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**Estimation of Small Business  
Activity by County for the National  
Infrastructure Information  
System (NIIS)**

Sharon E. Bell  
Thomas N. Yoder

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**Estimation of Small Business Activity by County for the National  
Infrastructure Information System (NIIS)**

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## TABLE OF CONTENTS

LIST OF TABLES .....	iv
LIST OF FIGURES .....	iv
1.0 INTRODUCTION .....	1
2.0 SMALL ESTABLISHMENT COVERAGE BY MAJOR INDUSTRY DIVISION .....	3
3.0 SECTORIZATION .....	9
4.0 REGIONAL CLASSIFICATION .....	11
5.0 BUILDING THE SMALL BUSINESS ESTIMATES DATA FILE .....	13
6.0 ADDITIONAL CONSIDERATIONS .....	19
6.1 AGRICULTURAL DATA .....	19
6.2 TRANSPORTATION AND PUBLIC UTILITIES .....	19
6.3 MINING .....	19
6.4 SALES AND EMPLOYMENT MEASURES .....	20
7.0 CONCLUSION .....	21
APPENDIX A. NIIS SECTORIZATION FOR SMALL ESTABLISHMENT ESTIMATES .....	23
APPENDIX B. DETAILED PROCEDURE FOR CREATING SMALL BUSINESS ESTIMATES FILE .....	29
APPENDIX C. LISTING OF CONVERSION FILE: 1977 TO 1987 STANDARD INDUSTRIAL CLASSIFICATION CODES .....	37
APPENDIX D. LISTING OF EMPLOYEE/ESTABLISHMENT FILE .....	41
APPENDIX E. LISTING OF SALES/EMPLOYEE FILE .....	45
APPENDIX F. SUPPORTING NIIS RESEARCH BRIEFS .....	49

## LIST OF TABLES

Table 1.	Comparison of employment by industry .....	4
Table 2.	Dun and Bradstreet industry coverage .....	5
Table 3.	Supplemental data sources .....	7
Table 4.	New counties .....	11
Table 5.	Nonstandard codes .....	15
Table 6.	Employment .....	16
Table 7.	Establishments .....	17
Table A-1.	Sectorization for NIIS SBE .....	26
Table B-1.	Unique codes .....	33
Table B-2.	New Federal Information Processing System codes .....	34
Table B-3.	Sample record format .....	35
Table C-1.	1977 to 1987 standard industrial classification codes .....	39
Table D-1.	Listing of employee/establishment file .....	43
Table E-1.	Listing of sales/employee file .....	47

## LIST OF FIGURES

Fig. 1.	Employment coverage by industry division. ....	6
Fig. 2.	Small business estimates steps. ....	13
Fig. B-1.	Procedure for developing the SBE data file .....	31

## 1.0 INTRODUCTION

The Federal Emergency Management Agency (FEMA) has commissioned the design of an assessment system to perform rapid analysis of the economic impacts of various disasters. Oak Ridge National Laboratory (ORNL) developed the National Infrastructure Information System (NIIS) in response to this need. Its design includes several modules to support emergency assessment--the Facility Damage Assessment Module to provide rapid summaries of economic capacity at risk in a disaster area, the Regional Impacts Module (RIM) to estimate the change in a region's production, consumption, and net exports as a result of capacity lost in the disaster area, the Inter-Regional Trade Flows Module to identify potential interruptions in commodity trade flows between regions, based on the results of the RIM analysis, and the National Economic Model to identify potential macroeconomic impacts of the disaster. In addition to the assessment system, FEMA needs a core data base that contains the comprehensive, county-level information required to conduct regional and national impact analyses. The effort is focused on a general overview of the seriousness of each disaster (e.g., how large is the relative impact) and not on detailed local effects. However, the core data file must be complete enough and accurate enough to support analysis of the relative costs of different disasters. Coverage must be comprehensive in order to address equity issues, as well as detailed in the specific industries that most affect the economy's ability to respond to disaster.

The files used to construct the current NIIS core file have been evaluated for completeness of coverage, both by Standard Industrial Classification (SIC) and by size of establishment. It is important that no major industry be overlooked, and that the substantial economic activity of small establishments be represented in the NIIS system. Small establishments can be represented either by establishment level data (e.g., from the complete Dun and Bradstreet file) or by county-level summary data obtained from sources such as *County Business Patterns*. Including data on individual establishments for small establishments would require an extremely large amount of storage space, which is not available on the current hardware at FEMA. In addition, there are several analytic reasons why summary data provide more appropriate information for FEMA's purposes. First, even the most complete Dun and Bradstreet file does not provide comprehensive industry coverage. Divisions such as Services and Finance, Insurance, and Real Estate, which have a large share of employment in small establishments, are not well covered in the Dun and Bradstreet data. Second, small establishments show a high turnover rate; survey experience suggests that 10-12% of establishments represented in one month's data have gone out of business by the next month. New establishments usually form just as quickly, and the overall level of economic activity in any industry or division is much more stable than the individual establishments. Since the primary purpose of the NIIS system is to evaluate the impact on economic activity, summary data can provide the most comprehensive coverage in the minimum amount of storage space.

This document addresses the specific evaluation of small business coverage in the Dun and Bradstreet "Twenty-Plus" file, in *County Business Patterns*, and the methods by which *County Business Patterns* data were used to supplement small business coverage in the core NIIS file.



## 2.0 SMALL ESTABLISHMENT COVERAGE BY MAJOR INDUSTRY DIVISION

The "Twenty Plus" file from Dun and Bradstreet may be considered an approximate universe of establishments with 20 or more employees that use commercial credit. While smaller establishments may be included in the file, Dun and Bradstreet makes no claim about the coverage of those establishments. In emergency planning, it is also important to have information on establishments that may not use commercial credit (such as city-owned gas, water, and sewer facilities) and on the type and relative size of small establishment sales or employment in a region. Therefore, it is important to review the completeness of Dun and Bradstreet coverage for FEMA's purposes, and to supplement key areas that are not well covered in the Dun and Bradstreet file.

The most widely accepted sources of data by industry and geographic area are the Census Economic Surveys and *County Business Patterns*. A comparison of total employment covered by major division is shown in Table 1. In divisions dominated by large establishments, such as manufacturing, Dun and Bradstreet agrees well with the other sources, while in divisions with a concentration of small establishments, Dun and Bradstreet undercounts employment by a considerable amount.

To verify that small establishments accounted for most of the difference, *County Business Patterns* totals for establishments with 20 or more employees were compared to Dun and Bradstreet totals for the same group. Since *County Business Patterns* excludes some industries, the Dun and Bradstreet data were adjusted as needed to provide a corresponding employment figure for comparison. As expected, Table 2 shows much better agreement between the two sources for these larger establishments.

The higher the percentage of employment in small establishments the less complete the Dun and Bradstreet "Twenty Plus" coverage. This pattern holds true for most three-digit major industry groups and four-digit industries, as well as the industry divisions (two-digit SIC). The Dun and Bradstreet employment for the Manufacturing and Public Administration divisions, which are dominated by large establishments, is within 10% or better of the estimates available from other sources. There was no need to supplement these divisions with data from other sources. The composite Dun and Bradstreet "Twenty-Plus" and *County Business Patterns* small establishment estimates cover 95% of employment reported in Census and *County Business Patterns* data (see Fig. 1). The remaining omissions are concentrated in a few industries and a few divisions; these are discussed in more detail in Section 6.0, Additional Considerations. A summary of the major divisions and the supplemental sources identified or used for each is shown in Table 3.

Table 1. Comparison of employment by industry

Major SIC Group	1987 Employment			Small Establishment Employment Share <sup>1</sup>	
	<i>County Business Patterns</i>	Census	Survey of Current Business		Dun and Bradstreet 1991
Agriculture, Forestry, Fishing	N/A	N/A	4,023,000 <sup>2</sup>	472,288	N/A
Mining	724,967	704,000	716,000	600,308	18%
Construction	4,884,281	5,100,000	5,081,000	2,651,195	42%
Manufacturing	19,002,692	18,933,600	19,121,000	19,309,720	8%
Transportation and Public Utilities <sup>3</sup>	5,384,254	1,905,576 <sup>4</sup>	5,732,000	4,281,441	17%
Wholesale Trade	5,820,453	5,609,024	5,944,000	3,779,679	37%
Retail Trade	18,416,653	17,779,942	18,972,000	9,384,959	36%
Finance, Insurance, and Real Estate	6,727,313	N/A	6,796,000	5,352,394	29%
Services	32,549,580 <sup>5</sup>	22,791,408 <sup>5</sup>	26,126,000 <sup>5</sup>	25,101,308	30%
Public Administration	N/A	N/A	5,553,000 <sup>6</sup>	5,065,443	N/A

<sup>1</sup> Small Establishment Share is the amount of *County Business Patterns* employment in establishments with fewer than 20 employees as a percent of total *County Business Patterns* employment in the industry division.

<sup>2</sup> 1988 paid and unpaid farm workers, National Agriculture Statistics Service, plus 1989 average annual employees in Agricultural Services, Forestry, Fishing, from *Employment & Earnings*. Data from this source are not available by size class.

<sup>3</sup> Excludes employment in U.S. Postal Service. *County Business Patterns* employment in all establishments is supplemented with 1989 full-time equivalent railroad employees, from *Survey of Current Business*.

<sup>4</sup> Includes only SIC codes 4200 (Motor Freight Transportation and Warehousing), 4400 (Water Transportation), 4700 (Transportation Services).

<sup>5</sup> *County Business Patterns* employment in all establishments is supplemented with *Employment & Earnings* 1989 average annual employees in Education Services and Private Households. Census and *Survey of Current Business* include only parts of SIC 8200, Educational Services.

<sup>6</sup> 1989 annual average employees, from *Employment & Earnings*. Data from this source are not available by size class.

Table 2. Dun and Bradstreet industry coverage

INDUSTRY DIVISION	Dun and Bradstreet 20+ EMPLOYMENT	<i>County Business Patterns</i> 20+EMPLOYMENT
Agriculture, Forestry, Fishing <sup>1</sup>	239,875	185,538
Mining	571,162	595,989
Construction	2,682,228	2,812,952
Manufacturing	19,713,100	17,527,653
Transportation & Public Utilities <sup>2</sup>	4,436,394	4,226,399
Wholesale Trade	3,717,667	3,691,556
Retail Trade	9,764,340	11,697,775
Finance, Insurance, Real Estate	5,647,577	4,796,062
Services <sup>3</sup>	27,108,495	16,831,594
	18,936,963 <sup>4</sup>	15,553,684 <sup>4</sup>

<sup>1</sup> Excludes Agricultural Production major industry groups.

<sup>2</sup> Excludes Railroad Transportation and US Postal Service major industry groups.

<sup>3</sup> Excludes Private Households major industry group.

<sup>4</sup> Excludes Educational Services major industry group.

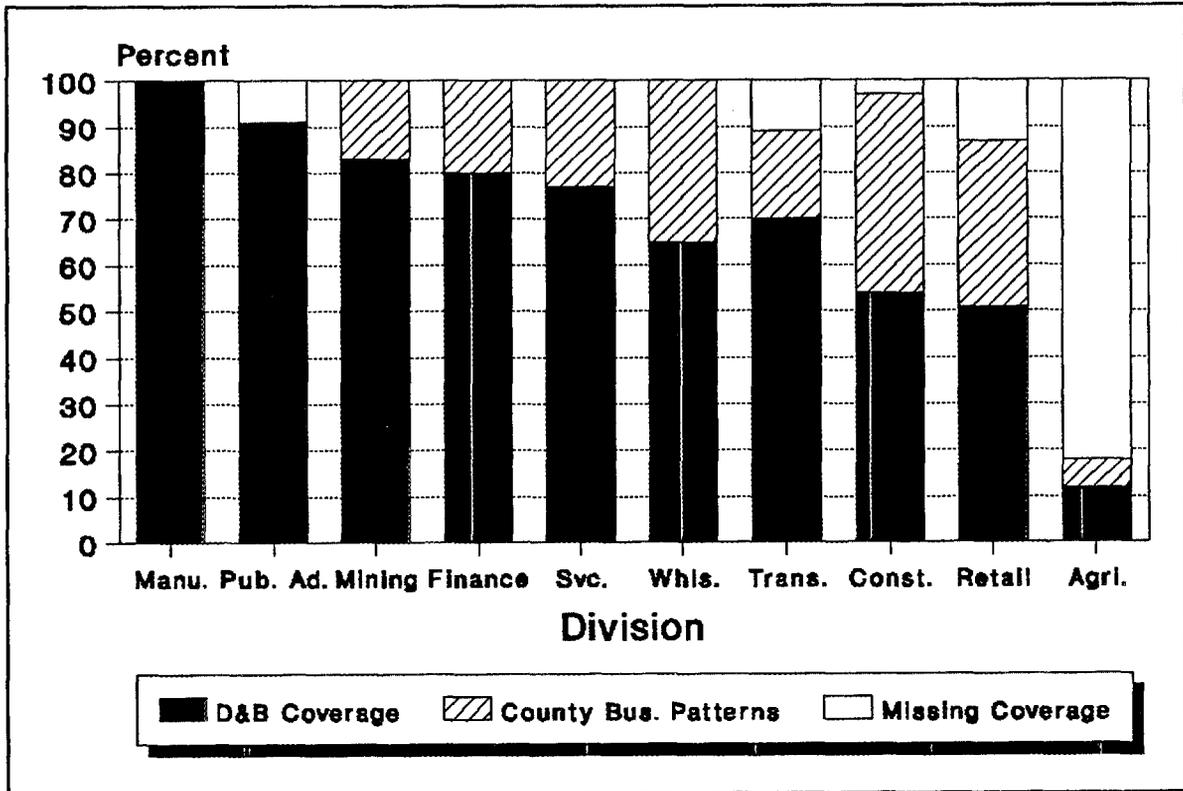


Fig. 1. Employment coverage by industry division

Table 3. Supplemental data sources

INDUSTRY DIVISION	RECOMMENDED SUPPLEMENTAL DATA SOURCES
Agriculture, Forestry, Fishing	Census of Agriculture
Mining	<i>County Business Patterns</i>
Construction	<i>County Business Patterns</i>
Manufacturing	none needed
Transportation & Public Utilities	<i>County Business Patterns</i> , others being investigated for railroads, water transportation, utilities, and U.S. Postal Service.
Wholesale Trade	<i>County Business Patterns</i>
Retail Trade	<i>County Business Patterns</i>
Finance, Insurance, Real Estate	<i>County Business Patterns</i>
Services	<i>County Business Patterns</i>
Public Administration	none needed
Nonclassifiable Establishments	<i>County Business Patterns</i>



### 3.0 SECTORIZATION

All data used in the NIIS system must conform to a common sectorization scheme so that data from a variety of sources can be merged into a meaningful core of information. The sectorization scheme was chosen after considering compatibility with other classification systems, FEMA's special information needs, and *County Business Patterns* internal consistency. The NIIS system requires that any classification scheme be additive. For example, the sum of employment in all the industries in a major industry group equals the total employment for that group, and the sum of the major industry groups within a major industry equals the total employment within that major industry. Ideally, the NIIS sectorization should allow conversion to other industry classification schemes in common use at FEMA so that analyses can be linked to the output of other systems. It is also important for validation that the figures can be compared to standard aggregates used in widely accepted data series, such as *County Business Patterns* cited above. Sectorization is also a primary factor in computer storage requirements for the NIIS core file. The more detailed the sectorization, the more storage space the file requires.

The sectorization scheme selected is identified in Appendix A. In general, it uses major industry groups to preserve necessary detail while minimizing storage requirements. Because of data suppression to avoid disclosure at the most detailed level, major industry groups also provide the most detailed estimates for which data are consistently available at the county level. In some cases, such as the manufacturing division, it was important to provide more detail, and in these cases the four-digit industry codes were used. Moreover, the large establishments included from the Dun and Bradstreet file still retain the full industry (four-digit) level identification.



## 4.0 REGIONAL CLASSIFICATION

Each component file of the core NIIS system must contain data at least at the county level of geographic detail. Each record requires a latitude and longitude coordinate to place it in a specific location. (See the report entitled "Data Structures Concepts and Definitions: The NIIS Partitioning Concept" for more information about NIIS system organization). For consistency with the existing NIIS system, county centroid coordinates were obtained from the IMPLAN 1977 county definitions file. Data in this file follow the Federal Information Processing System (FIPS) standard number 6-3. Thirteen counties have been added to the standard since 1977, and these counties were added to the NIIS definitions file. They are listed in Table 4. Coordinates for these counties were obtained from the Melissa Data Company zip code file, or from National Planning Associates county definition file. When zip code data were used, an effort was made to select a zip code at or near the geographic center of the county.

