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**Alternative methods for counting of population, in particular hard-to-count population groups****Reengineering Address Canvassing for the 2020 Census of the United States****Note by the United States Census Bureau<sup>1</sup>***Summary*

The purpose of the 2020 Census is to conduct a census of population and housing and disseminate the results to the President, the states, and the American people. The goal of the 2020 Census is to count everyone once, only once, and in the right place, and the challenge is to do this at a lower cost per household than the 2010 Census, while maintaining high quality results. The 2020 Census includes sweeping design changes in four key innovation areas, including new methodologies to conduct address canvassing, innovative ways of optimizing self-response, the use of administrative records and third-party data to reduce the nonresponse follow-up workload, and the use of technology to replace tasks traditionally conducted by humans.

This paper provides an overview of the U.S. Census Bureau's current plans for Reengineering Address Canvassing. Specifically, plans to reduce the nationwide in-field address canvassing of the past, by developing innovative methodologies for updating and maintaining the Census Bureau's address list and spatial database throughout the decade.

In 2009, in preparation for the 2010 Census, the Census Bureau conducted a nationwide in-field address canvassing effort. The agency hired approximately 150,000 employees – called canvassers - to walk or drive nearly every road in the United States and Puerto Rico, comparing addresses observed on the ground to addresses on the Census Bureau's address list. This decade, most of that work will occur in the office, as part of an operation called In-Office Address Canvassing.

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## I. Overview of the 2020 Census of the United States

1. The purpose of the 2020 Census is to conduct a census of population and housing and disseminate the results to the President, the states, and the American people. The goal of the 2020 Census is to count everyone once, only once, and in the right place, and the challenge is to do this at a lower cost per household than the 2010 Census, while maintaining high quality results.
2. The 2020 Census includes sweeping design changes in four key innovation areas, including new methodologies to conduct address canvassing, innovative ways of optimizing self-response, the use of administrative records and third-party data to reduce the nonresponse follow-up workload, and the use of technology to replace tasks traditionally conducted by humans. Said otherwise, the goal is to achieve dramatic cost avoidance by: adding new addresses to the Census Bureau's address frame using geographic information systems and aerial imagery instead of sending census employees to walk and physically check 11 million census blocks; encouraging the population to respond to the 2020 Census using the Internet; using data the public has already provided to the government to enumerate the most difficult to reach households; and using a sophisticated operational control system to send census employees to follow up with non-responding housing units and to track daily progress..
3. The Census Bureau estimates that conducting a 2020 Census that includes these major cost-saving innovations has the potential to avoid up to \$5.2 billion as compared with the cost of repeating the 2010 design in the 2020 Census.

Figure 1

### The Four Key Innovation Areas



4. This paper focuses on the major innovations in census methodology and technology for establishing where to count the population for the 2020 Census. This innovation area is Reengineering Address Canvassing. First, however, it is important to share the history of address list and map development and maintenance at the U.S. Census Bureau.

## II. History

5. From the first U.S. census in 1790 until 1960, census enumerators traveled from house to house while collecting housing and population information on census schedules<sup>2</sup>. For the first time, in 1960, the Census Bureau mailed out questionnaires to some addresses (those in urban areas) by having the U.S. Postal Service deliver forms to each address in these areas. Householders were asked to complete the questionnaire and hold it for an

<sup>2</sup> U.S. Census Bureau. 1940 Decennial Census population and housing questionnaires [Internet]. Available from: [https://www.census.gov/history/pdf/1940\\_population\\_questionnaire.pdf](https://www.census.gov/history/pdf/1940_population_questionnaire.pdf) and [https://www.census.gov/history/pdf/1940\\_housing\\_questionnaire.pdf](https://www.census.gov/history/pdf/1940_housing_questionnaire.pdf).

enumerator to collect. Enumerators compiled the address list during these visits. They also enumerated any addresses they found that had not received a form from the U.S. Postal Service.

6. In 1970, the Census Bureau expanded the use of mailout to about 60 percent of the population and employed a mailback strategy (rather than having enumerators pick up the completed forms). This required development of an address list before the census to use in labeling questionnaires and for controlling the fieldwork for visiting those households that did not respond by mail. For most urban areas, the Census Bureau built this address list by purchasing commercial address lists, followed by a U.S. Postal Service review, and then by an operation called Precanvass where enumerators walked each of these blocks to check the list for completeness. For more rural areas, enumerators canvassed each block and compiled the address list from scratch (Prelist). A similar process was used to construct the address list for the 1980 and 1990 Censuses.

