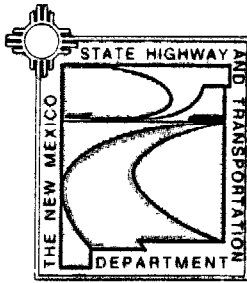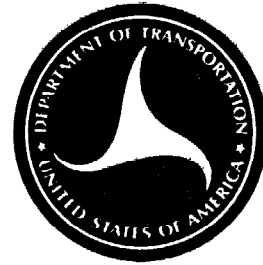New Mexico State
Highway and Transportation
Department

# SURVEY DESIGN FOR A STATEWIDE MULTIMODAL TRANSPORTATION FORCASTING MODEL

Prepared by:
Barton-Aschman Associates, Inc.
100 Park Center Plaza
Suite 450
San Jose, CA 95113

February 1992

**FINAL REPORT**

*1345*

Final Report

# Survey Design for a Statewide Multimodal Transportation Forecasting Model

Prepared for

Transportation Planning Division
New Mexico Highway and Transportation Department
P.O. Box 1149
Santa Fe, New Mexico 87504-1149

By

Barton-Aschman Associates, Inc.
100 Park Center Plaza, Suite 450
San Jose, CA 95113

February 17, 1992

| 1. Report No. | 2. Government Accession No. | 3. Recipient's Catalog No. |
|---|---|---|
| | | |

| 4. Title and Subtitle | 5. Report Date |
|---|---|
| SURVEY DESIGN FOR A STATEWIDE MULTIMODAL TRANSPORTATION FORECASTING MODEL | February 1992 |
| | 6. Performing Organization Code |

| 7. Author | 8. Performing Organization Report No. |
|---|---|
| D. Kurth, R. Donnelly, B. Arens, J. Hamburg, W. Davidson | 39072602 |

| 9. Performing Organization Name and Address | 10. Work Unit No. |
|---|---|
| Barton-Aschman Associates, Inc. 100 Park Center Plaza, Suite 450 San Jose, California 95113 | 11. Contract or Grant No. |

| 12. Sponsoring Agency Name and Address | 13. Type of Report and Period Covered |
|---|---|
| New Mexico State Highway and Transportation Department P.O. Box 1149 Santa Fe, New Mexico 87504-1149 | Final Report April 1991-February 1992 |
| | 14. Sponsoring Agency Code HPR 91-10 |

15. Supplementary Notes

NMSHTD Project Manager: David P. Albright

16. Abstract

In 1990, the NMSHTD initiated an ambitious and long-term research project. The project was to define the process for and undertake the development of a statewide multimodal transportation forecasting model. The project commenced in April, 1991. The first activity was an intensive two-day knowledge-sharing and brainstorming session. A research process for development of a multimodal travel forecasting model resulted from the meeting. This report is the specification of two prototype surveys to collect information that will be necessary for the development of the model. An establishment survey of visitors and employees is specified to obtain data on passenger flows. An establishment survey of commodity flows is also recommended. The geographic location, sample design, sample selection, and expected statistical accuracy are documented. Recommendations are presented for the classification of commodities for forecasting purposes.

| 17. Key Words | 18. Distribution Statement |
|---|---|
| Travel demand forecasting Truck forecasting Multimodal transportation Statewide transportation planning | No restrictions. This report is available from the National Technical Information Service. |

| 19. Security Classif. (of this report) | 20. Security Classif. (of this page) | 21. No. of Pages | 22. Price |
|---|---|---|---|
| | | 47 | |

Form DOT F 1700.7

Table of Contents

# Introduction

Substantial data will be required to develop and implement a multimodal transportation forecasting model for New Mexico. Data needs will include socioeconomic data, transportation network data, geographic data, and primary travel survey data. The data will be used to develop and calibrate the travel models, to apply the models for a base year validation, and finally, to develop projections of future travel under varying conditions. Much data has been previously collected or developed for normal planning activities (e.g., socioeconomic data and transportation network data for the Albuquerque area). However, substantial data must still be collected and developed to extend the current practice.

The compilation of the information that will ultimately be required by the multimodal transportation forecasting model will require considerable effort and coordination between agencies. Travel data will need to be collected and developed for many parts of the State. Since some of the component models of the multimodal forecasting system have not yet been developed, procedures for the collection of required data have not been specified.

A considerable effort will be required to coordinate the data collection effort. Data that will be useful to the development of the multimodal transportation forecasting model will be collected by agencies other than the New Mexico State Highway and Transportation Department (NMSHTD). For example, the New Mexico Department of Economic Development project to assess the economic development potential along the New Mexico-Mexico border could collect useful information. Likewise, the Middle Rio Grande Council of Governments (MRGCOG) is initiating a project to update their travel models that will include data collection. It will be necessary to ensure that some data standards are established to ensure the myriad data collected and developed for various parts of the state can be combined and used in the statewide modeling process.

Task 2 of the "Conceptual Process for Multimodal Transportation Forecasting for New Mexico" is the specification of two prototype surveys to collect information that will be necessary for the development of a travel forecasting model. This paper describes (1) an establishment survey of visitors and employees (referred to as an establishment survey), and (2) an establishment survey of commodity movements (referred to as a commodity survey). This paper will suggest the geographic location for the example surveys, the purpose and approach for each survey, the sample design, the sample selection, the survey design, and the expected statistical accuracy for each survey. The surveys should be pretested to identify possible problems with the design and conduct of the surveys. The pretest results are not expected to provide usable data with any degree of statistical significance. They will provide direction and necessary survey corrections prior to the complete, full-sized surveys which will be required for the collection of data for model development.

Data consistency is an important aspect of the development and collection of travel data. This consistency need extends to all types of travel survey data collected in the state (not just establishment survey and commodity movement survey data). Appendix A discusses standards for travel survey data collection. It envisioned that these standards will be expanded to include other types of surveys as the multimodal forecasting system develops..

The design of the example surveys has been influenced by the results of Task 1 of this project, the Development of a Conceptual Basis for Multimodal Transportation Forecasting. It was determined in Task 1 that there are a number of areas where additional research is required for the development of a multimodal transportation forecasting process. For example, additional work will be required in:

- geographical representation of the travel through the use of a geographical information system (GIS),

- development of consistent database information,

- estimates of intercity passenger travel,

- estimates of goods/commodity movement.

In Task 1, it was suggested that one of the weakest areas in travel demand forecasting was goods-commodity movement and that the first phase the development of a multimodal transportation forecasting model should be undertaken to improve our understanding and modeling of commodity movements by mode. A demonstration project to collect data on commodity movement generation is an appropriate next effort to undertake.

Establishment surveys of visitors and employees have been performed in the recent past (e.g., Dallas-Ft. Worth in 1984, San Juan in 1990, Minneapolis-St. Paul in 1991), but they are not as common as home interview surveys in the travel demand forecasting process. The commodity movement survey is envisioned as an extension to an establishment survey. Such a survey has not previously been performed. This extension is a research activity and will need to be carefully monitored to ensure that the results will move us closer to our goal as stated in the Task 1 summary paper:

> The multimodal transportation modeling process should project all travel of people and goods involving New Mexico at a specified point in time, in order that wise decisions can be made regarding the design of and the expenditure of public funds on safe, environmentally sound transportation facilities.

Thus, the commodity survey must be evaluated on its ability to collect information that can be used to increase our understanding of commodity movements to, from, and through New Mexico.

## Establishment Survey of Visitors and Employees

### Purpose and Approach

Establishment surveys are generally designed to be used in conjunction with the results of home-interview surveys for the calibration of regional (generally, urban) travel models. Home interview surveys collect data on the travel of residents of a sampled household. That is, all of the travel by each member of a household is enumerated. The object of an establishment survey is to collect travel data for a sample of the person arrivals at a sampled establishment. Because

2

of their sampling frame (the establishment), establishment surveys are ideal for the calibration of trip attraction models, just as household surveys are ideal for the calibration of trip production models.

The use of establishment surveys to collect data for travel model calibration is not new. Establishment surveys have been successfully administered and used for the calibration of travel models in several areas. However, establishment surveys are not as widely used as home-interview surveys for the collection of primary travel data. The design of an establishment survey for New Mexico is important to demonstrate its usefulness in collecting primary travel data.

In an establishment survey, persons arriving at an establishment are interviewed with respect to the characteristics of their trip to the establishment and, in the case of the employees of the establishment, multiple trips which they make to and from the establishment during the day. The establishment survey seeks to obtain data for a sample of the work and non-work trips to a specific establishment during a 24-hour period. When expanded to the total arrivals at the establishment, these work and non-work trips can then be expressed as work trips and non-work trips per employee.

The mechanics of the establishment survey involve the use of two self-enumeration questionnaires, one for employees and one for non-employees. In addition, the owner or person in charge of the establishment is personally interviewed to obtain information regarding the establishment, the number of persons employed at the establishment, and the number of employees in attendance at the establishment on the day of the survey. Finally, counts of all people entering the establishment (through all entrances) are taken on the day of the survey. This information is used to factor the survey responses from the employees in attendance and the visitors to represent all employees in attendance on the survey day and all visitors on the survey day.

## Survey Location

The establishment survey pretest should be conducted in Doña Ana County. Doña Ana County has been selected since it is the site of the GIS pilot study and is also the focus of a study by the New Mexico Economic Development Department.

## Sample and Survey Design

### Stratification

In a survey, it is desirable to collect travel survey data that is representative of all travel in the region. In an establishment survey, the primary sampling unit is the establishment, so the sample should be representative of all establishments in the region being surveyed. Depending on the resources available for the survey and anticipated use of the data, it might be appropriate to stratify the establishments. Quota samples are then taken for each stratum. Stratifications that have been used in past surveys include Standard Industrial Classification (SIC) code groupings, establishment size, and area type of the establishment location.

