



October 2014

2020 CENSUS

Census Bureau Can Improve Use of Leading Practices When Choosing Address and Mapping Sources

GAO Highlights

Highlights of [GAO-15-21](#), a report to Congressional Requesters

Why GAO Did This Study

A complete and accurate address list is a key building block of a successful census, but developing such a list is costly and labor intensive. For the 2020 Census, the Bureau is reexamining approaches to control cost and maintain accuracy, including approaches to meet its address and mapping needs.

GAO was asked to examine potential private sector roles in 2020 Census address list and map development. GAO (1) evaluated the extent to which the Bureau is considering non-Bureau data source opportunities to meet such 2020 needs, and (2) reviewed the status of the Bureau's plans for meeting its key 2020 address and mapping needs.

GAO compared Bureau documentation to leading practices for planning, management, and scheduling from industry guides for project management, reviewed relevant documentation, and interviewed Bureau officials familiar with decennial census needs and data source decisions.

What GAO Recommends

GAO recommends the Bureau implement processes for reviewing the cost and quality of data source selections and for documenting support for those decisions; document management approval of key data source decisions; and—for remaining data source decisions—develop a detailed plan with measurable goals, track performance against these goals, and set a timeline.

The Department of Commerce generally agreed with GAO's findings and recommendations.

View [GAO-15-21](#). For more information, contact Robert Goldenkoff at (202) 512-2757 or goldenkoff@gao.gov.

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Census Bureau Can Improve Use of Leading Practices When Choosing Address and Mapping Sources

What GAO Found

The U.S. Census Bureau (Bureau) is working with stakeholders to identify various data sources to meet its address and mapping needs. For example, the Bureau has worked with state, local, and tribal governments and with commercial vendors to identify potential data sources to augment or verify data collected through its Geographic Support System Initiative (GSS-I) program. GSS-I allows government agencies at all levels to regularly share and continuously update their address lists and road data with the Bureau. Federal internal control standards and Office of Management and Budget guidance on geospatial data suggest that the Bureau should support significant data source decisions in terms of both data cost and quality.

However, the Bureau has inconsistently documented cost and quality support for decisions already made to use address and mapping data from state, tribal, and local governments, other federal agencies, and a commercial vendor. Without a systematic consideration of the quality of the variously sourced data that the Bureau plans to rely on, it cannot ensure that effective choices are being made and that possible data limitations that might affect their use are fully understood. Further, the Bureau did not document management approval in support of its data source decisions at the time that the decisions were made; without such documentation, the Bureau lacks accountability and transparency for future sourcing decisions. The Bureau does not have guidance clearly outlining the need or process for ensuring consideration of cost and quality—primary concerns of the Bureau's reexamination—or documentation of management approval for those data sources selected. By implementing a process for documenting such steps, the Bureau can ensure that data source decisions are transparent to Congress, commercial vendors, and other stakeholders.

The Bureau's approach for meeting its address and mapping needs lacks key elements of effective project management outlined in guidance GAO reviewed. Specifically, while the Bureau prepared planning documents to guide GSS-I, it did not include

- clear and measurable performance goals to help it effectively meet its address and mapping needs;
- milestones detailed at a level where decisions on GSS-I data sources might be tracked; and
- performance measures, data, and reporting to help guide planning and track progress toward filling gaps in the Bureau's data needs.

While the Bureau has taken some positive steps—such as preparing a series of planning documents that provide high-level examples of measurable goals, schedules, and deadlines—the absence of detailed goals, schedules, deadlines, metrics, or data on monitoring progress toward outcomes, as well as the absence of a detailed integrated plan that incorporates these elements, means any limitations of the GSS-I strategy may not be fully known or apparent until late in the decade. Without these elements, it will be difficult for the Bureau to ensure that it is adequately evaluating the costs and benefits of alternative data sources, measuring and reporting its progress, or holding managers accountable for results.

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Abbreviations

ACS	American Community Survey
Bureau	U.S. Census Bureau
CAUS	Community Address Updating System
DSF	Delivery Sequence File
GSS-I	Geographic Support System Initiative
MAF	Master Address File
NGA	National Geospatial-Intelligence Agency
TIGER	Topologically Integrated Geographic Encoding and Referencing system
USDA	U.S. Department of Agriculture
USPS	U.S. Postal Service

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October 2, 2014

Congressional Requesters:

The U.S. Census Bureau (Bureau) relies on a complete and accurate address list, along with precise maps, as the fundamental building blocks of a successful census. An accurate address list is critical because it both identifies all households that are to receive a census questionnaire and serves as the control mechanism for following up with households that fail to respond to the initial questionnaire. Precise maps are critical for counting the population in the proper locations—the basis of congressional reapportionment, redistricting, and allocations of federal aid to state and local governments. If the Bureau’s address list and maps are inaccurate, people are more likely to be missed, counted more than once, or counted at the wrong location.

Our prior work has shown that developing an accurate address list has been both labor intensive and costly. For example, in 2000, the Bureau tried to construct an address list largely from scratch; in addition, for both the 2000 and 2010 Census, Bureau field staff updated the Bureau’s address list throughout the nation by going door to door to add missing housing units.¹ In 2012,² we reported that the Bureau’s 2010 door-to-door effort—known as address canvassing—required 140,000 temporary workers to verify 145 million addresses at a cost of \$444 million.³ (The Bureau proceeded with full address canvassing in 2010 after concluding that anything less than door-to-door visits could produce unreliable results.)

With a life-cycle cost of around \$13 billion, the 2010 Census was the most expensive population count in U.S. history, costing over 50 percent more

¹For the 2010 Census, the Bureau did not conduct a separate listing operation everywhere: in sparsely inhabited areas of Maine and Alaska, Bureau field staff updated addresses while enumerating. They did so as well in areas with special enumeration needs—such as American Indian reservations and seasonal resort areas.

²GAO, *2020 Census: Initial Research Milestones Generally Met but Plans Needed to Mitigate Highest Risks*, [GAO-13-53](#) (Washington, D.C.: Nov. 7, 2012).

³The \$444 million cost estimate for address canvassing comes from a Bureau assessment of the cost of the field staff for that operation only and does not include any infrastructure costs such as for census offices, equipment, and office staff.

than the \$8.1 billion 2000 Census (in constant 2010 dollars). To manage tradeoffs between controlling costs and maintaining accuracy, the Bureau is examining several approaches for the 2020 Census. By September 2015, the Bureau plans to announce its preliminary design decision—including the approaches it expects to use to meet its address listing and mapping needs. In addition, the Bureau is currently researching how to reduce the amount of fieldwork and the cost of address and map updates. As part of this effort, the Bureau is researching plans to reduce the scope of its door-to-door address canvassing by targeting areas that it believes have experienced change and for which the Bureau has no other address and geospatial data sources capturing those changes. Moving forward, the Bureau is considering what role, if any, the private sector could play in address and map building for 2020.

In light of the Bureau's use of information from private sector vendors, federal agencies, and other entities to meet its address and mapping needs, you asked us to examine the potential private sector role in address list and map development for the 2020 Census. Specifically, we reviewed (1) the extent to which the Bureau is considering non-Bureau sources of data to meet its key address and mapping needs for the 2020 Census, and (2) the status of the Bureau's plans for meeting those needs, paying particular attention to leading practices for project management.