Table 4. New counties

---

FIPS	COUNTY
02122	Kenai Peninsula, AK
02185	North Slope, AK
02201	Prince of Wales, Outer Ketchikan, AK
02231	Skagway, Yakutat, Angoon, AK
02261	Valdez, Cordova, AK
04012	La Paz, AZ
13215	Muscogee, GA
15005	Kalawao, HI
29186	Ste. Genevieve, MO
30113	Yellowstone National Park, part, MT
35006	Cibola, NM
55078	Menominee, WI
55115	Shawano, WI

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## 5.0 BUILDING THE SMALL BUSINESS ESTIMATES DATA FILE

- Building the Small Business Estimates (SBE) data file involved five steps, as shown in Fig. 2. A more complete discussion of the data files and programs is included in Appendix B.

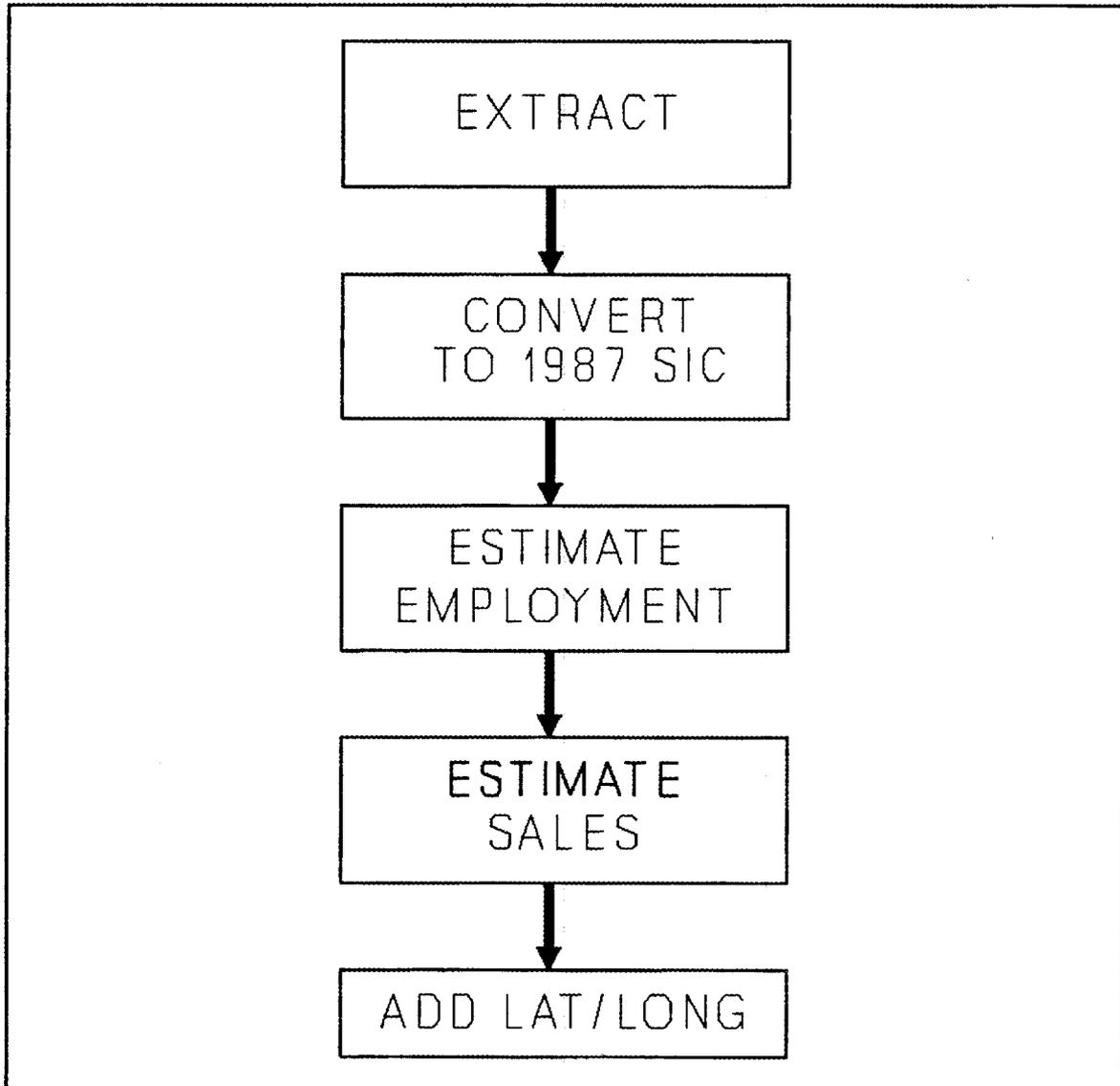


Fig. 2. Small business estimates steps

The first step was to extract the necessary records from the raw data files provided by the Bureau of the Census. The 1987 *County Business Patterns* files on CD-ROM included one file of county-level records for each state and the District of Columbia. Each record in these files includes

total establishment and employment data and number of establishments categorized by size of establishment for each 1977 SIC code and county FIPS code. For the purpose of developing the SBE data file, data by county on the number of establishments in size classes 1-4 employees, 5-9 employees, and 10-19 employees were used. The extract data file includes a record for each major industry group (as identified in Appendix A) within each county. If no record is included for a major industry group within a county, there was no economic activity for that group in that county. A record with an entry of zero sales and employment indicates that the county contains at least one establishment with 20 or more employees in that industry group, but no establishments with less than 20 employees.

In the second step, the 1977 SIC codes were converted to 1987 standard codes, according to the table, "Relation of 1977 to 1987 SIC Industries" in the *1987 Standard Industrial Classification Manual*. Forty-two of the 1987 SIC codes could not be reconciled with the 1977 definitions. Any solution to this problem involves a tradeoff between consistency of the final estimates with the original *County Business Patterns* data and obtaining comprehensive coverage in the NIIS core file. Since comprehensive coverage measures are required for the NIIS core data file, the 1977 SIC codes were assigned to the most appropriate 1987 definitions available. As a result, the small business estimates are not completely consistent with *County Business Patterns* data. Appendix C includes a list of the resulting conversion table.

*County Business Patterns* uses several codes not specified in the 1987 SIC Manual. Each division contains one code which represents Administrative and Auxiliary establishments (e.g., central administrative offices, warehouses, research laboratories, and maintenance locations). *County Business Patterns* separates these establishments from all others and reports them as one record at the industry division level. The decision was made to retain the consistency of the data rather than to arbitrarily allocate the establishments to each industry group in the division. The same reasoning applies to the other four unique codes which represent an aggregation of two or more industry groups; data could not be disaggregated to the industry group level without a loss in consistency. The unique codes are listed in Table 5.

As reported in the NIIS Research Brief, "Internal Consistency of *County Business Patterns* Employment and Establishment Data," (included in Appendix F) these data are summarized independently at each level of aggregation. At the county level, employment data for each industry division at the major group (two-digit SIC), industry group (three-digit), and industry (four-digit) levels are not consistent with the total employment record, as shown in Table 6. However, the sum of the number of establishments in each of the nine size classes is consistent with the total number of establishments as given in the record (Table 7).

Three causes of inconsistencies were identified: 1) for an industry group that contains only one industry, *County Business Patterns* reports the data only at the industry group level; 2) data for several major groups are not recorded at the most detailed level; and 3) employment records are not published at the most detailed level if the data would disclose the operations of an individual employer (Federal Law, Title 13, Section 9). A fourth potential cause of inconsistencies apparently did not affect this file. Census procedures classify establishments independently at each level of aggregation, and it is theoretically possible for the same establishment to be classified in one group at the industry level, but assigned to a different code at the industry group or major industry group level. National employment totals for the *County Business Patterns* data show full consistency

Table 5. Nonstandard codes

<u>Unique codes</u>	
0908	AGR Adm. & Aux.
1409	MIN Adm. & Aux.
1709	CON Adm. & Aux.
4907	TRN Adm. & Aux.
5109	WHS Adm. & Aux.
5909	RTL Adm. & Aux.
6709	FIN Adm. & Aux.
8909	SER Adm. & Aux.
1510	Resid. & Nonresid. Contractors
8310	Social Services, exc. 836
1210	Coal Mining, Small Estab.
4450	Water Transportation, NEC, Sm. Estab.

Table 6. Employment

Industry Division	Level of consistency with total employment record		
	two-digit records	three-digit records	four-digit records
Retail Trade	100 %	98 %	96 %
Wholesale Trade	100 %	94 %	81 %
Services	99 %	97 %	59 %
Construction	39 %	39 %	39 %
Manufacturing	55 %	34 %	29 %
Mining	16 %	0 %	0 %
Ag. Services, Forestry, Fishing	0 %	0 %	0 %
Transportation & Public Utilities	93 %	51 %	12 %
Finance, Insurance, Real Estate	76 %	57 %	29 %

Table 7. Establishments

Industry Division	Level of consistency with total establishments record		
	two-digit records	three-digit records	four-digit records
Retail Trade	100 %	99 %	99 %
Wholesale Trade	100 %	99 %	96 %
Services	100 %	99 %	89 %
Construction	100 %	80 %	62 %
Manufacturing	100 %	99 %	92 %
Mining	100 %	77 %	77 %
Ag. Services, Forestry, Fishing	100 %	90 %	0 %
Transportation & Public Utilities	100 %	97 %	37 %
Finance, Insurance, Real Estate	100 %	76 %	40 %

between the industry, industry group, major industry group, and division figures. If this practice accounted for any of the inconsistencies at the county level, its effects were far outweighed by the other three reasons identified above.

Since comprehensive industry measures require consistent and complete estimates, the most complete measure -- establishments -- has been used as the basis for the other estimates. For each industry group, average employee per establishment ratios were calculated for size classes 1-4 employees, 5-9 employees, and 10-19 employees using *County Business Patterns* national employee and establishment counts. If employment data were withheld for an industry group, employee ratios for the corresponding major group were used. If those figures were unavailable, figures for industry division were used. The number of establishments in each industry and size class was then multiplied by the appropriate employee/establishment ratio and the employment estimates summed across size classes to generate consistent employment estimates by industry. The employee per establishment ratios are contained in the ratios reference file, [name of file], listed in Appendix D.

Because *County Business Patterns* does not include sales data, and sales estimates were derived using sales per employee ratios from the Dun and Bradstreet file. While these ratios could also be obtained from Census data, preliminary comparisons of Dun and Bradstreet versus Census figures identified potentially large differences in the two ratios. The Small Business file was intended to be used with the Dun and Bradstreet data to provide comprehensive coverage, and the differences would result in under-reporting the relative share of sales attributable to small establishments if the Census figures were used. Each method of collecting data also uses its own definitions and measures of sales, and measures obtained by Dun and Bradstreet need not be consistent with Census definitions. In order to avoid bias between small and large facilities, the estimation procedure used ratios calculated

from the Dun and Bradstreet file. This also ensures a consistent definition of sales between the major facility file and the SBE file. The procedure implicitly assumes that the ratios differ more between establishments in different industries than they do between small and large establishments in the same industry. Administrative and Auxiliary establishments were given a ratio which equalled the average of the sales per employee ratios in the corresponding industry division. The ratios were then applied to the estimated employment to obtain estimated sales value.

The Dun and Bradstreet ratios were compared to ratios calculated from Census data. In all but one instance (Crude Petroleum and Natural Gas industry group) they were reasonably close to the Census estimates. In order to test sensitivity to the specific calculation method used, ratios were calculated by two different methods and the results compared. Again the results agreed well, except in the Crude Petroleum and Natural Gas industry group. For this group the ratio calculated by one method was approximately three times the size of the corresponding estimate from Census data. The other estimate was closer to the expected figure, and this is the estimate that was used. Further resolution was beyond the scope of this task, but FEMA may wish to investigate the cause of this discrepancy further. Potential causes may involve the definition of sales in this group, market volatility, or a data error in figures reported for a small number of very large establishments. For more detailed information about the calculation procedure and a listing of the ratios used, see NIIS Research Brief, "Consistency of Sales per Employee Estimates in the May 1991 Dun and Bradstreet Data File," included in Appendix F.

The final step in creating the SBE file was to add latitude and longitude coordinates for each county. For consistency with the existing NIIS system, county centroid coordinates were obtained from the IMPLAN 1977 county definitions file. Data in this file follow the FIPS 6-3 standard. Thirteen counties have been added to the standard since 1977. Coordinates for these counties were obtained from the Melissa Data Company zip code file, or from National Planning Associates county definition file. When zip code data were used, an effort was made to select a zip code at or near the geographic center of the county.



## 6.0 ADDITIONAL CONSIDERATIONS

The analysis also identified some other discrepancies. While detailed analyses were beyond the scope of this task, FEMA may wish to consider future research in these areas.

### 6.1 AGRICULTURAL DATA

Neither Dun and Bradstreet nor *County Business Patterns* provides good coverage for primary agricultural production. However, a summary of crop production and livestock inventories by county is available from the *City and County Data Book*. While these figures were not included in the small business estimates task, they have been included in the data made available for the core NIIS file. The summaries are based on the 1987 Census of Agriculture, which includes a wealth of detail on farm acreage, production, inventories and land use. In emergency situations it can be important to know where potential agricultural supplies are (food, raw materials), or to identify other local agricultural characteristics. Moreover, dollar volume of sales may not be the most important measure of agricultural activity for FEMA's needs. Acreage and average yield for key commodities may prove more useful. Any agricultural supplement to the NIIS core file should be based on careful consideration of FEMA's information needs in this area.

### 6.2 TRANSPORTATION AND PUBLIC UTILITIES

A few major industry groups in Transportation and Public Utilities are systematically undercounted by both Dun and Bradstreet and *County Business Patterns*. These include establishments in water transportation, transportation by air, communications, and electric, gas and sanitary services. The undercount affects both large and small establishments. *County Business Patterns* includes no data for railroads, while Dun and Bradstreet coverage accounts for about 60% of the employment reported in *Survey of Current Business* for that group in 1989. Nor does *County Business Patterns* include U. S. Postal Service establishments; Dun and Bradstreet covers 24% of the 1989 average postal service employment reported in *Employment and Earnings*. While a thorough analysis of the discrepancies was beyond the scope of this task, FEMA may wish to conduct an in-depth review based on the importance of these industries to emergency response. Many of these establishments are government or government-related entities, and appropriate information may well be available from government sources. (See NIIS Research Brief entitled, "Transportation and Public Utilities Coverage in the Dun and Bradstreet Data File," included in Appendix F.)

### 6.3 MINING

Employment in each of the major groups in the Mining division may be subject to large fluctuations in annual employment. These fluctuations may cause inaccuracies in employment data compiled from two sources collected in different years, such as the 1991 Dun and Bradstreet file and the 1987 *County Business Patterns* file. As in all other sectors, there is a tradeoff in the level of detail available and the cost, storage requirements, and development of the data. More detailed treatments of the mining sector have been developed elsewhere (for example in the IMPLAN 1977 version) and could be incorporated if FEMA determines that the cost, development and storage requirements are justified.

#### 6.4 SALES AND EMPLOYMENT MEASURES

While sales as a measure of output provides a convenient economic indicator, sales figures measure different things in different industry divisions. For example, in Manufacturing, annual sales may be a reasonable indicator of output generated and sold during a particular time period. In Finance, Insurance, and Real Estate, the meaning of sales is less clear. Insurance policies generally cover multiple years, and the face value of an insurance policy is very different from the annual receipts associated with that policy. Moreover, the annual revenues to a company are the summation both of policies sold in that year and policies sold over many previous years. Thus even the revenues in a given year are less clearly linked to the actual industry output in that year. Census figures in general use the measure that most closely approximates the concept of sales in each industry division, yet that measure may not be the most appropriate for use in a damage assessment concerned with economic capacity. Economists routinely use different measures for different purposes, and the "best" measure is the one most closely suited to the purpose for which it is used. Examples of alternate output measures are value added, gross product originating, and value of shipments. FEMA may wish to determine and estimate the measures in each division that yield the most accurate assessment of productive capacity, rather than rely on measures developed for other purposes. Evaluation would include an analysis of the potential bias introduced in comparisons made between industry divisions, and their dependence on the measures used.

## 7.0 CONCLUSION

County level sales and employment estimates for small establishments derived from *County Business Patterns* were used to supplement large establishments data available from Dun and Bradstreet. The composite data file covers 95% of employment reported in Census Bureau publications. The estimation procedure included five steps: 1) extract appropriate records, 2) convert from 1977 to 1987 SIC standard, 3) estimate employment for each industry and size class, 4) estimates sales, and 5) add latitude and longitude for each county record. The resulting data base is sufficient to evaluate the magnitude and equity effects of a wide variety of national, regional, and local emergencies.