SIC code groupings are important since person trip attraction rates tend to vary by establishment type. For example, very few home-based shop trips are made to "basic" industry establishments (agriculture, mining, manufacturing, etc), while a substantial number of home-based shop trips are made to retail industry establishments. Industry groupings by two digit SIC codes are shown in Appendix B. Past surveys have used groupings such as basic (SIC codes 0 to 51), retail (SIC codes 52 to 59), service (SIC codes 60 to 89), and government (SIC codes 90 to 97).

The size of an establishment may also have an impact on its trip generation characteristics. In addition, it is possible for many small firms to be excluded from lists of establishments (e.g., Dun and Bradstreet listings). Because of this problem, the stratification of establishments by size might also be desirable to ensure that all size groupings of establishments are adequately sampled.

Finally, it is often desirable to stratify establishments by function. Classifications of establishments by SIC code or size might not fully reflect differences in establishment trip generation characteristics when firms are very large with specific functions spatially separated. For example, a large petroleum products firm might have actual oil wells, refineries, and administrative offices among its corporate activities. The administrative functions might be housed in a downtown office building with trip generation characteristics substantially different from the actual production facilities (probably located in rural areas).

Stratification of an establishment survey by area type has been used as an attempt to separate and classify establishments by these different characteristics. Area type is really a surrogate for different levels of development density, the provision of free or paid parking, the amount of activity that can be satisfied by walk trips, etc. These items impact trip generation rates. As long as area type is correlated with the factors that affect trip rates, the stratification of the establishment survey by area type is useful in explaining variations in trip rates. However, it must be realized that area types are only surrogate measures for the underlying causes of variations in the trip rates.

If sufficient resources are available, it is desirable to obtain survey data from 30 or more establishments from each stratum resulting from the above stratification procedures. Obviously, the number of strata increase with each new classification. For example, if four major SIC groupings, three size groupings, and three area type groupings were used, 36 different strata would result. If 30 establishments were sampled for each of the strata, a total of 1,080 samples would be required. If the area type stratification was dropped, only 12 strata would result, and only 360 surveys would be required.

Since this survey will be a pretest of the process, the stratification of the sample for the example survey will not be crucial to the results other than to demonstrate the process by which it can be performed. The main purpose of the example survey will be to demonstrate the survey, test the procedures, and identify potential problems with the survey instruments and approach. Thus, the example survey need not be stratified. However, since the survey is a pretest, it will be useful to select a sample of establishments that might be particularly difficult to survey or might indicate other problems with the survey design. Examples of such establishments include:

- large or small establishments,
- an establishment that shares space in a building (perhaps on the same floor as another establishment) such as a doctors or lawyers office,
- a retail or other commercial establishment in a shopping mall,
- a large manufacturing or commercial establishment (with multiple entrances)
- a school (elementary, secondary, college, or technical).

## The Sample Element

The sample element is the establishment. The goal of the survey is to collect the number of trips destined to the establishment in order to be able to estimate the number of trips per employee for different establishment types. After the data are collected, establishments can be grouped to minimize the variation in trip rates among like establishments.

## Sample Size

For the establishment survey pretest for New Mexico, 30 employers should be selected. Then, efforts should be made to sample as many visitors to those establishments and employees of the establishments as possible on the specified survey days. The actual number of visitor and employee surveys that will be obtained cannot be pre-determined.

## Interview Methodology

Different techniques will be used to acquire the data. Information collected from the employer will be collected by a personal interview. These data include: total employment, attendance on the survey day, the type of activity at the establishment (to determine the SIC code), the hours of operation, and the floor area. Entrance counts will be performed by survey personnel. The actual travel data for non-employees will be obtained using self-enumeration questionnaires which the traveler will complete and return to the survey personnel administering the survey or will mail back. Worker surveys will also be self enumerated but will be returned to the employer.

The distribution of the questionnaires will be handled in two ways. The non-employee questionnaire will be distributed by a field surveyor who will hand out the questionnaires at the entrance(s) to the sampled establishment. The non-employees will return completed surveys to the field surveyor, deposit them in a collection box, or mail them using business reply mail. The employee questionnaire will be given to the employer to distribute to the employees in attendance on the survey day. The employee questionnaires will be returned to the employer for collection by field survey personnel on the following day.

In the survey, employee questionnaires are distributed to all employees by the employer and to all people arriving at the establishment by the field survey personnel. There is a high probability of an employee being given both questionnaires. For this reason, the non-employee questionnaire

has instructions which ask the person if he or she is a regular employee. If this is the case, the person is requested to not answer the remaining questions but to return the form to the person who gave him or her the questionnaire.

*Questionnaire Design*

The employee questionnaire is shown in Figure 1 and the non-employee questionnaire is shown in Figure 2. On the employee questionnaire, only two of the 13 data items will require coding (question K, "Occupation", and question L, "Home Address"). All other items are self coding. The non-employee questionnaire asks for eight data items, seven of which are self coding. Only question C, the start location of the trip, requires coding by survey personnel. Note that the coding of the home location for the employee survey and the start location for the non-employee survey will be to geographic coordinates in order to be compatible with the GIS.

Seasonality issues are important issues that it might be possible to address with the multimodal models. It is not feasible to survey each establishment at its peak season nor is it desirable since the models will also need to respond to questions regarding travel on an "average" day. As a result, true "peak" season demand will not be known. However, the relative relation to the peak season can be obtained by asking about the relationship of the activity on the day being surveyed to the peak season.

Figure 3 shows the employer questionnaire and Figure 4 shows the entrance count sheets. These forms will be completed by survey personnel.

All four forms are linked by a common establishment sequence number. This number will ensure that the data from all four forms can be related for analysis.

## Sample Selection

The sample selection procedure will involve selecting establishments from a list of non-residential establishments. There are two possibilities for drawing the sample. First, the sample can be selected from files maintained by the New Mexico Department of Labor. Alternatively, the sample can be purchased from a commercial vendor.

For the purposes of the example survey, the sample will not be stratified. As a result, selection from New Mexico Department of Labor files is probably most cost-effective. However, in a full survey to collect information for model calibration, the sample should be stratified by major SIC groupings (e.g., basic, retail, service, and government) and, possibly, by establishment size and area type. In an actual survey, 30 establishments might be selected for each stratum. The number of establishments included in the sample would have to be expanded to account for employers who refuse to participate in the survey. The sample for each stratum would be selected using a systematic process that would ensure a random sample of establishments (if the sample is purchased, the need for an unbiased sample will be one of the criterion used in specifying the required list of sample establishments).

6

**New Mexico State Highway and Transportation Department**
**Employee Travel Survey**                    **Establishment Number** _____

The New Mexico State Highway and Transportation Department is sponsoring a survey of travel in Doña Ana County. We ask your cooperation by completing the information requested below. If possible, please return this questionnaire to the person who gave it to you.

YOUR RESPONSES WILL BE KEPT CONFIDENTIAL AND WILL ONLY BE USED TO PRODUCE STATISTICAL DATA NEEDED TO IMPROVE TRANSPORTATION SERVICES IN THE AREA.

---

**A. At what TIME do you usually arrive at work?**
_____:_____   AM   PM   Noon   Midnight   (Write time and circle AM, PM, Noon or Midnight)

**B. HOW did you travel to work today? (Check box)**
☐ I drove a car/van/pickup/motorcycle.          ☐ I rode in a taxi.
☐ I was a passenger in a car/van/pickup/motorcycle. ☐ I walked or bicycled.
☐ I rode in a public bus.                        ☐ I used another means.
☐ I rode in a school bus.                        ☐ _____ (specify)

**C. If you traveled by auto, van, pickup, or motorcycle, HOW MANY PERSONS were in the vehicle, including yourself?**          _____ (Enter number of persons)

**D. If you were the DRIVER today, how much did you PAY TO PARK?** (Enter amount and check box as appropriate)
☐ Free        I pay $_____.____   ☐ daily        ☐ weekly        ☐ monthly

**E. If you were the DRIVER today, how many MINUTES did it take you to walk from where you parked?** _____ (Enter number of minutes)

**F. If you traveled BY BUS to get to work today, how did you get to your first bus stop?** (Check box)
☐ I drove a car/van/pickup/motorcycle.          ☐ I rode in a taxi.
☐ I was a passenger in a car/van/pickup/motorcycle. ☐ I walked or bicycled.
☐ I rode in a public bus.                        ☐ I used another means.
☐ I rode in a school bus.                        ☐ _____ (specify)

**G. Did you make any STOPS on your way TO work today?** (Check yes or no)
☐ No, I traveled directly to work.
☐ Yes, I made the following stops:

| PURPOSE OF STOP | 1ST STOP | 2ND STOP | 3RD STOP | 4TH STOP |
|---|---|---|---|---|
| Work Related | ☐ | ☐ | ☐ | ☐ |
| Shopping | ☐ | ☐ | ☐ | ☐ |
| School | ☐ | ☐ | ☐ | ☐ |
| Social / Recreational | ☐ | ☐ | ☐ | ☐ |
| Personal Business | ☐ | ☐ | ☐ | ☐ |
| Eat a Meal | ☐ | ☐ | ☐ | ☐ |
| Pick up or drop off passenger | ☐ | ☐ | ☐ | ☐ |

**Figure 1: Employee Survey Questionnaire**

H. Did you make any STOPS on your way FROM work yesterday or your last weekday at work? (Check yes or no)
☐ No, I traveled directly home.
☐ Yes, I made the following stops:

| PURPOSE OF STOP | 1ST STOP | 2ND STOP | 3RD STOP | 4TH STOP |
|---|---|---|---|---|
| Work Related | ☐ | ☐ | ☐ | ☐ |
| Shopping | ☐ | ☐ | ☐ | ☐ |
| School | ☐ | ☐ | ☐ | ☐ |
| Social / Recreational | ☐ | ☐ | ☐ | ☐ |
| Personal Business | ☐ | ☐ | ☐ | ☐ |
| Eat a Meal | ☐ | ☐ | ☐ | ☐ |
| Pick up or drop off passenger | ☐ | ☐ | ☐ | ☐ |