To meet the first objective, we reviewed documents regarding data sources the Bureau considered for meeting key address and mapping needs, and determined the extent to which the Bureau documented the support we identified as necessary for significant data source decisions. To meet the second objective, we reviewed the Bureau's efforts in developing its address and mapping needs for 2020 Census operations and in preparing to make its data sourcing decisions. We compared Bureau documentation to leading project planning and management practices related to results-oriented strategic planning and reporting that we identified in our previous work and from other sources. For both objectives, we interviewed Bureau officials familiar with decennial census needs and data source decisions. For more details on our scope and methodology, see appendix I.

We conducted our work from February 2014 to September 2014 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that

the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

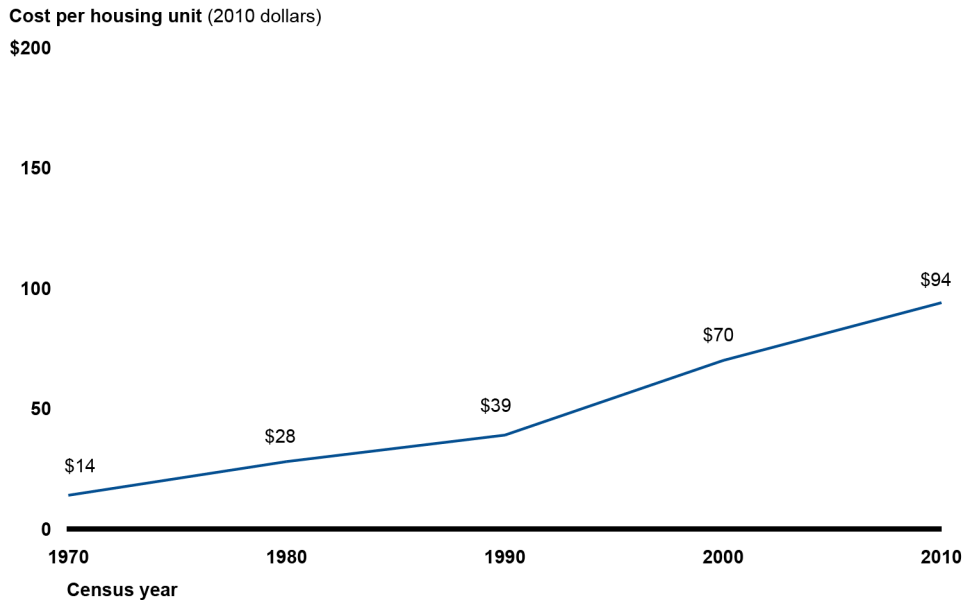
Background

Because of rising costs, a fundamental reexamination of how the Bureau conducts the decennial census—including improving the cost-effectiveness of the actual count, or enumeration—is needed. In response to external pressures to contain costs, including our 2010 report calling for such a reexamination,⁴ the Bureau is researching and testing innovations and improvements (as necessary) in an effort to conduct the 2020 Census at a lower cost per housing unit than the cost estimate of the 2010 Census, while still maintaining high quality. (The 2010 Census cost estimate was approximately \$94 per housing unit, in constant 2010 dollars.)

Census costs have risen over the years: the cost of the 2010 Census represents a 38 percent increase in the cost per housing unit over costs for the 2000 Census; this in turn was a 76 percent increase over 1990 Census costs. According to Bureau officials, without substantial and bold innovation, the cost of conducting the 2020 Census likely will continue this trend, and may become prohibitive. (Figure 1 illustrates the increase in cost per housing unit from 1970 through 2010.)

⁴GAO, *2010 Census: Data Collection Operations Were Generally Completed as Planned, but Long-standing Challenges Suggest Need for Fundamental Reforms*, [GAO-11-193](#) (Washington, D.C.: Dec. 14, 2010).

Figure 1: Cost per Housing Unit by Census Year, 1970-2010 (2010 dollars)



Source: Bureau of the Census. | GAO-15-21

Note: Amounts include the costs for the Master Address File/Topologically Integrated Geographic Encoding and Referencing Enhancement Program and the American Community Survey.

According to the Bureau's 2020 Census Business Plan, the rising costs of the 2010 Census were largely driven by several factors, including substantial investments in a major national update of its address list during 2009, just prior to the enumeration in 2010.⁵ The address list—referred to by the Bureau as its Master Address File (MAF)—is a data file that contains a list of all known living quarters in the United States and Puerto Rico. Since 2000, the Bureau has used addresses provided by the U.S. Postal Service (USPS) Delivery Sequence File (DSF)⁶ as a starting point to update the MAF. The Bureau uses the MAF to support the decennial census as well as the American Community Survey and other

⁵Bureau of the Census, *Business Plan for the 2020 Census in Support of the Fiscal Year 2013 Budget Submission, Version 1.0* (Suitland, MD: Aug. 9, 2012).

⁶The USPS maintains and regularly updates the DSF as a database of all addresses to which it delivers mail. It has provided this information biannually to the Bureau.

ongoing demographic surveys.⁷ In conjunction with the MAF, the Bureau maintains its Topologically Integrated Geographic Encoding and Referencing system (TIGER): this system contains spatial geographical information that associates MAF address data with TIGER geography data on the Bureau's maps.

To determine whether and how to reengineer address canvassing for the 2020 Census, the Bureau is conducting ongoing efforts to improve its map and address databases. For example, the Bureau's Geography Division is working with USPS, other federal agencies, and state, local, and tribal governments on a new program called the Geographic Support System Initiative (GSS-I). This initiative allows government agencies at all levels to regularly share and continuously update their address lists and road data with the Bureau. According to Bureau documents, GSS-I is relying on partnering with federal, state, tribal, and local government entities—as well as the private sector—to meet two Census-related data needs:

- obtaining accurate, complete, and timely information about where people live (such as address data), coordinates of residential structures, and other map features (such as street centerlines), and
- detecting information changes, so that the Bureau can identify such things as new roads and structures and update the MAF/TIGER database in response.

According to the Bureau's current plans, state, local, and tribal governments (which maintain address lists for purposes such as emergency response and property assessment) would have the opportunity to share addresses with the Bureau throughout the decade, rather than only during the 2 years prior to the census, as was done for the 2010 Census.

One of the Bureau's efforts to improve its address and mapping database involves two projects within the Bureau's 2020 Research and Testing Program. These projects are using modeling to predict where changes (e.g., address additions and deletions) are likely to occur in the MAF.

⁷The American Community Survey is an ongoing statistical survey that provides data every year. Information from the survey generates data that help determine how federal and state funds are distributed each year.