It provides enough detail to assess efficiency effects for a variety of purposes. Remaining discrepancies are concentrated in a few industries and a few divisions. While they represent only a small fraction of overall economic activity, some of these industries may be important for emergency planning, such as electric, gas and sanitary services or railroads. Potential sources of detailed information on these industries have been identified and may be incorporated at a later date.



**APPENDIX A. NIIS SECTORIZATION FOR SMALL ESTABLISHMENT ESTIMATES**



## APPENDIX A. NIIS SECTORIZATION FOR SMALL ESTABLISHMENT ESTIMATES

The SBE file contains summary data intended to preserve the level of detail necessary for standard emergency assessments while minimizing the storage space required for the final data file. The sectorization scheme is shown in Table A-1. The classification can be refined or expanded as FEMA's needs are further identified, and as additional space is made available for the NIIS system. Considerable attention focused on three criteria: 1) conformity with other sectorization schemes in common use or in use at FEMA; 2) the level of detail that the *County Business Patterns* data could accurately represent; and 3) minimizing storage space, which is directly related to the number of industry sectors defined. Analysis of inforum industry definitions revealed that major industry group data were consistent with that classification scheme, except for the Manufacturing Division, the Agricultural Production major groups (SIC 01, 02), and industry groups Miscellaneous Business Services (SIC 739) and Offices of Other Health Practitioners (SIC 804). As discussed in Section 2.0 and Section 6.0 of this report, neither of the first two divisions is affected by the small business sectorization; Manufacturing data are obtained from Dun and Bradstreet, with full industry (four-digit) information, and agricultural data must be developed from alternate sources, based on FEMA's determination of its information needs.

For conformity with the two-digit (85-level) I/O classification, major industry records are sufficient for the following Divisions and Major Groups: Transportation and Public Utilities; Wholesale Trade, Retail Trade; Services; Agricultural Services, Forestry and Fishing. All other records must be stored at the industry or commodity level (five-digit or higher) in order to conform to the two-digit I/O classification. Industry Group records for Wholesale and Retail Trade, and Agricultural Services, Forestry and Fishing also conform to the four-digit and six-digit (366-level and 537-level) I/O classification. Records for other industries must be stored at the industry or commodity level to conform to these standards.

Table A-1. Sectorization for NIIS SBE

<u>SIC</u>	<u>INDUSTRY GROUP NAME</u>	<u>SIC</u>	<u>INDUSTRY GROUP NAME</u>
0700	AGRICULTURAL SERVICES	4740	RENTAL OF RAILROAD CARS
0800	FORESTRY	4780	MISCELLANEOUS TRANSPORTATION SERVICES
0900	FISHING, HUNTING, AND TRAPPING	4810	TELEPHONE COMMUNICATIONS
0909	AGR. ADM. & AUX., SMALL ESTABLISHMENTS	4820	TELEGRAPH & OTHER COMMUNICATIONS
1010	IRON ORES	4830	RADIO AND TELEVISION BROADCASTING
1020	COPPER ORES	4890	COMMUNICATIONS SERVICES, NEC
1030	LEAD AND ZINC ORES	4909	TRN ADM & AUX, SMALL ESTABLISHMENTS
1040	GOLD AND SILVER ORES	5010	MOTOR VEHICLES, PARTS, AND SUPPLIES
1060	FERROALLOY ORES, EXCEPT VANADIUM	5020	FURNITURE AND HOME FURNISHINGS
1080	METAL MINING SERVICES	5030	LUMBER AND CONSTRUCTION MATERIALS
1090	MISCELLANEOUS METAL ORES	5040	PROFESSIONAL & COMMERCIAL EQUIPMENT
1090	MISCELLANEOUS METAL ORES	5040	PROFESSIONAL & COMMERCIAL EQUIPMENT
1210	COAL MINING, SMALL ESTABLISHMENTS	5050	METALS AND MINERALS, EXCEPT PETROLEUM
1210	COAL MINING, SMALL BUSINESS ESTIMATES	5060	ELECTRICAL GOODS
1310	CRUDE PETROLEUM AND NATURAL GAS	5070	HARDWARE, PLUMBING & HEATING EQUIPMENT
1320	NATURAL GAS LIQUIDS	5080	MACHINERY, EQUIPMENT, AND SUPPLIES
1380	OIL AND GAS FIELD SERVICES	5080	MACHINERY, EQUIPMENT, AND SUPPLIES
1410	DIMENSION STONE	5080	MACHINERY, EQUIPMENT, AND SUPPLIES
1420	CRUSHED AND BROKEN STONE	5080	MACHINERY, EQUIPMENT, AND SUPPLIES
1440	SAND AND GRAVEL	5080	MACHINERY, EQUIPMENT, AND SUPPLIES
1450	CLAY, CERAMIC & REFRACTORY MINERALS	5080	MACHINERY, EQUIPMENT, AND SUPPLIES
1470	CHEMICAL AND FERTILIZER MINERALS	5080	MACHINERY, EQUIPMENT, AND SUPPLIES
1480	NONMETALLIC MINERALS SERVICES	5080	MACHINERY, EQUIPMENT, AND SUPPLIES
1490	MISCELLANEOUS NONMETALLIC MINERALS	5090	MISCELLANEOUS DURABLE GOODS
1409	MIN ADM & AUX, SMALL ESTABLISHMENTS	5090	MISCELLANEOUS DURABLE GOODS
1510	RESID, NONRESID BLDG CONST, SMALL ESTABLISHMENTS	5090	MISCELLANEOUS DURABLE GOODS
1530	OPERATIVE BUILDERS	5110	PAPER AND PAPER PRODUCTS
1610	HIGHWAY AND STREET CONSTRUCTION	5120	DRUGS, PROPRIETARIES, AND SUNDRIES
1620	HEAVY CONSTRUCTION, EXCEPT HIGHWAY	5130	APPAREL, PIECE GOODS, AND NOTIONS
1710	PLUMBING, HEATING, AIR CONDITIONING	5140	GROCERIES AND RELATED PRODUCTS
1720	PAINTING AND PAPER HANGING	5150	FARM-PRODUCT RAW MATERIALS
1730	ELECTRICAL WORK	5160	CHEMICALS AND ALLIED PRODUCTS
1740	MASONRY, STONEMWORK, AND PLASTERING	5170	PETROLEUM AND PETROLEUM PRODUCTS
1750	CARPENTRY AND FLOOR WORK	5180	BEER, WINE, AND DISTILLED BEVERAGES
1760	ROOFING, SIDING, AND SHEET METAL WORK	5190	MISC. NONDURABLE GOODS
1770	CONCRETE WORK	5109	WHO ADM & AUX, SMALL ESTABLISHMENTS
1780	WATER WELL DRILLING	5210	LUMBER AND OTHER BUILDING MATERIALS
1790	MISC. SPECIAL TRADE CONTRACTORS	5230	PAINT, GLASS, AND WALLPAPER STORES
1709	CON ADM & AUX, SMALL ESTABLISHMENTS	5250	HARDWARE STORES
4210	TRUCKING & COURIER SERVICES, EX. AIR	5260	RETAIL NURSERIES AND GARDEN STORES
4220	PUBLIC WAREHOUSING AND STORAGE	5270	MOBILE HOME DEALERS
4230	TRUCKING TERMINAL FACILITIES	5310	DEPARTMENT STORES
4410	DEEP SEA FOREIGN TRANS. OF FREIGHT	5330	VARIETY STORES
4420	DEEP SEA DOMESTIC TRANS. OF FREIGHT	5390	MISC. GENERAL MERCHANDISE STORES
4430	FREIGHT TRANS. ON THE GREAT LAKES	5410	GROCERY STORES
4440	WATER TRANSPORTATION OF FREIGHT, NEC	5420	MEAT AND FISH MARKETS
4450	SMALL ESTABL. WATER TRANSPORTATION, NEC	5430	FRUIT AND VEGETABLE MARKETS
4450	SMALL BUSINESS WATER TRANSPORTATION, NEC	5440	CANDY, NUT, AND CONFECTIONERY STORES
4610	PIPELINES, EXCEPT NATURAL GAS	5450	DAIRY PRODUCTS STORES
4720	PASSENGER TRANSPORTATION ARRANGEMENT	5460	RETAIL BAKERIES
4730	FREIGHT TRANSPORTATION ARRANGEMENT	5490	MISCELLANEOUS FOOD STORES
4730	FREIGHT TRANSPORTATION ARRANGEMENT	5510	NEW AND USED CAR DEALERS
		5520	USED CAR DEALERS
		5530	AUTO AND HOME SUPPLY STORES

SIC INDUSTRY GROUP NAME

5540 GASOLINE SERVICE STATIONS  
5550 BOAT DEALERS  
5560 RECREATIONAL VEHICLE DEALERS  
5570 MOTORCYCLE DEALERS  
5590 AUTOMOTIVE DEALERS, NEC  
5610 MEN'S AND BOYS' CLOTHING STORES  
5620 WOMEN'S CLOTHING STORES  
5630 WOMEN'S ACCESSORY & SPECIALTY STORES  
5630 WOMEN'S ACCESSORY & SPECIALTY STORES  
5640 CHILDREN'S AND INFANTS' WEAR STORES  
5650 FAMILY CLOTHING STORES  
5660 SHOE STORES  
5690 MISC. APPAREL & ACCESSORY STORES  
5710 FURNITURE AND HOME FURNISHINGS  
STORES 5720 HOUSEHOLD APPLIANCE STORES  
  
5730 RADIO, TELEVISION, & COMPUTER STORES  
5810 EATING AND DRINKING PLACES  
5910 DRUG STORES AND PROPRIETARY STORES  
5920 LIQUOR STORES  
5930 USED MERCHANDISE STORES  
5940 MISCELLANEOUS SHOPPING GOODS STORES  
5960 NONSTORE RETAILERS  
5980 FUEL DEALERS  
5990 RETAIL STORES, NEC  
5909 RET ADM & AUX, SMALL ESTABLISHMENTS  
6010 CENTRAL RESERVE DEPOSITORIES  
6020 COMMERCIAL BANKS  
6030 SAVINGS INSTITUTIONS  
6030 SAVINGS INSTITUTIONS  
6080 FOREIGN BANK & BRANCHES & AGENCIES  
6090 FUNCTIONS CLOSELY RELATED TO BANKING  
6110 FEDERAL & FED.-SPONSORED CREDIT  
6110 FEDERAL & FED.-SPONSORED CREDIT  
6140 PERSONAL CREDIT INSTITUTIONS  
6150 BUSINESS CREDIT INSTITUTIONS  
6160 MORTGAGE BANKERS AND BROKERS  
6210 SECURITY BROKERS AND DEALERS  
6220 COMMODITY CONTRACTS BROKERS,  
DEALERS  
6230 SECURITY AND COMMODITY EXCHANGES  
6280 SECURITY AND COMMODITY SERVICES  
6310 LIFE INSURANCE  
6320 MEDICAL SERVICE AND HEALTH INSURANCE  
6330 FIRE, MARINE, AND CASUALTY INSURANCE  
6350 SURETY INSURANCE  
6360 TITLE INSURANCE  
6370 PENSION, HEALTH, AND WELFARE FUNDS  
6390 INSURANCE CARRIERS, NEC  
6410 INSURANCE AGENTS, BROKERS, & SERVICE  
6410 INSURANCE AGENTS, BROKERS, & SERVICE  
6510 REAL ESTATE OPERATORS AND LESSORS  
6530 REAL ESTATE AGENTS AND MANAGERS  
6540 TITLE ABSTRACT OFFICES  
6550 SUBDIVIDERS AND DEVELOPERS  
6710 HOLDING OFFICES  
6720 INVESTMENT OFFICES  
6730 TRUSTS  
6790 MISCELLANEOUS INVESTING  
6709 FIN ADM & AUX, SMALL ESTABLISHMENTS

SIC INDUSTRY GROUP NAME

7010 HOTELS AND MOTELS  
7020 ROOMING AND BOARDING HOUSES  
7030 CAMPS AND RECREATIONAL VEHICLE PARKS  
7040 MEMBERSHIP-BASIS ORGANIZATION HOTELS  
7210 LAUNDRY, CLEANING, & GARMENT SERVICES  
7220 PHOTOGRAPHIC STUDIOS, PORTRAIT  
7230 BEAUTY SHOPS  
7240 BARBER SHOPS  
7250 SHOE REPAIR AND SHOE SHINE PARLORS  
7260 FUNERAL SERVICE AND CREMATORIES  
7290 MISCELLANEOUS PERSONAL SERVICES  
7310 ADVERTISING  
7320 CREDIT REPORTING AND COLLECTION  
7330 MAILING, REPRODUCTION, STENOGRAPHIC  
7340 SERVICES TO BUILDINGS  
7350 MISC. EQUIPMENT RENTAL & LEASING  
7360 PERSONNEL SUPPLY SERVICES  
7370 COMPUTER AND DATA PROCESSING  
SERVICES  
7380 MISCELLANEOUS BUSINESS SERVICES  
7510 AUTOMOTIVE RENTALS, NO DRIVERS  
7520 AUTOMOBILE PARKING  
7530 AUTOMOTIVE REPAIR SHOPS  
7540 AUTOMOTIVE SERVICES, EXCEPT REPAIR  
7620 ELECTRICAL REPAIR SHOPS  
7630 WATCH, CLOCK, AND JEWELRY REPAIR  
7640 REUPHOLSTERY AND FURNITURE REPAIR  
7690 MISCELLANEOUS REPAIR SHOPS  
7810 MOTION PICTURE PRODUCTION & SERVICES  
7820 MOTION PICTURE DISTRIBUTION & SERVICES  
7830 MOTION PICTURE THEATERS  
7910 DANCE STUDIOS, SCHOOLS, AND HALLS  
7920 PRODUCERS, ORCHESTRAS, ENTERTAINERS  
7930 BOWLING CENTERS  
7940 COMMERCIAL SPORTS  
7990 MISC. AMUSEMENT, RECREATION SERVICES  
7990 MISC. AMUSEMENT, RECREATION SERVICES  
8010 OFFICES & CLINICS OF MEDICAL DOCTORS  
8020 OFFICES AND CLINICS OF DENTISTS  
8030 OFFICES OF OSTEOPATHIC PHYSICIANS  
8040 OFFICES OF OTHER HEALTH PRACTITIONERS  
8050 NURSING AND PERSONAL CARE FACILITIES  
8060 HOSPITALS  
8070 MEDICAL AND DENTAL LABORATORIES  
8090 HEALTH AND ALLIED SERVICES, NEC  
8090 HEALTH AND ALLIED SERVICES, NEC  
8110 LEGAL SERVICES  
8310 SOCIAL SERVICES, NEC, SMALL  
ESTABLISHMENT  
8360 RESIDENTIAL CARE  
8410 MUSEUMS AND ART GALLERIES  
8420 BOTANICAL AND ZOOLOGICAL GARDENS  
8610 BUSINESS ASSOCIATIONS  
8620 PROFESSIONAL ORGANIZATIONS  
8630 LABOR ORGANIZATIONS  
8640 CIVIC AND SOCIAL ASSOCIATIONS

SIC INDUSTRY GROUP NAME

8650 POLITICAL ORGANIZATIONS  
8660 RELIGIOUS ORGANIZATIONS  
8690 MEMBERSHIP ORGANIZATIONS, NEC  
8710 ENGINEERING & ARCHITECTURAL SERVICES  
8720 ACCOUNTING, AUDITING, & BOOKKEEPING  
8730 RESEARCH AND TESTING SERVICES  
8730 RESEARCH AND TESTING SERVICES  
8730 RESEARCH AND TESTING SERVICES  
8740 MANAGEMENT AND PUBLIC RELATIONS  
8990 SERVICES, NEC  
8909 SER ADM & AUX, SMALL ESTABLISHMENTS  
9990 NONCLASSIFIABLE ESTABLISHMENTS

**APPENDIX B. DETAILED PROCEDURE FOR CREATING  
SMALL BUSINESS ESTIMATES FILE**



## APPENDIX B. DETAILED PROCEDURE FOR CREATING SMALL BUSINESS ESTIMATES FILE

The procedure for developing the SBE data file involved five steps. These five steps are listed in the shaded area of Fig. B-1. The source data extracted at the top of the diagram goes through a series of processing steps using dBASE programs and reference files and emerges as the SBE data file at the bottom.

