CAMBRIDGE SYSTEMATICS

NCFRP 20 - Developing Subnational Commodity Flow Databases Subtask Report

Subtask Report - Demonstration of Application of Establishment Survey

subtask

report

prepared for

National Cooperative Freight Research Program

prepared by

Cambridge Systematics, Inc.

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NCFRP 20 - Developing Subnational Commodity Flow Databases: Task 4 Report

Demonstration of Application of Establishment Survey

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1.0 Introduction and Description of Survey Design

This report describes the results of a pilot survey demonstration (conducted as Task 4 of NCFRP 20) that can be used to support the development of subnational commodity flow databases. The specific objective of the survey was to demonstrate and test a procedure for estimating the value, tonnage and amount of goods received or shipped, as well as origin and destination of shipments. This document describes the survey design process, the survey implementation, and the lessons learned from the survey that can be used to design and implement future surveys to develop subnational commodity flow databases.

The survey locations were the Seattle metropolitan region and the Spokane metropolitan region. These regions were selected due to their differences in size, differences in their economic structures, and proximity to the data collectors. In the Seattle region, the industries surveyed were the apparel industry and the transportation equipment industry. In the Spokane region, the industries surveyed were food manufacturing and fabricated metal products. InfoUSA and Dun & Bradstreet (D&B) business establishment data were utilized to identify specific companies to survey.

The survey was conducted in two steps. In Phase I, a first set of companies was interviewed in person to collect some general information on shipments and receive feedback on the survey instrument. For the broader sample in Phase II, telephone interviews were used. The surveys were conducted by faculty and students at Washington State University.

This report is structured as follows:

- Chapter 1 – Introduction and Description of Survey Design
- Chapter 2 – Analysis of Process for Identifying Interviewees
- Chapter 3 – Analysis of In-Person Interviews (Phase I)
- Chapter 4 – Analysis of Phone Surveys (Phase II)
- Chapter 5 –Implications for Developing Subnational Commodity Flow Surveys
- Appendix A – Survey Design process
- Appendix B – Generalized Survey Instrument
- Appendix C – Industry-Specific Survey Instruments

1.1 OVERVIEW OF LOCAL SURVEYS FOR SUBNATIONAL COMMODITY FLOW DATA

Throughout this report, we will describe procedures for conducting local establishment surveys to obtain subnational commodity flow data and we will use the pilot survey conducted in Task 4 as an example of the procedures. In subsequent tasks, this will form the basis for the guidebook of procedures for conducting local surveys by providing in-practice examples of how to conduct a similar survey. So this report has two purposes that overlap – 1) to describe the pilot test as a test – that is, what worked and what didn't and what lessons can be learned for the future and 2) to describe the pilot test as a demonstration of procedures that can be replicated by others.

As noted in the Task 3 tech memo, local commodity flow surveys can add much to the development of subnational commodity flow databases but they also have their limitations. To some degree, these limitations are due to the fact that getting a high level of commodity and geographic detail from a survey will generally require a large survey effort that will be costly and may be beyond the means of many state DOTs and MPOs. In addition, as will be shown in the results of the pilot test survey conducted for Task 4, getting a high level of geographic detail on origins and destinations of the flows in a survey at the local level is very difficult and may not be worth the effort. Therefore, the survey design that was implemented in Task 4 is anticipated to be used for the following broad applications:

- Developing county-level detail supporting state-level commodity flow databases, models and studies and developing county or city-level detail for higher level studies of freight flows in regional studies (and, when combined with disaggregation techniques, support for modeling commodity flows at the MPO level with greater accuracy than could be obtained by disaggregating national commodity flow databases directly).
- Providing improved data for industries that are locally significant (large flows or large contributions to the local economy) or for conducting focused commodity/industry studies.

In developing the survey design, we attempted to replicate many elements of the Bureau of Transportation Statistics Commodity Flow Survey (CFS) as a model of an establishment survey. However, as will be described throughout the report, the survey design ultimately deviated from the design of the CFS in several ways that will be described in this report:

- Respondents were asked about both inbound and outbound shipments
- Respondents were asked to provide estimates of shipping activity for a specified period of time rather than to provide information about individual shipments.

- Respondents were asked about seasonal variations in shipping behavior in a single interview rather than being surveyed multiple times during the year (this is a feature that could be altered in actual practice. It was not practical to conduct seasonal surveys as part of this test.).
- The survey was structured to start with questions about information that is most likely to be easily available and then move to more challenging questions giving the respondents the options of answering questions with more or less detail than was ultimately desired. This allowed for the collection of "partial" information and thus increased response rates.

Each of these features of the pilot survey and its application to future practice is described in more detail throughout this report.

1.1.1 Choosing the Appropriate Level of Geographic Detail and Geographic Coverage for the Pilot Test

There are two considerations in describing the level of geographic detail in a local commodity flow survey: 1) geographic stratification of the sample and 2) the level of geography at which origins and destinations are reported. In general, we recommend that both states and MPOs consider designing their sampling strategies to ensure adequate coverage at the county level but attempt to obtain data at a more disaggregate level of geographic detail. The geographic stratification of the sample can be accomplished prior to sampling to ensure adequate coverage of all counties or after the survey has been conducted. Expansion of the data should be accomplished county by county, as described later in this report.

In terms of the level of geography at which origins and destinations are reported, the pilot test determined that while it is generally possible to achieve reasonable results for data reported at the city level, getting a greater level of geographic detail is far more difficult and may not be possible with the types of surveys that can be accomplished by most states and MPOs.

For many applications of subnational commodity flow data at the state level and even several at the MPO level, county-level detail is very useful. Having control totals for movements to/from an MPO region (particularly those that are rolled up into "Rest of State" totals in the CFS or FHWA Freight Analysis Framework national commodity flow databases) or county (within an MPO region) would be a big step up in terms of the quality of local data that would be available for key commodities in a region as compared to estimates that are obtained by disaggregating national data. With these control totals, it may subsequently be possible to disaggregate the commodity flows to smaller zones using more conventional techniques, assign flows using network models, and then calibrate the network flows to vehicle counts. There are techniques to conduct this validation for both truck and rail flows. Since air and water flows typically

involve longer distance movements and have more limited origins and destinations (e.g., at marine and air ports), county level origin-destination information should be sufficient for these modal flows.

The research team understands that any disaggregation technique that relies on indicator variables such as industry employment will introduce error in the estimation of flows. Locally collected establishment surveys allow for the creation of control totals for smaller areas than are covered in the national data sets. Using these smaller areas as the starting point for disaggregation will significantly reduce the errors used by indicator variables such as industry employment when applied to county or city-level data to get to more disaggregate geographies.

The other factor to consider when selecting the geography for sampling purposes is that geography becomes one dimension of a sampling matrix. The more geographic zones there are from a sampling perspective, the larger the number of cells that will need to be filled, and the more surveys that will need to be collected. Since geographic stratification of a sample is not likely to reduce the variance in the parameter to be estimated (e.g., the value of shipments or the tonnage of shipments), very geographically disaggregate sampling will increase sample size requirements significantly. It should be noted that not all geographic zones will have shipments for all commodities and this can be taken into account in allocating samples. Data from either the sampling frame or from sources such as County Business can be used to determine if there are likely to be shipments to or from a county, city, or zip code geographic zone that will need to be sampled depending on the level of geographic stratification of the sample. All of these factors suggest that city or county disaggregation is an appropriate level of detail for a local commodity flow survey

As noted previously, the two locations selected for conducting the pilot-scale test survey were:

- The Puget Sound Regional Council (PSRC) region (Seattle, Washington), and
- The Spokane, WA metropolitan region.

These two regions were selected because:

- It allowed us to demonstrate procedures for both large and small metropolitan regions.
- It allowed us to demonstrate procedures for very different freight-related economies. Seattle has a diversified freight-related economy that includes a major container port. Spokane has a much less diverse economy.
- The survey was conducted by students at Washington State University and managed by two professors at Washington State University with extensive research experience in each region. Therefore, these metropolitan regions were more familiar to the research team than ones that are located further away. This will in some ways be similar to the experience of state DOTs and

MPOs that have general familiarity with their local economies and are interested in understanding more details about the freight flows of various industry sectors. As described in the Task 3 tech memo, it is advantageous for the agency conducting the survey to have begun to develop relationships with major industries/shippers/carriers in their area of jurisdiction through freight advisory committees or prior year's surveys and to use these relationships to conduct the type of Phase I in-person interviews that were incorporated as part of the pilot-scale test survey described in this memo.

1.1.2 Industry Coverage

The sampling units for this establishment survey are businesses. Each business can be assigned to a specific industry, and therefore sampling is also done by industry. The final database to be developed is based on commodities. Therefore, it is important to include all of the industries that produce or ship a commodity in the sample that is developed. In most instances, this relationship is straightforward such that only a company that is in the apparel industry produces apparel. However, there are some circumstances in which commodities transcend multiple industries, and therefore all of those industries need to be included in the survey. This is particularly true of industries that provide intermediate handling of a commodity prior to shipping it to an ultimate consumer.

When a survey such as this is implemented in practice, the agency may be interested in focusing the survey on particular industries or commodities that are significant in the local area. This might be done as part of a study of the shipment characteristics of particularly significant industries/commodities. It might also be done to generate data for the commodities shipped by the selected industries in a more comprehensive state/regional commodity flow database that are more accurate than might be obtained through disaggregation of national data sets or through the use of other sources of local data. In a case where the survey will focus on a specific set of important industries or commodities, the procedures that were used to select industries in the pilot-scale test survey may be useful.

The industries for the pilot-scale test were selected based on two primary criteria:

1. the importance of an industry to each region's economy and
2. the need to demonstrate commodity shipment patterns that are expected to be important to regional economies but that may not be well captured in the national data sets.

This second criterion led us to select certain industries that were involved in retail trade and/or involved with international imports of particular commodities that were important to their supply chain. Retail goods are clearly an important element of commodity flows in most metropolitan areas and their flows into and within urban areas is likely not fully captured in the CFS. In addition an increasing amount of consumer products are produced overseas and

this makes up an important commodity flow path in regions with international ports of entry. Since import flows are not captured in the CFS, it would be valuable to demonstrate how at least one example of a major import commodity would be captured in a local survey.

In order to select industries for the pilot-scale test, the consultant team examined data from U.S. Census County Business Patterns to determine number of employees, annual payroll, and number of establishments by industry sector (three-digit NAICS codes were used for this analysis as reported in County Business Patterns). For the Spokane region, the intent was to select manufacturing industries in order to demonstrate the relationship between outbound commodity shipments and industries with manufacturing industry classifications. The largest manufacturing industry in the region in terms of employment and number of establishments was the fabricated metal manufacturing industry (NAICS 332). Another large industry was the food manufacturing industry (NAICS 311) and this was selected because Spokane is the largest metro area in Eastern Washington and food manufacturing in an urban area surrounded by rural agricultural regions may exhibit some unique commodity flow patterns.

For the Seattle region, the transportation equipment manufacturing industry was the largest manufacturing sector. Analysis of County Business Patterns also shows that the average size of companies in this industry sector is larger than other industries. Inbound shipments to this industry also would represent a wide variety of input commodities.

The choice of the second major industry category for the Seattle region was more complicated. In this case, the research team wanted to be able to survey industries that were involved in shipping retail goods and goods that were likely to be imported through the Port of Seattle or the Port of Tacoma. We examined data on containerized import commodities at the Port of Seattle and looked at FAF data for the Puget Sound region and determined that apparel is a major commodity through the port and also is a major consumer retail commodity for the region. Clearly, there are many different industries in the Puget Sound region that have either inbound or outbound shipments of apparel. For the purpose of the test survey, the research team focused on some of the larger industries that handle apparel, including apparel manufacturers (relatively small presence in the Puget Sound region based on County Business Patterns data), wholesalers, and retailers. When the surveys were conducted, samples were drawn to ensure that at least some of the respondents were importers.

1.1.3 Linking Industries and Commodities – Commodity Classification and Elements of Survey Design

While an industry may ship and/or receive multiple commodities, the survey test in Task 4 was focused on a small number of commodities shipped and received by the businesses sampled. It was believed prior to conducting the survey that if the commodities were pre-classified using an existing commodity

classification system, that it might be easier for the respondents to answer the questions and it would be easier to consistently code the responses. In order to provide consistency with the CFS and FAF, which might be used to provide control totals for the survey at more aggregate levels of geography, the Standard Classification of Transported Goods (SCTG) system was the preferred classification system. However, in some cases, the Standard Transportation Commodity Code (STCC) system provided a classification that it was believed better matched the primary commodities handled by the industries that were being surveyed.

- Transportation Equipment Manufacturing (Seattle) – The major commodity produced by this industry is easily classified in the SCTG system as Transportation Equipment (SCTG code 37). It was recognized that some manufacturers of transportation equipment may produce products that are classified with other commodity codes and the survey instrument was designed to allow for the collection of data on some of these other commodities.
- Apparel (Seattle) – Examining the commodity classification coding options for apparel, either the STCC classification (STCC 32, Apparel) or SCTG 304 seem to be appropriate.
- Food Manufacturing (Spokane) – The STCC classification system provides a simpler bridge of commodity classifications for the outbound shipments of this industry (STCC 20, Food, and Kindred Products).
- Fabricated Metal Products (Spokane) – The primary commodities shipped outbound by this industry can be classified as SCTG code 33, Articles of Base Metals.

In all cases, during the survey, respondents were asked if they shipped or received any of the pre-classified commodities but were also given the options to name commodities they ship and receive using their own terminology. Additional, information about this aspect of the survey design is described in the following section.

1.1.4 Survey Design

The survey design was based on an establishment survey where shippers/ receivers would be contacted to gather information about their shipments. This approach is similar to the CFS. After considering a variety of options, the research team concluded that a cost-effective approach to conducting the survey would be to do a telephone survey working from a questionnaire. The original survey design involved a two tier data collection process that is described in more detail in Chapter 2.

The survey questionnaires and the survey design also allowed for the respondent to provide information at different levels of detail. For example, if the respondent was only willing to provide county detail for origins and

destinations, this was collected, but if they were willing to provide city or zip code detail, this was collected. This required that the interviewers be well trained and preferably, somewhat familiar with how the data would be used and the general logistics practices of the industries that were being surveyed. The use of university students with a background in freight transportation and/or logistics is an obvious plus for this type of interviewing.

The survey questionnaire had four main sections:

- Background information about the company and surveyor – filled out in advance
- Size of the facility
- Outbound shipments – tonnage and value, timeframe, seasonality, modes and origins and destinations.
- Inbound shipments – tonnage and value, timeframe, seasonality, modes and origins and destination.