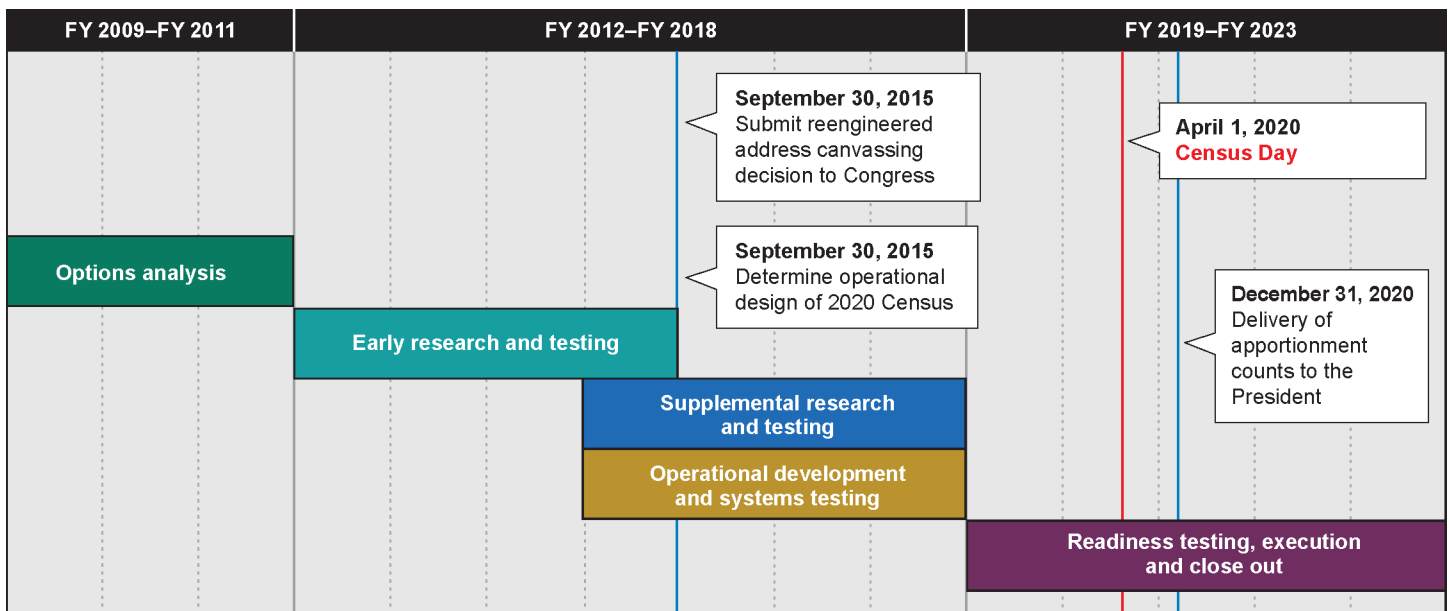
These models may be used to identify areas where update activities are required to assure the MAF is as complete and accurate as possible. If the Bureau decides to limit its address canvassing, this information is intended to help determine which areas meet acceptable quality thresholds for address coverage, as well as to identify areas in which address canvassing would be more effective in assuring a complete and accurate address list.

In another, related effort—also integrated with the 2020 Research and Testing Program—the Bureau’s Geography Division has a team in place to interactively review address and mapping information (including imagery and other source materials) in order to identify areas in which counts of addresses in the MAF are consistent with numbers of housing units on the ground, as well as to identify areas in need of updating. Bureau officials said that they are planning to test the modeling projects in 2014 and 2015, and to compare them to the interactive review effort, in order to establish evidence of what mix of modeling and imagery-based reviews might best identify areas most in need of updating. Details on how the comparison will be made and tested are not yet available for our review.

Additionally, in a test beginning in September 2014, the Bureau will conduct a Partial Block Canvassing Test—a component of their larger Address Validation Test. For this test, Census staff will canvass in areas even smaller than the usual blocks of geography used for canvassing, according to Bureau officials. This is being done under the belief that if the Bureau can demonstrate operational success at canvassing such small areas—what it refers to as “partial block canvassing”—it may be able to reengineer its canvassing operation by targeting efforts to similarly small areas. Doing so would eliminate the expense of canvassing an entire geographic block when only a part of it is in need of update. In another effort, the Bureau is investigating the role and possible contributions the private sector can make in improving its address and mapping databases. According to Bureau officials, reliance on the private sector is necessary in order to maintain the major upgrades that were made to its address and mapping databases for the last decennial.

As we have previously reported, it is important for the Bureau to remain on schedule to keep downstream activities on track.⁸ As part of its 2020 Census schedule development, the Bureau divided the 14-year life cycle of the 2020 Census into five phases. The life cycle began in fiscal year 2009 with the *Options Analysis* phase. The second phase, *Early Research and Testing*, comprises work being done through the Bureau's GSS-I program and the 2020 Research and Testing Program. This work is intended, in part, to explore how MAF/TIGER updates could be modified to control costs or improve quality. Figure 2 illustrates the sequencing of the five 2020 Census phases.

Figure 2: 2020 Census—Planned Research and Testing Schedule



Source: GAO analysis of Census Bureau data. | GAO-15-21

⁸GAO, *2020 Census: Bureau Needs to Improve Scheduling Practices to Enhance Ability to Meet Address List Development Deadlines*, [GAO-14-59](#) (Washington, D.C.: Nov. 21, 2013).

The Bureau Is Considering a Variety of Sources to Meet Key Address and Mapping Needs, but Has Not Systematically Documented Its Decisions

The Bureau Has Begun Making Decisions About Data Sources to Meet Key Address and Mapping Needs

The Bureau is taking a number of actions to help it develop a better understanding of the different sources available for updating address and mapping data and to better position it for cost reduction opportunities in data acquisition while increasing the quality of the MAF/TIGER database. According to Bureau officials, while more significant decisions on data sources remain, they have decided to initially use the following data sources to help improve address and mapping information in the 2020 Census MAF/TIGER database:

- sufficiently reliable address and geospatial data through GSS-I, provided by state, local, and tribal governments with active address and mapping efforts underway;
- address, aerial, and spatial data from other federal agencies; and
- imagery via a commercial source.

GSS-I partnerships. As the Bureau continuously updates and maintains data in the MAF/TIGER database, Bureau officials have decided that state, local, and tribal governments that have data of sufficient quality—and that participate in GSS-I partnerships—will be the primary source of address and geospatial data in their geographic areas. For governments whose data passes a series of Bureau content and quality checks, the GSS-I partnership program data will be collected throughout the decade. According to current plans, state, local, and tribal governments that reliably maintain address lists (for purposes such as emergency response and property assessment) would be invited to share addresses with the Bureau throughout the decade, rather than only during the 2 years prior to the census, as was done for the 2010 Census.

Federal agencies. Bureau officials have decided that some address, aerial, and spatial data will be collected from other federal agencies. Thus far, Bureau officials indicated that the federal agency data being used to update the MAF/TIGER address and spatial data for 2020 includes address data from the USPS Delivery Sequence File, and satellite imagery provided by the U.S. Department of Agriculture's (USDA) National Agriculture Imagery Program and the National Geospatial-Intelligence Agency (NGA).⁹ These address, aerial, and spatial data are used to identify areas with growth or reduction in the number of housing units.

Commercial sources. Bureau officials have decided to use a commercial imagery service, giving the Bureau the capacity to store and manage imagery it has already collected from other sources—such as local governments—and the ability to use imagery provided from the commercial vendor for areas where the Bureau lacks imagery data. The Bureau is exploring other options as well, including in-house use of imagery from other federal agencies or from additional commercial vendors.

