Implications of the 1990 Census Geographic Support System for Place-of-Work Coding

Robert W. Marx

Few groups of people in the United States have a greater appreciation for the problems of dealing with small-area data than do urban transportation planners. For this reason, it is especially useful for the Census Bureau in its geographic planning process to understand planners' concerns about the problems of the past and discuss plans for the 1990 decennial census.

In the development of the geographic support system for 1990 a fundamental improvement will be made in the way geographic work is performed at the Census Bureau and elsewhere, an improvement that will affect the Census Bureau and the nation for decades to come. In this paper some history is given that explains how geographic support activities fit into the Census Bureau's program, describes how geographic support work was performed in the past, and discusses some of the problems that resulted from the process. Then an overview of what will be done to improve the performance of these products for 1990 and the implications of this change for planners will be given.

A look at an organizational manual of the United States government would show that the mission of the Census Bureau is to provide basic statistics about the people and the economy of the nation to the Congress, the executive branch, state and local governments, and the general public. The success of a census rests not only on how well the data are collected but also on how well those data are linked to geographic areas. Figure 1 shows the types of geographic areas and number of each for which data were tabulated in the 1980 census.

POLITICAL AREAS

- United States
- States & State Equivalents (57)
  - States (50)
  - D.C. (1)
  - Outlying Areas (6)
- Counties, Parishes, & Other County Equivalents (3,231)
- Minor Civil Divisions — MCD (30,491)
- Incorporated Places (19,176)
- American Indian Reservations (275)
  - Indian Subreservation Areas (228)
- Alaska Native Villages (209)
- Congressional Districts — CD (435)
- Election Precincts (36,361) [In 23 participating States]
- School Districts (16,075)
- Neighborhoods (28,381)
- ZIP Codes (≅ 37,000)

STATISTICAL AREAS

- Regions (4)
- Divisions (9)
- Standard Consolidated Statistical Areas — SCSA (17)
- Standard Metropolitan Statistical Areas — SMSA (323)
- Urbanized Areas — UA (373)
- Census County Divisions — CCD (5,512)
- Unorganized Territories (274)
- Census Designated Places — CDP (3,733)
- Census Tracts (43,383)
- Block Numbering Areas — BNA (3,404)
- Enumeration Districts — ED (102,235)
- Block Groups — BG (156,163)
  - (Tabulated parts — 200,043)
- Blocks (2,473,679)
  - (Tabulated parts — 2,545,416)
- Traffic Analysis Zones (≅ 160,000)

FIGURE 1 Tabulation units recognized in the 1980 census.

This is where geographic support comes in. For the Census Bureau to accomplish its mission, the Geography Division must provide the mechanism for doing two basic jobs: first, each housing unit or business establishment must be assigned to the correct geographic location, for example, a city block, and second, each location must be classified according to all of the various tabulation areas represented in each particular census or survey. This same type of geographic support is needed for several major Census Bureau programs--the decennial census, the economic and agricultural censuses, and the intercensal population estimates.

GEOGRAPHIC SUPPORT SYSTEM FOR THE 1980 DECENNIAL CENSUS

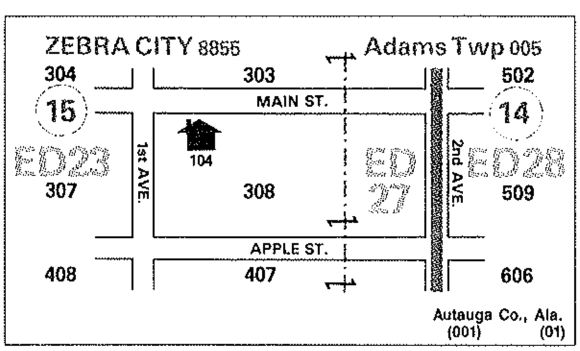
For 1980 the Geography Division provided three major geographic tools to assist the bureau's field staff in the completion of their data collection task and the bureau's processing office staff in the subsequent capture, editing, and tabulation of the collected data. These tools were maps, address reference files (called GBF/DIME files), and a geographic reference file (called the Master Area Reference File).

Maps: The Cartographic Base for a Geographic Support System

Maps describe the earth in graphic form. Census maps (Figure 2) show the streets, railroads, streams, and other types of features an enumerator would expect to see while collecting data for an area. They also show the geographic chunks outlined by those features--which are called blocks--and the numeric codes that identify those blocks: the state, county, census tract, and block numbers. These same maps are used to show the boundaries for most of the higher-level geographic units into which blocks are classified: cities, townships, urbanized areas, and so forth.