One major difference between this survey and the CFS is that both inbound and outbound freight flows were covered. It is necessary to survey for inbound flows in a regional or state survey because at this level of geography, a substantial fraction of total commodity flows are inbound flows and these would never be captured in a survey that only focused on outbound shipments. This is less of a problem at the national scale, where the largest fraction of flows have both an origin and a destination within the national boundaries (although, even in the case of the national CFS, import flows are not included). In order to ensure that there is no double counting, the survey procedures recommend only using the data on inbound shipments when these shipments have an origin outside of the region. Chapter 3 provides information that compares the success rates for collecting information on inbound shipments as compared to outbound shipments.

As noted in Section 1.1.3, a unique feature of the survey design used in this study was that the primary inbound and outbound commodities that were expected to be received or shipped by each industry were pre-classified and information was asked for about these commodities. Respondents also were given the opportunity to identify other commodities that they shipped or received. While the identification of outbound commodities was generally fairly straight-forward in the cases that were tested, these industries may purchase supplies that represent a broad range of different commodities. For the design of the survey, an input-output table (otherwise known as the "make-use" table of an input-output model) was used to identify the principal commodities purchased by each of the industries that were surveyed and this information was used in the survey design for outbound shipments. Thus, the questionnaires used were customized for each industry at least insofar as the naming of commodities in the inbound and outbound shipments section of the questionnaire was concerned.

Additional information about the survey and questionnaire design and how it was modified and adapted to the situations encountered in the test is described in Chapters 2 and 3.

1.1.5 Sampling

This section addresses general issues about sample design for a local commodity flow establishment survey.

As noted previously, the sampling unit for the survey is the business. Two commercial sampling frames were identified as potentially useful: InfoUSA and Dun & Bradstreet business establishment data. Chapter 2 provides more information about how these sources were used to draw samples of businesses, to stratify the sample, and to obtain certain information about the business prior to making the initial contacts. There may be other public sources for sampling frame such as business license databases, tax records, and employment security data (ES 202). Because many of these public sources contain confidential information, they may not always be available to state DOTs and MPOs.

There is always a question as to how large the sample size should be. Even in the case of the national CFS, sample size is significantly impacted by budget constraints. This was not a real issue for the pilot-scale test because it was not intended for the purpose of obtaining statistically reliable data. However, for designing a sampling strategy it is important to establish statistical criteria for the data in advance of the survey. The survey design will consist of a number of different dimensions, including the geography or origins and destinations, the commodity, and the mode. Using the dimensions of this matrix and ruling out any cells which are expected to have zero values (e.g., rail movements of lightweight commodities with both an origin and a destination within an MPO region), it is possible based on estimates of cell of sample means (e.g., value or tonnage of shipments by a business) and variance to establish criteria for the coefficient of variation. After the survey is completed, cells that do not meet the statistical criteria can be excluded or additional surveys can be conducted. Alternatively, the data can be aggregated to fewer cells.

For the pilot-scale test survey that was conducted for this research, there were two additional considerations for sample design:

- Random versus Nonrandom samples – Using the establishment data from sampling frames, the research team determined the largest companies in each of the industry categories. These establishments were included in the sample to maximize the usefulness of the responses received by ensuring that those industries that represent a disproportionate share of total commodity flows are not excluded from the sample. This is considered a nonrandom sample. The remaining samples were selected randomly. For the CFS, approximately 40 percent of the sample is nonrandom.
- Pre-canvassing – This refers to conducting an advance survey of select companies to finalize the survey instrument, provide information on most

effective survey processes. These surveys can also be used to collect field data, but that was not done for this particular pilot survey effort.

Chapter 2 provides more detail on the Phase I in-person interviews that were conducted as part of the pilot-scale test survey and how what was learned from these interviews was used to prepare for the actual telephone interviews conducted in Phase II. The Phase II procedures and results are described in Chapter 3.

2.0 Analysis of In-Person Interviews (Phase I)

2.1 OVERVIEW

The survey was conducted in two steps. Phase I was comprised of a first set of companies that were interviewed primarily to receive feedback on the survey instrument and the survey process. In these Phase I interviews, general information on shipments also was collected. These interviews were made in-person by a team member from Washington State University. The feedback received from these interviews was utilized to finalize the Phase II phone survey process and instrument. For the broader sample in Phase II, telephone interviews were used. These telephone surveys were conducted by students at Washington State University, and are described in greater detail in Chapter 3 of this report.

In all, a total of 11 firms were interviewed during Phase I. Five of the firms were located in the Seattle region and six were located in the Spokane region. Three of the firms in Seattle were in the transportation equipment industry and two of the Seattle firms were in the apparel industry. Four of the Spokane firms were in the food manufacturing industry and two were in the fabricated metal product manufacturing industry. These firms were identified based on previous contacts of the research team.

The main focus of the interviews was to inquire about whether or not potential respondents would be able to provide the information requested over the phone and whether the questions were using the appropriate language for the industry. The interviews verified the format and content of the questions as originally designed.

The interview questionnaire was modified by the study team to fit each of the industries and the new form was used in the face to face interviews, tailored for each industry.

Table 2.1 Number of Companies Interviewed In-Person By Industry

Region	Industry	Number of Companies Interviewed In-Person
Seattle	Transportation Equipment Manufacturing	3
	Apparel Manufacturing	2
Spokane	Food Manufacturing	4
	Fabricated Metal Product Manufacturing	2
	Total	11

2.2 FINDINGS FROM IN-PERSON INTERVIEWS

The in-person interviews led to the following results:

- All 11 interviewees were interested in the goal of the study and felt it was a worthwhile endeavor. This seemed to be borne out by response rates in the final survey. This indicates that if the survey is relatively short and focused it may not be necessary to expend significant time and resources to convince interviewees that surveys are important or that survey data can be used for transportation planning.
- Interviewees in this Phase I process felt that commodity information would be available from the Phase II survey respondents. There was a sentiment amongst some of the interviewees that the companies should provide the commodity information rather than having it be pre-identified. The results of Phase II did seem to bear out that respondents chose to use their own terminology when identifying commodities but that these alternative terms were easy to relate to the actual pre-classified commodities, making the coding of results much easier to accomplish.
- Nine of the 11 interviewees were concerned to some degree that too much detail was being requested from the survey. They believed that survey respondents would not have detailed data available and only general responses would be received. This was particularly seen as an issue for the origin and destination data for both inbound and outbound shipments. Giving respondents the ability to respond for "typical" patterns and allowing them to adjust the level of geographic detail at which they were willing to respond were recommended approaches suggested by the Phase I interviewees (see below for more detail).
- The interviewees were of the opinion that the identification of subregional flows could be accomplished using the questionnaire. However, they also did believe that different survey respondents would be providing varying levels of detail.
- The interviewees also were skeptical of the ability to obtain revenue or value data. The interviewees felt that providing shipment value information would be equivalent to providing proprietary information about the company such as rate schedules and profit margins. This was borne out by the results of the Phase II surveys.
- The interviewees consistently suggested that the questionnaire script should be rephrased to request "estimates of data," "typical years," or "last year" shipments or attributes. Such an approach was expected to generate more complete responses, even if these would need to be considered expert estimates rather than precise data amounts.
- At least three of the interviewees suggested that asking for temporal variability in freight flows would be particularly difficult to answer. This

was specifically noted when considering seasonal freight flows throughout the year. If this type of data was considered essential, it was recommended that the year be broken into quarters to make it easier to request information. Another potential solution to this issue is to save the temporal information until the end of the survey after the easier to answer questions have been asked.

- The interviewees suggested that the conversation with the phone interviewer be "dynamic" rather than scripted. This would allow for a dialogue to unfold which would generate the information in regards to the origin-destination patterns of shipments and the percent allocation by location and temporal factors. This would require that the interviewers be in a "visiting" mode during the interviews, and then work sequentially towards the needed information. For example, when inquiring about origin-destination information, it might be necessary to start with the most general information, and then move gradually to more detailed geographic and temporal information. The first iteration of questions could be something like "What percent of your outbound shipments are to locations outside of the metropolitan area?" Then, you could ask for external flows, "What percent go west, east, north or south?" Similarly, for internal flows, the metropolitan region can be divided into sections and the percent of flows to each internal region can be collected. Subsequently, specific cities and finally zip code destination information can be inquired about. After the origin-destination information is collected, then the surveyor could ask "What type of seasonal or other temporal patterns exist for your shipping practices?" In this fashion, useful information is collected quickly, and more detailed information is obtained when it is available.
- The interviewees stated that different information might be held at different levels or positions in the firm and multiple phone calls or waiting for the information might be necessary. This indicates that it will be necessary for interviewers to make tradeoffs between the effort expended and the amount and accuracy of information received. During the Phase II interviews, there were several cases where respondents said they would need to research the answers to questions and invited the interviewer to call back. In most cases the information could be obtained using this procedure.

These results led to some changes in the questionnaire. Specifically, the changes included different or fewer categories offered in the revised questionnaire. Additionally, space was changed on the physical questionnaire to allow the interviewer to capture information that was being offered and some known information (e.g., name and location of firm) was not always asked since the interviewer already had that information. The final questionnaires are those shown in Appendix B.

The determination of whether or not pre-canvassing is needed if this survey approach were to be replicated by MPOs and state DOTs depends on two factors:

1. the degree of familiarity with the industry being surveyed and
2. the types of questions that are being included in the establishment survey.

If transportation agencies are comfortable with their familiarity of an industry and they are asking standard questions, then Phase I type interviews are generally not needed. However, if "out-of-the-box" questions are being considered, then a pre-canvassing survey would be recommended. Additionally, if a survey is being conducted on an industry that the transportation agency is not familiar with, then pre-canvassing also would be recommended.

Pre-canvassing surveys such as the surveys conducted in this Phase I process are most effective when they are implemented using companies that already are familiar with the MPOs or DOTs. These companies are most likely to take the time to assist the transportation agency, and they are more likely to provide thoughtful, complete answers rather than companies that are unknown prior to the survey effort.

Alternatively, companies also can be identified by using state or local Chambers of Commerce, industry associations, and establishment information provided from companies such as InfoUSA or Dun & Bradstreet. This implies that conducting an establishment survey should be one component of a broader private sector freight stakeholder effort that DOTs or MPOs operate. This ongoing outreach activity will improve pre-canvassing efforts, provide a sounding board to confirm reasonableness of full survey efforts, and provide guidance on freight planning decisions that are made based on collected data.

3.0 Analysis of Phone Surveys (Phase II)

The findings from Phase I were incorporated into the survey instrument for Phase II. The general survey instrument used in Phase II is provided in Appendix A. The final questionnaires, as modified for each industry are provided in Appendix B. This section describes the survey process from selection of firms to analysis of survey results.

3.1 IDENTIFICATION OF FIRMS TO CONTACT

To develop an exhaustive list of firms in each of the industries and regions of concern, the research team purchased establishment data from both Dun & Bradstreet and InfoUSA. Both of these sources are commonly used to identify specific companies in specific industries in predefined geographic regions. For our survey purposes, we received the following data from these databases:

- Contact name;
- Contact phone number;
- Company web site;
- Estimated revenue of the company;
- Size of establishment by square feet; and
- Size of establishment by number of employees.

All of these data items are useful in collecting establishment survey data. They also are useful for expanding collected data to represent the full population across an entire industry. However, it should be noted that these data are typically provided in ranges, so estimates of these data are ultimately developed. Other sources of control totals such as County Business Patterns should also be checked to determine which source is the best for each region. Table 3.1 shows the number of firms identified in each industry and geographic region. As shown in Table 3.1, there is wide variability in the number of establishments that are found in each industry by the separate databases. This is largely due to the different methodologies that are used to identify and define establishments by each of the sources and the frequency and procedures for updating and purging the database of inactive companies.

The County Business Patterns database is extracted from the Business Register, a database of all known single and multi-establishment employer companies maintained and updated by the U.S. Census Bureau. The Business Register

contains the most complete, current and consistent data for business establishments. The annual Company Organization Survey provides individual establishment data for multi-establishment companies. Data for single-establishment companies are obtained from various Census Bureau programs, such as the Economic Census, Annual Survey of Manufactures and Current Business Surveys, as well as from administrative record sources. County Business Patterns data is the most complete source of business information and is probably the best source of data for expanding survey results. However, it does not provide contact information or size of establishment information for individual companies. Therefore, the proprietary sources of InfoUSA and Dun & Bradstreet are used to get this detailed information.

InfoUSA and Dun & Bradstreet data are obtained from a less systematic information gathering processes. Sources include business licenses, trade associations, phone book directories, and other proprietary sources that are identified by these companies. In addition, the categorization of businesses also may be somewhat different between these two sources and relative to the Census County Business Patterns data. If the survey budget allows, it is recommended to purchase data form both of these companies to obtain as comprehensive a list of companies as possible. This will provide as exhaustive a list of potential companies to survey as possible. This is especially important given the relatively low response rate that is experienced as part of establishment surveys.

Table 3.1 Number of Establishments Identified by Industry and Region

		Number of Establishments		
Region	Industry	County Business Patterns (CBP)	Info USA	Dun& Bradstreet
Seattle	Transportation Equipment Manufacturing	229	263	536
	Apparel Manufacturing	59	16	272
Spokane	Food Manufacturing	50	72	75
	Fabricated Metal Product Manufacturing	112	28	125

The contact information provided in the two sampling frames (D&B and InfoUSA) for establishments was found to be very accurate. Only 2 out of roughly 120 contacts had incorrect phone numbers. However, there were some cases where area codes were not provided and had to be researched on-line.

To find the correct individual to survey at each firm, the surveyor called the general number and discussed the purpose of the survey with the receptionist that answered the phone. Generally speaking, the first person contacted in this manner knew who the right person would be within the company to provide answers to the questions. However, that identified individual was often unavailable immediately which necessitated calling two or three times to find a time when the correct person was available. It was generally felt by the surveyors that getting the correct individual on the phone is one of the most

critical aspects of completing the survey. The title of the individual was generally transportation manager or operations manager, even though a specific title was not requested when contacting companies through their general phone number.

Only a small portion of the firms in the InfoUSA and Dun & Bradstreet databases were contacted for this survey. The process of identifying which firms to contact was to use the listing of companies and stratify by size of the establishment, generally based on square footage. The larger firms were sampled more frequently to attempt to survey as large a proportion of actual flows as possible. As several of the larger firms declined, firms of smaller sizes were included in the sampling process. Ultimately, companies of all sizes were represented.

The identification of which companies to survey is a complex process that involves a mix of statistics and pragmatic selection. Some industries are dominated by a single company or handful of companies and in these cases, non-random sampling (as described previously) is a critical part of the sampling plan. Understanding the freight flows of these individual large companies provides valuable information on a large percentage of the actual freight flows for the industry, even if the individual companies are not representative of other companies in the industry. General guidance is that any company that represents 10 percent or more of the total industry (by employment or output) should be selected as part of the survey sample.

However, it is generally important to also survey a range of companies across various sizes to ensure that variations in shipment patterns by size can be estimated at the end of the survey process. Therefore, it also is important to stratify the sample based on at least two size categories, so that it can determined at the end of the survey process if different expansion factors need to be developed for companies of different sizes.