Additional data sources. In addition to these data source decisions, Bureau officials have been conducting ongoing research and outreach with a variety of entities to identify additional data source options the Bureau could use to meet its address and mapping needs. Table 1 describes data sources the Bureau has already identified that might possibly meet its address and mapping needs.

⁹We have ongoing work addressing progress made on efforts to better coordinate and reduce duplication of geospatial data, and plan to issue a report on this in early 2015.

Table 1: Identified Data Sources—Census Bureau Key Address and Mapping Needs

Need	State/local/tribal governments	Private sector	Federal agencies (outside the Census Bureau)	Census Bureau field collection
Address data	<p style="text-align: center;">↑</p> <p style="text-align: center;">Governments with sufficient quality data for Geographic Support System Initiative, other state and local administrative records</p> <p style="text-align: center;">↓</p>	Commercial vendors of address data	U.S. Postal Service Delivery Sequence File, other federal administrative records	American Community Survey (ACS) updates, ^a Community Address Updating System (CAUS) updates of select rural addresses, ^b reengineered address canvassing
Coordinates of residential structures		Commercial vendors of imagery and spatial databases	U.S. Departments of Agriculture (USDA) and Transportation, National Geospatial-Intelligence Agency (NGA), National Oceanic and Atmospheric Administration, National Park Service	Minor updates as observed by field staff during various field operations
Other map features (e.g., street centerlines)		Commercial vendors of digital imagery	USDA, NGA, U.S. Geological Survey	
Imagery supporting change detection ^c to help update the MAF/TIGER system database				

Source: GAO analysis of Census Bureau-provided documents. | GAO-15-21

^aACS is an ongoing statistical survey that provides yearly data. Information from the survey generates data that help determine how federal and state funds are distributed each year.

^bCAUS enables the Bureau to conduct block address listing operations in targeted areas with a high proportion of non-city-style addresses.

^cChange detection is the practice of using digital imagery and other data to identify, represent, and geographically position new roads and structures.

As an example of work with entities outside the Bureau, during fiscal year 2011, the Bureau invited officials from USPS and the U.S. Geological Survey to participate in GSS-I research and development working groups to help identify sources for address and feature updates for the MAF/TIGER database. In September 2011, the Bureau hosted a meeting with state and local governments, nonprofit organizations, and various national associations to discuss techniques for address list development and maintenance, as well as potential pilot programs for data sharing among these groups.

The Bureau has also taken steps to work with commercial vendors to review potential sources of commercial data that the Bureau could use to augment or verify data collected through GSS-I. For example, in July 2013, the Bureau completed a market research project with one vendor to

evaluate the prospects for using commercially available source data in the event a future need arose for supplemental data from areas of the country where local, state, or tribal governments lack spatial data to provide to the Bureau. During the project, the Bureau obtained information on quality assurance and quality control processes it can use to maintain accuracy of spatial data within the MAF/TIGER database. Additionally, in July 2014, the Census Bureau issued a request for information conducting market research to identify available sources for street centerline data and address data. The solicitation stated that the Bureau was engaging industry in order to identify potential vendors and their ability to provide spatially accurate road networks, addresses, and other geospatial data to supplement the information already available in the MAF/TIGER database. As of August 2014, Bureau officials were continuing to visit vendors, attend conferences with geospatial industry leaders to learn about their address and mapping technologies, and interact with Census Scientific Advisory Committee and National Academy of Sciences panels.

The Bureau Has Not Systematically Documented Its Decisions on Data Sources

Officials at the Bureau explained the rationale for the data source decisions that have been made thus far and provided us with background documents and testimonial evidence about each of the decisions. However, they provided inconsistent support for the decisions themselves. Federal internal control standards¹⁰ and Office of Management and Budget guidance on geospatial data¹¹ suggest that the Bureau should be supporting its significant data source decisions—such as for its address and mapping needs—in terms of both cost and quality, as well as with clear management approval for the decisions. Further, these documents should be readily available for examination.

Cost considerations. According to leading practices for data sourcing, decisions should be based on consideration of cost. Such considerations could be documented in a variety of ways, including market research, minutes of meetings with relevant discussion, summaries of data cost

¹⁰GAO, *Internal Control Management and Evaluation Tool*, [GAO-01-1008G](#) (Washington, D.C.: Aug. 1, 2001); and *Standards for Internal Control in the Federal Government*, [GAO/AIMD-00-21.3.1](#) (Washington, D.C.: Nov. 1, 1999).

¹¹Office of Management and Budget, *Stages of the Geospatial Data Lifecycle pursuant to OMB Circular A-16* (Washington, D.C.: Mar. 31, 2010).

research, transaction costs, or pricing schedules. The decisions on data sources the Bureau has made thus far—using local, tribal, and state governments; other federal agencies; and a commercial imagery server—involved acquiring free data. For each of those decisions there is no additional charge to the Bureau for obtaining data from the respective source, largely obviating the need to justify cost. For instance, the Bureau established a memorandum of understanding with state, local, and tribal governments participating in GSS-I, indicating that no funds will be exchanged between the Bureau and participants for sharing address and map data. Bureau officials told us that getting such updates at no charge is a key to reducing expensive broader canvassing costs later in the census cycle. The Bureau’s recent congressional budget justification documents echo this argument as well. Additionally, Bureau officials have stated that they are able to obtain data from other federal agencies at no cost and can rely on a vendor-provided imagery service that the Bureau already had access to under other paid licensing arrangements. No additional charges are associated with such access.

Moving forward, by improving its use of leading practices to determine the relative cost-effectiveness of using data sources in updating the MAF/TIGER database, the Bureau can better ensure sufficient consideration of costs. When deciding on each additional source, consideration includes indirect costs, such as the incremental costs of data processing or quality assurance.

Quality considerations. According to leading practices for data sourcing, decisions should be based on consideration of data quality, including data accuracy, completeness, and timeliness. Such considerations can be documented by market research, minutes of meetings with relevant discussion, summaries of data quality research, relevant test or evaluation results, schedules of data updates and availability, reporting on quality measures, and evidence of successful historical use of the data. Thus far, the Bureau has partially supported consideration of quality across its data sourcing decisions. For example, its decision to rely on address and mapping data submitted from state, tribal, and local governments was based on expectations that many of the governments would be able to provide data of sufficient quality. Bureau officials stated they are relying on procedures to assess the content of submitted data files on a case-by-case basis. Bureau timelines indicate the quality reviews will likely extend over many years, and Bureau officials do not know for sure how many (or which) government sources will be good enough to use. For their decision to rely on USPS, USDA, and NGA for address and mapping data, Bureau officials provided evidence that they

reviewed research on the quality of data sources from each of the agencies. For example, since the 2000 Census, the Bureau has successfully relied on USPS address data, and—leading up to the 2010 Census—on USDA aerial imagery as well. Over the years, several evaluations have helped document limitations of the USPS data in particular, so that the Bureau targets its use of them. In addition, the Bureau documented a review of how the quality of NGA imagery sources can help meet Bureau needs.