I. Did you make any TRIPS during working hours yesterday or your last weekday at work? (Check yes or no)
☐ No, I didn't make any trips.
☐ Yes, I made the following trips:

| PURPOSE OF TRIP | 1ST TRIP | 2ND TRIP | 3RD TRIP | 4TH TRIP |
|---|---|---|---|---|
| Work Related | ☐ | ☐ | ☐ | ☐ |
| Shopping | ☐ | ☐ | ☐ | ☐ |
| School | ☐ | ☐ | ☐ | ☐ |
| Social / Recreational | ☐ | ☐ | ☐ | ☐ |
| Personal Business | ☐ | ☐ | ☐ | ☐ |
| Eat a Meal | ☐ | ☐ | ☐ | ☐ |
| Pick up or drop off passenger | ☐ | ☐ | ☐ | ☐ |
| Go Home | ☐ | ☐ | ☐ | ☐ |

| MEANS OF TRAVEL | 1ST TRIP | 2ND TRIP | 3RD TRIP | 4TH TRIP |
|---|---|---|---|---|
| Auto/Van/Pickup/Motorcycle | ☐ | ☐ | ☐ | ☐ |
| Bus | ☐ | ☐ | ☐ | ☐ |
| Other | ☐ | ☐ | ☐ | ☐ |

| NEXT ACTIVITY | 1ST TRIP | 2ND TRIP | 3RD TRIP | 4TH TRIP |
|---|---|---|---|---|
| Return to Work | ☐ | ☐ | ☐ | ☐ |
| Go to Next Trip | ☐ | ☐ | ☐ | ☐ |

J. How many AUTOS, PICKUPS, and VANS are available for use by members of your household?
_____ (Enter number of vehicles)

K. What is your OCCUPATION? _____

L. What is your home ADDRESS? _____
(Number and Street)

_____   _____
(City)                                    (Zip)

M. What is your annual HOUSEHOLD INCOME? (Check box)
☐ Less than $10,000          ☐ $30,000 - $34,999
☐ $10,000 - $14,999          ☐ $35,000 - $39,999
☐ $15,000 - $19,999          ☐ $40,000 - $49,999
☐ $20,000 - $24,999          ☐ $50,000 - $59,999
☐ $25,000 - $29,999          ☐ $60,000 or more

Figure 1 (Continued): Employee Survey Questionnaire

8

**New Mexico State Highway and Transportation Department**
**Visitor Travel Survey**                                    **Establishment Number** _____

The New Mexico State Highway and Transportation Department is sponsoring a survey of travel in Doña Ana County. We ask your cooperation by completing the information requested below. If possible, please return this questionnaire to the person who gave it to you.

YOUR RESPONSES WILL BE KEPT CONFIDENTIAL AND WILL ONLY BE USED TO PRODUCE STATISTICAL DATA NEEDED TO IMPROVE TRANSPORTATION SERVICES IN THE AREA.

**A.  Is your regular place of employment at this address?** (Check box)
    ☐  Yes
    ☐  No

IF YOU ANSWERED "YES" TO QUESTION A, DO **NOT** ANSWER THE REMAINING QUESTIONS AND PLEASE RETURN THIS FORM TO THE PERSON WHO GAVE IT TO YOU.

**IF YOU ANSWERED "NO," PLEASE CONTINUE.**

**B.  At what TIME did you arrive here today?** (Record time and check box)
          ☐  AM  ☐  Noon
_____:_____  ☐  PM  ☐  Midnight

**C.  Where did you START the trip that brought you to this address?**

_____     _____     _____
Street address (or nearest intersection or place name)          City                    Zip

**Is this your home?**  ☐  Yes         ☐  No  (Enter name of place _____)

**D.  HOW did you get here?** (Check box)
    ☐  I drove a car/van/pickup/motorcycle.        ☐  I rode in a taxi.
    ☐  I was a passenger in a car/van/pickup/motorcycle.  ☐  I walked or bicycled.
    ☐  I rode in a public bus.               ☐  I used another means.
    ☐  I rode in a school bus.            ☐  _____(specify)

**E.  If you traveled to this place by auto, truck, or van, HOW MANY PERSONS were in the vehicle, including yourself?** _____ (Enter number)

**F.  If you were the driver today, how many MINUTES did you walk from where you parked?** (Check box)
    ☐  1 or less    ☐  2    ☐  3    ☐  4    ☐  more than 4 (_____ minutes)

**G.  If you traveled by BUS to get to this place, how did you get to the first bus stop?** (Check box)
    ☐  I drove a car/van/pickup/motorcycle.        ☐  I rode in a taxi.
    ☐  I was a passenger in a car/van/pickup/motorcycle.  ☐  I walked or bicycled.

**H.  What is the REASON for your trip here?** (Check box)
    ☐  I work here        ☐  Personal
    ☐  Shopping         ☐  Job related
    ☐  School           ☐  Eat a meal
    ☐  Social / Recreational    ☐  Pick up or drop off a passenger

**Figure 2:  Visitor Travel Survey**

**New Mexico State Highway and Transportation Department**
**Employer Interview**                                        Establishment Number _____

Interview Date: _____ Day: _____ Time: _____

1.    **Establishment Information:**

      Name _____ Telephone _____

      Type of Establishment _____ [SIC Code _____ ]

      Address _____

      City _____ Zip Code _____

      GPS Coordinates:        Latitude _____ Longitude _____


2.    **Contact Person Information:**

      Name _____ Department _____

      Title _____ Telephone _____


3.    **Number of Employees by Shift:**

      ___:___ am / pm to ___:___ am / pm        Employees: full-time _____ part-time _____

      ___:___ am / pm to ___:___ am / pm        Employees: full-time _____ part-time _____

      ___:___ am / pm to ___:___ am / pm        Employees: full-time _____ part-time _____


4.    · **Number of Establishment Entrances:**                              '

      Public entrances _____    Employee entrances _____    Loading docks / delivery areas _____

      Estimated number of surveyors needed _____


**TO BE COMPLETED BY LEAD SURVEYOR ON SURVEY DAY**


5.    **Survey Day** _____ **Date** _____


6.    **Attendance on Survey Day:** Full-time _____ Part-time _____


7.    **Employee Questionnaires Delivered:**        _____ to _____
                                                    _____ to _____


8.    **Non-Employee Questionnaires Delivered:**    _____ to _____
                                                    _____ to _____


Figure 3:  Employer Interview Form

New Mexico State Highway and Transportation Department
Establishment Survey
Arrival Count Sheet

Establishment Number _____

Survey Day _____ Date _____

1.  **Establishment Information**

    Name _____     Telephone _____

    Address _____

    City _____ Zip Code _____

    Type of Establishment _____

    Contact Person _____    Department _____

    Title _____    Telephone _____

2.  **Entrance Information:**

| | Location of Entrances (Draw Diagram and Indicate This Entrance with an X) | Non-Employee | From _____ To _____ |
| | | Questionnaire | From _____ To _____ |
| | | Serial Numbers | From _____ To _____ |
| | | for this Entrance | From _____ To _____ |

| Time | Total Number of Entering Persons | Comments |
|---|---|---|
| Midnight - 6:59 AM | | |
| 7:00 AM - 8:59 AM | | |
| 9:00 AM - 11:59 AM | | |
| Noon - 2:59 PM | | |
| 3:00 PM - 5:59 PM | | |
| 6:00 PM - 8:59 PM | | |
| 9:00 PM - 11:59 PM | | |
| TOTAL | | |

Surveyor on Site    From ___:___ To: ___:___    Surveyor: _____

Establishment Operation    From ___:___ To: ___:___    Supervisor: _____

Figure 4:  Arrival Count Sheet

## Survey Expansion and Accuracy

### Survey Expansion

In an establishment survey, employee questionnaires are distributed to all employees and to all people arriving at the establishment. Not all people receiving the survey will complete the form and not all completed forms will result in usable surveys (due to illogical or inconsistent responses by those surveyed). For these reasons, it will be necessary to factor the survey responses so that they are representative of all the people entering the establishment. The following data will be available at the end of a survey:

| Symbol | Data Item |
|---|---|
| C | A complete count of all persons entering the establishment during the hours of operation of the establishment (i.e., total person arrivals) |
| A | Employee attendance on the day of the survey |
| E | Total number of people employed at the establishment on the day of the survey (whether or not they were in attendance) |
| $Q_{nw}$ | Number of non-employee questionnaires completed for an establishment |
| $Q_w$ | Number of employee questionnaires completed for an establishment. The employee questionnaire also obtains trips made by employees to and from the establishment during the day. These data are key to the factoring of survey responses to the total count of persons arriving. |

The above data items can be used to expand the survey responses to match the arrival counts. The derivation of the expansion factors is as follows:

$$C = C_w + C_{nw} \tag{1}$$

where:    $C_w$ is the sum of all arrivals at the establishment by employees
$C_{nw}$ is the sum of all arrivals by non-employees.

In most cases, $C_w$ and $C_{nw}$ cannot be counted separately and are, therefore, not known. However, since the attendance on the survey day is known, an expansion factor for employee responses can be calculated:

$$F_w = \frac{A}{Q_w} \qquad (2)$$

An employee might enter the building once, twice, or three or more times. Each entrance will be counted on the count sheets. Since the employee questionnaire obtained trips by employees to and from the establishment throughout the day, the total arrivals by employees is the sum of recorded entrances by employees multiplied by the employee response expansion factor, $F_w$:

$$C_w = F_w \sum_{i=1}^{n} (1 + K_i) \qquad (3)$$

where: $K_i$ is the number of return trips to an establishment for the ith employee of the establishment

1 is for the first trip of the day to the establishment by the ith employee.

Based on the information developed using the above equations, the number of arrivals by non-employees can be estimated:

$$C_{nw} = C - C_w \qquad (4)$$

Finally, the expansion factor for non-employee survey responses ($F_{nw}$) can be estimated:

$$F_{nw} = \frac{C_{nw}}{Q_{nw}} \qquad (5)$$

As can be seen from the above description of the establishment survey factoring process, obtaining an accurate count of the total number of arrivals at the establishment and the correct attendance by employees on the survey day is crucial to the using the data collected by the survey.