In this demonstration survey, there was a trend of smaller companies being more responsive to the survey process both in terms of overall responsiveness and specific responses to individual questions. Many of the larger firms stated that they were too busy to respond to the survey, or that they needed approval from staff at corporate headquarters that was not co-located within the establishment. Therefore, the bureaucracy of larger organizations caused them to have a lower response rate than the smaller firms. At smaller firms, individuals felt more empowered to provide this information to the surveyor.

The smaller companies also seemed more confident in the responses that they did provide. This is likely related to it being easier for a single person to understand the full shipping practices at a smaller firm rather than a larger firm. At larger firms, shipments are likely to be managed by a team of people with expert knowledge only of the shipment types under their purview.

The lower response rate of larger firms underscores the need to incorporate an establishment survey process as part of a larger freight stakeholder outreach effort. The larger companies will likely need more time to approve survey

participation, and this approval is more likely to occur if they have worked with the transportation agency extensively in previous efforts, and if their participation is likely to impact actual decisions that are made by the agency. Having senior-level executives on an ongoing freight advisory council can accelerate this approval process, and allow for transmittal of more detailed shipment information.

3.2 PROCESS FOR CONDUCTING SURVEYS

Graduate students from Washington State University were employed and trained to conduct the phone surveys. Detailed explanations regarding the type of information being solicited from each question was explained in addition to definitions of unfamiliar terms. The survey's goal was to capture information on four levels: total shipment value, shipment modes, commodity, and shipment origin/destination. The questionnaire asked questions in a tiered manner so that the most important information was asked first. This allowed for partial responses to be still useful in the commodity flow estimation process.

The introductory conversations generally began with:

"Hello, my name is _____ and I'm a student at Washington State University, in Pullman, WA. We are working with the U.S. Department of Transportation to survey businesses in the Pacific NW in regards to their use of the transportation infrastructure. In particular, we are interested in your company's annual shipments into and out of facilities and the locations where shipments originate and final destinations. Is there someone within your business that I can talk to in regards to this study?"

The surveyors were encouraged to check the web sites of the selected firms before making the initial call. Interviewer knowledge of the firm characteristics information, prior to the phone call, was expected to make the phone survey more effective and efficient in terms of increasing response rates and receiving more precise responses.

Initially no time length was mentioned in the introduction, but once the survey began it became clear that without some stated bounds on the time required to complete the survey, respondents were not willing to participate. Thus, the students began stating that the survey would take five minutes or less.

Approximately 15 percent of survey respondents ended up taking more than five minutes, but respondents were relieved if the five-minute time limit was maintained. Given that the proprietary establishment lists also contained information on company web sites, the students were asked to spend a few minutes browsing the company web site prior to calling to familiarize themselves with the company and the freight activities that this type of business was likely to conduct. This additional preparation increased survey labor time, but it also improved the students' ability to understand who they were calling and target their questions toward collecting the desired information.

Table 3.3 shows the response rates for each of the questions in the survey. The following sections discuss the response rates in more detail and provide guidance on how the survey effort can be used to guide future establishment surveys conducted at the regional level.

Table 3.2 Response Rates to Individual Questions

Item		Metropolitan Region and Industry				
		Spokane Food	Spokane Fabric. Metal	Seattle Apparel	Seattle Trans. Equip.	Total
BACKGROUND INFORMATION RESPONSE RATES						
Total Establishments Contacted		41	34	30	42	147
Percent Establishments Responding		25%	30%	33%	24%	27%
Number of Establishments Responding		10	10	10	10	40
Provided Response to Revenue Information		60%	90%	30%	70%	63%
Provided Response to Background Information		100%	100%	100%	100%	100%
Provided Response to Size of Facility		100%	100%	90%	90%	95%
INBOUND SHIPMENT RESPONSE RATES						
Provided Response to Inbound Annual Tons or Other Shipping Units		100%	100%	100%	100%	100%
Provided Response to Inbound Value of Shipments		0%	0%	0%	0%	0%
Provided Response to Inbound Seasonal Question		30%	20%	70%	90%	53%
Percent of Respondents that Provided Inbound Seasonal Information		30%	10%	70%	30%	35%
Provided Response to Inbound Distribution of Comm. #1		100%	100%	70%	80%	88%
Provided Response to Inbound Distribution of Comm. #2		0%	30%	50%	0%	20%
Provided Response to Inbound Distribution of Comm. #3		30%	10%	20%	30%	23%
Provided Response to Inbound Distribution of Comm. #4		0%	N/A	N/A	0%	0%
Provided Response to Comm. #1 Origin Attribute	City	40%	90%	70%	60%	65%
	State	100%	100%	80%	80%	90%
	Zip Code	0%	0%	0%	0%	0%
	Country	100%	100%	70%	80%	88%
	Port of Entry	0%	0%	60%	0%	15%
	Mode	100%	100%	80%	80%	90%

Item		Metropolitan Region and Industry				
		Spokane Food	Spokane Fabric. Metal	Seattle Apparel	Seattle Trans. Equip.	Total
Provided Response to Comm. #2 Origin Attribute	City	50%	60%	10%	60%	45%
	State	80%	70%	10%	60%	55%
	Zip Code	0%	0%	0%	0%	0%
	Country	80%	80%	10%	70%	60%
	Port of Entry	0%	0%	10%	0%	3%
	Mode	80%	80%	10%	60%	58%
Provided Response to Comm. #3 Origin Attribute	City	10%	20%	0%	30%	15%
	State	20%	50%	0%	40%	28%
	Zip Code	0%	0%	0%	0%	0%
	Country	30%	50%	0%	20%	25%
	Port of Entry	0%	0%	0%	0%	0%
	Mode	30%	50%	0%	40%	30%
Provided Response to Comm. #4 Origin Attribute	City	30%	N/A	N/A	10%	20%
	State	30%	N/A	N/A	10%	20%
	Zip Code	0%	N/A	N/A	0%	0%
	Country	30%	N/A	N/A	30%	30%
	Port of Entry	0%	N/A	N/A	0%	0%
	Mode	30%	N/A	N/A	30%	30%
OUTBOUND SHIPMENT RESPONSE RATES						
Provided Response to Outbound Annual Tons or Other Shipping Units		100%	100%	100%	100%	100%
Provided Response to Outbound Value of Shipments		0%	0%	0%	0%	0%
Provided Response to Outbound Seasonal Question		0%	0%	0%	0%	0%
Percent of Respondents that Provided Outbound Seasonal Information		N/A	N/A	N/A	N/A	N/A
Provided Response to Outbound Distribution of Comm. #1		100%	80%	90%	20%	73%

Item		Metropolitan Region and Industry				
		Spokane Food	Spokane Fabric. Metal	Seattle Apparel	Seattle Trans. Equip.	Total
Provided Response to Outbound Distribution of Comm. #2		0%	40%	30%	70%	35%
Provided Response to Outbound Distribution of Comm. #3		10%	30%	0%	40%	20%
Provided Response to Outbound Distribution of Comm. #4		N/A	N/A	N/A	N/A	N/A
Provided Response to Comm. #1 Destination Attribute	City	50%	50%	30%	0%	33%
	State	90%	90%	70%	20%	68%
	Zip Code	0%	0%	0%	0%	0%
	Country	80%	100%	100%	20%	75%
	Port of Entry	10%	0%	0%	0%	3%
	Mode	90%	100%	100%	20%	78%
Provided Response to Comm. #2 Destination Attribute	City	40%	60%	10%	0%	28%
	State	60%	80%	60%	20%	55%
	Zip Code	0%	0%	0%	0%	0%
	Country	70%	80%	70%	20%	60%
	Port of Entry	20%	20%	0%	0%	10%
	Mode	80%	90%	70%	20%	65%
Provided Response to Comm. #3 Destination Attribute	City	0%	10%	N/A	0%	3%
	State	40%	40%	N/A	10%	30%
	Zip Code	0%	0%	N/A	0%	0%
	Country	60%	50%	N/A	10%	40%
	Port of Entry	0%	10%	N/A	0%	3%
	Mode	60%	50%	N/A	0%	37%

3.3 OVERALL RESPONSE RATE

In aggregate, 27 percent of those contacted agreed to participate and provide some information. This proportion of positive response varied slightly across region and industry with the transportation equipment industry in Seattle producing the lowest response rate at 24 percent and the apparel industry in Seattle producing the highest response rate at 33 percent. However, both in terms of sample selection and population coverage, the geographical/spatial representation appears well-balanced (see Figures 3.1 to 3.4).

This implies that for future establishment surveys, an expectation of between one-quarter and one-third of the companies contacted would provide useful survey responses. Therefore, if a transportation agency desired to have 100 completed establishment surveys for a specific industry, it would be recommended that a list of 300 to 400 companies within that industry be identified.