The Bureau summarized detailed market research for several alternative sources of imagery from commercial vendors and other federal agencies related to the positional accuracy and current geographic coverage of the imagery data and the rate at which imagery data were updated. However, it is not clear how the Bureau used that information or whether the quality of the imagery data source exceeded quality standards (or had limitations) compared to others. Bureau officials stated that they selected the commercial imagery service during meetings assessing and comparing options, because it met their needs and its use was included in other licensing arrangements that had already been paid for. However, Bureau officials could provide no contemporaneous documentation of the results of those comparative assessments. By having a systematic process to consider the quality of the data that the Bureau relies on from various sources, the Bureau can help ensure that effective choices are being made and that possible limitations in data that might affect their use are better understood.

Documenting decisions. Internal control standards require documentation of significant management decisions, which can be documented with decision memorandums, memorandums of understanding, or meeting minutes indicating acceptance of data source recommendations, or other documentation of senior management approval for deciding upon a specific data source. We found that at the time decisions were made, the Bureau did not document management approval in support of sourcing decisions for any of the data sources discussed above. Bureau officials provided extensive documentation on GSS-I, which indicated that governments across the country would be playing a major role as partners with the Bureau by providing data; however, there was no formal decision documenting (as an accountability check) that senior Bureau leadership had agreed that the net benefits of these sources are greater than alternative data sources. Regarding the decision to rely on several federal agencies for various types of geospatial data, the Bureau similarly lacks a formal record establishing the Bureau's approval of these sources as official inputs to the 2020

Census. The extensive public interactions documented between Bureau and other agency officials leaves little doubt that the decision to rely on data from these other federal agencies is known and acceptable to senior Bureau officials, yet evidentiary support for the Bureau's decision to rely on some agencies and not other sources is absent. For the decision to rely on a commercial imagery source, Bureau officials told us that the chief of the Geography Division approved the use of commercial imagery server software (to host freely available imagery acquired from federal, state, and local sources) during a January 2012 meeting, although no record of the meeting was produced and there was no separate documentation of the decision. Developing evidence of management approval for data sourcing decisions can help ensure that as the Bureau moves forward, stakeholders—such as Congress and commercial vendors—have greater transparency regarding the data sources being considered to meet the Bureau's key address and mapping needs, how decisions are being made, who made them, and on what basis. Such evidence would enhance the accountability of senior Bureau officials for decisions at the time those decisions are made.

Cost and quality are two key traits linked to the goals and objectives of the Bureau's agency-wide strategic plan and feature prominently in other broad strategic documents for the 2020 Census. Yet we found the Bureau does not have guidance outlining the need or the process for ensuring (1) systematic justification for decisions related to using specific data sources in terms of cost, quality, or other important considerations, and (2) documentation of management approval for such decisions. Although the Bureau's initial data sourcing decisions involved acquiring data at little cost to the Bureau, according to Bureau officials, they have much more to resolve about meeting their address and mapping data needs, with future decisions potentially involving other stakeholders and significant cost. By developing more rigorous support and evidence of such decisions, the Bureau can ensure transparency to Congress, commercial vendors, and other stakeholders. In turn, these efforts could lead to increased stakeholder support for the Bureau's plans for the 2020 Census and could enable the Bureau to consistently support why the data sources it selected are better than alternatives. Rigor in decision making can also help reduce the Bureau's risk of failing to select the most cost-effective, accurate, complete, and timely address and mapping data for updating the MAF/TIGER database.

The Bureau Has Not Fully Applied Leading Planning Practices to Identify What Other Address and Mapping Data Sources It Needs for 2020

The Bureau's efforts to design a cost-effective enumeration (starting with complete and accurate address and mapping data) present a significant project management challenge,¹² one that demands meticulous planning. However, we found that the Bureau's approach to meeting its address and mapping needs is missing key elements that comprise a rigorous, integrated plan, including clear and measurable goals, decision milestones at a level where decisions on GSS-I data sources might be tracked, and performance data that management could use to track progress. Without consolidating these elements in a plan that lays out how Bureau officials should monitor progress, it will be difficult for Bureau management (and others) to know that the Bureau is on track to meet its address and mapping needs; it will also be difficult to pinpoint improvement opportunities.

To identify key elements of effective project management, we reviewed a number of guides for project management and business process reengineering.¹³ Although there is no one best approach to project planning, we found that the guides contained many elements in common, including the following:

- the project plan should consider all phases of the project and should have clear and measurable goals, or targets;
- schedules, milestones, and deadlines should be clearly stated; and
- performance data should be gathered and reported to determine and monitor progress toward goals.

Additionally, OMB Circular A-11 specifies that an agency's general goals should be sufficiently precise to direct and guide agency staff in actions that carry out the agency's mission and aid the agency in developing

¹²The Bureau considers GSS-I a program made up of various projects. The criteria we relied on for this report offer leading management practices generally applicable to managing programs or projects.

¹³The guides include the latest editions of the following publications: Project Management Institute, *A Guide to the Project Management Body of Knowledge, 5th Edition* (2013); Carnegie Mellon Software Engineering Institute, *Capability, Maturity Model Integration Project Planning Guide* (November 2010); Information Technology Resource Board, *Project Management for Mission Critical Systems, a Handbook for Government Executives*, (Apr. 5, 2001); and GAO, *Business Process Reengineering Assessment Guide*, [GAO/AIMD-10.1.15](#) (Washington, D.C.: May 1997).

annual performance goals.¹⁴ Without these elements of effective project management, the Bureau cannot ensure it will make informed decisions about its data needs in a timely manner.

Measurable goals. As discussed earlier, to help address its data needs, the Bureau decided to rely on state, local, and tribal government address and geospatial data that met its quality standards. However, Bureau officials have not set measurable goals for that effort. For example, the chief of the Geography Division estimated that these government sources may be able to provide data coverage for about two-thirds of the over 3,200 counties in the country.¹⁵ However, Bureau officials could not provide any detailed support for that estimate, and said that they recognize the need for better information in order to make decisions on these and remaining needs, and are working to gather it. Knowing what percentage of the country—and perhaps, what different regions and different types of geographies, such as rural and urban—may be covered by sufficiently reliable sources would help the Bureau (and others) better know both the nature and magnitude of the remaining data gaps. Whether in terms of estimated numbers of addresses, numbers of housing units, or in terms of area, a measurable goal—such as the amount of address and mapping data expected to be sufficiently reliable—could help inform estimates of the level of effort needed to achieve goals: in turn, this can help inform decisions about resource allocations and other elements of project planning. Measurable goals can also help improve communication with other stakeholders who might be able to help the Bureau fill the data gap. Bureau officials acknowledge that they need to determine and report more precisely the extent of the coverage gaps in addresses and mapping data obtained from reliable government sources.

Similarly, the Bureau's strategic plan for GSS-I includes high-level goals. However, the plan, its related management plan, and other planning documents lack the specificity needed regarding clear and measurable goals or targets representing the address and mapping results GSS-I needs to achieve. Such goals or targets can help Bureau staff ensure

¹⁴OMB Circular A-11, as revised July 2014, provides guidance to agencies on budget preparation, performance reporting, and capital asset acquisition.