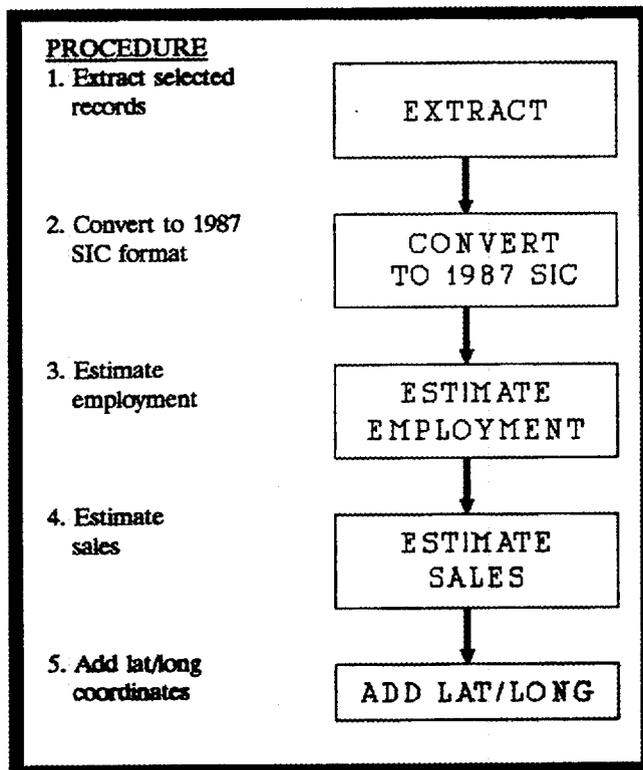


Fig. B-1. procedure for developing the SBE data file

### B.1 THE SMALL BUSINESS DATA SOURCE

The 1987 *County Business Patterns* files on CD-ROM were chosen as the source of small establishment data. There is one file for each state plus the District of Columbia. Each record in these files includes total establishment and employment data and number of establishments categorized by size of establishment for each 1977 SIC code and county fips code. For the purpose of developing the SBE data file, data on the number of establishments in size classes 1-4 employees, 5-9 employees, and 10-19 employees were used.

## B.2 EXTRACT SELECTED RECORDS

Following the sectorization scheme outlined above, data was extracted from the *County Business Patterns* files using a dBASE program. Each county has a record for each selected SIC code unless there is no economic activity located within the county. A record with an entry of zero sales and employment indicates the county contains at least one "large" establishment, but no small establishments in the designated industry group.

## B.3 CONVERT TO 1987 SIC FORMAT

A reference file was created which relates the 1977 SIC codes with the 1987 definitions. The table "Relation of 1977 to 1987 SIC Industries" in the *1987 Standard Industrial Classification Manual* was used as the source of this information. For forty-two of the selected 1987 SIC codes, changes in SIC definitions between 1977 and 1987 could not be reconciled. A tradeoff exists between choosing to keep the 1977 SIC definitions and choosing to redefine the *County Business Patterns* data to approximately match the 1987 SIC definitions used in the NIIS file. If the data is redefined, the consistency of the *County Business Patterns* data is jeopardized. If the 1977 SIC definitions are kept, then obtaining comprehensive coverage measures for each industry group in the NIIS core data file is not possible. Since comprehensive coverage is a requirement for the core NIIS file, the decision was made to redefine the *County Business Patterns* data to approximately match the 1987 SIC definitions for these forty-two industry groups. A listing of this relation file is found in Appendix C. For each 1987 SIC code found in the SBE file, the corresponding 1977 SIC code is listed along with an indicator (either Y or N) of whether the two definitions could be reconciled.

Several unique (non 1987 SIC) codes are included in the SBE file. Each division contains one code which represents Administrative and Auxiliary establishments (e.g. central administrative offices, warehouses, research laboratories, and maintenance locations). *County Business Patterns* separates these establishments from all others and reports them as one record at the industry division level. The decision was made to retain the consistency of the data rather than to arbitrarily allocate the establishments to each industry group in the division. The same reasoning applies to the other four unique codes which are an aggregation of two or more industry groups; data could not be disaggregated to the industry group level without jeopardizing the consistency of the data. The unique codes are listed in Table B-1.

## B.4 ESTIMATE EMPLOYMENT

As discussed in NIIS Research Brief, "Internal Consistency of *County Business Patterns* Employment and Establishment Data," employment data at the county industry group level is inconsistently reported in the *County Business Patterns* data file (see Appendix F for NIIS Research Briefs). However, consistent establishment data is available. This allows for consistent employment estimates to be generated using employee per establishment ratios.

For each industry group, average employee per establishment ratios were calculated for size classes 1-4 employees, 5-9 employees, and 10-19 employees using *County Business Patterns* national employee and establishment counts. If employment data was withheld for an industry group,

Table B-1. Unique codes

0909	AGR Adm. & Aux.
1409	MIN Adm. & Aux.
1709	CON Adm. & Aux.
4909	TRN Adm. & Aux.
5109	WHS Adm. & Aux.
5909	RTL Adm. & Aux.
6709	FIN Adm. & Aux.
8909	SER Adm. & Aux.
1510	Resid. & Nonresid. Contractors
8310	Social Services, exc. 836
1210	Coal Mining, Small Estab.
4450	Water Transportation, NEC, Sm. Estab.

employee ratios at the major group or industry division level were used. These employee per establishment ratios are contained in the ratios reference file listed in Appendix D. A dBASE program calculates employment for each record by multiplying the number of establishments in each size class times the corresponding employee per establishment ratio, and then summing employment across the three size classes to obtain total small establishment employment.

## B.5 ESTIMATE SALES

To ensure consistency of sales estimates in the NIIS core data file, all components should use the same sales definitions. Since sales definitions tend to vary both between data files and within each data file, the decision was made to use Dun and Bradstreet sales per employee ratios to estimate small establishment sales. This method will ensure consistency between the SBE component and the Dun and Bradstreet major facility component of the NIIS data file. (For a further discussion of consistency of sales data, see NIIS Research Brief, "Consistency of Sales per Employee Estimates in the May 1991 Data File," included in Appendix F.)

A SAS program was used to calculate sales per employee ratios using the May 1991 Dun and Bradstreet data. The program calculated sales per employee ratios for each non-HQ facility for which sales and employment data was available, and then summed these ratios over all matching SIC codes. This sum was divided by the number of facilities to obtain the average sales per employee ratio for each SIC code. Administrative and Auxiliary establishments were given a ratio which equalled the average of the sales per employee ratios in the industry division. For the Crude Petroleum and Natural Gas industry group, the sales per employee ratio was very large relative to all other industry groups. To correct for this anomaly, the sales per employee ratio for this industry group was

calculated by summing sales and employees for each facility and then dividing total sales by the total number of employees. This method provided a more consistent ratio for this industry group. A listing of the sales ratio reference file is given in Appendix E. A dBASE program calculates sales estimates for each record by multiplying the number of employees by the corresponding sales per employee ratio.

## B.6 ADD LATITUDE/LONGITUDE COORDINATES

Latitude/longitude centroid coordinates for IMPLAN County Definitions were copied to the lat/long reference file. This file was updated with thirteen new county fips codes found in *County Business Patterns*. Using this reference file, a dBASE program adds latitude/longitude coordinates to each record in the SBE file. A list of these new fips codes is found in Table B-2.

The final SBE data file contains 336,522 records. The SBE component is stored separately from the Dun and Bradstreet major facility file in the NIIS system. Table B-3 contains a sample of the record format.

Table B-2. New Federal Information Processing System codes

FIPS	COUNTY
02122	Kenai Peninsula, AK
02185	North Slope, AK
02201	Prince of Wales, Outer Ketchikan, AK
02231	Skagway, Yakutat, Angoon, AK
02261	Valdez, Cordova, AK
04012	La Paz, AZ
13215	Muscogee, GA
15005	Kalaupoo, HI
29186	Ste. Genevieve, MO
30113	Yellowstone National Park, part, MT
35006	Cibola, NM
55078	Menominee, WI
55115	Shawano, WI

Table B-3. Sample record format

<u>FIPS CODE</u>	<u>LATITUDE</u>	<u>LONGITUDE</u>	<u>SIC CODE</u>	<u>EMPLOYEES</u>	<u>SALES</u>	<u>BUSINESS NAME</u>
21211	38.21389	-85.20778	1610	14	3330143	Small Business Estimates
21219	36.84000	-87.17778	1610	1	237867	Small Business Estimates
21227	36.98583	-86.43916	1610	17	4043745	Small Business Estimates
21229	37.74556	-85.19028	1610	0	0	Small Business Estimates
21235	36.77444	-84.16055	1610	1	237867	Small Business Estimates
21239	38.03444	-84.74277	1610	22	5233082	Small Business Estimates
21001	37.09139	-85.27444	1620	3	335571	Small Business Estimates
21007	37.08222	-88.99722	1620	0	0	Small Business Estimates
21009	36.97861	-85.91695	1620	18	2013426	Small Business Estimates
21011	39.15667	-83.75111	1620	12	1342284	Small Business Estimates
21013	36.71000	-83.67693	1620	7	782999	Small Business Estimates



**APPENDIX C. LISTING OF CONVERSION FILE:  
1977 TO 1987 STANDARD INDUSTRIAL CLASSIFICATION CODES**



Table C-1. 1977 to 1987 standard industrial classification codes

1987 SIC TITLE	1977 SIC I <sup>1</sup>	1987 SIC TITLE	1977 SIC I
0700 AGRICULTURAL SERVICES	0700 Y	5010 MOTOR VEHICLES, PARTS, AND SUPPLIES	5010 N
0800 FORESTRY	0800 Y	5020 FURNITURE AND HOME FURNISHINGS	5020 Y
0900 FISHING, HUNTING, AND TRAPPING	0900 Y	5030 LUMBER AND CONSTRUCTION MATERIALS	5030 Y
0908 AGR ADM. & AUX., SMALL ESTABLISHMENTS	0908 Y	5040 PROFESSIONAL & COMMERCIAL EQUIPMENT	5043 Y
1010 IRON ORES	1010 Y	5040 PROFESSIONAL & COMMERCIAL EQUIPMENT	5081 Y
1020 COPPER ORES	1020 Y	5040 PROFESSIONAL & COMMERCIAL EQUIPMENT	5086 Y
1030 LEAD AND ZINC ORES	1030 Y	5050 METALS & MINERALS, EXCEPT PETROLEUM	5050 Y
1040 GOLD AND SILVER ORES	1040 Y	5060 ELECTRICAL GOODS	5060 N
1060 FERROALLOY ORES, EXCEPT VANADIUM	1060 Y	5070 HARDWARE, PLUMBING & HEATING EQUIP	5070 Y
1080 METAL MINING SERVICES	1080 Y	5080 MACHINERY, EQUIPMENT, AND SUPPLIES	5082 N
1090 MISCELLANEOUS METAL ORES	1090 Y	5080 MACHINERY, EQUIPMENT, AND SUPPLIES	5083 N
1090 MISCELLANEOUS METAL ORES	1050 Y	5080 MACHINERY, EQUIPMENT, AND SUPPLIES	5084 N
1210 COAL MINING, SMALL ESTABLISHMENTS	1100 Y	5080 MACHINERY, EQUIPMENT, AND SUPPLIES	5085 N
1210 COAL MINING, SMALL BUSINESS ESTIMATES	1200 Y	5080 MACHINERY, EQUIPMENT, AND SUPPLIES	5087 N
1310 CRUDE PETROLEUM AND NATURAL GAS	1310 Y	5080 MACHINERY, EQUIPMENT, AND SUPPLIES	5088 N
1320 NATURAL GAS LIQUIDS	1320 Y	5090 MISCELLANEOUS DURABLE GOODS	5090 Y
1380 OIL AND GAS FIELD SERVICES	1380 Y	5090 MISCELLANEOUS DURABLE GOODS	5041 Y
1410 DIMENSION STONE	1410 Y	5090 MISCELLANEOUS DURABLE GOODS	5042 Y
1420 CRUSHED AND BROKEN STONE	1420 Y	5110 PAPER AND PAPER PRODUCTS	5110 Y
1440 SAND AND GRAVEL	1440 Y	5120 DRUGS, PROPRIETARIES, AND SUNDRIES	5120 Y
1450 CLAY, CERAMIC & REFRACTORY MINERALS	1450 Y	5130 APPAREL, PIECE GOODS, AND NOTIONS	5130 Y
1470 CHEMICAL AND FERTILIZER MINERALS	1470 Y	5140 GROCERIES AND RELATED PRODUCTS	5140 Y
1480 NONMETALLIC MINERALS SERVICES	1480 Y	5150 FARM-PRODUCT RAW MATERIALS	5150 Y
1490 MISCELLANEOUS NONMETALLIC MINERALS	1490 Y	5160 CHEMICALS AND ALLIED PRODUCTS	5160 Y
1409 MIN ADM & AUX, SMALL ESTABLISHMENTS	1409 Y	5170 PETROLEUM AND PETROLEUM PRODUCTS	5170 Y
1510 RESID, NONRES BLDG CONST, SMALL ESTAB	1510 Y	5180 BEER, WINE, AND DISTILLED BEVERAGES	5180 Y
1530 OPERATIVE BUILDERS	1530 Y	5190 MISC. NONDURABLE GOODS	5190 Y
1610 HIGHWAY AND STREET CONSTRUCTION	1610 N	5109 WHO ADM & AUX, SMALL ESTABLISHMENTS	5109 Y
1620 HEAVY CONSTRUCTION, EXCEPT HIGHWAY	1620 N	5210 LUMBER AND OTHER BUILDING MATERIALS	5210 Y
1710 PLUMBING, HEATING, AIR CONDITIONING	1710Y	5230 PAINT, GLASS, AND WALLPAPER STORES	5230 Y
1720 PAINTING AND PAPER HANGING	1720 Y	5250 HARDWARE STORES	5250 Y
1730 ELECTRICAL WORK	1730 Y	5260 RETAIL NURSERIES AND GARDEN STORES	5260 Y
1740 MASONRY, STONEMWORK, AND PLASTERING	1740 Y	5270 MOBILE HOME DEALERS	5270 Y
1750 CARPENTRY AND FLOOR WORK	1750 Y	5310 DEPARTMENT STORES	5310 Y
1760 ROOFING, SIDING, AND SHEET METAL WORK	1760 Y	5330 VARIETY STORES	5330 Y
1770 CONCRETE WORK	1770 N	5390 MISC. GENERAL MERCHANDISE STORES	5390 Y
1780 WATER WELL DRILLING	1780 Y	5410 GROCERY STORES	5410 Y
1790 MISC. SPECIAL TRADE CONTRACTORS	1790 Y	5420 MEAT AND FISH MARKETS	5420 Y
1709 CON ADM & AUX, SMALL ESTABLISHMENTS	1709 Y	5430 FRUIT AND VEGETABLE MARKETS	5430 Y
4210 TRUCKING & COURIER SERVICES, EX. AIR	4210 Y	5440 CANDY, NUT, & CONFECTIONERY STORES	5440 Y
4220 PUBLIC WAREHOUSING AND STORAGE	4220 Y	5450 DAIRY PRODUCTS STORES	5450 Y
4230 TRUCKING TERMINAL FACILITIES	4230 Y	5460 RETAIL BAKERIES	5460 Y
4410 DEEP SEA FOREIGN TRANS. OF FREIGHT	4410 N	5490 MISCELLANEOUS FOOD STORES	5490 Y
4420 DEEP SEA DOMESTIC TRANS. OF FREIGHT	4420 N	5510 NEW AND USED CAR DEALERS	5510 Y
4430 FREIGHT TRANS. ON THE GREAT LAKES	4430 N	5520 USED CAR DEALERS	5520 Y
4440 WATER TRANSPORTATION OF FREIGHT, NEC	4440 N	5530 AUTO AND HOME SUPPLY STORES	5530 Y
4450 SMALL ESTABL. WATER TRANSPORT, NEC	4450 N	5540 GASOLINE SERVICE STATIONS	5540 Y
4450 SMALL BUSINESS WATER TRANSPORT, NEC	4460 N	5550 BOAT DEALERS	5550 Y
4610 PIPELINES, EXCEPT NATURAL GAS	4610 Y	5560 RECREATIONAL VEHICLE DEALERS	5560 N
4720 PASSENGER TRANSPORT ARRANGEMENT	4722 Y	5570 MOTORCYCLE DEALERS	5570 Y
4730 FREIGHT TRANSPORTATION ARRANGEMENT	4710 Y	5590 AUTOMOTIVE DEALERS, NEC	5590 N
4730 FREIGHT TRANSPORTATION ARRANGEMENT	4723 Y	5610 MEN'S AND BOYS' CLOTHING STORES	5610 Y
4740 RENTAL OF RAILROAD CARS	4740 Y	5620 WOMEN'S CLOTHING STORES	5620 Y
4780 MISCELLANEOUS TRANSPORT SERVICES	4780 Y	5630 WOMEN'S ACCESS. & SPECIALTY STORES	5630 Y
4810 TELEPHONE COMMUNICATIONS	4810 Y	5630 WOMEN'S ACCESS. & SPECIALTY STORES	5680 Y
4820 TELEGRAPH & OTHER COMMUNICATIONS	4820 N	5640 CHILDREN'S AND INFANTS' WEAR STORES	5640 Y
4830 RADIO AND TELEVISION BROADCASTING	4830 N	5650 FAMILY CLOTHING STORES	5650 Y
4890 COMMUNICATIONS SERVICES, NEC	4890 N	5660 SHOE STORES	5660 Y
4907 TRN ADM & AUX, SMALL ESTABLISHMENTS	4907 Y	5690 MISC. APPAREL & ACCESSORY STORES	5690 Y

<sup>1</sup>Indicates whether 1977 and 1987 definitions could be reconciled.