Figure 3.1 Location of Food Manufacturing Sample, Spokane, WA

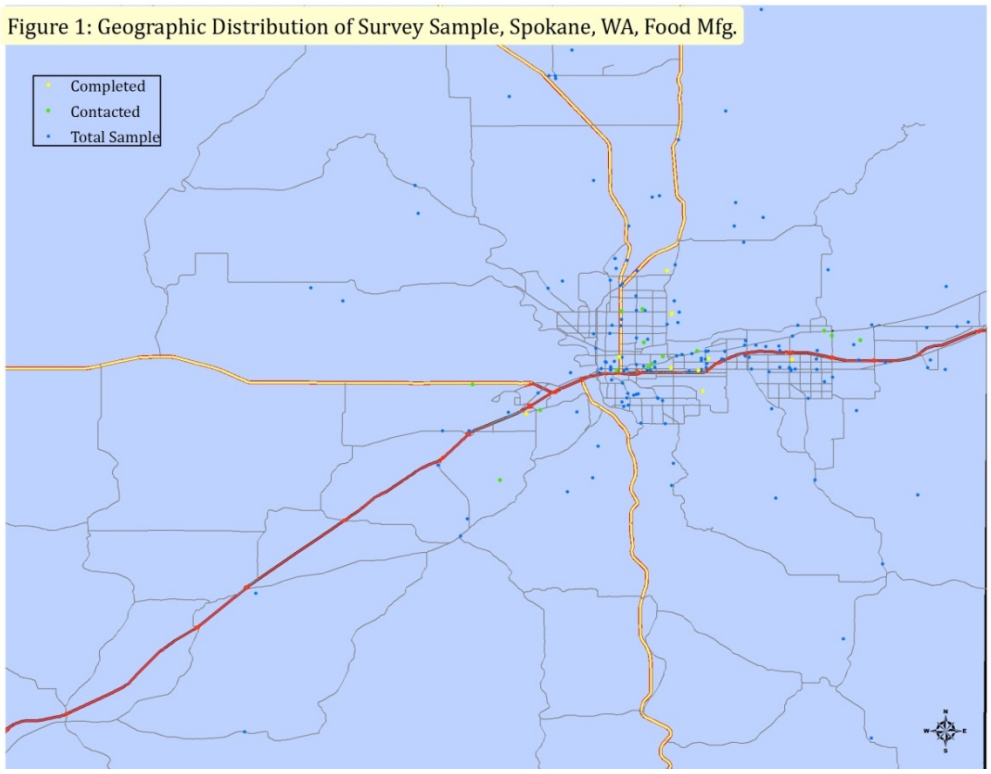


Figure 3.2 Location of Metal Fabrication Sample, Spokane, WA

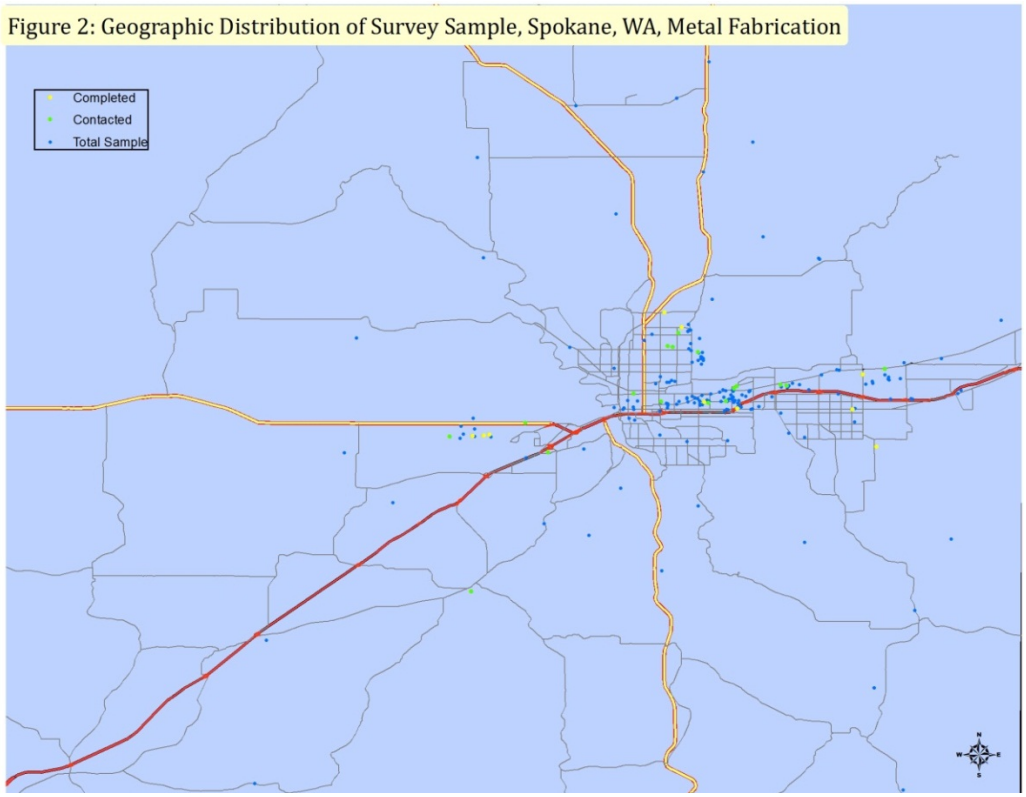


Figure 3.3 Location of Transportation Equipment Sample, Seattle, WA

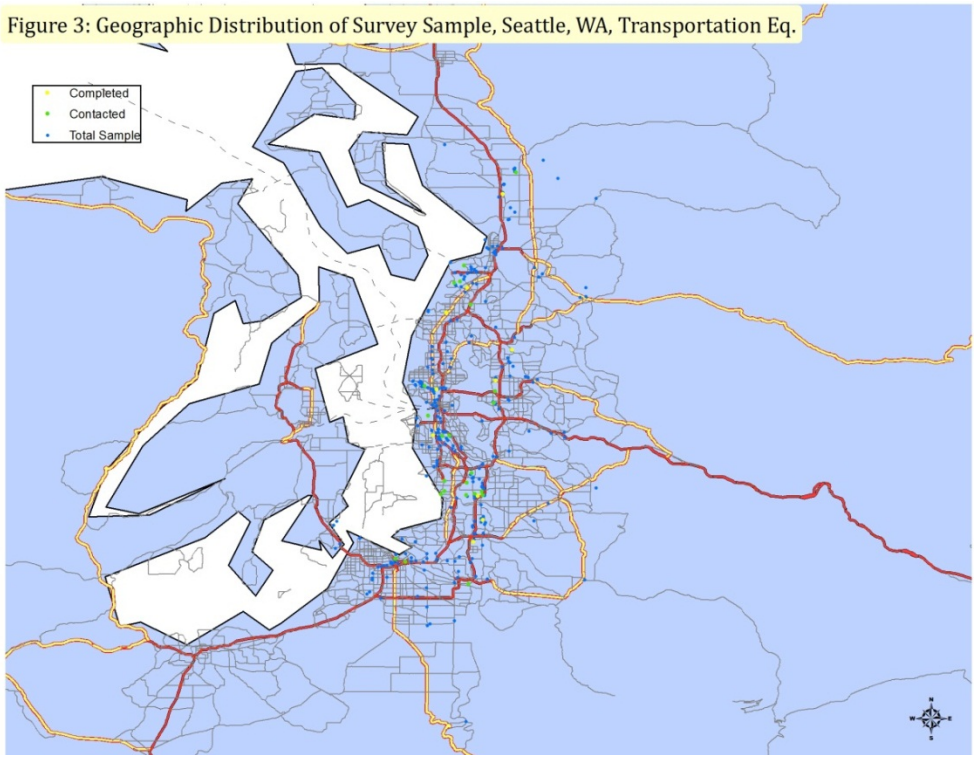
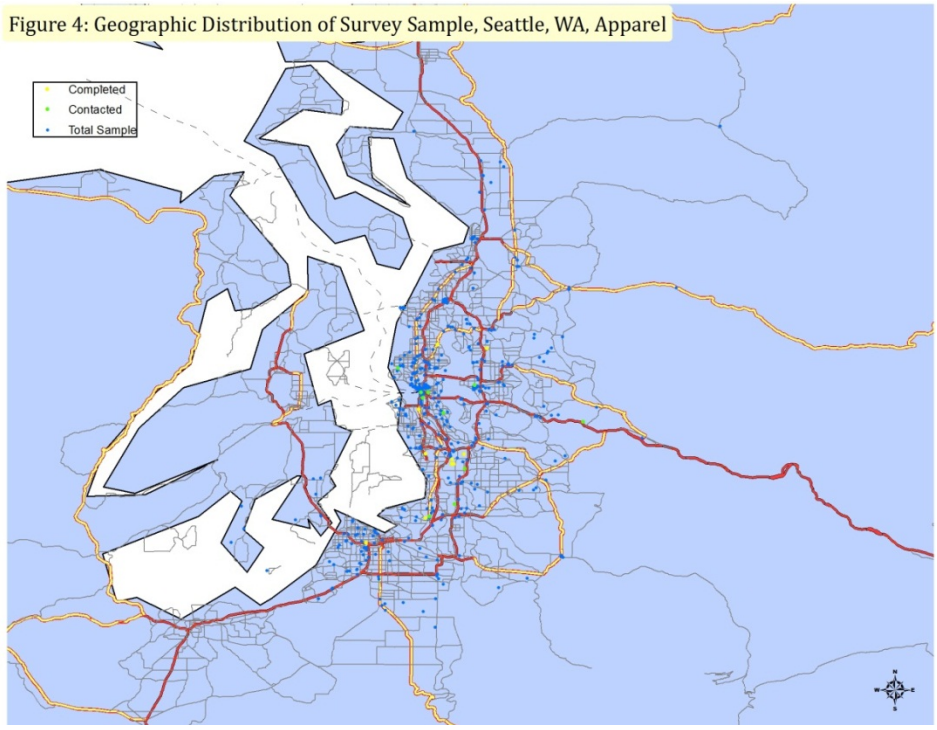


Figure 3.4 Location of Apparel Sample, Seattle, WA



3.4 COMPANY CONTACT INFORMATION

Most of the company contact information on the phone survey questionnaire already was available from the sample list. This information was verified during the course of the interview. This information was provided by 100 percent of the respondents.

In addition to the company name and complete address, the name/title of the person being interviewed also was requested. This information was not always provided and slightly less than half those interviewed agreed to provide their names. This implies that interviewees were willing to provide information to assist in completing the survey, but many of them did not want to be held accountable if some of the information was incorrect. Alternatively, there could have been concerns about consequences if this information was somehow made available to competitors.

3.5 SIZE OF FACILITY

Information on the size of the facility was readily provided with 95 percent of all respondents providing information on number of employees. Those that did not provide it simply did not know for certain. The size of establishment information that was collected through the survey also matched with the ranges that were provided in the establishment databases. Therefore, the databases can be deemed generally reliable for this information. However, the databases provide information in a range, so if precise information is needed, collecting it through the survey is the better option.

This implies that this is a variable that is widely known by survey participants. Therefore, it can be expected that information on this can be easily collected through survey methods. It is recommended that this data item be asked on all establishment surveys.

3.6 INBOUND SHIPMENTS

3.6.1 Annual Tons or Other Shipping Units

Information on tonnage of inbound shipments also was provided by 100 percent of the respondents on the phone surveys, primarily in tons. This is a critically important variable to capture in establishment surveys. Therefore, it is recommended that this variable also be included in future establishment surveys.

Note that there may be a fairly wide variance on the accuracy of some of these answers, given that some respondents replied that this is a "ballpark" estimate. Therefore, these numbers cannot be taken literally, and should actually be aggregated across respondents to develop an estimate for a geographic region.

3.6.2 Value of Inbound Shipments

Few of the respondents were willing to provide information on the value of inbound (or outbound) shipments. Most either stated they did not know this particular piece of information or that the information was confidential.

It is possible that rephrasing this question, to ask if shipments fall into predefined ranges (e.g., $1 to $100,000 versus $100,000 to $1,000,000), would generate more responses. However, it is more likely that it is simply too difficult to track down the few people at each company that have this information. Additionally, if that person can be found, they likely would not be comfortable providing this information. This question would likely be a good one to be removed from the interview survey process. The size of the establishment is better estimated based on the number of employees at the facility which is an easier number for respondents to provide. Establishment surveys that require this information should develop ranges and also should expect that response rates would be very low.

3.6.3 Seasonal Peaks

Slightly more than half of the respondents provided information on seasonality of inbound shipments. 71 percent of these respondents indicated periods of seasonal peak flows for inbound movements. Therefore, roughly one-third of all respondents provided specific information that can be used to derive seasonal patterns in freight flows. The specific type of seasonal information provided consisted of both a time period (either multi-month span or season) and proportion of total inbound volume occurring during this period.

There was significant variability in the response to this question by industry and by region. The Spokane respondents in the food industry and the fabricated metal industry only had 30 percent and 20 percent response rates, respectively. The Seattle respondents in the apparel industry and transportation equipment industry had 70 percent and 90 percent response rates, respectively. It is difficult to tell if this difference is related to the relative sizes of the metropolitan regions, specific attributes of the industries surveyed, or some other factor. However, it is important for future survey efforts to be aware of the potential for this information to not be available, or only be achievable at a low response rate.

3.6.4 Commodity Types

In the survey instrument, commodity information was requested into categories defined prior to conducting any interviews. There were either three or four categories depending on the industry being surveyed with one of the categories being other. The full survey is included as Appendix B of this report. This approach is relatively novel for establishment surveys. Typically, respondents are asked to self-define commodities and these commodities are later translated into commodity groupings as part of the post-survey analysis. This novel approach was undertaken to determine if the expected commodities to be

shipped at each facility matched with actual activity. It also was undertaken to try to make it easier for respondents to include all goods shipped from their location.

In aggregate, 88 percent of respondents were able to provide inbound distribution information for at least one commodity. This indicates that this also is a question that will have a high success rate in a full blown establishment survey effort. As this is a critical variable, it is a further indicator of the success of establishment surveys in providing useful freight flow information.

The questions regarding the second and third largest commodities in the survey had much lower success rates. Part of this lower rate was due to the fact that many industries only shipped goods in one commodity. Part of this lower rate was due to the fact that even though multiple commodities were shipped at the location, the respondent was only familiar with the largest commodity.

Overall, the method of predefining commodities appears to have been very successful. It is recommended that this element be included on establishment surveys conducted by regional transportation agencies.

3.6.5 Origins (City, State, Zip, and by Mode Percent)

Initially, surveyors asked companies to provide shipment origin-destination information by city, state, zip code, and mode. After several interviews which failed to provide any zip code level information, it was determined that this information could not be collected using this type of survey format. Therefore, the response rate for zip codes is shown as zero percent for all of the industries and commodities.

Overall, the questions associated with specific origins had a mixed response rate in these surveys. For the first commodity, the response rates by state, country of origin, and mode were close to 90 percent. This value also was roughly the same for all of the industries surveyed. The response rate for city of origin varied significantly by industry. The Spokane food industry response rate was only 40 percent, while the Spokane fabricated metal industry was 90 percent. This indicates that it should be expected the availability of this data will vary by industry.

The origin data became more sparse when considering the second and third largest commodities shipped at each location with greater variability by industry. For the apparel industry in Seattle, only 10 percent of the respondents were aware of the city, state, country, port of entry, and mode information. This is much lower than the 50 percent of apparel industry respondents that stated that there was a second commodity that was shipped to their location. For the fabricated metal industry, information about origins was available from 60 percent to 80 percent of the respondents depending on the specific variable. Response rates declined more for third and fourth commodities.

Overall, this variable appears to be the most challenging in terms of its importance for developing freight flows and the availability from interviewees. It implies that this should be one of the critical response rates that is utilized to determine the size of the sample that is needed. Additionally, to the extent that the interviewer can predefine regions of interest for the survey (e.g., west coast versus east coast, domestic versus international), this will assist the interviewee in providing information that is most useful for the final commodity flow development.

3.7 OUTBOUND SHIPMENTS

3.7.1 Annual Tons or Other Shipping Units

Similar to the information on inbound commodity shipments, all respondents provided estimates for outbound shipments, primarily in tons.

3.7.2 Value of Shipments

Similar to the question dealing with value of inbound shipments, none of the respondents were willing to provide the value of inbound shipments. This was based in part on data availability and in part on data confidentiality.

3.7.3 Seasonal Peaks

Respondents also did not provide information on seasonality of outbound shipments. This is in contrast to the relatively high response rates that were achieved for this question in the inbound direction. This was likely due to the wide dispersion of customers for the outbound shipments over geography and time. In contrast, inbound shipments were found to be much more concentrated in number and timing, so that seasonal patterns were more easily identifiable.

3.7.4 Commodity Types

Overall, the response rates on commodity types for outbound shipments are roughly equivalent for inbound shipments. However, for outbound shipments there was much greater variability between commodities. For the Seattle transportation industry, the response rate was only 20 percent for the largest outbound commodity. The Spokane food industry had a 100 percent response rate for its largest outbound commodity.

Response rates for second largest commodities varied from 0 percent to 70 percent. Response rates for third-largest commodities varied from 0 percent to 40 percent. This may be an indication that this is an attribute that may be problematic in terms of collecting or that there are no more than two commodities shipped from these companies.

3.7.5 Destination Attributes (City, State, Zip, and by Mode Percent)

Obtaining destination attribute information on inbound flows was more challenging than inbound flows. The response rate for destination state for the largest commodity was 68 percent for outbound flows compared to 90 percent for inbound flows. The response rate for destination mode for the largest commodity was 78 percent for outbound flows compared to 90 percent for inbound flows. These rates are noticeably lower, but still high enough to achieve a reasonable sample of responses through the establishment survey.

For the apparel industry, because final products ship to many locations and retail stores using a combination of less-than-truckload trucks or parcel delivery, the outbound shipment information was particularly problematic. Similarly, metal fabrication also had better information on inbound flows, because steel slabs have few origins, while outbound shipments of metal fabrication products are destined for construction sites that vary throughout the year.

The most significant difference in response rates between outbound and inbound flows for the largest commodity was for destination city. This value was 65 percent for inbound flows and only 33 percent for outbound flows. For the second and third-largest commodities, there also was a lower response rate for outbound flows relative to inbound flows.

These results indicate that greater effort (via more surveys) would be needed to determine information on outbound freight flows relative to inbound freight flows. The amount of additional surveys is likely to vary by industry, but it has the potential to triple or quadruple the number of surveys needed. Transportation agencies will need to weigh the importance of capturing outbound information relative to the increased costs associated with the additional survey effort.

3.8 INDUSTRY-SPECIFIC INFORMATION

The surveys revealed several differences between industries that impacted the responses to the survey process. The information in this section is provided as examples of the range of issues that can be faced for each industry in responding to survey questions.

In general, the Seattle apparel manufacturing industry is characterized by relatively small companies that import textile mill products from overseas, transform them into apparel products, and then ship the products to several regions across the U.S. The fact that the apparel manufacturing industry had the highest survey response rate of all of the industries (33 percent) was related to the small size of companies this industry. The structure of the industry indicated that they had very specific and accurate information about their inbound goods. Most knew specifically which port handled their inbound goods. Outbound shipping was much more of a mystery. Some companies had shipments too disperse to summarize. Other companies shipped a significant amount of their

products by parcel of less than truckload shipments. These types of shipments likely utilized a mix of truck and rail on their deliveries, but this could not be known by the respondent. They only knew that these goods left their facility via truck.

Companies in the Seattle transportation equipment industry had some of the simplest supply chains. Most sourced one type of goods from a small set of suppliers. They also produced very specific products ranging from boats to aerospace parts that were sold to a very narrow range of customers. The information provided by these companies was the most straightforward in terms of pre-classifying commodities on both the inbound and outbound side. The pre-classification of commodities seemed to make the responses simpler, since respondents did not need to consider their entire product line, but group them together into (parts or finished vehicles). Virtually all of their inbound and outbound shipments were made by truck.

For the Spokane food manufacturing industry, the process of pre-classifying commodities was the most difficult. Most respondents were not clear whether their inbound or outbound shipments were considered farm products or food manufacturing. For these respondents, they simply stated specific product items (e.g. sugar, meat) and described the quantities shipped and origin-destination patterns for each specific product item. Respondents in this category generally also knew very specifically where their inbound shipments were coming from down to the city/state level. These respondents had a smaller set of outbound deliveries, but still much more detailed than their inbound shipments. Several of the inbound shipments were received by rail which was also known specifically by the company. These companies did have significant seasonal peaks, but were not generally able to easily quantify the nature of the peaks.

The Spokane metal fabrication industry was dominated by several companies that served the local area. Most of the outbound shipments of goods were destined for other regions in Washington. In several circumstances, inbound goods were sourced locally as well. These companies preferred to discuss the specific product lines that they shipped (e.g. rolled steel, titanium) rather than commodity categories as pre-classified in the survey.