If estimated totals for the survey region (e.g., total home-based work trips made to basic industry establishments) are required, a final expansion factor will need to be calculated and applied. The expansion factors for the region can be calculated for each stratum sampled (e.g., retail establishments in the central business district).

$$F_h = \frac{E_h}{e_h} \qquad (6)$$

where: $F_h$ is the expansion factor to regional totals for stratum h
$E_h$ is the total number of establishments in the region for stratum h
$e_h$ is the number of establishments surveyed for stratum h.

# Commodity Survey

## Purpose and Approach

The purpose of the commodity survey is to generate information on commodity movement generation and commodity movement distribution. The modeling of the generation and distribution of commodities is not a new concept. However, attempting to model the movement of commodities using an approach similar to the standard four step urban transportation modeling process is not well developed. One recent attempt has been made to develop a theoretical model to link personal transportation and goods movement[1]. The theoretical model developed has not been calibrated or implemented. More typically, "truck trip" generation and distribution models, not commodity movement models, are used in travel demand forecasting, if explicit modeling of goods movement is performed at all.

Before specifying the commodity movement survey, the focus of the survey must be identified. The dictionary defines a commodity as "an economic good as a product of agriculture or mining or an article of commerce, especially when delivered for shipment."[2]

Some commodities, such as coal, are easy to identify. However, some firms produce information or ideas. In the broadest sense, information and ideas can also be called commodities since they might be articles of commerce (i.e., they are bought and sold). It might be important to consider information and ideas as commodities in the long run. The following sections will, however, concentrate on the traditional definition of commodities in order to simplify the focus of the commodity movements survey.

It is necessary to consider both commodities and the movement of those commodities in defining the focus of the survey. There are six major facets that should be considered:

- life-cycle or stage of a commodity
- duration and frequency of shipment
- origin and destination of shipment
- commodity class of shipment
- shipment amount / size
- mode of shipment

### *Life-Cycle or Stage of a Commodity*

There are several basic stages through which most commodities pass as they move from extraction or harvesting to consumption. The life-cycle facet concentrates on the state of the

---

[1]Oppenheim, Norbert, "A Combined, Equilibrium Model of Urban Personal Travel and Goods Movements", presented at the Passenger Travel Demand Forecasting Committee (A1C02) meeting, Transportation Research Board, January, 1991.

[2]Webster's New Collegiate Dictionary, G. & C. Merriam Co., 1975.

actual commodities. This could be crucial to the generation and distribution of commodity movements. Transportation is often required to move the commodity from each stage to the next, although each stage need not necessarily be on the same site (with the exception of consumption).

- The extraction / harvesting stage. This stage includes mining, harvesting, fishing, etc. This stage represents the aggregation of raw materials such as mineral ore, livestock, harvested grain, etc., into one place. No processing of the commodity is performed in this stage. In other words, the ore would not have been processed by a smelter, the beef would not have been slaughtered, and the grain would not have been cleaned, hulled, or milled. This stage generally takes place at dispersed sites such as farms, ranches, and mines. Transportation of commodities from extraction / harvesting sites often relies on bulk shipping in trucks, although trains, barges, and ships might also be used.

- Initial processing stage. This stage represents the initial processing or refining of the commodity. For example, the mined ore is refined or smelted, cattle are slaughtered, grain is cleaned, hulled, or milled, etc. Not all commodities will pass through this stage (e.g., coal and petroleum might skip this stage in the life-cycle). Transportation of commodities from this stage to the next often relies on bulk shipping in trains, barges, and ships, although trucks are also used.

- Secondary processing stage. This stage represents the final processing of raw materials into commodities that can be used for manufacturing or consumption. For example, iron ore is made into steel, the beef is butchered into steaks, hamburger, and roasts, or the grain is milled into flour. Again, not all commodities will pass through this stage. Transportation of commodities from this stage to the next often relies on trains, barges, and ships, although trucks are also used. Bulk shipping (e.g., hopper trailers of cement), packaged shipping (e.g., sacks of flour), and unit shipping (e.g., steel beams) shipping are used to transport commodities from this stage to the next.

- Manufacturing stage. This stage represents the final processing of commodities into commodities that can be used for consumption. Continuing our example, the steel is used to build an automobile or make a paper clip, or the hamburger has been combined with dough made from the flour to make a frozen pizza. Shipments from this stage are typically made to distributors and retailers. Transportation of commodities from this stage to the next often relies on trains, barges, and ships, although trucks are also used. Most shipments from this stage to the next are of packaged commodities (e.g., cases of pizzas) or individual units (e.g., automobiles).

- Distribution stage. This is typically the final stage before retail sale and consumption of a commodity. Warehousing and transportation facilities or terminals are heavily involved at this stage. Examples include the storage of automobiles at train or truck terminals prior to shipment to auto dealers or the storage of the frozen pizzas at a wholesaler's or distributor's warehouse. Again,

not all commodities pass through this stage. For example, some coal is shipped directly from mines to electric power generating plants (by-passing all stages after the production / extraction stage). Trucks are often used in the shipping of commodities from this stage since the destinations are usually dispersed. Again, most shipments from this stage to the next are of packaged commodities or of individual units.

- Retail sale / consumption stage. This is the last stage in the commodity life-cycle. It typically takes place at widely distributed points: stores, homes, business establishments, etc.

## Duration and Frequency of Shipment

Much of the research into and applications involving traffic flow assumes that traffic operates within a diurnal cycle and largely within the geographic confines of an urban area. The primary example of research into and application of traffic flow theory is the urban transportation planning process. In contrast, commodity flows by truck, rail, barge, etc., often extend well past the 24-hour time period typically used in person trip forecasting, and are often intercity or interstate in nature.

Frequency of shipment is a related concern. Many shipments are made on a regular basis, although they might not be made daily. For example, shipments of coal from the mine to the electric generating plant might be made on a weekly basis. Conversely, many shipments, such as grain from a farm, are made on an infrequent, and possibly irregular, basis.

A commercial vehicle intercept survey was performed in 1990 on Interstate Highway 10 near Las Cruces. In total, 1,117 eastbound trucks and 850 westbound trucks were surveyed. While the survey covered only a sample of commercial trucks required to stop at a weigh station, it did provide some interesting insights into the movements of commodities. A question regarding the frequency of trips was asked. The response categories were:

- daily
- weekly
- monthly
- yearly
- infrequently

While the categories are coarsely defined, a rough idea of the average frequency of for commodity shipments can be estimated by weighting the above categories by 365, 52, 12, 1, and 0.5 to estimate the average number of commodity shipments per year. The average number of days between eastbound shipments was 8.0, and 10.2 for westbound shipments. Thus, based on the Interstate Highway 10 truck intercept survey, it can be seen that a commodity survey that covers only a single day will be likely to miss commodity shipment information unless a very large survey is performed. This would be true for both intercept and establishment surveys.

## Origin and Destination of Commodity Shipments

The origin and destination of shipments are crucial pieces of information in the commodity survey. The origin and destination should include the type of establishments shipping and receiving the commodities as well as their actual location. This information might be useful in conjunction with the life-cycle and frequency / duration information in the development of trip generation models.

The Interstate 10 survey provides some interesting information that will impact the design of the data collection procedure for commodity movements. Of the 1,967 trucks surveyed, 14 (0.7 percent), were making trips within New Mexico, 80 (4.1 percent) were trips to New Mexico from other states, and 139 (7.1 percent) were trips from New Mexico to other states. The remaining 1,724 (87.6 percent) were truck trips through the state. These percentages were affected by the location of the survey. Nevertheless, the results suggest that to fully understand commodity movements through and throughout the state, an intercept survey will be needed to supplement commodity surveys of New Mexico establishments. Since intercept surveys have been performed many times in the past, no test of an intercept survey will be performed as part of this study.

## Commodity Classification

For urban travel models which forecast person trips, the "commodity" being transported is simple to classify: a person. The trips made by the individual traveler are for different purposes that can be grouped into about ten categories: return home, work, shop, school, job related, personal business, social-recreational, serve passenger, change mode, or other. A commodity survey presents a different problem in the classification of trips for modeling purposes. The type of commodity considered might provide useful information for developing commodity movement generation and distribution models. For example, grain is shipped from farms seasonally at harvest time, while iron ore or coal is generally shipped from mines on a regular or semi-regular basis throughout the year. For distribution purposes, grain is shipped from farms to grain mills, not steel mills; steel is shipped to manufacturing plants, not bakeries; etc.

Since commodities are many different shapes and sizes, their classification is difficult. The Association of American Railroads (AAR) has developed and copyrighted standard transportation commodity (STC) codes for rail transportation. The STC codes are three level, seven digit codes. The first two digits represent the industry and are approximately the same as SIC codes listed in Appendix B. The next three digits represent the manufacturer or manufacturing process, and the final two digits represent the actual commodity. The AAR has classified approximately 15,000 commodities and 4,200 hazardous wastes using STC codes.

Alternatively, the Federal Highway Administration (FHWA) has developed standard commodity codes for truck shipments. These codes are shown in Table 1. The FHWA codes offer the advantage over the STC codes of having been developed by a federal agency and not being copyrighted. The FHWA codes are generally used throughout the nation. A drawback to the FHWA codes is that they are not as detailed as the STC codes.