5710 FURNITURE & HOME FURNISHING STORES	5710 Y	7520 AUTOMOBILE PARKING	7520 Y
5720 HOUSEHOLD APPLIANCE STORES	5720 Y	7530 AUTOMOTIVE REPAIR SHOPS	7530 Y
5730 RADIO, TELEVISION, & COMPUTER STORES	5730 Y	7540 AUTOMOTIVE SERVICES, EXCEPT REPAIR	7540 Y
5810 EATING AND DRINKING PLACES	5800 Y	7620 ELECTRICAL REPAIR SHOPS	7620 Y
5910 DRUG STORES & PROPRIETARY STORES	5910 Y	7630 WATCH, CLOCK, AND JEWELRY REPAIR	7630 Y
5920 LIQUOR STORES	5920 Y	7640 REUPHOLSTERY & FURNITURE REPAIR	7640 Y
5930 USED MERCHANDISE STORES	5930 N	7690 MISCELLANEOUS REPAIR SHOPS	7690 Y
5940 MISC. SHOPPING GOODS STORES	5940 Y	7810 MOTION PICTURE PROD. & SERVICES	7810 Y
5960 NONSTORE RETAILERS	5960 Y	7820 MOTION PICTURE DISTR. & SERVICES	7820 Y
5980 FUEL DEALERS	5980 N	7830 MOTION PICTURE THEATERS	7830 Y
5990 RETAIL STORES, NEC	5990 N	7910 DANCE STUDIOS, SCHOOLS, AND HALLS	7910 Y
5909 RET ADM & AUX, SMALL ESTABLISH.	5909 Y	7920 PRODUC., ORCHESTRAS, ENTERTAINERS	7920 Y
6010 CENTRAL RESERVE DEPOSITORIES	6010 N	7930 BOWLING CENTERS	7933 Y
6020 COMMERCIAL BANKS	6020 N	7940 COMMERCIAL SPORTS	7940 Y
6030 SAVINGS INSTITUTIONS	6030 N	7990 MISC. AMUSEMENT, RECREATION SERVICE	7932 N
6030 SAVINGS INSTITUTIONS	6120 N	7990 MISC. AMUSEMENT, RECREATION SERVICE	7990 N
6080 FOREIGN BANK BRANCHES & AGENCIES	6050 N	8010 OFFICES & CLINICS OF MEDICAL DOCTORS	8010 N
6090 FUNCTIONS CLOSE RELATED TO BANKING	6040 N	8020 OFFICES AND CLINICS OF DENTISTS	8020 N
6110 FEDERAL & FED.-SPONSORED CREDIT	6110 N	8030 OFFICES OF OSTEOPATHIC PHYSICIANS	8030 Y
6110 FEDERAL & FED.-SPONSORED CREDIT	6130 N	8040 OFFICES OF MISC. HEALTH PRACTITIONERS	8040 Y
6140 PERSONAL CREDIT INSTITUTIONS	6140 N	8050 NURSING AND PERSONAL CARE FACILITY	8050 Y
6150 BUSINESS CREDIT INSTITUTIONS	6150 N	8060 HOSPITALS	8060 Y
6160 MORTGAGE BANKERS AND BROKERS	6160 Y	8070 MEDICAL AND DENTAL LABORATORIES	8070 Y
6210 SECURITY BROKERS AND DEALERS	6210 Y	8090 HEALTH AND ALLIED SERVICES, NEC	8080 N
6220 COMMOD. CONTRACTS BROKERS DEALERS	6220 Y	8090 HEALTH AND ALLIED SERVICES, NEC	8090 N
6230 SECURITY & COMMODITY EXCHANGES	6230 Y	8110 LEGAL SERVICES	8100 N
6280 SECURITY AND COMMODITY SERVICES	6280 Y	8310 SOCIAL SERVICES, NEC, SMALL ESTAB.	8310 Y
6310 LIFE INSURANCE	6310 Y	8360 RESIDENTIAL CARE	8360 Y
6320 MEDICAL SERVICE & HEALTH INSURANCE	6320 Y	8410 MUSEUMS AND ART GALLERIES	8410 N
6330 FIRE, MARINE, & CASUALTY INSURANCE	6330 Y	8420 BOTANICAL & ZOOLOGICAL GARDENS	8420 N
6350 SURETY INSURANCE	6350 Y	8610 BUSINESS ASSOCIATIONS	8610 Y
6360 TITLE INSURANCE	6360 Y	8620 PROFESSIONAL ORGANIZATIONS	8620 Y
6370 PENSION, HEALTH, AND WELFARE FUNDS	6370 Y	8630 LABOR ORGANIZATIONS	8630 Y
6390 INSURANCE CARRIERS, NEC	6390 Y	8640 CIVIC AND SOCIAL ASSOCIATIONS	8640 Y
6410 INSURANCE AGENTS, BROKERS, & SERVICE	6400 N	8650 POLITICAL ORGANIZATIONS	8650 Y
6410 INSURANCE AGENTS, BROKERS, & SERVICE	6600 N	8660 RELIGIOUS ORGANIZATIONS	8660 Y
6510 REAL ESTATE OPERATORS AND LESSORS	6510 Y	8690 MEMBERSHIP ORGANIZATIONS, NEC	8690 Y
6530 REAL ESTATE AGENTS AND MANAGERS	6530 N	8710 ENGINEER. & ARCHITECTURAL SERVICE	8910 Y
6540 TITLE ABSTRACT OFFICES	6540 Y	8720 ACCOUNTING, AUDIT, & BOOKKEEPING	8930 Y
6550 SUBDIVIDERS AND DEVELOPERS	6550 Y	8730 RESEARCH AND TESTING SERVICES	7391 N
6710 HOLDING OFFICES	6710 Y	8730 RESEARCH AND TESTING SERVICES	7397 N
6720 INVESTMENT OFFICES	6720 Y	8730 RESEARCH AND TESTING SERVICES	8920 N
6730 TRUSTS	6730 Y	8740 MANAGEMENT & PUBLIC RELATIONS	7392 N
6790 MISCELLANEOUS INVESTING	6790 Y	8990 SERVICES, NEC	8990 Y
6709 FIN ADM & AUX, SMALL ESTABLISHMENTS	6709 Y	8909 SER ADM & AUX, SMALL ESTABLISHMENTS	8909 Y
7010 HOTELS AND MOTELS	7010 Y	9990 NONCLASSIFIABLE ESTABLISHMENTS	99-- Y
7020 ROOMING AND BOARDING HOUSES	7020 Y		
7030 CAMPS & RECREATIONAL VEHICLE PARKS	7030 Y		
7040 MEMBERSHIP-BASIS ORGAN. HOTELS	7040 Y		
7210 LAUNDRY, CLEAN., & GARMENT SERVICE	7210 N		
7220 PHOTOGRAPHIC STUDIOS, PORTRAIT	7220 Y		
7230 BEAUTY SHOPS	7230 Y		
7240 BARBER SHOPS	7240 Y		
7250 SHOE REPAIR & SHOE SHINE PARLORS	7250 Y		
7260 FUNERAL SERVICE AND CREMATORIES	7260 Y		
7290 MISCELLANEOUS PERSONAL SERVICES	7290 N		
7310 ADVERTISING	7310 Y		
7320 CREDIT REPORTING AND COLLECTION	7320 Y		
7330 MAILING, REPRO., STENOGRAPHIC	7330 Y		
7340 SERVICES TO BUILDINGS	7340 Y		
7350 MISC. EQUIPMENT RENTAL & LEASING	7394 N		
7360 PERSONNEL SUPPLY SERVICES	7360 N		
7370 COMPUTER & DATA PROCESSING SERVICES	7370 Y		
7380 MISCELLANEOUS BUSINESS SERVICES	7350 Y		
7380 MISCELLANEOUS BUSINESS SERVICES	7393 Y		
7380 MISCELLANEOUS BUSINESS SERVICES	7395 Y		
7380 MISCELLANEOUS BUSINESS SERVICES	7396 Y		
7380 MISCELLANEOUS BUSINESS SERVICES	7399 Y		
7510 AUTOMOTIVE RENTALS, NO DRIVERS	7510 Y		

**APPENDIX D. LISTING OF EMPLOYEE/ESTABLISHMENT FILE**



Table D-1. Listing of employee/establishment file

EMPLOYEES/ESTAB.															
SIC	1-4	5-9	10-19												
0700	1.48	6.54	13.05	4890	1.73	6.62	13.71	5980	2.26	6.62	13.05	7690	1.78	6.51	13.19
0800	1.47	6.54	13.55	4907	1.73	6.64	13.79	5990	1.91	6.60	12.88	7810	1.29	6.50	13.55
0900	1.14	6.54	13.23	5010	2.15	6.62	13.48	5909	2.04	6.75	13.75	7820	1.91	6.51	13.31
0908	1.47	6.54	14.50	5020	1.93	6.65	13.42	6010	2.10	6.60	14.82	7830	1.67	6.51	13.78
1010	1.69	6.67	13.75	5030	1.93	6.66	13.53	6020	2.49	7.02	13.44	7910	1.79	6.51	12.81
1020	1.69	6.69	13.75	5040	1.76	6.59	13.45	6030	2.38	6.93	13.39	7920	1.39	6.60	13.57
1030	1.69	6.69	13.00	5050	1.93	6.67	13.58	6060	2.45	6.20	13.31	7930	1.79	6.82	13.99
1040	1.10	6.69	13.97	5060	2.01	6.67	13.48	6080	1.97	6.60	13.14	7940	1.41	6.51	13.52
1050	1.69	6.69	13.75	5070	2.12	6.63	13.48	6090	1.95	7.79	14.19	7990	1.79	6.62	13.53
1060	1.49	5.88	13.75	5080	1.97	6.68	13.45	6110	1.71	6.58	12.22	8010	2.04	6.40	13.08
1080	1.68	6.64	13.08	5090	1.73	6.57	13.52	6140	2.45	6.20	13.31	8020	2.30	6.40	12.40
1090	1.69	6.58	13.97	5110	1.95	6.71	13.56	6150	1.71	6.58	13.38	8030	2.17	6.37	12.57
1210	1.38	6.86	14.03	5120	1.93	6.67	13.93	6160	1.71	6.58	13.43	8040	1.87	6.26	12.61
1310	1.69	6.52	13.43	5130	1.71	6.59	13.40	6210	1.72	6.62	13.93	8050	1.37	6.89	14.10
1320	2.15	6.82	14.02	5140	1.81	6.70	13.69	6220	1.37	6.34	13.39	8060	1.57	6.68	13.40
1380	1.71	6.66	13.62	5150	2.17	6.64	13.30	6230	1.53	6.58	13.39	8070	1.81	6.44	13.33
1410	1.36	6.70	14.27	5160	1.91	6.68	13.36	6280	1.46	6.58	13.15	8080	1.94	6.71	13.59
1420	1.69	7.01	14.33	5170	2.11	6.69	13.48	6310	1.93	6.94	13.58	8090	1.67	6.65	13.76
1440	1.69	6.81	13.60	5180	1.93	6.85	13.83	6320	1.71	6.58	13.39	8110	1.68	6.47	13.24
1450	1.69	6.69	13.75	5190	1.91	6.59	13.48	6330	1.99	6.39	13.66	8310	1.93	6.72	13.55
1470	1.45	6.83	12.73	5109	2.24	6.68	13.87	6350	1.79	6.58	14.09	8360	1.86	6.79	13.59
1480	1.43	6.69	14.89	5210	1.90	6.77	13.53	6360	1.71	6.63	13.74	8410	1.88	6.60	13.59
1490	1.59	6.69	13.12	5230	2.28	6.39	12.96	6370	1.15	6.55	13.44	8420	1.69	6.59	14.50
1409	2.42	6.81	14.04	5250	2.09	6.58	13.17	6390	1.60	6.72	13.39	8610	2.02	6.46	13.32
1510	1.65	6.56	13.44	5260	1.75	6.57	13.43	6410	1.77	6.44	13.26	8620	1.95	6.51	13.26
1530	1.81	6.61	13.45	5270	1.90	6.56	12.87	6510	1.71	6.47	13.12	8630	1.88	6.63	13.24
1610	1.44	6.56	13.75	5310	1.90	6.60	13.37	6530	1.53	6.48	13.35	8640	1.69	6.55	13.38
1620	1.63	6.65	13.55	5330	1.90	6.56	13.56	6540	2.06	6.62	13.46	8650	1.40	6.51	13.09
1710	1.79	6.59	13.37	5390	1.90	6.46	13.70	6550	1.41	6.50	13.53	8660	2.07	6.44	13.42
1720	1.50	6.50	13.16	5410	1.92	6.48	13.17	6710	1.66	6.63	13.64	8690	1.87	6.51	13.47
1730	1.77	6.59	13.37	5420	1.92	6.44	13.06	6720	1.78	6.36	13.17	8710	1.65	6.62	13.37
1740	1.64	6.57	13.47	5430	1.53	6.56	13.60	6730	1.48	6.50	13.45	8720	1.71	6.46	13.09
1750	1.52	6.45	13.14	5440	2.00	6.40	12.66	6790	1.43	6.48	13.27	8730	1.79	6.59	13.45
1760	1.65	6.56	13.49	5450	1.68	6.63	12.40	6709	1.94	6.58	13.39	8740	1.49	6.56	13.45
1770	1.54	6.60	13.36	5460	1.84	6.73	13.38	7010	1.44	6.73	13.90	8990	1.34	6.49	13.22
1780	1.80	6.42	13.23	5490	1.80	6.65	13.13	7020	1.64	6.51	13.31	8909	1.79	6.77	13.31
1790	1.63	6.62	13.46	5510	1.90	6.60	14.33	7030	1.21	6.51	13.46	9990	0.45	6.51	13.06
1709	2.49	6.56	14.24	5520	1.71	6.40	13.03	7040	1.81	6.51	13.31				
4110	1.40	6.64	13.85	5530	2.10	6.60	13.37	7210	1.89	6.54	13.23				
4120	1.43	6.64	13.46	5540	2.19	6.56	12.72	7220	1.78	6.57	12.82				
4130	1.73	6.64	13.61	5550	1.84	6.66	13.12	7230	1.79	6.52	12.89				
4140	1.73	6.64	13.61	5560	1.90	6.66	13.20	7240	1.79	6.47	13.00				
4150	1.75	6.84	13.69	5570	2.09	6.67	13.00	7250	1.58	6.33	13.06				
4170	1.73	6.85	12.75	5590	1.90	6.41	13.75	7260	2.20	6.51	12.84				
4210	1.60	6.66	13.57	5610	1.90	6.63	13.14	7290	1.56	6.56	13.36				
4220	1.73	6.64	13.56	5620	1.97	6.74	13.37	7310	1.69	6.57	13.38				
4230	1.73	6.64	13.52	5630	1.97	6.12	12.68	7320	1.87	6.65	13.65				
4410	1.73	6.82	12.81	5640	1.91	6.53	13.76	7330	1.68	6.52	13.28				
4420	1.73	6.63	13.60	5650	1.88	6.82	13.37	7340	1.57	6.62	13.42				
4430	1.46	6.64	13.61	5660	2.50	6.32	12.36	7350	1.70	6.67	13.53				
4440	1.73	6.64	13.61	5690	1.67	6.44	12.83	7360	1.53	6.68	13.44				
4450	1.54	6.61	13.36	5710	1.98	6.60	13.37	7370	1.52	6.63	13.60				
4610	1.73	6.64	13.97	5720	2.00	6.60	13.07	7380	1.70	6.67	13.53				
4720	2.07	6.44	13.10	5730	2.05	6.54	13.03	7510	1.94	6.55	13.11				
4730	1.73	6.64	13.41	5810	1.62	6.74	13.90	7520	1.79	6.48	13.22				
4740	1.93	6.64	15.00	5910	2.32	6.77	13.37	7530	1.79	6.43	12.84				
4780	1.73	6.64	13.69	5920	2.02	6.46	12.82	7540	1.69	6.54	13.26				
4810	1.90	6.71	13.67	5930	1.83	6.50	12.79	7620	1.80	6.49	13.30				
4820	1.73	6.64	13.75	5940	1.85	6.60	12.90	7630	1.81	6.29	12.99				
4830	1.37	6.64	14.02	5960	1.74	6.64	13.60	7640	1.67	6.33	12.76				