¹⁵The overall number of counties does not provide any indication of geographic or population coverage. For example an urban county may have a large population in a small area.

they are effectively taking steps toward meeting address and mapping needs and might help in the identification of helpful sources. For example, the Bureau's GSS-I Strategic Plan has as one of its goals that the Geography Division be efficient, effective, and adaptable, with a strategic objective of efficient and effective source data acquisition.¹⁶ The plan goes on to list potentially useful strategies, such as expanding the use of available imagery for source data assessments and embracing the most efficient data acquisition methods using viable technologies. However, the GSS-I planning documents do not describe measurable goals or targets (such as the estimated numbers of addresses) expected or needed from state, local, and tribal governments under GSS-I for the efforts to be successful, or to have met stated needs, goals, or related objectives. In addition, the documents do not identify what coverage of the housing in any given area is sufficient to meet the Bureau's needs.

The Bureau's GSS-I Strategic Plan includes one example of the type of detailed, measurable goal that could better guide planning and decision making. That data need, or target, is described as "maintain a standard of 7.6 meters or better positional accuracy for existing streets and newly acquired streets." However, this specific information is the only occurrence in the document with this level of detail. Bureau documents elsewhere provide examples of what could serve as measurable goals, if they were formally stated as quality standards needed from all potential sources of address data. For example, a description of the Bureau's process for reviewing government partner data files describes assessment of, among other characteristics, whether addresses include each of several different required elements and whether road centerline data are updated within 2 years; however, it does not describe measures of how complete the data must be to meet the Bureau's needs. A detailed integrated plan that includes complete descriptions of what the Bureau deems sufficient quality data for its address and mapping needs can help focus efforts of the Bureau and its private and public partners on satisfying them.

Decision milestones. Bureau officials provided a high level master activity schedule through the 2020 Census that includes some decision points, such as go/no go decisions for whether it will reengineer its

¹⁶Bureau of the Census, *Geographic Support Systems Program and GSS Initiative Strategic Plan, Version 1.4* (Suitland, MD: Dec, 31, 2013).

address canvassing operation (limiting it to only targeted areas) and the deadline for creating and finalizing the address canvassing workload. Additionally, officials provided a version with much more detail through September 2015, when the Bureau plans to announce its preliminary design decisions. However, Bureau staff indicated that they have not yet refined the schedule at the lower level beyond September 2015, such as at a level where decisions about GSS-I data sources might be tracked. Bureau officials also provided a schedule that describes in detail the implementation of a workflow management system used to track the handling of address and other files received from partners, but the system was implemented in 2013 and does not include any future milestones. Whether immediately included in the master activity schedule or not, without schedules moving toward near term goals and decisions included in a more rigorous plan, the Bureau and Congress cannot determine whether the Bureau is on track to meet its key address and mapping needs for the 2020 Census.

Specifically, while work is under way in these areas, we found that the Bureau does not have milestones or deadlines for remaining decisions in the following areas:

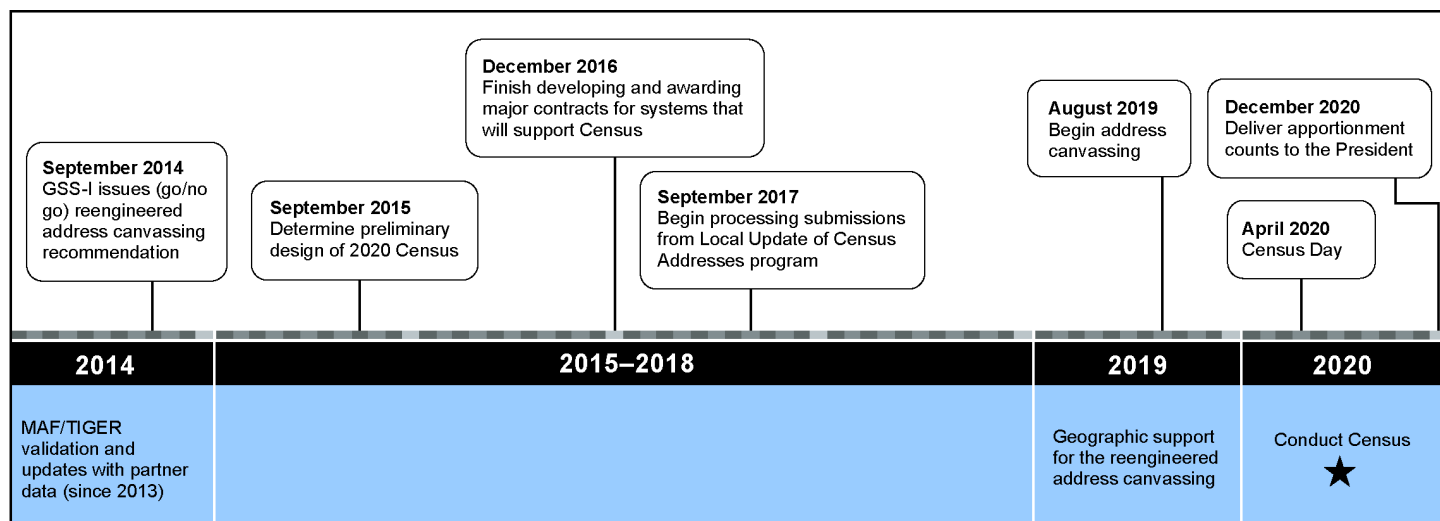
- to what extent state, tribal, and local governments can be relied on as acceptably reliable data sources;
- how the Bureau will obtain address, boundary, and feature data for areas not covered by state, tribal, and local governments; and
- how good its various data sources are or need to be so as to be acceptably reliable. That is, address data obtained from the sources must meet minimum standards for timeliness, accuracy, and completeness—sufficient coverage of the nation’s housing.

Bureau officials indicated that they do not yet have milestones such as these, because, among other reasons, those decisions need to be informed by the 2014 Census Test,¹⁷ occurring in summer 2014, and the results of other tests in 2015. While this creates some uncertainty regarding what the future milestone dates might need to be, without at least preliminary milestones pending the results of census tests, the Bureau may not have sufficient time left to complete remaining activities,

¹⁷According to the Bureau, during the 2014 Census Test it researched modern and cost-efficient methods for the population to be counted in the 2020 Census.

especially given the fact that some of the activities may require long lead times for completion (see figure 3). For example, it may take significant time to research and select which data sources are needed, depending on how the Bureau decides to address them. The Bureau has separately set a deadline of December 31, 2016, for finishing the development and awarding of major contracts for systems that will support the 2020 Census, recognizing the lead time as necessary. Furthermore, the Bureau's 2020 Lifecycle Risk Register states that, "many of the decisions on the final 2020 Census design may not be finalized until late in the research time frame, which could include decisions to outsource some of the development effort. However, acquisitions require established lead times that include set processes and review milestones, both at the agency and at the department level. If 2020 Census design decision milestones do not allow the requisite lead times for acquisition processes and reviews, then the Census Bureau may not be able to procure the necessary products and services in sufficient time to align with the 2020 Census development life cycle." The Bureau identified this risk and rated it as medium on its scale of low to high, underscoring that it values managing to a timeline of key milestones and deadlines.