## Table 1: FHWA Cargo Classification Categories

| FHWA Code | Description |
| --- | --- |
| 01 | Farm products |
| 08 | Forest products |
| 09 | Fresh fish and other marine products |
| 10 | Metallic ores |
| 11 | Coal |
| 13 | Crude petroleum, natural gas, and natural gasoline |
| 14 | Nonmetallic minerals, except fuels |
| 19 | Ordnance and accessories |
| 20 | Food and kindred products |
| 21 | Tobacco products |
| 22 | Textile mill products |
| 23 | Apparel and other finished textile products, including knit |
| 24 | Lumber or wood products, except furniture |
| 25 | Furniture or fixtures |
| 26 | Pulp, paper, and allied products |
| 27 | Printed matter |
| 28 | Chemicals or allied products |
| 29 | Petroleum and coal products |
| 30 | Rubber or miscellaneous plastics products |
| 31 | Leathers or leather products |
| 32 | Stone, glass, clay, or concrete products |
| 33 | Primary metal products |
| 34 | Fabricated metal products, except ordnance, machinery or transportation equipment |
| 35 | Machinery (except electrical) |
| 36 | Electrical machinery, equipment, or supplies |
| 37 | Transportation equipment |
| 38 | Instruments, photographic and medical goods, watches, and clocks |
| 39 | Miscellaneous products of manufacturing |
| 40 | Waste and scrap materials |
| 42 | Containers, shipping, returned empty |
| 46 | Miscellaneous mixed shipments |

At their most aggregate level, the STC codes and FHWA codes are similar to and offer little advantage over the SIC codes. At their most disaggregate level, the STC codes are too detailed. Because of this, a commodity coding system (CCS) for the survey is proposed based on the SIC codes shown in Appendix B. This system is listed in Appendix C. It is possible to aggregate the CCS codes to the FHWA categories. While the CCS will be used to code the commodities to a reasonable number of categories, the survey will also collect information on the actual commodity being shipped.

## Amount or Size of Shipment

The amount or size of a shipment is a major concern in the study of commodity movements. Shipment sizes can vary drastically. For example, a commodity shipment might be as small as several cases of goods weighing under 100 pounds to unit trains of coal or barge loads of grain weighing multiple tons. Defining a common metric to measure the size of a shipment is not possible. For the shipment of some commodities, weight is used as the measure of size (e.g., tons of grain), for other commodities, volume is the measure (e.g., cubic yards of concrete), and for other commodities, the number of units shipped is the measure (e.g., the number of autos shipped). For survey purposes, the amount or size of the commodities shipped will need to be recorded in the normal metric specified for the shipment.

## Shipping Mode

The mode used for shipping a commodity is the final facet to consider in the definition of commodity movements. It is possible to define the shipping mode by the means of conveyance used to transport the commodity. Under such a classification system, typical modes are:

- motorized truck (over the roadway system)
- rail
- barge or ship
- air

The above classification system is probably too restrictive. The size of the truck might be a concern since it can vary from small vans to large tractor-trailer combinations. Rail can vary by the type of rail car or train. Shipments might be made as less than carloads, carloads, piggy-back trailers, or unit trains. In addition, shipments might be mixed mode. Prime examples of mixed mode are piggy-back trailers on rail cars, containerized freight on ships, and air freight (since the commodity shipped must be transported to the air terminal).

As with shipment size and amount, commodity movement information should be collected in as much detail as possible. This will include specifying shipments on the roadway system using the FHWA vehicle classification categories[3] (shown in Table 2), identifying the type of rail car or rail shipping method, all modes used in mixed mode shipping (e.g., two-axle, four-tire single unit vehicle to airplane), etc.

---

[3]Office of Highway Planning, Federal Highway Administration, **Traffic Monitoring Guide**, Washington, D.C., June 1985.

## Table 2: FHWA Vehicle Classifications

| Class | Description |
|-------|-------------|
| 1 | Motorcycles |
| 2 | Passenger cars |
| 3 | Other two-axle, four-tire single unit vehicles |
| 4 | Buses |
| 5 | Two-axle, six-tire single unit trucks |
| 6 | Three-axle single unit trucks |
| 7 | Four or more axle single unit trucks |
| 8 | Four or less axle single trailer trucks |
| 9 | Five-axle single trailer trucks |
| 10 | Six or more axle single trailer trucks |
| 11 | Five or less axle multi-trailer trucks |
| 12 | Six-axle multi-trailer trucks |
| 13 | Seven or more axle multi-trailer trucks |

## Commodity Movement Survey Approach

In the commodity movement survey, information on all shipments sent or received during the survey period will be requested for the establishment. The commodity movement survey will be performed in conjunction with the establishment survey. However, the survey will be modified to collect the information required on commodity movements. As mentioned above, surveying for only a single day will not provide the information necessary for developing commodity movement models since many movements are made less frequently (unless a large number of establishments are surveyed). As a result, the commodity movement survey will collect commodity movement information for the preceding week (note that the time period can be expanded to the preceding two week or preceding month in a full survey). While the commodity portion of the survey will cover one week, the establishment portion of the survey portion will still cover a one day period.

The commodity survey information will be collected from secondary sources such as bills of lading, packing lists, and shipping and receiving personnel. The information collected from the secondary sources will include the commodity shipped, the amount shipped (weight, volume, and/or units), the shipping method (e.g., truck, rail, "mixed-mode" such as truck to rail or truck to air freight), the shipper type, the origin or destination of the shipment, and whether the shipment is a mixed load (e.g., a delivery truck sent on a route with multiple deliveries). In addition, attempts will be made to collect information on the commodity being shipped by its stage in its life-cycle, the seasonality of shipments, and the incidence of infrequently made shipments. For example, if only one shipment of a particular commodity is received during the survey period, an attempt will be made to determine if a shipment of that type is received bi-weekly, monthly, quarterly, semi-annually, etc.

Control total checks for the establishment will be determined by counting the number of commercial vehicles entering and leaving the establishment (for the survey day only). In some cases, such as a retail store in a shopping mall, counting the number of vehicles for a specific establishment might be difficult or impossible. However, it should be possible to count the number of pick-ups or deliveries made by delivery personnel in those cases.

Finally, delivery personnel will be interviewed upon their entry to the establishment (on the survey day only). These personnel will be given a survey that asks whether they are making a pick-up or delivery (or both), if the stop is part of a multi-stop trip or route, the previous stop location, the next stop location, and the time. This will be done through a modification to the visitor survey form used for the establishment survey.

## Survey Location

The example commodity survey should be conducted in Doña Ana County in conjunction with the establishment survey.

## Sample and Survey Design

### Stratification

As with the establishment survey, the primary sampling unit in the commodity survey is the establishment. In a full survey, it will be appropriate to stratify the establishments being surveyed. Stratifications that are likely to be important to the modeling of commodity movements include SIC code groupings, establishment size, and area type of the establishment location. These stratifications are similar to those that are important to the establishment survey of employees and visitors. It is likely that the commodity generation will be related to different strata than those used for person trip generation. As stated previously, many person trip attraction models stratify employment into basic, retail, and service categories. However, the number of commodity movements for grocery stores and for furniture stores are likely to be quite different simply because of the shelf life of the commodity. Thus, different stratifications of establishments might be appropriate for the commodity survey than would be appropriate for an establishment survey of employees and visitors.

Another factor that will affect the stratification of the commodity movement survey is the desire to collect information regarding the life-cycle of the commodity. An alternative SIC code stratification scheme could result. One possible stratification would be:

| Life-Cycle Stage | SIC Codes (see Appendix B for definitions) |
|---|---|
| Production/Extraction | 01 - 14 |
| Initial and secondary processing | 15 - 17, 22 - 24, 26, 28 - 33 |
| Manufacturing | 20 - 21, 23, 25, 27, 34 - 39 |
| Distribution | 40 - 51 |
| Retail sale/consumption | 52 - 99 |

21

Since this survey is an example of the process, there is no need to rigorously stratify the establishments. Rather, establishments that might be difficult to survey, as outlined for the establishment survey, should be selected.

## Sample Element

The sample element for the commodity movement survey will be the establishment. The goal will be to collect information on commodity shipments to and from the establishments in order to be able to group establishments with similar commodity trip generation rates. A second goal of the survey will be to determine methods for grouping commodities into similar groups for classification purposes.

## Sample Size

For the example commodity survey, the same 30 employers selected for the establishment survey should be used.

## Interview Methodology

Information collected from the employer will be collected in a personal interview. The same information collected from the employer for the establishment survey will be used for the commodity survey. For the commodity movement portion of survey, information will be collected in a personal interview. It is likely that the surveyor will need to meet with the appropriate establishment personnel and copy information from bills of lading for shipments to and from the establishment.

Self-enumerating survey questionnaires will be distributed to delivery personnel upon their entry to the establishment. This portion of the commodity survey can be accomplished by modifying the visitor survey to include questions regarding the delivery being made. This will be accomplished by directing the respondent to a special section of the questionnaire if he or she is making or picking up a delivery.

Counts of commodity deliveries and pick-ups will be performed by survey personnel. The survey personnel will count the number of commercial vehicles entering the establishment. In cases where delivery vehicles cannot be observed, the count will be made whenever a delivery person enters an establishment. This task will require surveyors to be especially vigilant.

## Questionnaire Design

Figure 5 shows the commodity shipment and delivery survey form that will be used by survey personnel to collect information on shipments for the previous week. The modified establishment survey form to include delivery personnel entering the establishment is shown in Figure 6 and the modified establishment entrance count sheets are shown in Figure 7. The employer survey used for the establishment survey (Figure 3) can be used for commodity survey. The forms will all be linked by using a common sequence number for the establishment participating in the commodity survey.