3.9 GENERAL OBSERVATIONS ON PHONE SURVEY

There were several general observations regarding the phone survey that also should be taken into consideration for broader establishment survey efforts.

- Respondents were much more willing to cooperate due to the students affiliation with the local university, since many expressed some association themselves (either a graduate or had children attending there). A private phone survey company may have had lower participation and response rates.

- The sample lists did not provide area codes which were problematic for Seattle where there exist four different area codes. These had to be tracked down prior to calling.
- Time is very critical to survey respondents and probably around 10 to 12 minutes is the maximum for survey length. Additionally, it is likely that the shorter the survey is in duration, the higher the response rate will be. There is an explicit tradeoff that needs to be considered in terms of number of completed surveys and detail provided in each survey response.
- Being somewhat familiar with the companies (via perusing their web site prior to calling) helped with completion of the survey.
- When companies refused to provide value of shipments, the interviewers were able to adjust and ask for company revenue information. Initially they were unwilling to provide this but by offering a broad range of revenue categories (0 to 5 million dollars, 5 to 10 million dollars, 10 to 20 million dollars…) we obtained revenue information on approximately 63 percent of respondents.
- It can be challenging to provide categories of inbound or outbound shipments for some industries. For the Seattle transportation equipment industry, the outputs were simply too many to mention or categorize. These ultimately were labeled "aerospace parts," even though they may have been electronic assemblies, mechanical components, commercial, military, etc.
- Detailed origin/destination information from an establishment is difficult to obtain for larger companies. Many of the larger firm respondents indicated they ship or receive from "all over the U.S." and attempting to ask for their top three was problematic. Smaller firms had origin-destination information more readily available, and seemed to be more confident in the accuracy of the information that they were providing.
- Gaining the trust of the respondent is critical for successful participation and completion. In several cases, the respondent asked for the interviewer's phone number and hung up and called back. In other cases they requested an e-mail copy of the questionnaire in advance. Therefore, interviewers should conduct these surveys from locations that can be easily verifiable by survey participants in terms of both telephone access and e-mail access. Additionally, having some sort of official project web site that can be referred to would be helpful as well.

4.0 Processing Survey Data

4.1 EXPANDING SURVEY DATA

Since only a sample of establishments is surveyed, it is necessary to develop statistical weights to expand the sample data to reflect the characteristics of the entire population of establishments for each industry.

The key step in this process is to determine an appropriate expansion variable. The most straightforward expansion variable is based on information already contained in the establishment database from which the survey sample was drawn. Sample expansion variables can be based on number of employees, amount of output, or size of establishment information as obtained in the InfoUSA or Dun & Bradstreet databases.

Because the information is provided in ranges, the midpoint for each establishment should be used to determine the total employment in the industry and the total employment of the companies included in the survey. For example, if the total employment in the metropolitan Seattle apparel industry was found to be 10,000 and the employment of the companies surveyed in the apparel industry was 1,000, then all of the data collected would be multiplied by 10 to develop estimates of freight flow patterns for the entire apparel industry.

Other survey expansion variables could include employment based on survey responses relative to outside sources of economic data for an industry. For example, if the Bureau of Economic Census estimates that there are 20,000 employees in the apparel industry rather than 10,000, then it may be deemed appropriate to expand the data by multiplying by 20 rather than 10. However, it is generally preferable to utilize an expansion variable hat was obtained from the original survey sample to avoid circumstances where different data estimation processes can generate different numbers.

Another option for survey expansion variables would be the information provided in freight flow databases such as the Bureau of Transportation Statistics Commodity Flow Survey (CFS). The CFS provides shipment values at the metropolitan level across two-digit commodities and several freight modes. In our earlier example, the commodity-specific tonnage totals for the Seattle region can be considered the control total. The tonnage collected through the survey can be expanded based on the proportion of tonnage surveyed relative to the CFS total. Therefore, if the CFS estimates 10 million tons of apparel shipped outbound and the survey estimates 1 million tons of apparel shipped outbound, then an expansion factor of 10 can be applied to the surveyed data to estimate freight flow patterns of apparel in the Seattle region.

There are also circumstances where more geographic detail is needed within the region of concern than was collected in the survey. For example, the survey data for the apparel manufacturing industry may have been collected for the region as a whole, and at a later time commodity flow at the zip code level is desired. Disaggregation of the expanded data can be used to estimate zip code level flows using an indicator variable (such as employment) for this estimation.

An example of this process would be to use the expanded apparel output total for the Seattle region as a control total, then assume that a specific zip code in the region has output of apparel goods in proportion to its employment within the apparel industry at the zip code level. In this fashion, a zip code with 5 percent of the region's apparel employment would also produce 5 percent of the region's apparel products. This process of using indicator variables is limited by three factors:

- The statistical correlation between the indicator variable and the amount of freight used;
- The detail available for indicator variables at the sub-regional level (e.g. if apparel data is available at the zip code level); and
- The accuracy of the indicator variable at the sub-regional level (e.g. some databases have estimates of these variables that are developed from other estimation processes).

4.2 ACCURACY OF SURVEY DATA - THEORY

The accuracy of the collected survey data is a function of the sampling approach and the desired confidence level in the data. In developing a sampling approach, the analyst needs to focus on the types of information that needs to be collected, the source that will provide a list of candidate respondents, and the number of responses that need to be collected. Sample size is probably the most important determinant of precision for the information collected from the drawn sample and it is jointly determined by:

- The distribution of a variable in the study population as is reflected on the mean variable value and its variability; and
- The desired degree of precision and the statistical confidence level with which the analysis needs to be conducted.

For the purposes of freight-related establishment surveys, the number of surveys required to generate sufficient accuracy at the regional level will be far less than the surveys required to generate sufficient accuracy at a sub-regional level such as zip codes. Similarly, the number of surveys needed is impacted by the number of external regions that are desired for the survey process. Therefore, defining the geography level of concern for both the internal region and external regions is an important consideration prior to commencing an establishment survey effort. Generally, internal and external regions should be defined with

only enough detail to match the freight planning activities that are being considered by the transportation agency. Additionally, it should be considered that future freight planning efforts that require more detailed data can be accompanied by smaller data collection efforts to validate if processes such as disaggregation can be used as a surrogate for collecting new establishment surveys.

Sample size also is an important determinant of costs in most data collection efforts. Given the budget constraints of a study, it is important to recognize the tradeoffs between the selected sampling method, the desired levels of precision and statistical confidence, and the corresponding sample sizes.

Given the distribution of the variable values in the population, there are two ways to approach the analysis of sample size questions. The analyst could determine:

- The **sample size** that would be required to achieve a desired level of precision and statistical confidence for selected variables of interest, or
- The **degree of precision** and the **confidence level** that would be expected for each variable of interest under a range of sample sizes.

It is therefore important to develop the sample size estimates while keeping in mind the implicit tradeoffs between sample size, costs of data collection, and the corresponding levels of precision and statistical confidence that can be achieved. It is often the case that the ideal sample size can't be collected given the schedule and budgetary constraints of a project. In this case, an assessment is often needed as to the degree of precision and level of statistical significance that could be expected for a range of different sample sizes that can be realistically collected. This approach provides the analyst with a clearer understanding of the tradeoffs of using a sample size that does not achieve the desired significance and precision levels for each variable of interest.

It is important to note that surveys as a whole do not have specific precision or accuracy associated with them, but the variables collected through the survey each have their own level of precision and accuracy based on the amount of variation of the variable, the sample size, and the percent of survey respondents that provided information regarding that specific variable.

Equations 1 to 3 show how to assess the precision that corresponds to a given sample size and confidence level using two steps. First, the standard error of the mean is calculated as a function of sample size, the population, and the standard deviation. The relative or absolute precision is then calculated as a function of the standard error and the desired confidence level is reflected in the value of the z-statistic.

Similarly, Equations 1, 4 and 5 show how to calculate in two steps the confidence level that corresponds to a given sample size and the desired degree of variable precision. First, the standard error of the mean is calculated as a function of sample size, the population, and the standard deviation. The confidence level (as

reflected in the value of the z-statistic) is then calculated as a function of the relative or absolute precision and the standard error. The confidence level associated with various z-statistics is shown in Table 4.1.

Formulas Used to Access Precision for a Given Sample Size

Standard Error: $$SE(\bar{x}) = \sqrt{\frac{\sigma^2}{n} * \frac{(N-n)}{N}} \quad \text{(Eq. 1)}$$

Precision: $$D = SE(\bar{x}) * z \quad \text{(Eq. 2)}$$

or $$d = \frac{SE(\bar{x}) * z}{m} \quad \text{(Eq. 3)}$$

Formulas Used to Assess Confidence Level for a Given Sample Size

Standard Error: $$SE(\bar{x}) = \sqrt{\frac{\sigma^2}{n} * \frac{(N-n)}{N}} \quad \text{(Eq. 1)}$$

z-statistic: $$z = \frac{D}{SE(\bar{x})} \quad \text{(Eq. 4)}$$

or $$z = \frac{d * m}{SE(\bar{x})} \quad \text{(Eq. 5)}$$

Table 4.1 Correlation of Z-Statistic and Confidence Levels for a Given Sample Size

z-statistic	Confidence Level ($1 - \alpha$)
0.67	50%
0.84	60%
1.04	70%
1.28	80%
1.64	90%

z-statistic	Confidence Level (1 – α)
1.96	95%
2.58	99%
3.29	99.9%

For simple random sampling, in the sampling design, all potential sample subjects have equal probability of being selected to be part of the sample. This process creates some element of error due to the randomness of how the sample is chosen. The selected sample may result in sample data that is not necessarily representative of the whole population of interest. This is especially an issue where population sizes are extremely large and the sample size small. But in most cases for local and state agencies employing freight surveys, the population of interest is all businesses in a given geographical region (county, city, state, etc.) that ship or receive freight. Depending on the availability of establishment data from which to develop the sample list, the sample may or may not be drawn as a truly random sample of the population. In this particular study, the sample list was developed from proprietary establishment databases which employ several approaches to compiling population establishment data. Therefore, it is difficult to ascertain how representative it is of the true population (all businesses that ship or receive freight). Other sources such as the state department of revenue (taxing authority) and department of commerce may provide better representation, but may not be accessible.

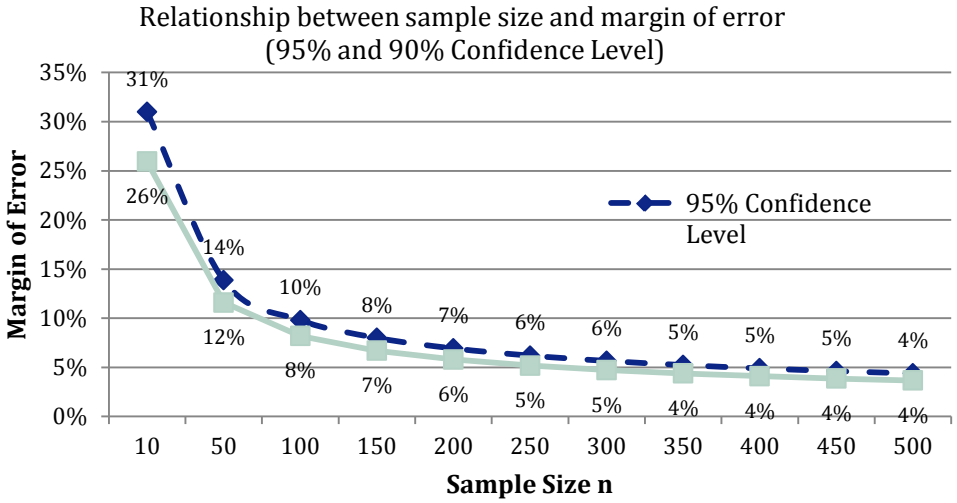
This study employed a mix of nonrandom sampling and stratified random sampling technique. For the stratified random samples, the process stratified the list of companies by industry type, where each of the four sub-categories is randomly sampled. The rationale for employing this approach is that we may expect the underlying characteristics within each stratification to be different and therefore this allows us the opportunity to make comparisons across groups and also helps improve the sampling efficiency. But since the number of establishments within each industry group are not likely the same, the underlying population associated with each strata is also different, and therefore the sampling or margin of error associated with each industry will also be different.

For full establishment survey efforts, it is possible to statistically compare the results of data collected from companies in different strata to determine if other variables are related to shipping characteristics. For example, the relationship between employment and output could be compared for small and large companies in the apparel industry in Seattle. Similarly, this relationship can be tested for food manufacturing in Spokane in the eastern side of town relative to the western side of town. These types of comparisons can also provide clues as to the types of future survey efforts that are most critical for a region.

The margin of error for a specific variable collected using the survey effort simply calculates the magnitude of sampling error related to a specific survey

and the total sample size. Assuming all other factors are constant, as sample size increases, the lower the margin of error and the narrower is the confidence interval associated with collected statistics. Intuitively this seems reasonable given that as the sample size increases and approaches the population size, the more confident we should become in reported results. We can calculate the percent margin of error at the 95 percent confidence level (assuming normal population distribution characteristics) at various sample sizes and plot this function over different sample sizes to illustrate how margin of error improves with increases in sample size. The generalized relationship between sample size and margin of error for variables that are normally distributed is shown in Table 4.1. As mentioned earlier, it is important to note that the sample size represents the number of completed survey responses for the specific variable not for the overall survey.

Figure 4.1 Location of Transportation Equipment Sample, Seattle, WA



4.3 ACCURACY OF SURVEY DATA – HYPOTHETICAL EXAMPLE

An example of calculating accuracy and sample sizes is useful to illustrate the theory described in the previous section. We can not provide specific survey results due to privacy guarantees that were promised to respondents during the survey process. Therefore, we will utilize a separate hypothetical example of an establishment survey of the paper products industry in the region of Seattle which is composed of West Seattle and East Seattle. The data collected in this hypothetical example are shown in Table 4.2.