**APPENDIX E. LISTING OF SALES/EMPLOYEE FILE**



Table E-1. Listing of sales/employee file

SIC	SALES PER EMPLOYEE						
0700	60471.47	4920	353643.00	5980	161774.97	7910	17797.58
0800	49727.30	4930	207314.29	5990	84550.85	7920	49604.11
0900	66634.84	4940	105242.94	6010	357221.12	7930	27855.11
1010	76477.29	4950	101226.86	6020	137315.24	7940	155226.67
1020	112367.98	4960	307622.38	6030	203805.95	7990	34278.60
1030	187739.52	4970	61990.37	6060	148012.51	8010	75611.22
1040	126338.02	5010	158267.38	6080	294847.36	8020	41164.87
1060	139645.44	5020	184804.07	6090	94847.99	8030	42745.19
1080	98024.87	5030	202845.00	6110	148236.24	8040	39966.99
1090	80142.61	5040	156430.76	6140	121863.14	8050	20532.12
1210	140450.70	5050	345250.60	6150	420651.55	8060	52103.58
1310	254649.42	5060	210231.78	6160	165500.47	8070	60796.27
1320	208441.78	5070	190546.23	6210	134500.07	8080	29867.62
1380	67657.97	5080	184550.45	6220	218638.69	8090	40186.79
1410	64755.69	5090	192536.55	6230	210380.36	8110	72119.33
1420	89309.33	5110	206535.51	6280	136157.90	8210	25773.61
1440	86479.44	5120	256779.13	6310	310797.24	8220	47466.89
1450	131975.15	5130	220529.97	6320	355147.64	8230	23922.96
1470	127578.25	5140	268097.55	6330	275395.85	8240	45149.86
1480	90433.46	5150	334219.34	6350	306360.35	8290	36620.28
1490	71314.66	5160	217012.72	6360	56121.63	8310	26674.77
1510	174502.09	5170	511059.28	6370	570253.22	8360	24496.82
1530	414853.73	5180	264123.30	6390	211213.54	8410	42770.72
1610	237867.38	5190	198907.71	6410	126359.77	8420	45312.49
1620	111856.98	5210	142797.69	6510	88590.26	8610	110123.69
1710	96722.55	5230	73720.71	6530	59040.81	8620	89380.05
1720	55931.61	5250	77217.03	6540	36839.14	8630	89149.86
1730	87303.98	5260	81667.77	6550	216143.10	8640	26096.39
1740	71000.26	5270	175913.52	6710	113611.82	8650	61615.53
1750	73435.48	5310	59723.11	6720	286002.09	8660	25906.79
1760	81571.83	5330	60616.80	6730	393183.03	8690	56737.92
1770	86775.33	5390	82551.07	6790	120320.78	8710	66516.74
1780	71645.84	5410	101774.04	7010	35327.03	8720	58514.44
1790	90470.45	5420	84158.61	7020	25318.44	8730	68934.38
4010	90226.34	5430	72093.75	7030	25239.10	8740	77114.78
4110	29058.93	5440	35338.04	7040	20154.12	8990	39715.26
4120	22233.28	5450	37546.44	7210	29618.89	0908	59970.04
4130	39810.31	5460	26014.56	7220	45727.27	1409	121941.92
4140	45913.22	5490	67777.43	7230	19298.89	1709	123885.68
4150	28032.88	5510	325571.22	7240	17546.17	4907	102936.75
4170	39020.16	5520	171362.51	7250	25519.97	5109	221713.49
4210	72257.88	5530	93638.86	7260	50820.11	5909	90940.48
4220	63664.88	5540	597440.95	7290	34487.87	6709	145232.93
4230	58562.94	5550	178312.17	7310	263086.75	8909	44537.18
4410	354828.86	5560	216705.55	7320	67559.75	9990	95942.38
4420	175179.13	5570	142822.13	7330	58625.22		
4430	132677.54	5590	125055.34	7340	17879.05		
4440	131668.81	5610	82827.27	7350	83158.23		
4450	75704.19	5620	57333.59	7360	56010.03		
4510	80532.07	5630	60019.01	7370	86722.25		
4520	100675.30	5640	54860.92	7380	49004.46		
4580	75605.92	5650	62504.12	7510	101979.56		
4610	239645.66	5660	65786.42	7520	39776.67		
4720	237421.45	5690	60396.92	7530	65063.01		
4730	125945.93	5710	103021.88	7540	39147.63		
4740	96614.77	5720	128423.68	7620	46468.14		
4780	74274.07	5730	122669.95	7630	38812.39		
4810	111055.14	5810	23656.95	7640	34848.27		
4820	54557.57	5910	77852.13	7690	69797.25		
4830	57569.43	5920	95498.66	7810	139623.38		
4840	117799.08	5930	42306.20	7820	132395.32		
4890	118457.35	5940	71699.30	7830	30472.47		
4910	260641.72	5960	118052.25	7840	36083.87		



**APPENDIX F. SUPPORTING NIIS RESEARCH BRIEFS**



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## NIIS RESEARCH BRIEF

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June 5, 1991

OAK RIDGE NATIONAL LABORATORY  
REGIONAL STUDIES PROGRAM  
DAVID P. VOGT

FEDERAL EMERGENCY MANAGEMENT AGENCY  
NIIS PROJECT

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### Sectoral Coverage in the Dun and Bradstreet Data File

*AUTHORS: Sharon Bell and Tom Yoder*

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#### BACKGROUND

FEMA has acquired the Dun and Bradstreet "Twenty Plus" file as the primary data file for use in the National Infrastructure Information System (NIIS). Like all data bases, the Dun and Bradstreet file was assembled for a specific purpose, and the Dun and Bradstreet validation and verification addressed that purpose. The "Twenty Plus" file is an extract of a larger file that Dun and Bradstreet maintains for the purpose of providing credit references for businesses.

The "Twenty Plus" file may be considered an approximate universe of establishments with 20 or more employees that use commercial credit. While smaller establishments may be included in the file, Dun and Bradstreet makes no claim about the coverage of those establishments. In emergency planning, it is also important to have information on establishments that may not use commercial credit (such as city-owned gas, water, and sewer facilities) and on the type and relative size of small establishment sales or employment in a region. Therefore, it is important to review the completeness of Dun and Bradstreet coverage for FEMA's purposes, and to supplement key areas that are not well covered in the Dun and Bradstreet file.

## FINDINGS

The Oak Ridge National Laboratory has been investigating Dun and Bradstreet coverage by sector with emphasis on the completeness of small establishment data, and ways to supplement the file's small establishment data at the county level. The Dun and Bradstreet figures have been compared to data from census publications such as County Business Patterns, National Agricultural Statistics Service, Employment and Earnings, Survey of Current Business, and Monthly Labor Review. Primary findings are summarized below.

- Dun and Bradstreet provides good coverage of employment in large establishments (20 or more employees) for all industry divisions except Agriculture, Forestry, and Fishing.
- As expected, Dun and Bradstreet total employment coverage is most complete for industry divisions dominated by large establishments.
- The higher the percentage of employment in small establishments, the less complete the Dun and Bradstreet coverage. This pattern holds true for most three-digit and four-digit SIC industries, as well as industry divisions.
- Dun and Bradstreet total employment for Manufacturing is within two percent of the County Business Patterns' total employment figure.
- Dun and Bradstreet total employment for Public Administration is within ten percent of the Employment and Earnings estimated total.
- For most industry divisions, Dun and Bradstreet data supplemented by small establishment data from County Business Patterns agrees well with other employment estimates.
- Preliminary results suggest Dun and Bradstreet provides good coverage of Educational Services and Private Households.
- For Agriculture, Forestry, and Fishing, neither Dun and Bradstreet nor County Business Patterns provide good coverage. Alternate sources of data are under investigation.
- A few major industry groups in transportation and public utilities (two-digit SIC) are systematically undercounted by both Dun and Bradstreet and County Business Patterns. These include establishments in railroads, air and water transportation, and communications, which probably indicates that a number of establishments are government entities and/or not part of the Social Security system. The undercount affects both large and small establishments. A thorough analysis of the discrepancies is beyond the scope of this task, but FEMA may wish to conduct an in-depth review based on the importance of these industries to emergency response.

Summary comparisons between Dun and Bradstreet figures and industry totals from other sources are shown in Table 1. In divisions for which County Business Patterns is incomplete (e.g., Agriculture, Public Administration, railroads, U. S. Postal Service, private households, and educational services), the employment figures have been supplemented or adjusted as noted on the table. Table 2 identifies the sources of data identified to date to supplement Dun and Bradstreet's coverage for small establishments.

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TABLE 1

INDUSTRY DIVISION	EMPLOYMENT			Small Establishment Employment Share*
	All Establishments		Small Establ.	
	D & B	CBP	CBP	
Agriculture, Forestry, Fishing	472,288	4,023,000 <sup>1</sup>	N/A	N/C
Mining	600,308	724,967	128,978	18%
Construction	2,651,195	4,884,281	2,071,329	42%
Manufacturing	19,309,720	19,002,692	1,475,039	08%
Transportation and Public Utilities <sup>2</sup>	4,281,441	5,384,254	1,157,855	17%
Wholesale Trade	3,779,679	5,820,453	2,128,897	37%
Retail Trade	9,384,959	18,416,653	6,718,878	36%
Finance, Insurance, and Real Estate	5,352,394	6,727,313	1,931,251	29%
Services <sup>3</sup>	25,101,308	32,549,580	7,308,460	30%
Public Administration	5,065,443	5,553,000 <sup>4</sup>	N/A	N/C
Nonclassifiable Establishments	10,447	221,842	172,639	78%

\* Small Establishment Share is the amount of CBP employment in establishments with fewer than 20 employees as a percent of total CBP employment in the industry division.

<sup>1</sup> 1988 paid and unpaid farm workers, National Agriculture Statistics Service, plus 1989 average annual employees in Agricultural Services, Forestry, Fishing, from Employment & Earnings.

<sup>2</sup> This data excludes employment in U.S. Postal Service. County Business Patterns employment in all establishments is supplemented with 1989 full-time equivalent railroad employees, from Survey of Current Business.

<sup>3</sup> County Business Patterns employment in all establishments is supplemented with Employment & Earnings 1989 average annual employees in Education Services and Private Households.

<sup>4</sup> 1989 annual average employees, from Employment & Earnings. Data from this source is not available by size class.

TABLE 2

INDUSTRY DIVISION	PROPOSED SUPPLEMENTAL DATA SOURCES
Agriculture, Forestry, Fishing	Under Current Investigation
Mining	County Business Patterns
Construction	County Business Patterns
Manufacturing	None Needed
Transportation & Public Utilities	County Business Patterns, others being investigated for railroads, and U.S. Postal Service
Wholesale Trade	County Business Patterns
Retail Trade	County Business Patterns
Finance, Insurance, Real Estate	County Business Patterns
Services	County Business Patterns
Public Administration	None Needed
Nonclassifiable Establishments	County Business Patterns

**SUMMARY**

For most industry divisions, Dun and Bradstreet data supplemented by small establishment data provide good information on local economic activity for all sizes of establishments. The exceptions are Agriculture, Forestry and Fishing, U. S. Post Offices, and industries in Transportation and Public Utilities. Because of their importance to emergency response, FEMA may wish to examine the latter industries in detail so that a data base more appropriate to FEMA's needs can be assembled from other existing sources.

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**NIIS RESEARCH BRIEF**

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July 22, 1991

OAK RIDGE NATIONAL LABORATORY  
REGIONAL STUDIES PROGRAM  
DAVID P. VOGT

FEDERAL EMERGENCY MANAGEMENT AGENCY  
NIIS PROJECT

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Transportation and Public Utilities Coverage in the Dun and Bradstreet Data File

**AUTHORS:** Sharon Bell and Tom Yoder

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**BACKGROUND**

The Oak Ridge National Laboratory has been investigating Dun and Bradstreet coverage by sector with emphasis on the completeness of small establishment data. As noted in the previous research brief entitled "Sectoral Coverage in the Dun and Bradstreet Data File", Dun and Bradstreet coverage is incomplete for several major industry groups in the Transportation and Public Utilities Division. This brief focuses on the limitations and omissions in Dun and Bradstreet and County Business Patterns data for this industry division. Because these industries are often important in emergency response, FEMA planners need to be aware of the limitations in currently available data.

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**FINDINGS**

Dun and Bradstreet employment for each major group in the Transportation and Public Utilities division was compared to data from Survey of Current Business, County Business Patterns, and various industry sources to determine the level of completeness of coverage. Primary findings are summarized below.

- Dun and Bradstreet provides adequate coverage of two major groups: Local and Interurban Passenger Transit; and Electric, Gas, and Sanitary Services.
- Dun and Bradstreet, if supplemented with County Business Patterns small establishment data, provides adequate coverage of these three major groups: Trucking and Warehousing; Pipelines, Except Natural Gas; and Transportation Services.

- For the Railroad Transportation major group, Dun and Bradstreet undercounts Survey of Current Business employment by 34%. Railroad establishment and employment data are not included in County Business Patterns.
- For the U. S. Postal Service major group, Dun and Bradstreet undercounts U. S. Postal Service employment records by 72%.
- For the Water Transportation major group, Dun and Bradstreet undercounts Survey of Current Business and County Business Patterns employment by approximately 33%. Dun and Bradstreet employment is incomplete in both large and small establishment data. County Business Patterns is an adequate source of large and small establishment data.
- Both Dun and Bradstreet and County Business Patterns are incomplete in their coverage of the Transportation By Air major group.
- For the Communications major group, Dun and Bradstreet undercounts County Business Patterns and Survey of Current Business employment by approximately 30%. Most of this shortfall occurs in both large and small establishment counts in the Telephone Communications industry group.
- Alternate sources of data exist for all of these areas (see Table 2).

Summary comparisons by major industry group between Dun and Bradstreet, County Business Patterns, and Survey of Current Business employment are shown in Table 1.

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TABLE 1

MAJOR GROUP	EMPLOYMENT ALL ESTABLISHMENTS			SMALL ESTAB EMPLOYMENT
	SURVEY OF CURRENT BUSINESS	DUN AND BRADSTREET	COUNTY BUSINESS PATTERNS	COUNTY BUSINESS PATTERNS
Railroad Transportation	277,000	182,703	N/A	N/A
Local and Interurban Passenger Transit	317,000	324,303	299,157	38,890
Trucking and Warehousing	1,543,000	1,221,412	1,428,571	385,714
U. S. Postal Service	763,743 <sup>1</sup>	215,993	N/A	N/A
Water Transportation	167,000	111,042	165,956	28,213
Transportation By Air	653,000	418,949	549,039	32,942
Pipelines, Except Natural Gas	18,000	13,823	16,315	1,631
Transportation Services	314,000	257,580	315,316	97,748
Communications	1,165,000	797,318	1,201,544	132,170
Electric, Gas, And Sanitary Services	915,000	954,311	847,883	67,831

<sup>1</sup> U. S. Postal Service Annual Report, 1989.

TABLE 2

MAJOR GROUP	POTENTIAL SUPPLEMENTAL DATA SOURCE
Railroad Transportation	Interstate Commerce Commission, American Association of Railroads
Local and Interurban Passenger Transit	None needed
Trucking and Warehousing	County Business Patterns
U. S. Postal Service	U. S. Postal Service
Water Transportation	County Business Patterns
Transportation By Air	Federal Aviation Administration
Pipe Lines, Except Natural Gas	County Business Patterns
Transportation Services	County Business Patterns
Communications	County Business Patterns, Federal Communications Commission
Electric, Gas, and Sanitary Services	None needed

**SUMMARY**

For sufficient establishment and employment coverage, a source other than County Business Patterns must be used to supplement Dun and Bradstreet records for the Railroad Transportation, U. S. Postal Service, and Transportation By Air major groups. Several potential sources of data that might be used to supplement Dun and Bradstreet and County Business Patterns have been identified (see Table 2). Because these industries may be critically important during emergencies, FEMA may wish to pay special attention to its information needs in this case. A supplemental data base could both fill in the gaps left by Dun and Bradstreet and County Business Patterns, and tailor the information to FEMA's emergency response needs. There are three steps to building such a data base. First, FEMA's information needs for these critical industries must be identified. Second, all sources of alternate data must be identified and evaluated for both their ability to provide the information FEMA requires and their consistency with established NIIS data standards. Third, the data must be validated, compiled, and converted to a form that meets NIIS data standards.