Making the Maps for the 1980 Census

The map bases that have been used for the past several censuses came from state and local sources; the state highway or transportation agencies were the most significant single source. During the last 2 years before the 1980 census, one group of about 900 people at the bureau's primary processing office in Jeffersonville, Indiana, assisted by a contractor in California with an additional 400 people, prepared these map bases for census use; plotted the boundaries for all the counties, cities, townships, census tracts, and so forth



Serial Number	Address (House Number and Street Name)	Block Number	ED Number	Occupant Name(s)
0001	104 Main Street	308	23	James
0002				
0003				
0004				

FIGURE 2 Portion of a census map and section of the related census address register.

in the country; and assigned by hand all of the block numbers--2.5 million of them in the major urban areas of the nation--to prepare the more than 32,000 map sheets that covered the United States for the 1980 decennial census.

In Figure 2, which represents a portion of a typical census map, 2nd Avenue is a census-tract boundary; census tract 14 is to the east or right of 2nd Avenue and census tract 15 is to the west or left of 2nd Avenue. This census-tract boundary and the boundary for Zebra City form field assignment area boundaries; these field assignment areas were called enumeration districts (EDs). ED 28 is to the east of 2nd Avenue, ED 27 is between 2nd Avenue and the city boundary, and ED 23 is to the west of the city boundary.

Many of the same people who made the 32,000 map sheets had to take each of the finished map sheets, which were in reproducible form at that stage of the process, and make enough diazo copies so that they could take scissors, cut out the appropriate sections of each map copy, and assemble approximately 300,000 individual assignment area maps for the field staff. These individual assignment maps were like a huge jigsaw puzzle in which no two pieces could overlap and no two pieces could leave a gap anywhere in the United States. This was a difficult task because the 32,000 map sheets were not all drawn to the same scale, they did not all use the same types of symbols, and the same feature often looked very different on one map than on the map next door.

The Map as a Tool

Once the map has been marked with the field assignment area boundaries, a census enumerator using such a map can walk around a block, list every address seen along each side of the block in a book called an address register, and then write down the number of the block in which that address is located. For example, the enumerator assigned to ED 23 would walk along Main Street listing each housing unit located there, such as the house at 104 Main Street, and show that it is in block 308.

In that simple act of writing down the block number, the enumerator has geocoded the address; that is, the enumerator has assigned it to a geographic location. This is the first of the two geographic support functions described earlier: assigning the address to a geographic location. It is important to understand that because the map is like a picture of the earth, it shows both geographic identification information and the relationships of one kind of area to another. When the enumerator uses a map, however, only the geographic identification information gets recorded; the relationships between the areas that our eyes can see when we look at the map are not written down in this process. The classification of each location into tabulation areas is done by the geographic reference file that is discussed later.

Address Reference Files: The First Step Toward an Automated Geographic Data Base

When the decision was made in the mid-1960s to use a mail-out, mail-back approach for future data collection activities in the economic and decennial censuses, the form in which geographic support was provided to the census-taking process also had to change. No longer would enumerators take their assignment area maps and actually visit each housing unit or every business establishment; now, many times they would visit only those units that did not return a questionnaire. For the 1970 and 1980 decennial censuses, because the enumerators did not visit every housing unit, they could no longer write down every block number next to each address in the address register. People were no longer the sole source of geocoding information.

To provide a tool that would do the job a map once did for an enumerator, the map had to be encoded in a way that would be understandable to a computer. The resultant geographic product was called an Address Coding Guide (ACG) at the time of the 1970 census. For the 1980 census, the ACGs were converted into a series of files called Geographic Base Files or Dual Independent Map Encoding Files, often referred to as GBF/DIME files. Generally, both the ACGs and the GBF/DIME files are address reference files. The U.S. transportation agencies played a major role in the development of these critical geographic files. This was done with support for the concept from the U.S. Department of Transportation, promotion of the idea by FHWA and UMTA, assistance from the state highway departments, and the direct participation of many regional transportation organizations.