Figure 3: 2020 Census—Key Decision Points and Milestones



Source: GAO augmentation of Census Bureau image. | GAO-15-21

Monitoring progress. Bureau officials could not provide us with the performance reports they are using to monitor progress toward ensuring that key 2020 address and mapping needs will be met. However, in August 2014, Bureau officials provided us with copies of presentations made to external groups reporting on progress made in reviewing data

from state, tribal, and local government partners under GSS-I. For example, one presentation indicated that as of February 17, 2014, as part of the GSS-I effort, the Bureau had contacted 375 partners, 247 of which had provided files. A Bureau report provided to the Office of Management and Budget on August 4, 2014, justifies resource requests for GSS-I and contains performance metrics, but the metrics on address data from state, local, and tribal governments are in terms of numbers of partner files acquired and processed in 2013 and 2014.¹⁸ There is no context given, such as how many potential partners there are, how many governments the Bureau anticipates participating or needs to participate, what level of participation the Bureau seeks to obtain year-by-year, or how complete the coverage of addresses needs to be. Without such context, these numbers do not provide complete information on the extent to which the Bureau is making progress. Furthermore, the metrics the Bureau provided do not address the extent to which the MAF/TIGER data are being updated or improved, such as in numbers of addresses, housing unit structures, linear miles of roads, or geographic square areas. If fewer than expected (or needed) state, tribal, and local partners are agreeing to participate, if less data are being updated than expected, or if the resulting database is not complete enough, then management needs to know in real time so that it can prioritize efforts to access other data sources that may be needed to meet its key address and mapping needs. By developing more accurate and timely documentation of progress on obtaining or updating address and mapping data, the Bureau can also better illustrate to stakeholders that it is effectively managing its data source decisions.

Our previous work has found that the Bureau has inconsistently followed key planning practices: for example, in 2012, we found that the Bureau's high-level schedule for the 2020 Census did not include milestones or deadlines for key decisions needed to support the transition between the planning phases for 2020.¹⁹ While the Bureau has taken some positive

¹⁸An Exhibit 300 is also called the Capital Asset Plan and Business Case. It is used to justify resource requests for major IT investments and is intended to enable an agency to demonstrate to its own management, as well as to the Office of Management and Budget, that a major investment is well planned.

¹⁹GAO, *2020 Census: Additional Steps Are Needed to Build on Early Planning*, [GAO-12-626](#) (Washington, D.C.: May 17, 2012).

steps, such as preparing a series of planning documents²⁰ that provide high-level examples of measurable goals, schedules, and deadlines, it has not put in place all elements integral to large complex projects. The absence of detailed goals, schedules, deadlines, metrics, or data on monitoring progress toward outcomes and the absence of a detailed integrated plan that incorporates these elements means any limitations of the GSS-I strategy may not be fully known or apparent until late in the decade. Without these elements, it will be difficult for the Bureau to ensure that it evaluates the costs and benefits of alternative data sources and measures and reports the Bureau's progress. It will also be difficult to hold managers accountable for results. Additionally, the Bureau may be lacking the information necessary to make its remaining 2020 address and mapping decisions. As a result, the Bureau is at risk of experiencing increased costs to obtain data for remaining gaps in address and mapping data.

Conclusions

Bureau efforts to update its MAF/TIGER database with accurate, complete, and timely address and mapping data are critical for carrying out a precise population count in a fiscally constrained environment. The Bureau has taken initial steps to plan and implement data collection efforts for meeting its key address and mapping needs, such as developing planning documents for its GSS-I program and identifying a series of potential data sources in coordination with internal and external stakeholders. Thus far, these efforts have enabled the Bureau to consider an array of government and commercial sources for updating its address and mapping data through GSS-I as it has made its initial data source decisions.

Continued Bureau efforts to prepare for remaining data source decisions would benefit from more systematic efforts to document cost and quality considerations for government and commercial sources. While the Bureau has decided thus far to use data sources that have little or no incremental acquisition cost, enhanced cost and quality assessments of alternative data sources considered for future decisions will position the

²⁰Individual plans have been written for each of the following process components: acquisition and sourcing management, budget management, communications and stakeholder engagement management, knowledge management, performance measurement and management, change and document management, risk management, and schedule management.

Bureau to demonstrate transparency in its decision making to Congress, to potential commercial vendors, and to other stakeholders. Implementing processes for supporting data source decisions that meet key address and mapping needs—particularly for assessments of cost and quality—will reduce the risk that the Bureau selects data sources that are not cost-effective or high quality. In addition, when decisions are being made about how to meet key address and mapping needs, it is also important that the Bureau document these decisions, such as through the use of decision memorandums or minutes of meetings where decisions are made. Implementing a process that ensures management approval is documented for key decisions on data sources in the future will help demonstrate accountability for those decisions.

As the Bureau moves forward in preparing and refining its design approaches for the 2020 Census, it can take additional steps to improve planning for data sourcing decisions. Currently, the Bureau does not have a detailed integrated plan that incorporates measurable goals. Such a plan would help ensure that the Bureau is collecting sufficient address and mapping data from its private and public partners. The Bureau has also not set a timeline regarding when it needs to make remaining data source decisions: setting a timeline will allow it to reduce the risk of not having enough time to adequately decide upon alternative data sources that, if needed, might potentially reduce cost or increase quality. Additionally, the Bureau has not established a process to monitor and report on progress in the management of GSS-I, which will enable it to better identify gaps in its data collection efforts, as well as to ensure and track the actions needed to fill such gaps in time for the 2020 Census.

Recommendations for Executive Action

To help ensure that the Bureau more rigorously considers data sources and remains on schedule to meet its address and mapping needs, the Secretary of Commerce and Undersecretary of Economic Affairs should direct the Census Bureau to take the following three actions:

- In order to ensure transparency of future decision making, implement a process for documenting the support for data source decisions intended to meet key address and mapping needs and the support for assessing the cost and quality of data sources the Bureau is considering.
- In order to ensure accountability for key decisions moving forward, implement a process for documenting management approval of key address and mapping data source decisions, such as through

decision memorandums or minutes of meetings where decisions occurred.

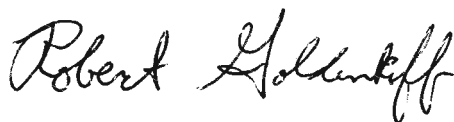
- In order to better ensure the Bureau meets its address and mapping needs for 2020 and stays on schedule,
 - develop a detailed integrated plan that includes items such as measurable goals (e.g., estimated numbers of addresses expected or needed from state, local, and tribal governments under GSS-I); schedules and deadlines; and progress monitoring and reporting, and
 - establish a timeline identifying when remaining data source decisions need to be made.

Agency Comments and Our Evaluation

We provided a draft of this report to the Department of Commerce and received the department's written comments on September 23, 2014. The comments are reprinted in appendix II. The Department of Commerce generally agreed with our findings and recommendations and provided technical comments, which we incorporated as appropriate.

We are sending copies of this report to the Secretary of Commerce, the Under Secretary of Economic Affairs, the Director of the U.S. Census Bureau, and interested congressional committees. In addition, the report is available at no charge on the GAO website at <http://www.gao.gov>.