Table 4.2 Features of Hypothetical Paper Product Survey in Seattle

Survey ID	Tons Shipped to Western Seattle	Tons Shipped to Eastern Seattle	Total Tons Shipped
West Seattle Company#1	10	100	1,000
West Seattle Company#2	20	150	1,500
West Seattle Company #3	30	200	2,000
West Seattle Company #4	40	250	2,500
West Seattle Company #5	50	300	3,000
East Seattle Company #1	25	700	5,000
East Seattle Company #2	35	750	5,500
East Seattle Company #3	45	800	6,000
East Seattle Company #4	55	850	7,000
East Seattle Company #5	65	900	8,000

To determine the accuracy of the estimate of the total tons of paper products shipped from the Seattle region, the first step is to calculate the mean and the standard deviation of this value for e data collected using the data in the far right column. The mean is estimated using the following formula:

- Mean = (1,000 + 1,500 + 2,000 + … + 7,000 + 8,000) / 10 = 4,150 tons
- Standard Deviation = $(1,000 - 4,150)^2 + (1,500 - 4,150)^2 + \ldots + (7000 - 4,150)^2 + (8,000 - 4,150)^2$ = 2,461 tons

The next step is to calculate the standard error using the following formula:

- Standard Error = 2,461 / (square root (10)) = 778

Using a confidence level of 90% gives us a z-statistic of 1.64. This is used to calculate the precision of the estimate using the following formula:

- Precision = D = 778*1.64 = 1,279

Therefore, the average number of tons produced by these 10 firms is 4,150, while the precision of the estimate of this average is +/-1,279 tons. This precision can be applied to the total of the tons estimated to be produced from this sample as

well. In this case, the total tonnage estimated by the sample is 41,500 tons and the precision of this estimate with a 90% confidence interval is +/-1,279 tons. The precision can also be applied to the fully expanded data as well.

Another example using the hypothetical data in Table 4.2 would be to determine the accuracy of the estimate of the total tons of paper products shipped from the Western Seattle region to the Eastern Seattle region. This estimate involves the same formulas, but different values within the formulas. The mean is estimated using the following formula:

- Mean = (100 + 150 + 200 + 250 + 300) / 5 = 200 tons
- Standard Deviation = $(100 - 200)^2 + (150 - 200)^2 + (200 - 200)^2 + (250 - 200)^2 + (300\text{-}200)^2$ = 79.1 tons

The next step is to calculate the standard error using the following formula:

- Standard Error = 79.1 / (square root (5)) = 35.3

Using a confidence level of 90% gives us a z-statistic of 1.64. This is used to calculate the precision of the estimate using the following formula:

- Precision = D = 35.3*1.64 = 58.0

Therefore, the total of the tons estimated to be produced from this sample is estimated to be 1,000 tons and the precision of this estimate with a 90% confidence interval is +/-58.0 tons. The precision can also be applied to the fully expanded data as well.

Similarly, the formulas described in section 4.2 can also be used on the collected data to determine the sample size needed to achieve a specific confidence level for specific types of origin-destination combinations. Using this process, future surveys can be targeted towards specific data elements within surveys where confidence levels and precision are desired to be increased.

5.0 Implications for Developing Subnational Commodity Flow Databases

5.1 USEFULNESS OF LOCALLY-COLLECTED ESTABLISHMENT SURVEYS

Conducting this pilot level establishment survey has demonstrated that it is possible to develop commodity flow data from locally collected data. For each of the four industries that were selected, the survey process was successful across the following critical dimensions:

- Identifying potential companies to survey
- Selecting individual companies to request participation in the survey
- Identifying appropriate individuals at a sufficient number of companies that were willing to participate in the survey
- Asking appropriate questions in a format that solicited information that could be used to determine commodity flow patterns at individual companies
- Identifying an expansion variable that can be used to develop regional estimates of commodity flows for an entire industry

The surveys were successful across a range of very different industries. They were also successful in both a small MPO with a small set of industries and modal options (Spokane) as well as a large MPO with a complex economy and several freight mode choices (Seattle).

The establishment survey also provides preliminary information on the resources needed to develop a full commodity flow database based on locally collected data. Based on this pilot establishment survey, between $500 to $1,000 is a reasonable cost to expect per completed survey for similar efforts in other metropolitan regions. Therefore, conducting establishment surveys across 30 industries with the goal of completing 30 to 50 surveys per industry would cost between $450,000 and $1.5 million. Additional resources would be needed to post-process the collected data into a single usable format, and then finally, more resources would be needed to convert the collected data into a comprehensive commodity flow database for use in supporting freight planning activities.

These additional resources should be expected to cost hundreds of thousands of dollars as well.

Based on the usefulness of the data collected and the resources required to collect the data, it is recommended that collecting commodity flow data at the local level be focused on specific industries or subregions of particular concern by a State DOT or MPO. It is also recommended that conducting establishment surveys be considered as a long-term process rather than a one-time effort. Viewing the data collection as a process allows for transportation agencies to conduct surveys as a series of smaller efforts that match with real-time budget availability.

Collecting local establishment surveys should also be considered one facet of a broader freight stakeholder outreach effort. Having pre-existing strong relationships with key members of the freight community improves several dimensions of the survey effort including developing appropriate survey instruments for each industry, increasing participation rates of the survey effort (particularly for larger companies), and interpreting survey responses. Freight stakeholders can also be used to assist in developing freight planning recommendations based on the data that are collected through the surveys.

5.2 SUMMARY GUIDANCE REGARDING IMPLEMENTATION OF ESTABLISHMENT SURVEYS

There were many lessons learned from this pilot survey effort that have been discussed in the previous sections. The key guidance is summarized below in this section.

5.2.1 Identifying Potential Companies to Survey

Proprietary establishment database sources were found to be adequate to identify potential companies to survey. Company names and contact information was accurate and current, even though the number of companies provided by each database was very different. It is recommended that multiple databases be purchased to allow for comparison between sources, and to create as comprehensive a list as possible of potential companies to survey.

Larger companies tended to have lower response rates than smaller firms, primarily due to larger privacy concerns and larger bureaucracies required to approve release of proprietary data. These larger firms are most likely best accessed in a more formal process using a private sector advisory council or chambers of commerce rather than a cold-call survey.

5.2.2 Identifying Individual Respondents within Companies

It was generally found that the receptionist was able to identify the correct person to respond to the survey, even though it often took multiple attempts to

speak to this individual. Tracking down and receiving approval from this individual is the key determinant in the response rate for the overall survey.

5.2.3 Survey Response Rates

Survey response rates in this pilot survey ranged from 25 percent to 33 percent. Other establishment survey efforts have had response rates as low as 10 to 15 percent. The response rate is largely dependent on the effectiveness of the surveyors in identifying and securing time from the appropriate person within each desired company. Keeping the survey short and focused helps increase response rates. Survey response rates for industries with very complex sourcing and distribution patterns is likely to be relatively low.

5.2.4 Survey Instrument Design

It is most effective to move from easiest to hardest questions in designing the survey. Because origin-destination information is generally the most complex, this should be saved for last and asked in an iterative fashion that starts with city and state, then graduates to zip code or more specific sub-city geographies as needed in the original survey.

The pre-canvassing process utilized in this pilot survey was found to be particularly helpful for industries where prior knowledge was not known. The survey instrument can be refined based on this input and key terminology regarding the operations of certain industries can be identified.

The questionnaire should be designed with a specific structure in mind that allows for data to be captured in a format that is most useful based on the purpose of the survey. However, there must also be flexibility in the questionnaire to capture information in the form that is most comfortable for the company being surveyed. The pre-selection of commodities as part of the survey was found to be useful to assist in post-processing of the data, but several respondents preferred to respond in other formats that need to be tracked in a different manner with the survey instrument.

Surveys should be designed to take no more than five minutes on average and this should be noted in the introductory information on the survey. Surveys that take longer than five minutes will be considered burdensome to many potential respondents.

5.2.5 Key Survey Questions

As mentioned above, collecting origin-destination information at the state level is the most easily accessible, at the city level it is somewhat less accessible, and zip code level information is near impossible using this survey approach.

Revenue or shipment value information cannot be obtained consistently from survey respondents. Similarly, seasonal information will likely be given as a general estimate, and not a precise variable amount.

Inbound data was generally more readily available than outbound data. It should be considered that the inbound shipment section of the surveys be done first. However, the availability of data depends in large part on the structure of the industry and the complexity of individual companies' supply chains. Therefore, as part of the pre-canvassing effort, it should be asked which portion of the supply chain is easier for the industry to provide and this industry should come first in the questionnaire.

5.2.6 Survey Implementation

Several survey respondents will be suspicious of being cold-called and asked about proprietary information regarding their firm's operations. It is important for surveyors to briefly summarize the purpose of the survey, the transportation agency that is implementing the survey, what the data will be used for, and the privacy controls of the data that is being collected. Additionally, surveyors should be physically located such that respondents can call them back through a general number to confirm that the survey is being conducted by the party that is stated. When surveys are conducted by outside consulting firms, then the sponsoring transportation agency contact and contact information should be readily provided to the respondent.

Surveyors should have some background in freight transportation to successfully implement the survey. This familiarity assists in the dynamic conversation that is needed to extract origin-destination information from respondents. It also assists in being able to efficiently identify and dialogue with potential respondents as well as ensure that responses are actually sufficient to support freight planning efforts.

Surveyors should do brief research on each company prior to the survey, so that specific products, suppliers and customers can more efficiently be discussed during the actual survey.

5.2.7 Survey Data Post-Processing

It should be expected that a significant amount of time will be needed to process the information that is collected into a single coherent database. As mentioned above, the survey can be designed to capture information in a way that is easiest for the surveyor. However, it can be expected that many of the respondents will provide information in a fashion that is inconsistent with the survey structure and will need post-survey calculations to put into a similar format as the survey was designed.

Expansion variables should be determined prior to survey implementation and post-processing to ensure that collected data enable for expansion to occur.

5.3 APPLICATIONS OF COLLECTED DATA

There are several potential applications for data collected in this pilot study. These applications assume that the pilot study was later used to implement a more comprehensive survey of the four industries including expansion of the collected data.

The most direct application of this data would be to identify key transportation needs of specific industries in the Seattle and Spokane regions. For example, if the Seattle region decided that they wanted to focus on ensuring that the freight infrastructure needs of the transportation equipment industry were well served, then the information collected in this survey could be used to determine the key modes, origin-destination patterns and routes are that are used by the industry. Separately, the region could analyze the operation of key pieces of infrastructure used by this industry to identify deficient locations for improvements.

The data collected in this survey could also be used to better understand and describe the benefits of existing infrastructure improvement plans. For example, if infrastructure improvements were under consideration for I-90 in or near the Spokane region, then information collected in this survey could be used to identify specific industries and companies that would benefit from these improvements. The approach to using the data for this type of analysis would likely involve an iterative process to determine the area of influence of the particular infrastructure and then conducting commodity flow surveys within this influence area. The influence area could then be determined by conducting one or more roadside intercept surveys at limited locations on infrastructure of interest (which could be a gate survey at an intermodal facility or a weigh station on a highway).

An alternative to conducting an intercept survey would be to start with an existing model of freight flows for the region to identify the influence area. Even if the model is not believed to be terribly accurate in terms of its ability to predict general area of influence served by the facility, it may be sufficient for design of a focused establishment survey within the area of influence. The collected data from the establishment survey could then be used to re-estimate the commodity flows on particular routes by developing models based on the commodity flow data collected in the establishment survey. Data from these more focused models could be used to estimate the economic benefits from making improvements in this corridor. This would be done by estimating the benefits to the industries that utilize the corridor, and then expanding that out to the full users of the corridor. Similarly, the survey could be used as a source of identifying supporters for these improvements as part of the stakeholder outreach process.

More broadly, the data collected from these establishment surveys could be used as one piece in the commodity flow database development for the Seattle and Spokane regions. The data collected in these surveys could be used in conjunction with other sources to develop a comprehensive commodity flow

database that incorporated all commodities, modes, and origin-destination patterns. For example, the data could be used to edit or correct data contained from proprietary commodity flow database sources. Alternatively, the data collected in this survey could be used to replace a portion of a local commodity flow database that was developed using disaggregation techniques from national data sources such as the FHWA Freight Analysis Framework or the Commodity Flow Survey. As more establishment surveys are conducted for more industries in the region, the disaggregated data could be replaced by more locally collected data such that the local commodity flow database becomes more accurate and useful over time for supporting freight planning decisions.

A. Description of Survey Design Process

A.1 Questionnaire Design

The different questionnaires were developed by the research team with the aim of satisfying multiple research objectives. As mentioned above, the in-person questionnaires to be utilized in Phase 1 were more detailed and broader in scope in order to allow better information on shaping/refining the questionnaires to be utilized in Phase 2. The primary objective of the in-person interviews and questionnaires was to inform the second phase in terms of the best way to obtain the necessary information. The phone survey questionnaires (in Appendix B) are the outcomes of this process and also represent several objectives. First, the content of the questions sought to obtain that basic data which is necessary for development of subnational freight commodity flow information. This included information regarding the facility, volume, value and type of inbound/outbound flows, seasonality, and for the top three commodities, detailed origin/destination information by mode. In most cases, depending on the business and facility type, obtaining this information may take more time than the respondent had available, so the length of the questionnaire also was designed to be brief with the aim that most respondents could complete in 10 to 15 minutes. Finally, the phone survey instrument was designed to provide insight and information regarding question type and implementation so that future designs/ questionnaires may benefit from knowledge obtained with this effort.

A.2 Geographic Coverage

The two locations selected for conducting the surveys were:

- The Seattle metropolitan region, and
- The Spokane metropolitan region.

Selecting these two regions had three key advantages:

1. It allowed the research team to demonstrate procedures for both large and small metropolitan regions.
2. It allowed demonstration of procedures for vastly different freight-related economies. Seattle has a diversified freight-related economy that includes a major container port. Spokane has a more narrow economy with significant agricultural volumes.

3. The implementation of the survey was done by students at Washington State University, under the guidance of two professors at Washington State University with extensive research experience in the State and region. Therefore, these metropolitan regions were more familiar than ones that are located further away. As will be mentioned later, this was both a positive for this test but becomes critical for the future implementation of this technique. This was, though, similar to the experience of MPOs that have general familiarity with their local economies and are interested in understanding more details about the freight flows of various industry sectors.

A.3 Industry Coverage – Seattle

The criteria that were utilized to select industries within each geography type were the degree to which industries are not well represented in the Bureau of Transportation Statistics Commodity Flow Survey (CFS) and the importance of the industry for each region. For both of the regions, one industry that met each of these criteria was selected. For full discussion, see the NCFRP 20 Task 4 Work Plan.

For the Seattle region, U.S. Census Bureau County Business Patterns data was first utilized to determine the general size of each of the major industry categories. Manufacturing is one of the largest industries in the region. It represents roughly 10 percent of the number of employees and the annual payroll in the region as of March 2011. It is just over 4 percent of the total number of establishments in the region which indicates that it has larger than average size companies relative to other industries.

Transportation equipment manufacturing was by far the largest component within the manufacturing industry. The specific number of employees is suppressed due to confidentiality requirements for the industry (likely due to Boeing). However, a range of employees is provided at 50,000 to 99,000 employees. Therefore, transportation equipment manufacturing represents roughly between one-third and two-thirds of the entire manufacturing employment base in the region. There are 239 transportation equipment manufacturing companies in the Seattle region which is six percent of the total number of establishments. This indicates that the size of the average company in this industry is larger than the average size of companies in other types of manufacturing.