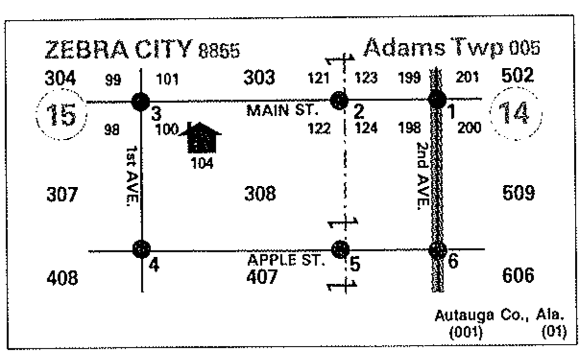
Building the GBF/DIME Files for the 1980 Census

The GBF/DIME files describe the same geographic information shown on a traditional census map--streets, railroads, streams, census tracts, and blocks--and add information on the address ranges that apply to each side of a street between intersections (Figure 3). The process of preparing the GBF/DIME files also required that additional identifying information be added to the maps in the form of little dots at every intersection, called node dots, with identifying numbers, called node numbers. This included intersections of streets and boundaries.

Figure 3 shows the same area as in Figure 2. The maps for the GBF/DIME file areas were redrafted to make the streets appear as single lines rather than the double lines typical of the maps obtained from state and local officials. For purposes of illustration, the intersections on this sample map are identified as nodes 1, 2, 3, 4, 5, and 6, and the addresses at all four corners of the two intersections along Main Street are shown along with the addresses where the city boundary intersects Main Street. The address information usually is obtained from other source materials found at local agencies and does not appear directly on census maps.

To complete the process, a clerk fills out a worksheet for each section of the street, working in the direction of increasing address numbers--in this case, going first from node 3 to node 2 and then from node 2 to node 1. The GBF/DIME file records show the geographic information presented on the map, the range of address numbers for each section of Main Street, and the associated adjacent block numbers: block 303 on the left side and block 308 on the right side.

From 1975 to 1979, more than 300 local agencies across the country worked with the Census Bureau to create the GBF/DIME files following procedures and



Street Name	From	To	Place	Tract	Left Block	Right Block
MAIN ST.	3	2	8855	15	303 101-121	308 100-122
MAIN ST.	2	1	—	15	303 123-199	308 124-198

FIGURE 3 Portion of a census map and section of the related GBF/DIME file.

using worksheets prepared by Census Bureau staff. They did this by transcribing the street names shown on earlier versions of the census maps along with all of the block numbers within the areas covered by the files and the address ranges that went with those street names and block numbers. They hand wrote more than 7,000,000 individual lines of information that then had to be keyed and converted to a series of computer files.

GBF/DIME File as a Tool

The additional information embedded in the GBF/DIME file allows the computer to see what addresses fit into each block using computer matching algorithms that perform the geocoding function previously done by an enumerator. In this example, 104 Main Street comes to the bureau on a computer tape and the computer determines that it fits in the address range 100 to 122 on Main Street. The house at 104 Main Street is therefore in block 308 and in Zebra City. The computer now is able to do the geocoding job once done by an enumerator.

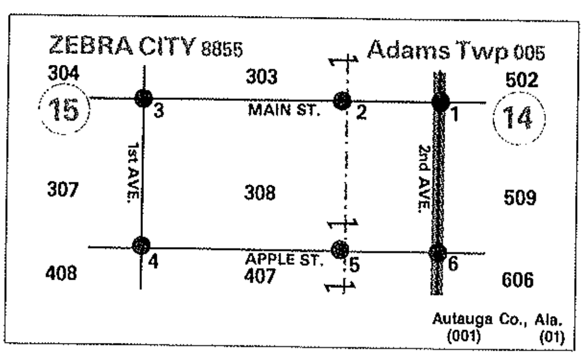
Although the GBF/DIME files contain geographic information, such as the geographic codes for the areas shown, they also contain some information about the geographic relationships shown on the maps, for example, which block numbers are across the street from each other and which census tract each block is part of. At this state, the GBF/DIME files still do not contain spatial information, such as the length of the street or position of the street on the earth; they still must be used in conjunction with a map when people need to participate in the geocoding process.

Adding the Spatial Dimension

For the parts of the Unites States covered by the GBF/DIME files (approximately 1 percent of the land area but 60 percent of the people), a first cut at encoding the spatial information has been made. The node points at every intersection in the areas covered by these files have had a latitude and longitude coordinate value calculated using a process called digitizing. Some curves, or inflection points in mathematical terms, also have had a coordinate value calculated (Figure 4). There are more than 7,000,000 node points in the 1980 version of the GBF/DIME files. It took 3 years to do this job with limited staff and equipment. Since 1980 more than 50 additional files have been created for the newly designated urbanized areas, bringing the total number of GBF/DIME files to more than 330.