If you have any questions about this report please contact me at (202) 512-2757 or goldenkoff@gao.gov. Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this report. The GAO staff that made major contributions to this report are listed in appendix III.



Robert Goldenkoff
Director
Strategic Issues

List of Requesters

The Honorable Thomas R. Carper
Chairman

The Honorable Tom Coburn, M.D.
Ranking Member

The Honorable Kelly Ayotte
Member

Committee on Homeland Security and Governmental Affairs
United States Senate

The Honorable Darrell Issa
Chairman

The Honorable Elijah E. Cummings
Ranking Member

Committee on Oversight and Government Reform
House of Representatives

Appendix I: Objectives, Scope, and Methodology

This report reviewed (1) the extent to which the Bureau is considering non-Bureau sources of data to meet its key address and mapping needs for the 2020 Census, and (2) the status of the Bureau's plans for meeting those needs, paying particular attention to leading practices for project management.

To categorize Bureau-identified address and mapping needs, we obtained Bureau documentation of such needs. Because address and mapping needs vary in their definition and level of specificity according to their different use or purpose, they may be dynamic until the Bureau makes sourcing decisions to meet them and some needs were not yet fully identified during the time of our review. To address this issue, the Bureau provided revised lists of key address and mapping needs during the course of our review. For this report, we include key address and mapping needs identified as of June 2014.

To review the Bureau's approaches for developing its address and mapping needs for 2020 Census operations and preparing it for data sourcing decisions, we compared the Bureau's organizational documents for its approaches—such as strategic, program management, and operational plans—to elements of project planning we identified from industry guides for project management and business process reengineering,¹ as well as other leading management practices we identified in our prior work on establishing a coherent agency mission and

¹The guides include the latest editions of the following publications: Project Management Institute, *A Guide to the Project Management Body of Knowledge, 5th Edition* (2013); Carnegie Mellon Software Engineering Institute, *Capability, Maturity Model Integration Project Planning Guide* (November 2010); Information Technology Resource Board, *Project Management for Mission Critical Systems, a Handbook for Government Executives*, (Apr. 5, 2001); and GAO, *Business Process Reengineering Assessment Guide*, [GAO/AIMD-10.1.15](#) (Washington, D.C.: May 1997).

integrated strategic goals,² and on adopting leading practices for results-oriented strategic planning and reporting.³

To identify data sources the Bureau considered for meeting key address and mapping needs, we reviewed documents provided by the Bureau for specific data sources used to obtain data for addresses, coordinates of residential structures, and other map features, and specific data sources used to perform change detection related to identifying new roads and structures for updating the MAF/TIGER database. We did not seek to identify an exhaustive list of data sources; rather, we identified those readily attributable to documents (1) that the Bureau created to analyze potential data sources or to explain its consideration of such sources, or (2) that the Bureau solicited from commercial vendors and other sources, even if such documents were more promotional than informative related to the Bureau's needs. We did not consider unsolicited documents sent to the Bureau from commercial vendors proposing the use or adoption of particular address or mapping data sources or solutions.

To review the extent to which the Bureau supported its decisions to use data sources to meet its key address and mapping needs, we obtained a Bureau-provided list of data sources it selected, and documentary and testimonial evidence the Bureau identified as justifying its decision for each source. We also reviewed our prior work on internal controls⁴ and Office of Management and Budget guidance on geospatial data,⁵ and

²GAO, *Highlights of a GAO Forum: Mergers and Transformation: Lessons Learned for a Department of Homeland Security and Other Federal Agencies*, [GAO-03-293SP](#) (Washington, D.C.: Nov. 14, 2002).

³See GAO, *Results-Oriented Cultures: Implementation Steps to Assist Mergers and Organizational Transformations*, [GAO-03-669](#) (Washington, D.C.: July 2, 2003). See also GAO, *Agency Performance Plans: Examples of Practices That Can Improve Usefulness to Decisionmakers*, [GAO/GGD/AIMD-99-69](#) (Washington, D.C.: Feb. 26, 1999); *Agencies' Annual Performance Plans Under the Results Act: An Assessment Guide to Facilitate Congressional Decisionmaking*, [GAO/GGD/AIMD-10.1.18](#) (Washington, D.C.: Feb. 1, 1998); *Agencies' Strategic Plans Under GPRA: Key Questions to Facilitate Congressional Review*, [GAO/GGD-10.1.16](#) (Washington D.C.: May 1, 1997); and *Executive Guide: Effectively Implementing the Government Performance and Results Act*, [GAO/GGD-96-118](#) (Washington, D.C.: June 1, 1996).

⁴GAO, *Internal Control Management and Evaluation Tool*, [GAO-01-1008G](#) (Washington, D.C.: Aug. 1, 2001); and *Standards for Internal Control in the Federal Government*, [GAO/AIMD-00-21.3.1](#) (Washington, D.C.: Nov. 1, 1999).

⁵Office of Management and Budget, *Stages of the Geospatial Data Lifecycle pursuant to OMB Circular A-16 (draft)* (Washington, D.C.: Mar. 31, 2010).

determined the Bureau should be supporting its significant data source decisions—such as for its address and mapping needs—in terms of cost, quality, and clear management approval of decisions.

For both objectives, we interviewed Bureau officials in the Geography Division, 2020 Research and Planning Office, and Decennial Systems and Contracts Management Office to discuss planning and decision-making efforts for meeting key address and mapping needs for 2020 Census operations.

We conducted this performance audit from February 2014 to September 2014 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

Appendix II: Comments from the Department of Commerce



THE DEPUTY SECRETARY OF COMMERCE
Washington, D.C. 20230

September 23, 2014

Mr. Robert Goldenkoff
Director, Strategic Issues
U.S. Government Accountability Office
441 G Street NW
Washington, DC 20548

Dear Mr. Goldenkoff:

The Department of Commerce appreciates the opportunity to comment on the U.S. Government Accountability Office's draft report titled "*2020 Census: Census Bureau Can Improve Use of Leading Practices When Choosing Address and Mapping Sources*" (GAO-15-21). Enclosed are the Department's comments on this report.

Sincerely,

A handwritten signature in black ink, appearing to read "B H Andrews", with a long horizontal flourish extending to the right.

Bruce H. Andrews
Deputy Secretary of Commerce

Enclosure

**Appendix II: Comments from the
Department of Commerce**

U.S. Department of Commerce
Comments on the
U.S. Government Accountability Office
Draft Report titled *2020 Census: Census Bureau Can Improve Use of Leading Practices When
Choosing Address and Mapping Sources*
(GAO-15-21)
September 2014

The U.S. Census Bureau and U.S. Department of Commerce reviewed this draft report. We have no substantive disagreements with any of the findings or recommendations, but have separately provided the U.S. Government Accountability Office with a few non-substantive editorial comments and suggested clarifications.

Appendix III: GAO Contact and Staff Acknowledgments

GAO Contact

Robert Goldenkoff, (202) 512-2757 or goldenkoffr@gao.gov

Staff Acknowledgments

Key contributors to this report include Ty Mitchell, Assistant Director; Tom Beall; Rob Gebhart; Andrea Levine; Mark Ryan; and Timothy Wexler.

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