**New Mexico State Highway and Transportation Department**
**Commodity Shipment Survey**                                        Establishment Number _____
**Page 1 of 2**

**Establishment Name:** _____
**Survey Day** _____ **Date** _____ .
**Survey Period:**        **From** ___/___/___        **To** ___/___/___

---

A.   **Commodity Shipment Sequence Number** _____ of _____

---

B.   **Was the commodity:**      **shipped?**  ☐        Date shipped or received: ___/___/___ Time: ___:___

                          **received?**  ☐        Commodity shipped to or received from:

                                      Establishment Name: _____

                                      Address:        _____

                                                  _____

                                                  _____

                          [GPS Coordinates: Latitude _____ Longitude _____]

---

C.   **Describe the commodity (e.g., coal, shoes, bread,...):** _____

                                      [CCS Code: _____]

---

D.   **What type of processing took place on this commodity where this shipment originated?**  (Check
     **one box)**

     ☐  extraction / harvesting    ☐  secondary processing    ☐  distribution / warehousing
     ☐  initial processing        ☐  manufacturing          ☐  retail sale / final consumption

     **What sort of processing will take place on this commodity at its destination?**  (Check one box)
     ☐  extraction / harvesting    ☐  secondary processing    ☐  distribution / warehousing
     ☐  initial processing        ☐  manufacturing          ☐  retail sale / final consumption

---

E.   **What is the packaging method and amount for this commodity?**
     ☐  bulk      amount _____    ☐ lbs  ☐ tons  ☐ cu. ft.  ☐ other (specify _____)
     ☐  individual units    number _____    weight / unit _____    ☐ lbs  ☐ tons

---

F.   **How often this commodity shipped from or received by this establishment?**
     ☐  every _____ days   ☐  every _____ months      ☐  one-time shipment
     ☐  every _____ weeks · ☐  irregular intervals/on demand  ☐  other (specify _____)

---

G.   **How long did it take for this commodity to reach you or will it take for it to reach its destination?**
         _____  ☐ hours ☐ days ☐ weeks    ☐ other (specify _____)

**Figure 5:  Commodity Shipment Survey**

23

**New Mexico State Highway and Transportation Department**
**Commodity Shipment Survey**
**Page 2 of 2**

H. **What shipping method was used or will be used for this commodity (check all that apply)?**

| Truck | Rail | Air Freight | Ship | Other |
|---|---|---|---|---|
| ☐ 2-axle, 4-tire single unit vehicle | ☐ full car | ☐ scheduled airline | ☐ barge | ☐ _____ |
| ☐ bus | ☐ part car | ☐ air freight service | ☐ freighter | |
| ☐ 2-axle, 6-tire single unit truck | ☐ trailer on | ☐ _____ | ☐ _____ | |
| ☐ 3-axle, single unit truck | flat car | | | |
| ☐ 4 or more axle single unit truck | ☐ _____ | | | |
| ☐ 4 or less axle single trailer truck | | | | |
| ☐ 5-axle single trailer truck | | | | |
| ☐ 6 or more axle single trailer truck | | | | |
| ☐ 5 or less axle multi-trailer truck | | | | |
| ☐ 6-axle multi-trailer truck | | | | |
| ☐ 7 or more axle multi-trailer truck | | | | |
| ☐ truck of unknown type | | | | |

I. **Does your establishment own or lease the vehicle(s) used to ship this commodity?**
☐ yes
☐ no
☐ some (which vehicles _____)

J. **Will this commodity be shipped from this establishment or was it received by this establishment along with another shipment on the same vehicle?**
☐ yes (commodity sequence numbers of co-shipments _____)
☐ no

K. **Comments and notes (list letter of question before each comment)**

_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

**Figure 5 (Continued): Commodity Shipment Survey**

**New Mexico State Highway and Transportation Department**
**Visitor Travel Survey**                          **Establishment Number** _____
**Page 1 of 2**

The New Mexico State Highway and Transportation Department is sponsoring a survey of travel in Doña Ana County. We ask your cooperation by completing the information requested below. If possible, please return this questionnaire to the person who gave it to you.

YOUR RESPONSES WILL BE KEPT CONFIDENTIAL AND WILL ONLY BE USED TO PRODUCE STATISTICAL DATA NEEDED TO IMPROVE TRANSPORTATION SERVICES IN THE AREA.

---

**A.  Is your regular place of employment at this address?** (Check box)
   ☐  Yes
   ☐  No

IF YOU ANSWERED "YES" TO QUESTION A, DO **NOT** ANSWER THE REMAINING QUESTIONS AND PLEASE RETURN THIS FORM TO THE PERSON WHO GAVE IT TO YOU. IF YOU ANSWERED "NO," PLEASE CONTINUE.

**B.  Are you making a pickup or delivery as part of your normal job?** (Check box)
   ☐  Yes
   ☐  No

IF YOU ANSWERED "YES" TO QUESTION B, PLEASE SKIP TO QUESTION J. IF YOU ANSWERED "NO," PLEASE COMPLETE QUESTIONS C THROUGH I.

**C.  At what TIME did you arrive here today?** (Record time and check box)
        ☐  AM ☐  Noon
____:____ ☐  PM ☐  Midnight

**D.  Where did you START the trip that brought you to this address?**

_____      _____   _____
Street address (or nearest intersection or place name)     City       Zip

**Is this your home?** ☐  Yes    ☐  No (Enter name of place _____)

**E.  HOW did you get here?** (Check box)
   ☐  I drove a car/van/pickup/motorcycle.      ☐   I rode in a taxi.
   ☐  I was a passenger in a car/van/pickup/motorcycle.  ☐   I walked or bicycled.
   ☐  I rode in a public bus.                 ☐   I used another means.
   ☐  I rode in a school bus.               ☐   _____ (specify)

**F.  If you traveled to this place by auto, truck, or van, HOW MANY PERSONS were in the vehicle, including yourself?** _____ (Enter number)

**G.  If you were the driver today, how many MINUTES did you walk from where you parked?** (Check box)
   ☐  1 or less    ☐  2    ☐  3    ☐  4    ☐  more than 4 (_____ minutes)

**H.  If you traveled by BUS to get to this place, how did you get to the first bus stop?** (Check box)
   ☐  I drove a car/van/pickup/motorcycle.       ☐   I rode in a taxi.
   ☐  I was a passenger in a car/van/pickup/motorcycle.   ☐   I walked or bicycled.

**Figure 6: Visitor Travel Survey**

New Mexico State Highway and Transportation Department
Visitor Travel Survey
Page 2 of 2

I.  **What is the REASON for your trip here?** (Check box)
    □   I work here                    □   Personal
    □   Shopping                       □   Job related
    □   School                         □   Eat a meal
    □   Social / Recreational          □   Pick up or drop off a passenger

IF YOU ANSWERED "NO" TO QUESTION B, STOP HERE.

J.  At what TIME did you arrive here today? (Record time and check box)
                    □   AM  □   Noon
    ____:____       □   PM  □   Midnight

K.  **Are you making a pickup, delivery, or both?**
    □ Pickup          □ Delivery   □ Both

L. · **Where did you come from before stopping here?**

    _____
    Name of place

    _____
    Street address (or nearest intersection or place name)

    _____   ____   _____
    City             State  Zip

    **Is this your normal place of employment?**   □   Yes      □   No

M.  **Where will you go after stopping here?**

    _____
    Name of place

    _____
    Street address (or nearest intersection or place name)

    _____   ____   _____
    City             State  Zip

    **Is this your normal place of employment?**   □   Yes      □   No

N.  **Is this stop part of a regular or frequent route?**

    □ Yes   □ No

    How often do you stop here? _____ times every  □ day  □ week  □ month  □ year

**Figure 6 (Continued):  Visitor Travel Survey** ·

26

New Mexico State Highway and Transportation Department
Establishment Survey
Arrival Count Sheet

Establishment Number _____

Survey Day _____ Date _____

1.    Establishment Information:

Name _____    Telephone _____
Address _____
City _____ Zip Code _____
Type of Establishment _____

Contact Person _____    Department _____
Title _____    Telephone _____

2.    Entrance Information:

Location of Entrances    Non-Employee Question-    From _____    To _____
(Draw Diagram and    naire Serial Numbers for    From _____    To _____
Indicate This Entrance    this Entrance    From _____    To _____
with an X)    From _____    To _____

| Count Item | Midnight - 6:59 AM | 7:00 AM - 8:59 AM | 9:00 AM - 11:59 AM | Noon - 2:59 PM | 3:00 PM - 5:59 PM | 6:00 PM - 8:59 PM | 9:00 PM - 11:59 PM |
|---|---|---|---|---|---|---|---|
| Entering Persons | | | | | | | |
| Arriving Delivery Vehicles | | | | | | | |
| 2-axle/4-tire single unit | | | | | | | |
| 2-axle/6-tire single unit | | | | | | | |
| 3-axle single unit | | | | | | | |
| 4+ axle single unit | | | | | | | |
| <5 axle single trailer | | | | | | | |
| 5 axle single trailer | | | | | | | |
| 6+ axle single trailer | | | | | | | |
| <6 axle multi-trailer | | | | | | | |
| 6-axle multi-trailer | | | | | | | |
| 7+ axle multi-trailer | | | | | | | |
| Unknown type | | | | | | | |

Surveyor on Site    From __:__ ,    To: __:__    Surveyor: _____

Establishment Hours    From __:__    To: __:__    Supervisor: _____

**Figure 7:  Arrival Count Sheet**

## Sample Selection

For the example survey, the same sample used for the establishment survey will be used for the commodity survey. In an actual survey, it might be necessary to increase the number of strata included in the commodity survey over the number of strata included in the establishment survey. This could cause the commodity survey sample to be drawn separately from the establishment survey. Alternatively, the establishment survey could be drawn as a subset of the commodity survey sample.

## Expansion and Accuracy

### Survey Expansion

In the commodity survey, information should be obtained for all shipments from and deliveries to an establishment. As a result, it should not be necessary to factor the survey information obtained from the shipment and delivery questionnaires. Note, however, that there will be a check regarding the total number of shipments sent and received. The number of stops made by delivery personnel to pick-up or deliver shipments can be summarized from the survey forms if mixed shipments are adjusted to represent one stop (some overcounting of the number of stops will occur when a stop by a delivery person results in both a delivery and a shipment). The number of stops estimated from the shipment and delivery questionnaires (for the survey day) should be approximately equal to the number of shipment stops or delivery stops recorded on the count sheets.

Not all delivery personnel will complete the survey form provided (as part of the establishment survey process) and not all of the completed forms by delivery personnel will result in usable surveys. Thus, the delivery personnel questionnaires will need to be factored to represent all delivery personnel entering the establishment. The expansion factor can be calculated by dividing the total number of stops calculated from the shipment and delivery questionnaires by the number of completed, usable delivery personnel survey forms.