Geographic Reference Files: Tabulation Base for Geographic Support System

Both of the geographic tools described so far have been concerned with the first



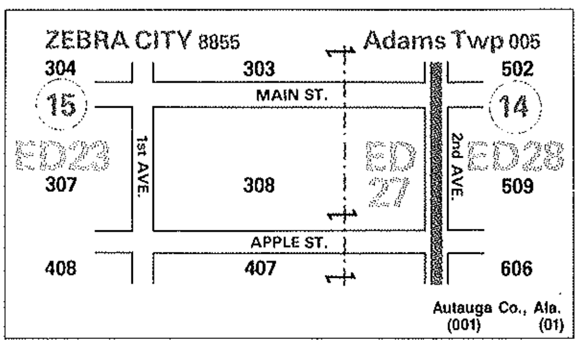
Node	Longitude (x)	Latitude (y)
1	92.0763°W	34.1552°N
2	92.0770°W	34.1552°N
3	92.0785°W	34.1552°N
4	92.0785°W	34.1541°N
5	92.0770°W	34.1541°N
6	92.0763°W	34.1541°N

FIGURE 4 Portion of a census map and list of the related node point coordinate values.

of the geographic support functions--assigning an address to a geographic location. The second support function--classifying each geographic location according to the tabulation units recognized in a particular census or survey--is performed by a geographic reference file. For the 1980 decennial census, this file was called the Master Area Reference File (MARF). This file shows, in a computer-readable form, the relationships between and among the geographic units for the entire United States, its territories, and its possessions. These are the same set of geographic units that would result if a full set of census maps was spliced together into a single sheet. Many of these geographic units are the same ones that planners work with when they prepare traffic-zone equivalency listings.

Creating the MARF for the 1980 Census

Figure 5 shows how Census Bureau clerical staff recorded the geographic relationships depicted on the maps one ED at a time. In the last 18 months



	State	County	MCD	Place	Tract	Blocks
ED23	01	001	005	8885	15	303P 304 307 308P 407P 408
ED27	01	001	005	—	15	303P 308P 407P
ED28	01	001	005	—	14	502 509 606

FIGURE 5 Portion of a census map and section of the related Master Area Reference File.

before the census, a group of about 300 people took the 32,000 map sheets and transcribed the same 2.5 million block numbers, along with the enumeration district numbers, census-tract numbers, place names and codes, county names and codes, and so forth, and wrote them on a set of worksheets. More than 300,000 lines were handwritten and then this information was keyed and converted into a series of computer files, state by state.

The MARF as a Tool

Using this file, the geographic location to which an address has been assigned--the specific block number written down by a field enumerator using a map or assigned by the computer using a GBF/DIME file--can be related to all higher-level geographic units for which data will be tabulated.

Each ED has a different set of geographic codes: ED 23 is in Zebra City and census tract 15, ED 27 is outside Zebra City but still in census tract 15, and ED 28 is outside Zebra City and in census tract 14. This information on geographic relationship is used to classify all of the housing units in the census to the correct tabulation areas--such as the house at 104 Main Street that was assigned to block 308. This geographic code file shows that block 308 of ED 23 is in census tract 15, in state 01 (which is Alabama), in county 001 (which is Autauga), in Minor Civil Division 005 (which is Adams Township), and so forth.

Problems with 1980 Geographic Support Products

All three of the geographic products produced for the 1980 census--the maps, the GBF/DIME files, and the MARF--have several items in common; that is, they are simply three different ways of describing a part of the earth's surface. Problems with these geographic materials for the 1980 census caused confusion on the part of the bureau's field staff and the data-using public, including the transportation planning community. The problems resulted because all three of these geographic tools were prepared in separate, complex clerical operations using hundreds of people. Because different people worked on each product and the work took place at different times in different locations, different errors were made on each product. This led to inconsistencies between the final products. Although there were some true errors, cases in which a city boundary was in the wrong location or a census tract had the wrong number, it was the inconsistencies between the products that caused the greatest problems.

This type of problem is shown in Figure 5 where the place code for Zebra City was entered in the MARF as 8885 instead of 8855, a common type of transcription or keying error. The map in Figure 5 and the GBF/DIME file in Figure 3 show the code for Zebra City as 8855. In 1980 this type of mismatch caused a cascade of problems in all subsequent geographic products related to Zebra City and resulted in much of the discontent expressed by Census Bureau field staff and data users. The same reaction resulted when the data products, tabulated based on the codes in the MARF, showed a block number that did not appear on the maps.