Inbound containers were selected as the second freight flow type to be surveyed in the Seattle region. While inbound containers are not a true industry, they do represent a freight flow category that is not well captured in the CFS. The Port of Seattle also is one of the largest single truck trip generators in the State of Washington, so understanding its freight flow characteristics would be useful information for transportation planners in the Seattle region. In 2009, the Port of Seattle moved over 1.5 million containers. This likely translates into roughly 3,000 truck moves per day depending on truck-rail mode split. Some concern

was expressed about the ability of the shippers to identify commodities in the containers. Test results do support that concern.

A.4 Industry Coverage – Spokane

The agriculture industry was selected as the first industry for the Spokane region, principally because agricultural commodities are not well covered in the CFS. In most economic databases, agriculture is combined with forestry, fishing and hunting. To determine the number of establishments in this industry, three data sources were compared: County Business Patterns, InfoUSA, and Dun & Bradstreet (D&B). These sources showed a wide divergence in the number of establishments estimated for each industry with estimates of 24, 13, and 219 respectively. This indicated that there is not concurrence in terms of how this industry is defined between all three sources. Additionally, because of the small sample size of agricultural establishments in the CBP and InfoUSA, it became necessary to include food manufacturing in the survey for this industry. Because many of the outbound shipments for agriculture are directed towards food manufacturing, it was possible to more easily track certain elements of this commodity by also surveying inbound shipments of food manufacturing companies.

The second industry that was selected was fabricated metal manufacturing. As shown, this industry is the second largest within Spokane for manufacturing with over 2,000 employees, a payroll over $100 million, and over 100 establishments. This is a significant industry for the Spokane region.

The final industry coverage for the two surveys is as follows:

- **Seattle region**
  - Transportation equipment manufacturing
  - Inbound containers
- **Spokane region**
  - Fabricated metal product manufacturing
  - Agriculture

A.5 Identification of Specific Companies to Consider for Surveying

The next step was to acquire information on specific establishments within each of the industries for both regions. This information was used to identify specific companies to contact for surveys. It also was used to determine the size and specific location of specific companies as well. InfoUSA and Dun & Bradstreet (D&B) business establishment data were both researched to determine the usefulness of each source. Table 1 shows the comparison of the number of

establishments for each of these two data sources along with CBP. There are variations in the number of businesses captured by each data source. As part of the "test" for this task, the consultant team purchased both InfoUSA and D&B data sets for these industries to enable comparisons between the firms captured and accuracy of both data sets. The cost of this purchase was $900 for the D&B data and $500 for the InfoUSA information. The survey team in Phase II found the InfoUSA lists of establishments more useful so D&B was used only for phone numbers if available. Discussions among the research team resulted in garments warehousing and manufacturing being the chosen commodity for container traffic. The sample list included data attributes such as company name, street address (including city, state, and zip code), contact last name, geographic location (Latitude and Longitude), industry type (NAICs code), square footage of facility, company web site, and number of personal computers. A geographic illustration of the sample lists for each is provided in Figures 1 through 4 below.

The study team used geography and industry as the stratification, using the two areas and four industries as sufficient to test the tool and process. The sample size was agreed to be 10 completed questionnaires for each of the four industries. This size did seem to provide an evaluative framework for the test survey.

Table A.1 Number of Business Establishments

			Number of Establishments		
Region	NAICS	Description	County Business Pattern (CBP)	Info USA	D&B
Seattle	336	Transportation Equipment Manufacturing	229	263	536
	N/A	Inbound Containers at Port	N/A	N/A	N/A
Spokane	311	Food Manufacturing	50	72	75
	321	Fabricated Metal Product Manufacturing	112	28	125

B. Generalized Survey Instrument

NCFRP 20 Task 4 Establishment Survey Instrument

SECTION 1: BASIC INFORMATION

1. Company Name: _____

2. Street Address: _____

City: _____ State: _____ Zip: _____

3. Name of Person Completing the Survey: _____ Phone #: _____

Please answer the following questions regarding typical freight activity at this location:

4. What are the hours and days of operation? (e.g., 8 a.m. to 5 p.m. Monday through Friday) Hours: _____ Days: _____

5. How many employees work at this facility? (Estimate OK): _____ **Employees**

6. Type of fleet service utilized: (check all that apply): ☐ Private Fleet ☐ Third Party Logistic Provider

SECTION 2: BASIC SHIPMENT CHARACTERISTICS

7. What is the total number of **outbound** and **inbound** shipments in the past **year** (annual)? What is the total tonnage and value of shipments for the same period? Please fill in the table below:

	OUTBOUND	**INBOUND**
Annual Number of Shipments	_____ **Shipments**	_____ **Shipments**
Annual Shipment Weight	_____ **Tons**	_____ **Tons**
Annual Shipment Value	**$** _____	**$** _____

Commodity Flow Establishment Survey (continued)

8. For the annual **outbound** and **inbound** shipment totals indicated above, please estimate the percent of shipments received and delivered by the various modes listed in the table below. For intermodal trips, list specific intermodal trip type (e.g., truck-to-rail).

OUTBOUND

Modes	Truck	Rail	Water	Air	Intermodal	Total
Percentage						**100%**

Outbound Intermodal Trip Type(s) _____

INBOUND

Modes	Truck	Rail	Water	Air	Intermodal	Total
Percentage						**100%**

Inbound Intermodal Trip Type(s) _____

Commodity Flow Establishment Survey (continued)

9. List major commodities shipped under each of the mode above, for both outbound and inbound flows. If a commodity's share is less than five percent, group under "Other".

OUTBOUND

Modes	Truck	Rail	Water	Air	Intermodal
Commodity 1					
Commodity 2					
Commodity 3					
Commodity 4					
Commodity 5					
Commodity 6					
Commodity 7					
Commodity 8					
Commodity 9					
Commodity 10					
Other					
Total	**100%**	**100%**	**100%**	**100%**	**100%**

INBOUND

Modes	Truck	Rail	Water	Air	Intermodal
Commodity 1					
Commodity 2					
Commodity 3					
Commodity 4					
Commodity 5					
Commodity 6					
Commodity 7					
Commodity 8					
Commodity 9					
Commodity 10					
Other					
Total	**100%**	**100%**	**100%**	**100%**	**100%**

Commodity Flow Establishment Survey (continued)

SECTION 3: ORIGIN AND DESTINATION CHARACTERISTICS

10. Is there any seasonality pattern to the shipments? For instance, there may be many more agriculture shipments in the fall than other times of the year.

11. Review last week's inbound and outbound shipment. Would you say the shipments represents a typical week of shipping activity? ☐ Yes ☐ No

    If no, pick one week's worth of shipments from the last month that is considered typical.

12. Using the reference table below, report individual **outbound** and **inbound** shipments for the week determined in question 11.

Number of outbound shipments reported in Line 1	Report every…	Mark (X) one
1-40	Report every outbound shipment	
41-80	Report every 2nd outbound shipment	
81-100	Report every 3rd outbound shipment	
101-200	Report every 5th outbound shipment	
201-400	Report every 10th outbound shipment	
401-800	Report every 20th outbound shipment	
801-1,600	Report every 40th outbound shipment	
1,601-3,200	Report every 80th outbound shipment	
3,201-6,400	Report every 160th outbound shipment	
6,401-12,800	Report every 320th outbound shipment	

If there are more than 12,800 of either inbound or outbound shipments, please contact survey administrator at (404) 460-2622.

Please enter responses into the tables provided on page 4 and 5. When entering shipment mode, use the modes provided on the previous tables in the survey.

Commodity Flow Establishment Survey (continued)

OUTBOUND SHIPMENTS

Number	Shipment ID	Day	Month	Shipment Value ($)	Shipment Weight (LBS)	Commodity Description	NAICS Code	Destination City	Destination State	Destination Zip Code	Destination Country (if not in U.S.)

Commodity Flow Establishment Survey (continued)

INBOUND SHIPMENTS

Number	Shipment ID	Day	Month	Shipment Value ($)	Shipment Weight (LBS)	Commodity Description	NAICS Code	Destination City	Destination State	Destination Zip Code	Destination Country (if not in U.S.)

C. Industry-Specific Questionnaires

NCFRP 20 – Developing Subnational Commodity Flow Databases

Establishment Survey Instrument – Food Manufacturing

Section 1: Background Information – To Be Filled in By Surveyor Prior To Survey

1. Company Name _____

2. Street Address: _____ City:_____State:___ Zip: _____

3. Name and Title of Person Being Surveyed: _____

4. Date of Survey: _____ Survey Method: _____

Section 2: Size of Facility

5. How many employees work at this facility? (Estimate, if needed) _____ Employees

Section 3: Outbound Shipments

6. What are the annual shipments from your facility in tons? _____

7. If annual tonnage shipments is not a available, please select the shipping unit and timeframe below that provides the highest level of accuracy.

Shipping metric (circle one): Tons Containers Truckloads Other (Please specify) _____

Timeframe (circle one): Annual Monthly Weekly Other (Please specify) _____

Amount of shipments _____

How many of these timeframe units (e.g., weeks) are in a shipping year? _____

8. What is the value of these shipments? _____

9. Does this facility have seasonal peaks for outbound shipments? If yes, when are they and what percent of the annual shipments do they represent?

10. It is assumed that you ship manufactured food products from this facility. Do you sell any raw agricultural products (e.g., not packaged or processed)? Also, do you have major shipments of other types of commodities? Please provide the percent by weight of the commodities shipped from this facility. Provide additional commodities, if needed.

Commodity #1 – Food or Kindred Products _____%

Commodity #2 – Agriculture _____%

Commodity #3 (Please specify) _____ _____%

Total **_100__%**

11. For each of the commodities indicated in Question #9, provide the top five destinations by city, state, and zip code by percentages in the tables below. Also, provide the mode share to each destination.

Note to surveyor: If respondent declines to provide city/state/zip code information, replace the first two blank rows with "In region" and "Out of region". As a follow-up, attempt to use the last three blank rows to disaggregate "In region" to top three counties in the region.

Commodity #1 – Food or Kindred Products

Destination				**Mode**				
City	**State**	**Zip Code**	**Percent Total**	**% By Truck**	**% By Rail**	**% By Air**	**% By Water**	**% other (specify)**
e.g., Las Vegas	*Nevada*	*89030*	*35%*	*60%*				*40% truck/rail intermodal*
Total			**100%**					

Commodity #2 – Agriculture _____

Destination				Mode				
City	**State**	**Zip Code**	**Percent Total**	**% By Truck**	**% By Rail**	**% By Air**	**% By Water**	**% other (specify)**
e.g., Las Vegas	*Nevada*	*89030*	*35%*	*60%*				*40% intermodal*
Total			**100%**					

Commodity #3 (Please specify) _____

Destination				Mode				
City	**State**	**Zip Code**	**Percent Total**	**% By Truck**	**% By Rail**	**% By Air**	**% By Water**	**% other (specify)**
e.g., Las Vegas	*Nevada*	*89030*	*35%*	*60%*				*40% intermodal*
Total			**100%**					

Section 4: Inbound Shipments

12. What are the annual shipments received at your facility in tons? _____

13. If annual tonnage shipments is not a available, please select the shipping unit and timeframe below that provides the highest level of accuracy.

Shipping metric (circle one): Tons Containers Truckloads Other (Please specify) _____

Timeframe (circle one): Annual Monthly Weekly Other (Please specify) _____

Amount of shipments _____

How many of these timeframe units (e.g., weeks) are in a shipping year? _____

14. What is the value of these shipments? _____

15. Does this facility have seasonal peaks for inbound shipments? If yes, when are they and what percent of the annual shipments do they represent?

16. Do you receive major shipments of any type that are inputs for your operations? It is assumed that you receive some types of farm products, fish products or other food products. Please provide the percent by weight of the commodities shipped from this facility. Provide additional commodities, if needed.

Farm Products	_____%
Fresh Fish or Other Marine Products	_____%
Food or Kindred Products	_____%
Comm. 4 (Please specify) _____	_____%
Total	**_100__%**

17. For each of the commodities indicated in Question #14, provide the top five destinations by city, state, and zip code by percentages in the tables below. Also, provide the mode share to each destination.

Note to surveyor: If respondent declines to provide city/state/zip code information, replace the first two blank rows with “In region” and “Out of region”. As a follow-up, attempt to use the last three blank rows to disaggregate “In region” to top three counties in the region.

Commodity #1 – Farm Products

Destination				Mode				
City	**State**	**Zip Code**	**Percent Total**	**% By Truck**	**% By Rail**	**% By Air**	**% By Water**	**% other (specify)**
e.g., Las Vegas	*Nevada*	*89030*	*35%*	*60%*				*40% truck/rail intermodal*
Total			**100%**					

Commodity #2 – Fresh Fish or Other Marine Products

Destination				Mode				
City	**State**	**Zip Code**	**Percent Total**	**% By Truck**	**% By Rail**	**% By Air**	**% By Water**	**% other (specify)**
e.g., Las Vegas	*Nevada*	*89030*	*35%*	*60%*				*40% truck/rail intermodal*
Total			**100%**					

Commodity #3 – Food or Kindred Products

Destination				Mode				
City	**State**	**Zip Code**	**Percent Total**	**% By Truck**	**% By Rail**	**% By Air**	**% By Water**	**% other (specify)**
e.g., Las Vegas	*Nevada*	*89030*	*35%*	*60%*				*40% truck/rail intermodal*
Total			**100%**					

Commodity #4 (Please specify) _____

Destination				Mode				
City	**State**	**Zip Code**	**Percent Total**	**% By Truck**	**% By Rail**	**% By Air**	**% By Water**	**% other (specify)**
e.g., Las Vegas	*Nevada*	*89030*	*35%*	*60%*				*40% truck/rail intermodal*
Total			**100%**					

NCFRP 20 – Developing Subnational Commodity Flow Databases

Establishment Survey Instrument – Fabricated Metals

Section 1: Background Information – To Be Filled in By Surveyor Prior To Survey

1. a) Company Name _____

b) Business NAICS Code_____

2. Street Address: _____ City:_____State:___ Zip: _____

3. Name and Title of Person Being Surveyed: _____

4. Date of Survey: _____ Survey Method: _____

Section 2: Size of Facility

5. How many employees work at this facility? (Estimate, if needed) _____ Employees

Section 3: Outbound Shipments

6. What are the annual shipments from your facility in tons? _____

7. If annual tonnage shipments is not a available, please select the shipping unit and timeframe below that provides the highest level of accuracy.

Shipping metric (circle one): Tons Containers Truckloads Other (Please specify) _____

Timeframe (circle one): Annual Monthly Weekly Other (Please specify) _____

Amount of shipments _____

How many of these timeframe units (e.g., weeks) are in a shipping year? _____

8. What is the value of these shipments? _____

9. Does this facility have seasonal peaks for outbound shipments? If yes, when are they and what percent of the annual shipments do they represent?

10. What kinds of metal products do you produce at this facility? Some examples include metal cans, metal sheet products, valves, etc. Please provide the percent by weight of the major commodities shipped from this facility.