# Appendix A

# Travel Survey Data Collection Standards

Every travel survey that is undertaken in New Mexico should be tailored to match the needs of the survey. This will require determining the data needs from the survey, the statistical accuracy required from the survey, the population to be sampled, the design of the survey forms, and the survey methodology. While these survey elements will be unique for each survey, it must be realized that the data collected in the survey might be of value for later analyses. Thus, there is a reason to specify some standards for data collection in order to provide consistency among different data collection efforts. Consistent or standard data are more likely to be usable for different studies or modeling efforts, more transferable, and less likely to misinterpreted.

Data consistency does not necessarily imply that the same data must be collected in all surveys. However, it does imply that the data collected should be easily aggregated or disaggregated. For example, if income information is collected in two different surveys, the compatibility of the surveys would be enhanced if the same income group definitions were used in both surveys. If fewer income groups are required in one of the surveys, the chosen income groups should be direct aggregations of the income groups used in the other survey.

## Survey Summary Standards

Every survey performed should have a summary prepared that describes, at the minimum, the following items:

- the survey methodology (e.g., self-enumeration survey, mail-out/telephone collection, etc.),

- the sampling procedure (e.g., simple random sample, stratified random sample, quota sample, etc.),

- the population sampled (e.g., all households including the total number of households in counties x, y, and z; all transit riders on bus system x; all establishments in counties x, y, and z; etc.),

- the sampling rate or the number of samples (e.g., 1532 completed, usable household samples),

- the survey forms

- the statistical accuracy of the survey, if available (e.g., average trip rates for the survey are ±5 percent at the .95 confidence level),

- caveats regarding the use of the survey data (e.g., biases in the distribution of households by income level may have been noted in the survey; weighted survey responses would then be used to calculate study area totals).

## Standards for Surveys of Person Trip Movements

Several types of surveys of person trip movements are used in travel demand forecasting. These surveys include:

30

- home-interview surveys,
- establishment surveys,
- intercept surveys (e.g., cordon line or screenline surveys),
- mode specific surveys (e.g., on-board bus surveys, air passenger surveys).

The common thread between all of the above types of surveys is that they are collecting information on all trips or specific trips made by a sampled respondent. In order to increase the utility of the data, data specification standards can be set for demographic data, trip data, and other data.

### Demographic Data Standards

At the minimum, three items should be included in any survey of person trips: household size, income level of the household, and the number of autos available to the household.

*Household Size*. Household size is the number of people normally residing at the place where the person lives. The people do not have to be related. Household size should not include family or household members temporarily living elsewhere (e.g., a college student currently living away from home). The actual number of persons living in the household should be recorded (i.e., 1, 2, 3, ..., 99).

*Income Level*. The total income for all members of the household for the previous calendar year should be recorded. Since this question is rather personal, income ranges should be requested. Since census data are generally used to define populations for a region, the income groupings used to report the 1990 census data are recommended. Those groupings are (in 1989 dollars):

- Under $10,000
- $10,000 - $14,999
- $15,000 - $19,999
- $20,000 - $24,999
- $25,000 - $29,999

- $30,000 - $34,999
- $35,000 - $39,999
- $40,000 - $49,999
- $50,000 - $59,999
- $60,000 or more

For surveys performed after 1990, the income groupings should be modified to account for inflation between 1989 and the year of the survey. In this way, the income groupings will be consistent across time. The survey summary should clearly report the income ranges used and their equivalent ranges in 1989 dollars.

*Auto Availability*. The number of personal use vehicles (i.e., automobiles, vans, pick-up trucks) available to the household should be collected. The vehicles do not have to be owned by the household. A company car made available for household use should be included. The actual number of personal use vehicles available should be recorded (i.e., 1, 2, 3, ..., 99).

The actual trip data collected will depend upon the type of survey being performed. At the minimum, trip origin and destination, trip purpose, trip start time, and travel mode should be collected.

*Trip Origin and Destination.* Trip origin and destination data should be collected in as much detail as possible. Ideally, this information would include the street address, the city, the state, and the zip code for each origin and destination. This information should be collected in full detail even if the origin or destination is not within the study region being surveyed. For example, if a travel survey is performed for the region included in the Middle Rio Grande Council of Governments (MRGCOG) travel modeling area, full address information should be included for trips destined to Santa Fe, even though Santa Fe is outside of the modeling area.

Quite often, survey respondents might not know the actual address of their origin or destination. In these cases, the closest intersecting streets should be requested. Obviously, the city and state would also be requested.

In all cases, the destination place name should be requested (unless it is a person's home). Examples of place names are: McDonald's, Burger King, Penney's, Santa Fe City Hall, etc. Destination place names can be very useful in determining addresses, especially if only intersecting street names are provided. This will make the assignment of geographic locations for the trip origins and destinations much more precise. Ultimately, the geographic information will be converted to latitude and longitude for storage in a GIS.

It is important to note that origins and destinations of trips should generally be homes or establishments. In some cases, locations such as parks or open space, or park and ride lots might be considered as origins or destinations of trips. However, bus stop locations should <u>not</u> be coded as origins or destinations (e.g., in an on-board bus survey). Bus stop locations might be collected as supplementary information; however, the actual origin and destination locations of the trips should always be collected.

*Trip Start Time.* The starting time of the trip should always be collected. This information should be collected in 24 hour clock time (also known as military time). In this convention, the hours from midnight to noon are coded as 4 digits, corresponding to the hour (i.e., 6:30 a.m. is coded as 0630). The hours from noon to midnight are coded as the hour plus 1200 (i.e., 3 p.m. is coded as 1500). Some surveys might also collect the ending time of the trip.

*Trip Purpose.* It has been traditional to collect trip purpose information using ten different categories. Most of the categories have been consistently defined. For travel surveys collected in New Mexico, the following trip purpose categories are recommended:

| Category | Description |
|----------|-------------|
| 0 | return home (or home) |
| 1 | work |
| 2 | shop |
| 3 | school |
| 4 | social and recreational |
| 5 | personal |
| 6 | job-related |
| 7 | eat meal |
| 8 | change mode (e.g., auto to bus) |
| 9 | pick up or drop off passengers |

In some surveys, some of the categories might not be useful or logical. For example, in an on-board bus survey, categories 8 and 9 would not be used. An on-board bus survey should request information on the access mode to the bus, obviating the need for a "change mode" trip purpose and few, if any, bus trips are made to pick up or drop off a passenger.

The above categories can be used to assign activities at the origin and at the destination of the trip. This can be done using different procedures depending on the actual survey form. Nevertheless, the end result is that it will be possible to classify trips by traditional categories (e.g., home-based work, home-based shop, home-based school, home-based other, and non-home-based) for any survey using the above classification scheme.

*Travel Mode.* If there is an option regarding the mode of travel, mode should be collected. For example, travel mode would be collected in a home-interview survey or an establishment survey, but travel mode would not be required in an on-board bus survey. The following modes are recommended as a guideline:

| Mode | Description |
|------|-------------|
| 1 | Private automobile driver |
| 2 | Private automobile passenger |
| 3 | Public bus passenger |
| 4 | School bus passenger |
| 5 | Private bus (e.g., Greyhound) passenger |
| 6 | Taxi passenger |
| 7 | Rail passenger |
| 8 | Airplane passenger |
| 9 | Pedestrian or bicycle rider |
| 0 | Other |

The above classification system should serve for most travel surveys. However, it might be necessary to modify the mode list for surveys performed for specific purposes. For example, for an intercity travel survey, it might be necessary to determine whether travelers used general aviation or a scheduled air carrier. Likewise, for an on-board bus survey, it might be important

to stratify the access mode to the bus into walk or bike access, auto park-and-ride access, and auto kiss-and-ride access.

It should also be noted that most travel surveys collect only trips made in motorized vehicles. However, planners in some cities are concerned with trips made by non-motorized vehicles. The above classification system allows for the collection of non-motorized trips.

Finally, it should be noted that if the mode of travel is driver (mode 1), it is important to collect information on the number of people in the automobile including the driver.

## Other Data Standards

Two other types of information are required on all travel surveys. The first is a "date stamp". The month, day, and year of the survey should be recorded on the travel survey data. It is recommended that the International Standards Organization (ISO) format be used for date specification. The date is coded in the format YYMMDD. For example, February 17, 1992 would be coded as 920217.

A crucial data item might also be a serial number, especially if the survey has used multiple forms. Such a serial number would be required on each form to permit the linking of records. For example, a home interview survey might have a household questionnaire, multiple person records for each household, and multiple trip records for each person. A unique household sample number should be assigned to each household, a unique person number to each person within each household, and a unique trip number to each trip made by each person. The household data would include the household number, each person data record would include the household and person numbers, and each trip data record would include the household, person, and trip numbers.

## Standards for Commodity Surveys

Commodity surveys are not well established as surveys to collect person trip information. While it is difficult to set many standards at this time, the commodity survey described in the main document provides an initial set of guidelines for a commodity survey. Several standards beyond the survey summary standards described above can, however, be set. These standards are:

- trip origin and destination data should be collected in as much detail as possible to allow for conversion to latitude and longitude for input to a GIS,

- the data collected should be date stamped,

- each survey form and data record should have a unique identifying number and numbering scheme to relate the data to other forms from each establishment sampled.

The above three standards are outlined more fully under the standards for person trip movement surveys.