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**NIIS RESEARCH BRIEF**

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August 16, 1991

OAK RIDGE NATIONAL LABORATORY  
REGIONAL STUDIES PROGRAM  
DAVID P. VOGTFEDERAL EMERGENCY MANAGEMENT AGENCY  
NIIS PROJECT

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**Large Establishment Coverage in the Dun and Bradstreet May 1991  
Data File****AUTHORS: Sharon Bell and Tom Yoder**

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**BACKGROUND**

FEMA has acquired the Dun and Bradstreet "Twenty Plus" file as the primary data file for use in the National Infrastructure Information System. This file may be considered an approximate universe of establishments with 20 or more employees that use commercial credit. Establishments with fewer than 20 employees also may be included in this file, but Dun and Bradstreet makes no claim about the coverage of these establishments. Indeed, previous research conducted by ORNL has shown that Dun and Bradstreet provides poor small establishment coverage. Because comprehensive coverage of economic indicators is a desired attribute of the core NIIS data file, it is important to review the completeness of coverage of large establishments in the Dun and Bradstreet data file, and to supplement this file with small establishment data and any large establishment data found to be missing.

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**FINDINGS**

Using the May 1991 Dun and Bradstreet data file, employment in establishments with 20 or more employees was compared with 1987 County Business Patterns large establishment employment for each industry division. Primary findings are summarized below.

- Dun and Bradstreet provides good coverage of employment in large establishments for all industry divisions except Agriculture, Forestry, and Fishing, and Retail Trade.
- In the Agriculture, Forestry, and Fishing division, both Dun and Bradstreet and County Business Patterns provide poor coverage of employment when compared with Employment & Earnings data.

- In the Retail Trade division, Dun and Bradstreet large establishment employment under counts County Business Patterns large establishment employment by 16.5%.

Summary comparisons of large establishment employment between the May 1991 Dun and Bradstreet data file and 1987 County Business Patterns data are shown in Table 1.

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## SUMMARY

For most industry divisions, Dun and Bradstreet large establishment data supplemented by small establishment data provide comprehensive coverage of local economic activity. The exception is the Agriculture, Forestry, and Fishing division. These findings support the results of previous research conducted on Dun and Bradstreet completeness of coverage using the data file received in late 1990.

TABLE 1

INDUSTRY DIVISION	D & B 20+ EMPLOYMENT	CBP 20+ EMPLOYMENT
Agriculture, Forestry, Fishing <sup>1</sup>	239,875	185,538
Mining	571,162	595,989
Construction	2,682,228	2,812,952
Manufacturing	19,713,100	17,527,653
Transportation & Public Utilities <sup>2</sup>	4,436,394	4,226,399
Wholesale Trade	3,717,667	3,691,556
Retail Trade	9,764,340	11,697,775
Finance, Insurance, Real Estate	5,647,577	4,796,062
Services <sup>3</sup>	27,108,495 18,936,963 <sup>4</sup>	16,831,594 15,553,684 <sup>4</sup>

<sup>1</sup> Excludes Agricultural Production major industry groups.

<sup>2</sup> Excludes Railroad Transportation and US Postal Service major industry groups.

<sup>3</sup> Excludes Private Households major industry group.

<sup>4</sup> Excludes Educational Services major industry group.

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**NIIS RESEARCH BRIEF**

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October 7, 1991

OAK RIDGE NATIONAL LABORATORY  
REGIONAL STUDIES PROGRAM  
DAVID P. VOGTFEDERAL EMERGENCY MANAGEMENT AGENCY  
NIIS PROJECT

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**Consistency of Sales per Employee Estimates in the May 1991  
Dun & Bradstreet Data File****AUTHORS: Sharon Bell and Tom Yoder**

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**BACKGROUND**

FEMA has acquired the Dun and Bradstreet "Twenty Plus" file as the primary data file for use in the National Infrastructure Information System. Currently, FEMA planners use sales information in this file to estimate economic capacity at risk during an emergency. Therefore, it is important to review the consistency of these sales estimates, and to identify all areas in which the currently available sales data may impose limitations on FEMA's ability to prepare an appropriate emergency response.

**FINDINGS**

Total non-HQ sales by industry division in the Dun and Bradstreet data file were compared with Census and Survey of Current Business sales data where available. Headquarters' sales were excluded to avoid double counting of branch sales. This comparison was used as an external consistency check for Dun and Bradstreet sales data. Dun and Bradstreet sales per employee ratios were calculated for each major industry group to check for the internal consistency of sales definitions. Primary findings are summarized below.

External Consistency of Non-HQ Data

- In the Retail and Service divisions, Dun and Bradstreet sales per employee ratios are within 5% of Census and/or Survey of Current Business sales per employee ratios.
- In the Manufacturing division, the Dun and Bradstreet sales per employee ratio is 22.1% and 33.1% lower than the Census and Survey of Current Business sales per employee ratios, respectively.

- Dun and Bradstreet overstates the Census sales per employee ratio in the Construction division by 19.4%. This difference may be due to productivity differences between large and small establishments.
- In the Mining division, the Dun and Bradstreet sales per employee ratio is 47.5% lower than the Census ratio. This difference may be due to the exclusion of HQ sales in computing the Dun and Bradstreet ratio.
- Data from Census and Survey of Current Business was not available for comparison with the Dun and Bradstreet ratios in the Finance, Insurance, and Real Estate and Transportation and Public Utilities divisions.

#### Internal Consistency

- In the Dun & Bradstreet file, 97.74% of the records contain sales data. Of these records, 22.16% contain actual sales data; 75.70% contain sales estimates based on defined norms; and 2.14% contain sales estimates based on the low end of a range.
- In the Dun & Bradstreet file, 2.26% of the records contain sales values equal to zero. Most of these records (97.6%) are in the Finance, Insurance, and Real Estate and the Services divisions. In the Manufacturing division, all records have non-zero sales values.
- The Dun and Bradstreet sales per employee ratio in the Finance, Insurance, and Real Estate division is 86% and 60% larger than the sales per employee ratios in the Retail Trade and Manufacturing divisions, respectively. The Insurance Carriers major group has the second highest sales per employee ratio.
- Sales per employee ratios within each major group are sensitive to the method used to calculate the ratio. For 38% of the major groups, the variation between methods is greater than 10%. The largest variation occurs in the Oil and Gas Extraction and Petroleum and Coal Products major groups.

Sales, employment, and sales per employee ratios for eight industry divisions are listed in Table 1. Dun & Bradstreet sales per employee ratios for each major group are listed in Table 2.

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TABLE 1

DIVISION	VARIABLE	D & B <sup>1</sup>	CENSUS <sup>2</sup>	SCB <sup>3</sup>
Retail	Sales (\$mil)	877,340	1,493,309	1,807,219
	Employees	9,981,546	17,779,942	19,683,000
	Sales per employee (\$)	87,896	83,990	91,816
Wholesale	Sales (\$mil)	853,198	1,478,169	1,790,321
	Employees	3,834,151	4,475,879	6,205,000
	Sales per employee (\$)	222,526	330,252	288,529
Service	Sales (\$mil)	1,251,753	1,039,684	n/a
	Employees	27,338,273	22,791,408	28,240,000
	Sales per employee (\$)	45,788	45,617	n/a
Construction	Sales (\$mil)	320,285	495,346	n/a
	Employees	2,714,500	5,014,598	5,136,000
	Sales per employee (\$)	117,990	98,781	n/a
Mining	Sales (\$mil)	81,449	157,964	n/a
	Employees	582,233	698,100	711,000
	Sales per employee (\$)	139,891	266,277	n/a
Manufacturing	Sales (\$mil)	2,020,346	2,480,236	2,917,465
	Employees	19,796,524	18,933,600	19,111,000
	Sales per employee (\$)	102,055	130,997	152,659
Trans. & Pub. Util.	Sales (\$mil)	558,660	n/a	n/a
	Employees	4,623,504	n/a	5,826,000
	Sales per employee (\$)	120,831	n/a	n/a
Fin., Ins., R.E.	Sales (\$mil)	935,469	n/a	n/a
	Employees	5,737,066	n/a	6,739,000
	Sales per employee (\$)	163,057	n/a	n/a

<sup>1</sup> Non-HQ records with non-zero sales and employment, except in the Manufacturing division where HQ facilities were included. May 1991 Dun and Bradstreet data tapes.

<sup>2</sup> 1987 Economic Census data.

<sup>3</sup> 1990 data, *Survey of Current Business*, July 1991.

TABLE 2

<u>SIC MAJOR INDUSTRY GROUP</u>	<u>SALES/ EMPLOYEES</u>	<u>AVG. SALES PER EMPLOYEE</u>
07 AGRICULTURAL SERVICES	53750	60471
08 FORESTRY	46984	49727
09 FISHING, HUNTING, AND TRAPPING	66938	66635
10 METAL MINING	109860	113097
12 COAL MINING	149156	140451
13 OIL AND GAS EXTRACTION	152869	465754
14 NONMETALLIC MINERALS, EXCEPT FUELS	98971	90116
15 GENERAL BUILDING CONTRACTORS	182444	188662
16 HEAVY CONSTRUCTION, EX. BUILDING	121001	159919
17 SPECIAL TRADE CONTRACTORS	84235	84760
20 FOOD AND KINDRED PRODUCTS	155438	268462
21 TOBACCO PRODUCTS	247208	164014
22 TEXTILE MILL PRODUCTS	67098	69137
23 APPAREL AND OTHER TEXTILE PRODUCTS	40829	50637
24 LUMBER AND WOOD PRODUCTS	88999	81548
25 FURNITURE AND FIXTURES	69376	69228
26 PAPER AND ALLIED PRODUCTS	118576	110202
27 PRINTING AND PUBLISHING	79993	99582
28 CHEMICALS AND ALLIED PRODUCTS	153023	150035
29 PETROLEUM AND COAL PRODUCTS	511737	291564
30 RUBBER AND MISC. PLASTICS PRODUCTS	83884	82575
31 LEATHER AND LEATHER PRODUCTS	56478	66278
32 STONE, CLAY, AND GLASS PRODUCTS	89799	93907
33 PRIMARY METAL INDUSTRIES	134176	116166
34 FABRICATED METAL PRODUCTS	86778	83760
35 INDUSTRIAL MACHINERY AND EQUIPMENT	97631	92016
36 ELECTRONIC & OTHER ELECTRIC EQUIPMENT	79252	84477
37 TRANSPORTATION EQUIPMENT	97260	92729
38 INSTRUMENTS AND RELATED PRODUCTS	87136	99504
39 MISCELLANEOUS MANUFACTURING INDUSTRIES	74414	82376
40 RAILROAD TRANSPORTATION	93211	90226
41 LOCAL AND INTERURBAN PASSENGER TRANSIT	31046	30526
42 TRUCKING AND WAREHOUSING	63947	69906
44 WATER TRANSPORTATION	114354	114043
45 TRANSPORTATION BY AIR	96221	81395
46 PIPE LINES, EXCEPT NATURAL GAS	241731	239646
47 TRANSPORTATION SERVICES	135476	168266
48 COMMUNICATIONS	111518	87528
49 ELECTRIC, GAS, AND SANITARY SERVICES	244510	208690
50 WHOLESALE TRADE-DURABLE GOODS	189663	191188
51 WHOLESALE TRADE-NONDURABLE GOODS	267959	269557
52 BUILDING MATERIALS & GARDEN SUPPLIES	125800	122474
53 GENERAL MERCHANDISE STORES	62587	61166
54 FOOD STORES	100238	95129
55 AUTOMOTIVE DEALERS & SERVICE STATIONS	296816	338295
56 APPAREL AND ACCESSORY STORES	64690	64101
57 FURNITURE AND HOMEFURNISHINGS STORES	121612	112301

<u>SIC MAJOR INDUSTRY GROUP</u>	<u>SALES/ EMPLOYEES</u>	<u>AVG. SALES PER EMPLOYEE</u>
58 EATING AND DRINKING PLACES	22996	23657
59 MISCELLANEOUS RETAIL	89540	85833
60 DEPOSITORY INSTITUTIONS	152517	151973
61 NONDEPOSITORY INSTITUTIONS	187194	228189
62 SECURITY AND COMMODITY BROKERS	113789	140409
63 INSURANCE CARRIERS	298138	292051
64 INSURANCE AGENTS, BROKERS, & SERVICE	102166	126360
65 REAL ESTATE	64982	91081
67 HOLDING AND OTHER INVESTMENT OFFICES	122188	154835
70 HOTELS AND OTHER LODGING PLACES	39320	34592
72 PERSONAL SERVICES	32139	29597
73 BUSINESS SERVICES	58901	69917
75 AUTO REPAIR, SERVICES, AND PARKING	73643	68043
76 MISCELLANEOUS REPAIR SERVICES	58811	61032
78 MOTION PICTURES	139128	83744
79 AMUSEMENT & RECREATION SERVICES	47863	39897
80 HEALTH SERVICES	44595	44628
81 LEGAL SERVICES	77288	72119
82 EDUCATIONAL SERVICES	35686	27311
83 SOCIAL SERVICES	25486	26217
84 MUSEUMS, BOTANICAL, ZOOLOGICAL GARDENS	46123	43154
86 MEMBERSHIP ORGANIZATIONS	40140	42354
87 ENGINEERING & MANAGEMENT SERVICES	61373	69523
89 SERVICES, NEC	38704	39715

source: Dun and Bradstreet data tapes, May 1991.

$$\frac{\text{sales}}{\text{employees}} = \frac{\sum_i^n \text{sales}_i}{\sum_i^n \text{employees}_i} \quad \text{where } i = (1 \dots n) \text{ facilities}$$

N = total number of facilities

$$\text{average sales per employee} = \frac{\sum_i^n \left( \frac{\text{sales}}{\text{employees}} \right)_i}{N}$$

**SUMMARY**

Both internal and external consistencies vary by industry division and major group. Further analysis of Dun and Bradstreet sales data is needed in several areas including 1) comparison between non-HQ sales data and HQ-inclusive sales data for each industry division; 2) investigation of the facility sales data in the major groups most sensitive to the method of calculating the sales per employee ratio; 3) identification of the sales definitions used in the banking and insurance major groups.

This summary analysis of the Dun and Bradstreet sales data highlights an important point. Unlike the measure of employment, sales measures lack a standard definition. This problem leads to inconsistencies within the data file, and to inconsistencies with other published sources of sales data. Using sales per employee ratios to calculate sales for each facility may provide the most consistent method of estimating sales.

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**NIIS RESEARCH BRIEF**

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October 28, 1991

OAK RIDGE NATIONAL LABORATORY  
REGIONAL STUDIES PROGRAM  
DAVID P. VOGTFEDERAL EMERGENCY MANAGEMENT AGENCY  
NIIS PROJECT

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**Internal Consistency of County Business Patterns Employment  
and Establishment Data****AUTHORS: Sharon Bell and Tom Yoder**

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**BACKGROUND**

County Business Patterns is the standard source for establishment data, including data on establishments with less than 20 employees. Internal consistency of County Business Patterns establishment and employment data is important in order for County Business Patterns to be used as a data source for the Small Business Estimates component of the NIIS core data file. ORNL has reviewed the County Business Patterns file to determine the consistency of reporting methods within the data file. Because of the emphasis on county level, regional information, special attention was given to consistency in county level data. Employment and establishment data were analyzed in detail for three counties: Ada County, ID, Knox County, TN, and Middlesex County, MA.

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**FINDINGS**

County Business Patterns data are summarized independently for each level of aggregation (e.g. county, state, U.S. and industry, industry group, major group, industry division). Data are internally consistent if the sum of the records at each level of aggregation is equal to the total record. Primary findings are summarized below.

- For each SIC code, the sum of the county records is consistent with the national total record.
- For each record at the county level, the sum of the number of establishments in each of the nine size classes is consistent with the number of total establishments as given in the record.