Note to surveyor: Fill in commodities, if possible based on the NAICS code information provided for each interviewee and input on Question #1b of this survey instrument.

Commodity #1 (Please specify) _____ _____%

Commodity #2 (Please specify) _____ _____%

Commodity #3 (Please specify) _____ _____%

Total **_100__%**

11. For each of the commodities indicated in Question #10, provide the top five destinations by city, state, and zip code by percentages in the tables below. Also, provide the mode share to each destination.

Note to surveyor: If respondent declines to provide city/state/zip code information, replace the first two blank rows with "In region" and "Out of region". As a follow-up, attempt to use the last three blank rows to disaggregate "In region" to top three counties in the region.

Commodity #1 (Please specify) _____

Destination				**Mode**				
City	**State**	**Zip Code**	**Percent Total**	**% By Truck**	**% By Rail**	**% By Air**	**% By Water**	**% other (specify)**
e.g., Las Vegas	*Nevada*	*89030*	*35%*	*60%*				*40% truck/rail intermodal*
Total			**100%**					

Commodity #2 (Please specify) _____

Destination				Mode				
City	**State**	**Zip Code**	**Percent Total**	**% By Truck**	**% By Rail**	**% By Air**	**% By Water**	**% other (specify)**
e.g., Las Vegas	*Nevada*	*89030*	*35%*	*60%*				*40% intermodal*
Total			**100%**					

Commodity #3 (Please specify) _____

Destination				Mode				
City	**State**	**Zip Code**	**Percent Total**	**% By Truck**	**% By Rail**	**% By Air**	**% By Water**	**% other (specify)**
e.g., Las Vegas	*Nevada*	*89030*	*35%*	*60%*				*40% intermodal*
Total			**100%**					

Section 4: Inbound Shipments

12. What are the annual shipments received at your facility in tons? _____

13. If annual tonnage shipments is not a available, please select the shipping unit and timeframe below that provides the highest level of accuracy.

Shipping metric (circle one): Tons Containers Truckloads Other (Please specify) _____

Timeframe (circle one): Annual Monthly Weekly Other (Please specify) _____

Amount of shipments _____

How many of these timeframe units (e.g., weeks) are in a shipping year? _____

14. What is the value of these shipments? _____

15. Does this facility have seasonal peaks for inbound shipments? If yes, when are they and what percent of the annual shipments do they represent?

16. What inputs do you receive at your facility? It is assumed that you receive some type/s of primary metal products. Please provide the percent by weight of the major commodities received at this facility.

Note to surveyor: Fill in commodities, if possible based on the NAICS code information provided for each interviewee and input on Question #1b of this survey instrument.

Commodity #1 (Please specify) _____ _____%

Commodity #2 (Please specify) _____ _____%

Commodity #3 (Please specify) _____ _____%

Total **_100__%**

17. For each of the commodities indicated in Question #16, provide the top five destinations by city, state, and zip code by percentages in the tables below. Also, provide the mode share to each destination.

Note to surveyor: If respondent declines to provide city/state/zip code information, replace the first two blank rows with “In region” and “Out of region”. As a follow-up, attempt to use the last three blank rows to disaggregate “In region” to top three counties in the region.

Commodity #1 (Please specify) _____

Destination				Mode				
City	**State**	**Zip Code**	**Percent Total**	**% By Truck**	**% By Rail**	**% By Air**	**% By Water**	**% other (specify)**
e.g., Las Vegas	*Nevada*	*89030*	*35%*	*60%*				*40% truck/rail intermodal*
Total			**100%**					

Commodity #2 (Please specify) _____

Destination				Mode				
City	**State**	**Zip Code**	**Percent Total**	**% By Truck**	**% By Rail**	**% By Air**	**% By Water**	**% other (specify)**
e.g., Las Vegas	*Nevada*	*89030*	*35%*	*60%*				*40% intermodal*
Total			**100%**					

Commodity #3 (Please specify) _____

Destination				Mode				
City	**State**	**Zip Code**	**Percent Total**	**% By Truck**	**% By Rail**	**% By Air**	**% By Water**	**% other (specify)**
e.g., Las Vegas	*Nevada*	*89030*	*35%*	*60%*				*40% intermodal*
Total			**100%**					

NCFRP 20 – Developing Subnational Commodity Flow Databases

Establishment Survey Instrument – Transportation Equipment

Section 1: Background Information – To Be Filled in By Surveyor Prior To Survey

1. a) Company Name _____

   b) Business NAICS Code and Description: _____

2. Street Address:_____ City:_____State:___ Zip: _____

3. Name and Title of Person Being Surveyed: _____

4. Date of Survey: _____ Survey Method: _____

Section 2: Size of Facility

5. How many employees work at this facility? (Estimate, if needed) _____ Employees

Section 3: Outbound Shipments

6. What are the annual shipments from your facility in tons? _____

7. If annual tonnage shipments is not a available, please select the shipping unit and timeframe below that provides the highest level of accuracy.

Shipping metric (circle one): Tons Containers Truckloads Other (Please specify) _____

Timeframe (circle one): Annual Monthly Weekly Other (Please specify) _____

Amount of shipments _____

How many of these timeframe units (e.g., weeks) are in a shipping year? _____

8. What is the value of these shipments? _____

9. Does this facility have seasonal peaks for outbound shipments? If yes, when are they and what percent of the annual shipments do they represent?

10. It is assumed that you ship transportation equipment from this facility. Please indicate the percentage that represents wholly finished vehicles (e.g., a completed car) or partially finished vehicles (e.g., car parts). Also indicate any other items shipped from this facility.

Finished vehicles _____%

Vehicle Parts (please specify) _____%

Commodity 3 (Please specify)_____ _____%

Total **_100__%**

11. For each of the commodities indicated in Question #10, provide the top five destinations by city, state, and zip code by percentages in the tables below. Also, provide the mode share to each destination.

Note to surveyor: If respondent declines to provide city/state/zip code information, replace the first two blank rows with "In region" and "Out of region". As a follow-up, attempt to use the last three blank rows to disaggregate "In region" to top three counties in the region.

Commodity #1 – Finished vehicles

Destination				Mode				
City	**State**	**Zip Code**	**Percent Total**	**% By Truck**	**% By Rail**	**% By Air**	**% By Water**	**% other (specify)**
e.g., Las Vegas	*Nevada*	*89030*	*35%*	*60%*				*40% truck/rail intermodal*
Total			**100%**					

Commodity #2 – Vehicle Parts

Destination				Mode				
City	**State**	**Zip Code**	**Percent Total**	**% By Truck**	**% By Rail**	**% By Air**	**% By Water**	**% other (specify)**
e.g., Las Vegas	*Nevada*	*89030*	*35%*	*60%*				*40% intermodal*
Total			**100%**					

Commodity #3 – Please specify _____

Destination				Mode				
City	**State**	**Zip Code**	**Percent Total**	**% By Truck**	**% By Rail**	**% By Air**	**% By Water**	**% other (specify)**
e.g., Las Vegas	*Nevada*	*89030*	*35%*	*60%*				*40% intermodal*
Total			**100%**					

Section 4: Inbound Shipments

12. What are the annual shipments received at your facility in tons? _____

13. If annual tonnage shipments are not available, please select the shipping unit and timeframe below that provides the highest level of accuracy.

Shipping metric (circle one): Tons Containers Truckloads Other (Please specify) _____

Timeframe (circle one): Annual Monthly Weekly Other (Please specify) _____

Amount of shipments _____

How many of these timeframe units (e.g., weeks) are in a shipping year? _____

14. What is the value of these shipments? _____

15. Does this facility have seasonal peaks for inbound shipments? If yes, when are they and what percent of the annual shipments do they represent?

16. What are the major inbound shipments that you receive at this facility for the following product categories? 1) Primary metal (e.g., steel), 2) fabricated metal products (e.g., sheet metal products) or 3) other products (vinyl, paint, glass, etc.). Please provide the percent by weight of the major commodities shipped from this facility.

Primary Metal Products _____%

Fabricated Metal Products _____%

Commodity #3 (Please specify)_____ _____%

Commodity #4 (Please specify) _____ _____%

Total **_100__%**

17. For each of the commodities indicated in Question #16, provide the top five destinations by city, state, and zip code by percentages in the tables below. Also, provide the mode share to each destination.

Note to surveyor: If respondent declines to provide city/state/zip code information, replace the first two blank rows with "In region" and "Out of region". As a follow-up, attempt to use the last three blank rows to disaggregate "In region" to top three counties in the region.

Commodity #1 – Primary Metal Products

Destination				Mode				
City	**State**	**Zip Code**	**Percent Total**	**% By Truck**	**% By Rail**	**% By Air**	**% By Water**	**% other (specify)**
e.g., Las Vegas	*Nevada*	*89030*	*35%*	*60%*				*40% truck/rail intermodal*
Total			**100%**					

Commodity #2 – Fabricated Metal Products

Destination				Mode				
City	**State**	**Zip Code**	**Percent Total**	**% By Truck**	**% By Rail**	**% By Air**	**% By Water**	**% other (specify)**
e.g., Las Vegas	*Nevada*	*89030*	*35%*	*60%*				*40% truck/rail intermodal*
Total			**100%**					

Commodity #3 – Other (Please specify) _____

Destination				Mode				
City	**State**	**Zip Code**	**Percent Total**	**% By Truck**	**% By Rail**	**% By Air**	**% By Water**	**% other (specify)**
e.g., Las Vegas	*Nevada*	*89030*	*35%*	*60%*				*40% intermodal*
Total			**100%**					

Commodity #4 – Other (Please specify) _____

Destination				Mode				
City	**State**	**Zip Code**	**Percent Total**	**% By Truck**	**% By Rail**	**% By Air**	**% By Water**	**% other (specify)**
e.g., Las Vegas	*Nevada*	*89030*	*35%*	*60%*				*40% intermodal*
Total			**100%**					

NCFRP 20 – Developing Subnational Commodity Flow Databases

Establishment Survey Instrument – Apparel

Section 1: Background Information – To Be Filled in By Surveyor Prior To Survey

1. a) Company Name _____

b) Business NAICS Code and Description: _____

2. Street Address: _____ City:_____State:___ Zip: _____

3. Name and Title of Person Being Surveyed: _____

4. Date of Survey: _____ Survey Method: _____

Section 2: Size of Facility

5. How many employees work at this facility? (Estimate, if needed) _____ Employees

Section 3: Outbound Shipments

6. What are the annual shipments from your facility in tons? _____

7. If annual tonnage shipments are not available, please select the shipping unit and timeframe below that provides the highest level of accuracy.

Shipping metric (circle one): Tons Containers Truckloads Other (Please specify) _____

Timeframe (circle one): Annual Monthly Weekly Other (Please specify) _____

Amount of shipments _____

How many of these timeframe units (e.g., weeks) are in a shipping year? _____

8. What is the value of these shipments? _____

9. Does this facility have seasonal peaks for outbound shipments? If yes, when are they and what percent of the annual shipments do they represent?

10. It is assumed that you ship finished apparel from this facility. Please indicate the percentage that represents apparel or textile mill products. Also indicate any other items shipped from this facility.

Apparel	_____%
Textile mill products	_____%
Commodity 3 (Please specify)_____	_____%
Total	**_100__%**

11. For each of the commodities indicated in Question #10, provide the **top five destinations** by city, state, and zip code by percentages in the tables below. Also, provide the mode share to each destination.

Note to surveyor: If respondent declines to provide city/state/zip code information, replace the first two blank rows with "In region" and "Out of region". As a follow-up, attempt to use the last three blank rows to disaggregate "In region" to top three counties in the region.

Commodity #1 – Apparel

Destination				Mode				
City	**State**	**Zip Code**	**Percent Total**	**% By Truck**	**% By Rail**	**% By Air**	**% By Water**	**% other (specify)**
e.g., Las Vegas	*Nevada*	*89030*	*35%*	*60%*				*40% truck/rail intermodal*
Total			**100%**					

Commodity #2 – Textile Mill Products

Destination				Mode				
City	**State**	**Zip Code**	**Percent Total**	**% By Truck**	**% By Rail**	**% By Air**	**% By Water**	**% other (specify)**
e.g., Las Vegas	*Nevada*	*89030*	*35%*	*60%*				*40% intermodal*
Total			**100%**					

Commodity #3 – Please specify _____

Destination				Mode				
City	**State**	**Zip Code**	**Percent Total**	**% By Truck**	**% By Rail**	**% By Air**	**% By Water**	**% other (specify)**
e.g., Las Vegas	*Nevada*	*89030*	*35%*	*60%*				*40% truck/rail intermodal*
Total			**100%**					

Section 4: Inbound Shipments

12. What are the annual shipments received at your facility in tons? _____

13. If annual tonnage shipments is not a available, please select the shipping unit and timeframe below that provides the highest level of accuracy.

Shipping metric (circle one): Tons Containers Truckloads Other (Please specify) _____

Timeframe (circle one): Annual Monthly Weekly Other (Please specify) _____

Amount of shipments _____

How many of these timeframe units (e.g., weeks) are in a shipping year? _____

14. What is the value of these shipments? _____

15. Does this facility have seasonal peaks for inbound shipments? If yes, when are they and what percent of the annual shipments do they represent?

16. It is assumed that you ship apparel material to this facility. Do you ship other types of commodities such as textile mill products? Please provide the percent by weight of the major commodities shipped from this facility.

Apparel _____%

Textile Mill Products _____%

Commodity #3 (Please specify) _____ _____%

Total **_100__%**

17. For each of the commodities indicated in Question #16, provide the **top five destinations** by city, state, and zip code by percentages in the tables below. Also, provide the mode share to each destination.

Note to surveyor: If respondent declines to provide city/state/zip code information, replace the first two blank rows with "In region" and "Out of region". As a follow-up, attempt to use the last three blank rows to disaggregate "In region" to top three counties in the region.

Commodity #1 Apparel

Destination				Mode				
City	**State**	**Zip Code**	**Percent Total**	**% By Truck**	**% By Rail**	**% By Air**	**% By Water**	**% other (specify)**
e.g., Las Vegas	*Nevada*	*89030*	*35%*	*60%*				*40% truck/rail intermodal*
Total			**100%**					

Commodity #2 – Textile Mill Products

Destination				Mode				
City	**State**	**Zip Code**	**Percent Total**	**% By Truck**	**% By Rail**	**% By Air**	**% By Water**	**% other (specify)**
e.g., Las Vegas	*Nevada*	*89030*	*35%*	*60%*				*40% truck/rail intermodal*
Total			**100%**					

Commodity #3 – Other (Please specify) _____

Destination				Mode				
City	**State**	**Zip Code**	**Percent Total**	**% By Truck**	**% By Rail**	**% By Air**	**% By Water**	**% other (specify)**
e.g., Las Vegas	*Nevada*	*89030*	*35%*	*60%*				*40% intermodal*
Total			**100%**					