It is not surprising that errors were made; people are bound to make mistakes as they perform repetitive clerical tasks and write down or data-key so much information. The complex and functionally separate processes used to create the geographic materials invited problems. In retrospect, the people in Jeffersonville and elsewhere who prepared these products should be praised for having done as well as they did--congratulated on the 98 to 99 percent done correctly. The operations used to create the 1980 geographic products, like the processes used to create these products in earlier censuses, were not designed for the computer age.

AUTOMATING THE GEOGRAPHIC SUPPORT SYSTEM FOR THE 1990 DECENNIAL CENSUS

An improved geographic support system is being built to meet the needs of the 1990 census, a system that will correct many of the problems of the past and provide a basis for future improvements that will benefit users of census data and result in geographic products with greatly increased capabilities. To begin the process, all available relevant information about an area will be recorded in a single computer file. This file is called the Topologically Integrated Geographic Encoding and Referencing (TIGER) file (Figure 6). Together with the attendant computer software and related operations, the TIGER system will permit the computer to assign residential and business addresses to the correct geographic location, to produce maps for field operations and publication, and to perform the data tabulation operations for any geographic unit whose boundaries have been recorded in the file.

Mathematical Basis and Structure of TIGER File

The design for the TIGER file has been created by adapting the theories of topology, graphs, and associated fields of mathematics (1). Using these theories, each segment of a line on the map between intersections is viewed as a key element, known as a 1-cell (Figure 7). The description of the line's curvature between intersections is recorded in a separate shape record used to

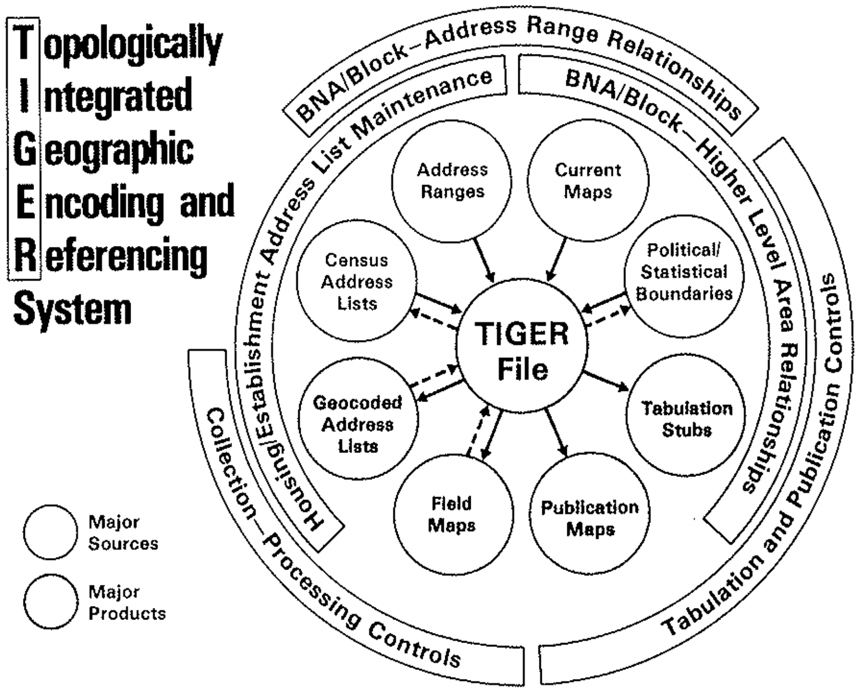


FIGURE 6 Components and functions of the TIGER system.