- At the county level, employment data for each industry division at the major group (2-digit SIC), industry group (3-digit SIC), and industry (4-digit SIC) levels are not consistent with the total employment record (see Table 1).
  - At the county level, establishment data are relatively consistent with the total establishments record for each industry division at the major group and industry group levels. The data are inconsistent at the industry level for several industry divisions (see Table 2).
  - Three causes of inconsistencies were identified: 1) for an industry group that contains only one industry, County Business Patterns reports the data only at the industry group level; 2) data for several major groups are not recorded at the most detailed level; and 3) employment records are not published at the most detailed level if the data would disclose the operations of an individual employer (Federal Law, Title 13, Section 9).
  - The first cause of these inconsistencies can be resolved by adding a 4-digit record which is identical to the 3-digit record for each omitted industry. The NIIS sectorization relies primarily on data at the industry group level, and the other two causes of inconsistencies have little effect on the NIIS core file. They would have a much greater impact on applications that required the most detailed level of information, since these two causes cannot be resolved.
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Table 1: Employment

Industry Division	Level of consistency with total county employment record		
	2-digit records	3-digit records	4-digit records
Retail Trade	100 %	98 %	96 %
Wholesale Trade	100 %	94 %	81 %
Services	99 %	97 %	59 %
Construction	39 %	39 %	39 %
Manufacturing	55 %	34 %	29 %
Mining	16 %	0 %	0 %
Ag. Services, Forestry, Fishing	0 %	0 %	0 %
Transportation & Public Utilities	93 %	51 %	12 %
Finance, Insurance, Real Estate	76 %	57 %	29 %

Table 2: Establishments

Industry Division	Level of consistency with total county establishments record		
	2-digit records	3-digit records	4-digit records
Retail Trade	100 %	99 %	99 %
Wholesale Trade	100 %	99 %	96 %
Services	100 %	99 %	89 %
Construction	100 %	80 %	62 %
Manufacturing	100 %	99 %	92 %
Mining	100 %	77 %	77 %
Ag. Services, Forestry, Fishing	100 %	90 %	0 %
Transportation & Public Utilities	100 %	97 %	37 %
Finance, Insurance, Real Estate	100 %	76 %	40 %

**SUMMARY**

ORNL has identified several inconsistencies in the County Business Patterns data file. By using industry group data (3-digit SIC) rather than industry data (4-digit SIC) when developing the Small Business Estimates component of the NIIS data file, many of the inconsistency problems are avoided for establishment data. These consistent establishment numbers can be used to generate consistent employment data at the industry group level using employee per establishment ratios.

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**NIIS RESEARCH BRIEF**

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November 11, 1991

OAK RIDGE NATIONAL LABORATORY  
REGIONAL STUDIES PROGRAM  
DAVID P. VOGTFEDERAL EMERGENCY MANAGEMENT AGENCY  
NIIS PROJECT

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**Census of Agriculture Data as a Component of the Core NIIS Data File**

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*Authors: Tom Yoder and Sharon Bell***BACKGROUND**

As part of the Small Business Estimates task, ORNL has reviewed the coverage of employment in the Dun and Bradstreet and County Business Patterns data files for each industry division. As reported in an earlier research brief entitled, "Sectoral Coverage in the Dun and Bradstreet data file," ORNL identified poor coverage of employment in the Agriculture, Forestry, and Fishing division by both Dun and Bradstreet and County Business Patterns data files. This division accounts for most of the remaining discrepancy between NIIS coverage and other estimates of economic activity. Because comprehensive coverage of economic indicators is a desired attribute of the core NIIS data file, ORNL has investigated using Census of Agriculture data to fill in the missing coverage in the Agriculture, Forestry, and Fishing division. Summary data are available from the *City and County Data Book*, while detailed figures are available from Census of Agriculture tapes.

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**FINDINGS**

Census of Agriculture data were analyzed to check for consistency with NIIS core data requirements. Primary findings are summarized below.

- Census of Agriculture data, as summarized in the 1988 *City and County Data Book*, provide information on total product value and crop and livestock percent for each county in the U. S. These data can be used to calculate sales estimates for the two agricultural production major groups (SIC 01 and 02) for each county. While not required under the current task, these estimates have been loaded into FDAM on a test basis for analysis at FEMA and ORNL.

- Employment data are not available.
  - Information on specific crops and livestock inventories is available in the Census of Agriculture data file at the county level. Detailed data are also available on general land use by county, farm value, and yields. The tapes use a sparse matrix format that requires a large amount of storage space per county, even if only a few crops are grown in each county.
  - The Census of Agriculture does not cover the Agricultural Services, Forestry, and Fishing major groups.
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## SUMMARY

Census of Agriculture data can be used to estimate sales for the Agricultural Production major groups. Since data are available by county, an Agricultural Production component consistent with the NIIS core data file format can be developed.

Employment data are not available. However, in this division employment may not be the most consistent base measure of output due to counting problems (e.g. family labor, seasonal labor, owner-operators). A more consistent and appropriate base measure may be acres in farms. From this base measure, farm output and earnings could be consistently estimated using crop price information and yield rates. ORNL has created one possible version of this component for illustration purposes. FEMA may also want to consider storing specific crop and livestock inventory data due to the importance of identifying potential food supply in emergency situations.

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**NIIS RESEARCH BRIEF**

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OAK RIDGE NATIONAL LABORATORY  
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NIIS PROJECT

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**The Effect of Using Small Disaster Impact Zones on FDAM Small Business Loss Estimates***Authors: Tom Yoder and Sharon Bell*

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**BACKGROUND**

The NIIS/FDAM system is designed to provide regional capacity loss estimates in response to a emergency. It uses spatial information on the location of the emergency (polygons or circles around a point) and the location of each facility or business activity to determine which activities will be affected, and what proportion of local or national capacity they represent. As a result, different ways of determining the location of a facility or business activity can affect the results obtained from an FDAM assessment. For example, the core data used in the NIIS system consists of two kinds of data: 1) individual facility records from the Dun and Bradstreet data file, and 2) small business summary records that represent the activity of multiple small establishments within each county. (See *Documentation for NIIS Small Business Estimates by County* for further information on the Small Business data file.)

While the location of individual facilities can be represented exactly, there is no single best location for county summary records. For large scale disasters, such as Hurricane Hugo and the San Francisco area earthquakes, using the county centroid as the location for summary records has provided reasonable results without requiring prohibitive amounts of storage space and processing time. The scale of these disasters is much larger than the average county size (about 20 miles in radius), and the chance that important business activities will be missed is small. County centroids are also the simplest and least expensive option to implement, and ORNL and FEMA agreed to use this method in the 1991 NIIS data update. As both organizations gained experience with FEMA's requirements and use of the system, this choice would be re-evaluated for its ability to meet FEMA's long-term information needs.

Alternate methods are available in the event that FEMA requires a different level of spatial resolution. NIIS also supports analyses in which the user specifies the counties involved, rather than coordinates. This method allows the user's judgment to override the system's automatic choices.

The Small Nuclear Attack (SNA) assessment provides the first opportunity to examine the effect of spatial resolution on accuracy. Theoretically, the greatest effect on accuracy should occur when the impact zones are smaller than the average county size, eg. smaller than 20 miles in radius. The impact zones used in this assessment are 15 miles in diameter, and thus small enough to indicate the accuracy of assessments that require resolution below the county level. This brief reports preliminary findings of the effect of spatial resolution in the small business file on the SNA assessment.

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## APPROACH

A standard assessment was conducted for the SNA scenario, and the small business activity results compared against the information obtained from the large facility file results. Two methods for assessing small business losses were compared; the first used the specific impact zones exactly as they were used for the large facility file. The second assumed that small establishments were distributed throughout affected counties in a pattern similar to the spatial distribution of large facilities. Percentage losses by county in the facility file were then applied to the small business activity in those counties to estimate small business losses. This second method avoids the problem encountered in assigning a single location to dispersed activities, and is supported in the NIIS system. In addition, the location of population centers in affected counties was compared to the geographic center. In general, small business activity is concentrated in population centers; the summary records should provide the most accurate results where population centers are located in the center of a county. They should be least accurate where population centers are distributed throughout a county, or located close to county boundaries.

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## FINDINGS

The first SNA FDAM run, which used the actual bomb impact zones, identified small business activity capacity loss in 6 counties, and large facility losses in 26 counties. Small business capacity loss estimates in the second assessment were over four times larger than in the first assessment. The results of the two assessments are summarized below.

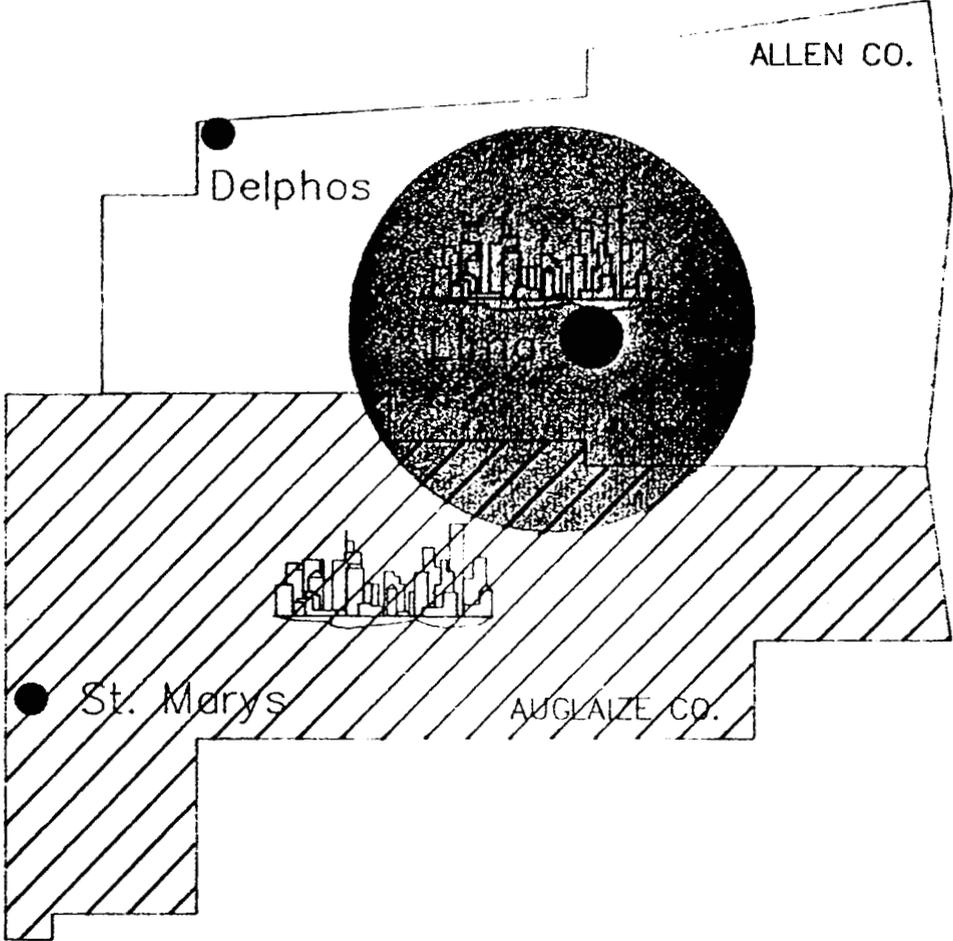
Measure	Method 1	Method 2
Small Business Sales Loss (\$millions)	8197.49	34879.91
Number of Impacted Counties (>10% Loss)	6	26
National %Loss of Small Business Sales	0.35	1.48

- Further analysis suggests that the discrepancies between the two analyses are consistent with the problems of spatial resolution identified above. Fewer small business losses were identified in the first assessment for two major reasons: 1) the population center (and probable small business activity) was not located in the center of a county, or 2) there were multiple population centers in the county.
  - Figure 1 gives an example of county for which the county centroid provides a reasonably accurate location for business activity. One bomb blast was centered in Allen Co., OH, and a large city, Lima, lies in the center of Allen Co. There are no cities located within the bomb impact zone which overlays Auglaize Co. The FDAM assessment lists 100% of small business sales capacity in Allen Co. lost and 0% capacity lost in Auglaize Co.
  - Figure 2 illustrates the case of multiple population centers. The cities of Fairborn and Dayton lie within or near the zone, but there is no estimated loss of small business capacity in Montgomery or Greene Counties.
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## CONCLUSION

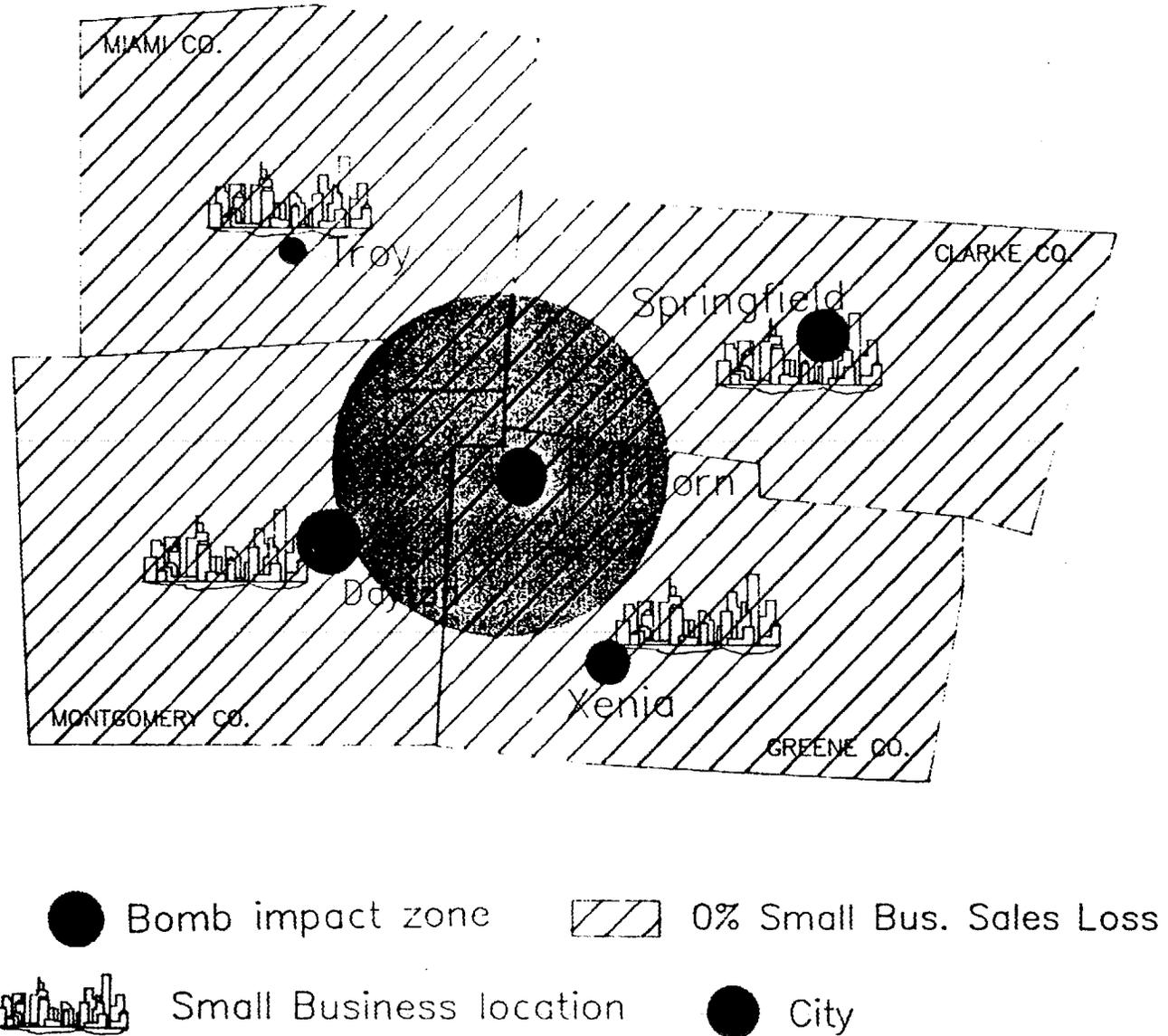
For assessments that involve small disaster impact zones, FEMA analysts should use method 2, as outlined above, to obtain the most accurate estimates of small business losses. Analysts should also be aware that the spatial resolution in the current small business file will provide ambiguous results if polygon files or circles are used for impact zones less than 20 miles in radius. FEMA may also wish to evaluate the frequency and importance of assessments that involve small impact zones. Small-zone accuracy can be improved by allocating small business activity to population centers rather than county centroids. This method involves additional costs and would considerably increase the storage space required for the NIIS core files. Note also that the improved accuracy applies only for small impact zones; for impact zones that encompass entire counties, the system already provides an accurate assessment. Therefore, FEMA needs to weigh the allocation procedure's costs against the potential benefits of greater small-area accuracy.

FIGURE 1



-  0% Small Bus. Sales Loss
-  Bomb impact zone
-  100% Small Bus. Sales Loss
-  City
-  Small Business Location

FIGURE 2





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