# Appendix B

## Standard Industrial Codes (SIC) Listing

## Table B1: Standard Industrial Classification Codes

| SIC Code | Description |
| --- | --- |
| | **Agriculture, forestry, and fishing** |
| 01 | Agricultural production--crops |
| 02 | Agricultural production--livestock · |
| 07 | Agricultural services |
| 08 | Forestry |
| 09 | Fishing, hunting, and trapping |
| | **Mining** |
| 10 | Metal mining |
| 11 | Anthracite mining |
| 12 | Bituminous coal and lignite mining |
| 13 | Oil and gas extraction |
| 14 | Mining and quarrying of nonmetallic minerals, except fuels |
| | **Construction** |
| 15 | Building construction--general contractors |
| 16 | Construction other than building construction--general contractors |
| 17 | Construction--special trade contractors |
| | **Manufacturing** |
| 20 | Food and kindred products |
| 21 | Tobacco manufactures |
| 22 | Textile mill products |
| 23 | Apparel and other finished products from fabrics and similar materials |
| 24 | Lumber and wood products, except furniture |
| 25 | Furniture and fixtures |
| 26 | Paper and allied products |
| 27 | Printing, publishing, and allied industries |
| 28 | Chemicals and allied products |
| 29 | Petroleum refining and related industries |
| 30 | Rubber and miscellaneous plastics products |
| 31 | Leather and leather products |
| 32 | Stone, clay, glass, and concrete products |
| 33 | Primary metal industries |
| 34 | Fabricated metal products, except machinery and transportation equipment |
| 35 | Machinery, except electrical |
| 36 | Electrical and electronic machinery, equipment, and supplies |
| 37 | Transportation equipment |
| 38 | Measuring, analyzing, and controlling instruments; photographic, medical, and optical goods; watches and clocks |
| 39 | Miscellaneous manufacturing industries |

**Table B1 (continued): Standard Industrial Classification Codes**

| SIC Code | Description |
| --- | --- |
| | **Transportation, communications, electric, gas, and sanitary services** |
| 40 | Railroad transportation |
| 41 | Local and suburban transit and interurban highway passenger transportation |
| 42 | Motor freight transportation and warehousing |
| 43 | U.S. Postal Service |
| 44 | Water transportation |
| 45 | Transportation by air |
| 46 | Pipe lines, except natural gas |
| 47 | Transportation services |
| 48 | Communication |
| 49 | Electric, gas, and sanitary services |
| | |
| | **Wholesale trade** |
| 50 | Wholesale trade--durable goods |
| 51 | Wholesale trade--nondurable goods |
| | |
| | **Retail trade** |
| 52 | Building materials, hardware, garden supply, and mobile home dealers |
| 53 | General merchandise stores |
| 54 | Food stores |
| 55 | Automotive dealers and gasoline service stations |
| 56 | Apparel and accessory stores |
| 57 | Furniture, home furnishings, and equipment stores |
| 58 | Eating and drinking places |
| 59 | Miscellaneous retail |
| | |
| | **Finance, insurance, and real estate** |
| 60 | Banking |
| 61 | Credit agencies other than banks |
| 62 | Security and commodity brokers, dealers, exchanges, and services |
| 63 | Insurance |
| 64 | Insurance agents, brokers, and service |
| 65 | Real estate |
| 66 | Combination of real estate, insurance, loans, law offices |
| 67 | Holding and other investment offices |

**Table B1 (continued): Standard Industrial Classification Codes**

| SIC Code | Description |
|---|---|
| | **Services** |
| 70 | Hotels, rooming houses, camps, and other lodging places |
| 72 | Personal services |
| 73 | Business services |
| 75 | Automotive repair, services, and garages |
| 76 | Miscellaneous repair services |
| 78 | Motion pictures |
| 79 | Amusement and recreation services, except motion pictures |
| 80 | Health services |
| 81 | Legal services |
| 82 | Educational services |
| 83 | Social services |
| 84 | Museums, art galleries, botanical and zoological gardens |
| 86 | Membership organizations |
| 88 | Private households |
| 89 | Miscellaneous services |
| | |
| | **Public administration** |
| 91 | Executive, legislative, and general government, except finance |
| 92 | Justice, public order, and safety |
| 93 | Public finance, taxation, and monetary policy |
| 94 | Administration of human resources programs |
| 95 | Administration of environmental quality and housing programs |
| 96 | Administration of economic programs |
| 97 | National security and international affairs |
| | |
| | **Non-classifiable establishments** |
| 99 | Non-classifiable establishments |

# Appendix C

## Commodity Classification System (CCS) Codes

## Table C1: Commodity Classification System Codes

| CCS Code | Description |
|---|---|
| | **Agriculture, forestry, and fishing** |
| 01 | Food crops--Grain (e.g., wheat, corn, barley) and other "non-perishable" crops (e.g., soy beans) |
| 02 | Food crops--"Truck" crops (e.g., vegetables, fruits) |
| 03 | Tobacco crops |
| 04 | Non-food crops--(e.g., cotton, flax, grass sod) |
| 05 | Livestock or poultry |
| 06 | Livestock or poultry products (e.g., milk, eggs) |
| 07 | Forestry--Raw Products (e.g., trees) |
| 08 | Fishing, Hunting, Trapping--Food products (e.g., fish, game) |
| 09 | Fishing, Hunting, Trapping--Non-food products (e.g., pelts, skins) |
| 10 | Other (including waste products) |
| | **Mining** |
| 11 | Metallic ores |
| 12 | Anthracite coal |
| 13 | Bituminous or lignite coal |
| 14 | Crude oil (unprocessed) |
| 15 | Natural gas (unprocessed) |
| 16 | Non-metallic ores (including sand, gravel, crushed rock) |
| 17 | Dirt or soil |
| 18 | Other (including mining waste products) |
| | **Construction** |
| 19 | Construction waste and scrap |
| | **Manufacturing** |
| 20 | Food products--Refined or processed--bulk (e.g., bulk sugar, milled flour, bulk milk) |
| 21 | Food products--Refined or processed--packaged (e.g., canned or dried foods, packaged sugar or flour, bottled water, liquor) |
| 22 | Food products--Refined or processed--refrigerated or frozen (e.g., meat, orange juice) |
| 23 | Food products for animals |
| 24 | Tobacco products |
| 25 | Textile products--finished or processed--bulk (e.g., cleaned cotton, fabric) |
| 26 | Textile products--finished apparel or similar products (e.g., clothes, curtains, carpets) |
| 27 | Lumber and wood products (except furniture)--bulk (e.g., lumber, plywood, chipboard, molding) |

## Table C1 (continued): Commodity Classification System Codes

| CCS Code | Description |
| --- | --- |
| 28 | Lumber and wood products (except furniture)--finished/packaged (e.g., doors, windows, cabinets, wooden toys, manufactured roof trusses) |
| 29 | Furniture and fixtures (except electrical) |
| 30 | Paper products--bulk (e.g., newsprint) |
| 31 | Paper products--finished/packaged (e.g., writing paper, computer paper, envelopes, paper plates, etc.) |
| 32 | Paper products--Printed or published items (e.g., newspapers, magazines, books, greeting cards, box games, etc.) |
| 33 | Chemicals and allied products--bulk liquid (e.g., ammonia) |
| 34 | Chemicals and allied products--bulk solids (e.g., sulfur, fertilizer, portland cement) |
| 35 | Chemicals and allied products--packaged liquids or solids (e.g., household cleansers, soaps, and other household products, antifreeze) |
| 36 | Chemicals and allied products--pharmaceutical and health products (e.g., medicines and drugs, toothpaste) |
| 37 | Petroleum products--bulk (e.g., gasoline, fuel oil) |
| 38 | Petroleum products--packaged (e.g., motor oil, gas treatments) |
| 39 | Rubber and plastic products--bulk or unfinished |
| 40 | Rubber and plastic products--packaged or finished (e.g., tires, toys, household items) |
| 41 | Leather goods--unfinished (e.g., tanned hides) |
| 42 | Leather goods--finished (e.g., shoes, clothes) |
| 43 | Stone, clay, glass, and concrete--finished products (e.g., mirrors, statuary, dishes) |
| 44 | Primary metal products (e.g., steel, aluminum) |
| 45 | Fabricated metal products except machinery and transportation equipment (e.g., tools, silverware, building materials, nails) |
| 46 | Non-electrical machinery--heavy duty or industrial (e.g., engines, compressors, farm equipment) |
| 47 | Non-electrical machinery--light duty (e.g., lawn mowers) |
| 48 | Electrical machinery and equipment--heavy duty (e.g., motors) |
| 49 | Electrical machinery and equipment--light duty (e.g., electrical hand tools, refrigerators, washers, dryers) |
| 50 | Electronic equipment (e.g., computers, calculators, televisions, radios, communications equipment) |
| 51 | Transportation--Motorized personal use vehicles (e.g., automobiles, trucks, vans, motorcycles) |
| 52 | Transportation--Motorized trucks and buses (e.g., heavy trucks, buses) |
| 53 | Transportation--Other self propelled vehicles (e.g., train engines, airplanes, boats with built in engines, motor homes) |
| 54 | Transportation--Recreational equipment (e.g., bicycles, pleasure boats, snowmobiles) |

**Table C1 (continued): Commodity Classification System Codes**

| CCS Code | Description |
|---|---|
| 55 | Transportation--Trailers and non-motorized equipment |
| 56 | Transportation--Replacement parts (e.g., windshields, fenders, engine parts) |
| 57 | Measuring, analyzing, and controlling instruments; photographic, medical and optical goods (e.g., photographic cameras, x-ray machines, medical instruments) |
| 58 | Ordnance and accessories (e.g., guns, howitzers, mortars, ammunition, combat vehicles and parts, nuclear bombs, etc.) |
| 59 | Miscellaneous manufactured products |

**Finance, insurance, real estate, other services, and public administration**

| CCS Code | Description |
|---|---|
| 60 | Money, negotiable or non-negotiable securities |
| 61 | Deeds, patents, and other official instruments |
| 62 | Miscellaneous "information" and documents |

**Recycling and Waste Disposal**

| CCS Code | Description |
|---|---|
| 63 | Recycled metals (e.g., aluminum cans, crushed cars, etc.) |
| 64 | Recycled paper products |
| 65 | Recycled plastic products |
| 66 | Recycled petroleum products (e.g., motor oil) |
| 67 | Recycled miscellaneous products (e.g., wood, brick) |
| 68 | Waste products--liquid (e.g., sewage) |
| 69 | Waste products--solid (e.g., trash) |
| 70 | Waste products--hazardous (e.g., chemicals, medical, radioactive) |

**Transportation and Shipping**

| CCS Code | Description |
|---|---|
| 71 | Empty shipping containers and devices being returned |