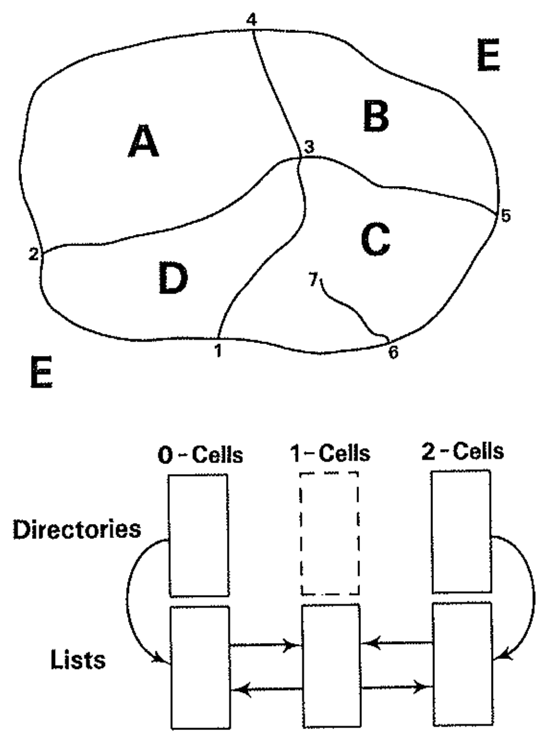


FIGURE 7 Topological elements on a map (top) and a schematic view of the TIGER file structure to store those elements (bottom).

drive computer plotters but not needed as part of the geocoding process. The end points of each 1-cell are known as 0-cells, and two 0-cells define each 1-cell. A cluster of three or more 1-cells bounds areas, which are known as 2-cells.

Using some of the latest concepts in computer science and operating on powerful new computer equipment, the TIGER file really is not a single file at all. As shown in Figure 7, it is a series of interlocked files, known as lists and directories, that are accessible through a master control program and a series of functional routines (2). The 0-cell, 1-cell, and 2-cell lists are characterized by random storage of the elements or records in the list. These elements contain the data items that describe each point, line, or area and pointers to the other related elements in the same list or other lists. It is these pointers that give the TIGER file its interlocking structure and set it apart from more conventional data-base systems.

Entry into each list is provided by a directory that is ordered by a B-tree structure. The directories provide rapid access to the lists with minimal computer storage requirements and ease of update. No decision has been made at this point on the need for a 1-cell directory, which is the reason for showing it with dashed lines in Figure 7. All geometric and topological relationships, along with the feature attributes, are stored either explicitly in the records or implicitly in the data-base structure (3).

Building the TIGER File

It is easier to say "TIGER" than it is to make one. The plan adopted for developing a nationwide TIGER file is ambitious but achievable when approached in well-thought-out, measured steps. To achieve this objective in time to meet the needs of the 1990 decennial census and to avoid duplicating geographic automation work done by others in the federal and private sectors, a series of contracts and interagency committees has been sponsored to identify and evaluate other automated geographic systems around the world, to assess the suitability of turnkey systems for this application, and to develop a statement of functional requirements for the automated geographic support system. As part of this process, the automated mapping activities of other federal agencies were explored to identify products and processes that could be of benefit.

As a result of these investigations, it was determined that one key to the plans for developing the TIGER file was having an accurate, consistent cartographic base. It was also learned that the U.S. Geological Survey, the agency in the Department of the Interior with responsibility for coordinating all federal civilian map-making activities, shared the Census Bureau's interest in automating a map base for the United States. As a result, a major cooperative project with the Geological Survey has been planned. Under the terms of the agreement, the survey and the Census Bureau will work together to use automated scanning and manual digitizing techniques, as appropriate, to convert their highly accurate maps for 48 states plus the District of Columbia into an automated file that will meet the mission responsibilities of both agencies. For Alaska, Hawaii, and Puerto Rico and other territories included in the census, a comparable machine-readable map is being prepared using available equipment. The resulting file of the United States will provide a more complete and useful product to both agencies than either agency would have achieved on its own and will do so at no long-term increase in cost to either agency. An overview of the major steps involved in building the TIGER file is shown in Figure 8.

