vanpool” selections from Question #4 to be “Car (Drove alone)”.
 - If user selects “2” or “3” people, the calculations change all “Carpool/Vanpool” selections from Question #4 to be “Carpool”.
 - If user selects “4” people (or more), the calculations change all “Carpool/Vanpool” selections from Question #4 to be “Vanpool”.
- Based on the user’s selection for Question #8, the calculations make the following adjustments:
 - If user selects “N/A” people, the calculations change all “Carpool/Vanpool” selections from Question #7 to be “Car (Drove alone)”.
 - If user selects “2” or “3” people, the calculations change all “Carpool/Vanpool” selections from Question #7 to be “Carpool”.
 - If user selects “4” people (or more), the calculations change all “Carpool/Vanpool” selections from Question #7 to be “Vanpool”.

Question #6 Assumptions:

- When user selects “Yes” to using the same method of transportation to get to/from work, the calculations assume the same method of transportation and the same mileage were used to go from work to home as the options that were selected in Question #4. (In other words, the mileage selected in Question #4 for each commute type is doubled.)

Assumptions for “Primary Commute Method”

- To determine the “primary commute method”:
 - Add up the number of times each commute method was selected in Question #4 (and Question #7, if applicable).
 - If one commute method is selected the most number of times, it is that user’s “primary commute method”.
 - If multiple commute methods tie for the most selected and “Car (Drove alone)” is one of the options, then “Car (Drove alone)” is assumed to be the “primary commute method”.
 - If multiple commute methods tie for the most selected and “Car (Drove alone)” is not one of the options, then the first item in the ordered list is assumed to be the “primary commute method”.

Calculations for Respondents

- If a user receives the survey and completes it, s/he is a “respondent”.
- For each respondent, determine the “primary commute method” (*See Assumptions for “Primary Commute Method”*).
- For each commute method for respondent, add up the total number of miles commuted via that method of transportation. (*NOTE: Be sure to include all Assumptions noted above to accurately account for number of miles adjustments, Carpool/Vanpool adjustments, and doubling mileage if necessary based on the answer to Question #6.*)
- For each respondent and each method of transportation, divide the total miles by 5 to calculate the daily mileage for each commute method for each of the respondents.
- Add together the daily mileage for each commute method for each respondent. This will result in the total daily mileage for each commute method for all respondents.

Calculations for Non-respondents

- If a user receives the survey but does not complete it, s/he is a “non-respondent”.
- Due to self-selection bias (i.e. “green” commuters are more likely to complete the survey than those who drive alone), all non-respondents are assumed to:
 - Drive alone as “Car (Drove alone)” commuters; and
 - Commute the average “Car (Drove alone)” distance of all individuals who for whom “Car (Drove alone)” is the “primary commute method”.
- Multiply the number of non-respondents by the average “primary commute method Car (Drove alone)” respondent’s mileage to calculate the total non-respondent “Car (Drove alone)” mileage.
- Divide the total miles by 5 to calculate the total daily “Car (Drove alone)” miles driven by all non-respondents.

Calculations for Extrapolation

- Add together the respondent and non-respondent total daily miles for each of the commute methods.
- Divide the population size (the total number of people in the agency) by the sample size (respondents + non-respondents) to determine the extrapolation factor.

- For each of the total daily mileage values for each of the commute methods, multiply the value by the extrapolation factor to arrive at the total number of miles driven by each commute method in the entire population.
- The resulting mileage will match the inputs required in the DOE FEMP workbooks.