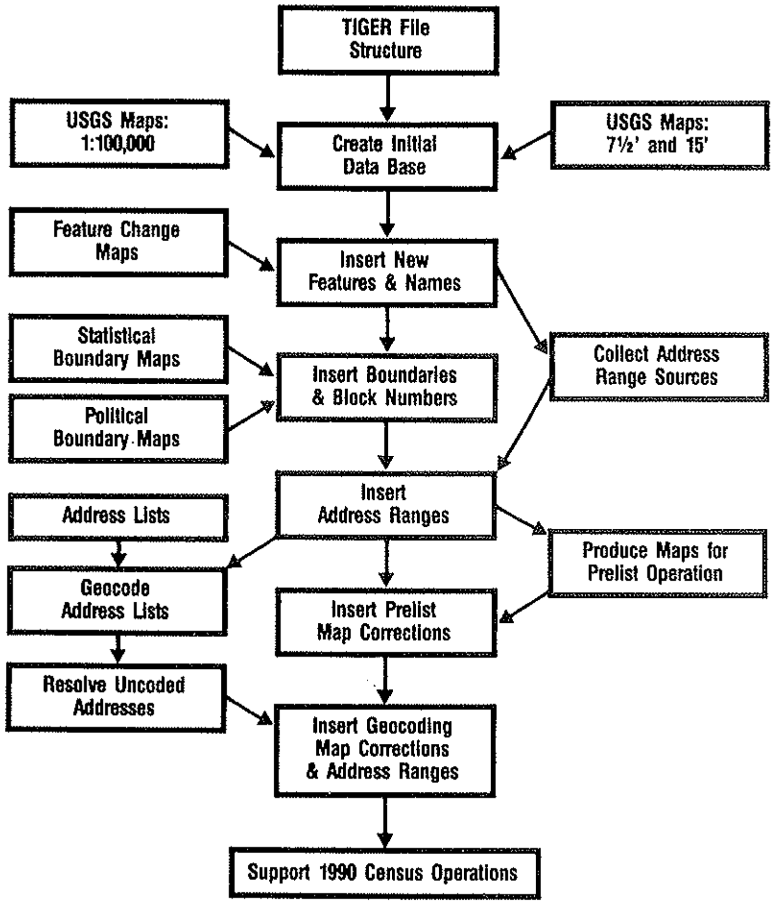


FIGURE 8 Major steps required to create an integrated geographic data base.

Using the TIGER File for the 1990 Census

Building the initial TIGER file is only the beginning of the plan to support the geographic needs of the 1990 census. Another important aspect of the plan is to identify separately every individual block nationwide. This would provide the potential nationwide to aggregate at least the origin data for work trips upward from the block level into traffic analysis zones. These fundamental changes in geographic processing will enable the Census Bureau to automate many other aspects of the data collection, processing, and publication continuum--especially those that are based geographically. Similarly, these improvements have the potential to be of great benefit to those who use the Urban Transportation Planning Package (UTPP) because they should make the planner's job much easier, the processing more flexible, and the results much more accurate than ever before. The following sections describe some of the expected benefits.

More Flexibility for Map-Related Activities

The TIGER system offers the potential for greater flexibility in the map production process:

1. It will provide the ability to generate a nationally consistent set of maps for the first time in the history of the census, a set of maps that fit together from ocean to ocean and border to border so that there is no longer the struggle with the problems of matching place maps into county maps, one country map with another, and so forth. All the maps can exist in a common format and at a common scale.
2. It will provide the ability to select map formats tailored to the task at hand. For example, to support the data collection operation, a series of large-scale maps with double-line streets can be prepared that allow adequate room for Census Bureau enumerators to make their required map notations, and from the same file a smaller-scale map can be prepared for the office staff that shows all the enumerator assignment areas under the control of a particular manager in a format that can be mounted on the wall. Later, for data users, maps can be prepared from the same file to cover the geographic areas of interest, for example, a place, township, or urbanized area.
3. Because all the maps will be in machine-readable form, the computer will be able to produce directly the listings of geographic units in the TIGER file without any opportunity for clerical transposition or omission. In this way the maps and the geographic listings that appear in conjunction with the 1990 census will, by definition, be consistent one with the other because they both will be derived from the same files. This is a major accomplishment in itself.
4. The early field activities of the 1990 census provide an excellent opportunity for continuing improvement of the TIGER file. When Census Bureau staff are working with the maps to compile or verify the address list for 1990, they will find any new development that has taken place since the TIGER file was prepared. With the map in computer-readable form, it is expected that these changes can be made quickly so that corrected maps can be produced for later field operations and census data users. This is a major advance over 1980 when the traditional map-making process was so laborious that no base map changes could be made once the maps had been sent to the field.

There is something far more significant that will derive from this preparatory activity, something of much greater direct benefit to the transportation planning processes. In the past, to create the equivalency file the bureau requires to prepare the UTPP, it was necessary to transfer the zone boundaries to census maps, compare these marked maps to a listing of geographic areas, and write the zone number next to each of the geographic area codes depicted on that listing. That was a tedious and time-consuming process with great opportunity for error. The wrong zone number could be written down, the digits could be transposed, or inconsistent entries could be made on the lines for the geographic identifiers that went with a particular zone. Furthermore, when that information was keyed, the opportunity existed to make the same types of mistakes again.

One of the most significant benefits of automating the geographic work as far as the transportation planning process is concerned is the potential that the work will be finished once zone boundaries have been transferred to the maps. By having the map in an automated format, the census map can be prepared by showing where the zone boundaries follow the block boundaries, the marked map can be mounted on a digitizing table, and an operator can run the cursor over the lines that have been plotted and record the position of those lines in the computer file. The computer than will be able to select the set of geographic units that fall within each of those boundaries. No longer will there be an opportunity for clerical error, omission, or transposition.

Other Benefits

The improved map production and update processes are only some of the advantages that are expected to derive from using the automated approach to providing geographic support services. Of perhaps equal importance to the transportation planning process is the concern with the accuracy of the geographic assignments the 1980 products provided for one or both ends of the work trip.

The TIGER system provides a mechanism to extend greatly the area of the country in which the housing units and business establishments in a census or sample survey can be assigned to a specific geographic location using automated geocoding processes. As mentioned earlier, address reference files have already been prepared for many of the recently designated urbanized areas, and all existing areas and other large population concentrations will be completed in the next 3 years. This pretty well takes care of the origin addresses.

There is a special problem with the workplace addresses. Often the place of work was not reported on the census questionnaire with a city-type street address that would permit rapid assignment to the correct geographic location. The concern about the ability to assign workplace addresses to the correct geographic location does, in fact, have some basis. Often the workplaces are listed by respondents on the census questionnaire only in terms of the name of a company, and many times a company does not have a street address. Street addresses for businesses are a very mixed bag of information. The Census Bureau, for example, does not have a street address: People that want to get to the bureau have to come to Federal Building 3 or Federal Building 4 at the corner of Suitland and Silver Hill Roads.

Corner-type addresses are a special problem when the objective is to assign structures at the city block level. At the typical corner, the intersection of two streets, there are really four blocks that come together. In this example, the Census Bureau could be located in any one of four blocks. Often major streets where businesses are located are also census-tract boundaries. When two major streets that are census-tract boundaries intersect, a corner address for a business could be in any one of four different census tracts. This is a problem.

Even a corner-type address is good by comparison with a response that simply lists an employer's name. This third category of work-trip address is even more difficult to assign at a detailed level. Some of the corner-type addresses and many of the employer-name addresses can only be assigned to higher levels of geography, census tract or place, for example.

Clearly, part of the solution to this problem is to work during the next several years on improving the workplace and residential building reference files so that these files will list the exact geographic location of major employment centers or major residential structures. The automated geographic structure being developed provides a means to accomplish this objective because it allows for recording spot-type address locations, such as individual buildings or worksites, in relation to the street pattern reflected in the base map itself. This problem is one that seems to have a lot of potential for a cooperative program of some sort. For example, many planners, over the years, have developed indexes or reference files that pinpoint these major work locations or trip generators for transportation studies. This information would be invaluable to improving the Census Bureau's reference files and therefore the ability to assign work-trip addresses.

The Census Bureau would like to hear views on the possibility of a cooperative agreement whereby transportation planners' reference files could be incorporated into the geographic reference materials that are being prepared for 1990. They would also like to learn more about the level of geographic detail needed to carry out the transportation planning process. In 1980 many work trips could be assigned only at the census-tract level; is this adequate? Is there really a need for block-level assignment of work trips? Why? Is is worth the greater preparatory costs to achieve this level of detail, including the preparation of more detailed reference files and the research of work-trip destinations that are difficult to assign geographically?

TIGER, TIGER, Burning Bright

The qualities of a real tiger were described by Satyendra Singh Huja, the Director of Planning and Community Development in Charlottesville, Virginia, as follows: "The tiger is a very intelligent animal, and it is extremely fast, elegant, and goal oriented." The TIGER file will let the computer know more about the maps processed and the geographic relationships those maps depict than most humans can absorb. It will help meet the 1990 census goal for quick delivery of cartographic and geographic products. It promises efficient production of high-quality maps and related census geographic products while at the same time eliminating the source of many errors.

If the accuracy of place-of-work coding can be improved by having an improved reference file, if the general quality of the geographic products can be improved by making the maps and the geographic listings consistent, if the need for clerical coding of traffic-analysis-zone to census-block equivalency file can be eliminated, the quality and the timeliness of the 1990 UTPP can be improved immeasurably.

The TIGER file will benefit the United States Congress, the executive branch agencies of the federal government, state and local governments, and the public. In short, the nation will benefit by the TIGER file's providing an orderly framework for all other activities of the Census Bureau.

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