7. In preparation for the 2000 Census, the Census Bureau started with the final 1990 Census address list rather than purchasing a commercial list<sup>3</sup>. “In its earliest state, the MAF (Master Address File) was an amalgamation of the 1990 Census Address Control File and the United States Postal Service’s (USPS) Delivery Sequence File (DSF). Census 2000 was the first major effort undertaken to update and, in a sense, validate the MAF.”<sup>4</sup> The Census Bureau used the DSF as a primary source to enhance the initial MAF, and subsequent DSF releases were used to update the address list through April of 2000. The Census Bureau also conducted Block Canvassing to update the list in more urban areas. A separate operation — Address Listing — was used to verify and, as needed build the address list from scratch, in more rural areas.

8. Between 2000 and 2010, the Census Bureau continued to maintain its MAF, with primary updates coming from DSF deliveries over time. With this approach, the Census Bureau was able to conduct a single operation (Address Canvassing) nationwide in 2009 to update the MAF ahead of questionnaire delivery. It is important to note that in 2009, in preparation for the 2010 Census, the Census Bureau conducted a nationwide in-field address canvassing effort. The agency hired approximately 150,000 employees – called canvassers - to walk or drive nearly every road in the United States and Puerto Rico, comparing addresses observed on the ground to addresses on the Census Bureau’s address list.

9. Canvassers validated existing addresses, added new addresses, deleted addresses that could not be found on the ground, and made other corrections to the list. The operation was one of the most labor intensive and expensive operations of the 2010 Census. But, it collected valuable address information, including latitude and longitude points for most housing units, creating a valuable baseline dataset for research and planning for the 2020 Census.

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<sup>3</sup> Trainor T. The MAF/TIGER enhancement program: the mechanics and maintenance of a large-scale national spatial database. Presented to the International Cartographic Association, 2005.

<sup>4</sup> U.S. Census Bureau. Testimony of Director Robert M. Groves concerning 2010 Census: master address file, issues and concerns [Internet]. Before the Subcommittee on Information Policy, Census, and National Archives; Committee on Oversight and Government Reform; United States House of Representatives. October 21, 2009. Available from: [https://www.census.gov/newsroom/releases/pdf/Groves\\_House\\_Testimony\\_10-21\\_Final.pdf](https://www.census.gov/newsroom/releases/pdf/Groves_House_Testimony_10-21_Final.pdf).

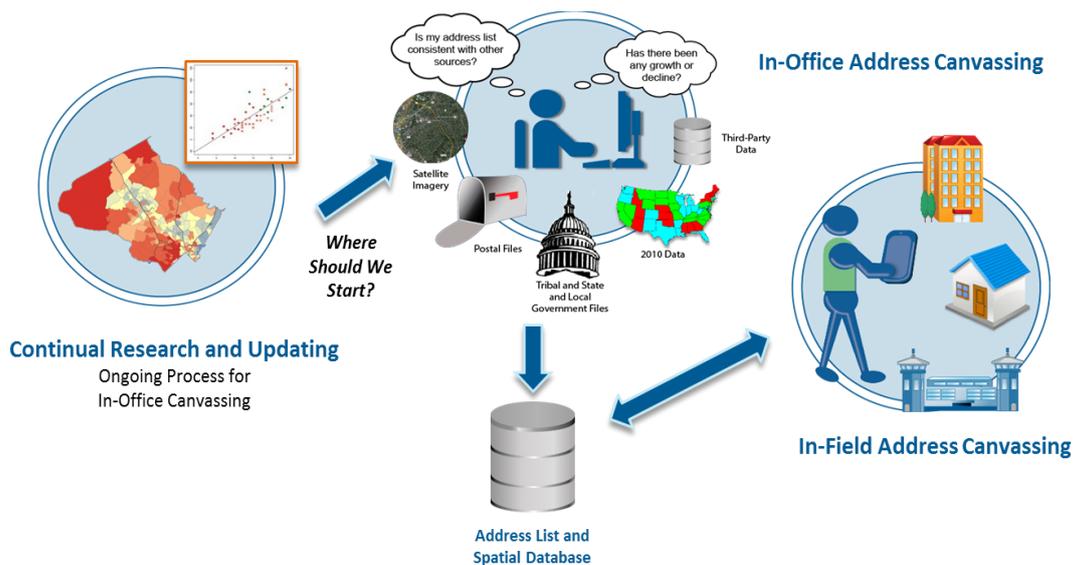
### III. Reengineering Address Canvassing for the 2020 Census

10. As the Census Bureau prepares for the 2020 Census, the goal of Reengineering Address Canvassing is to reduce the nationwide in-field address canvassing of the past, by developing innovative methodologies for updating and maintaining the Census Bureau's address list and spatial database throughout the decade.

11. For 2020, the Census Bureau will still be canvassing the entire nation, but will be doing it differently. Efforts to reengineer address canvassing consist of three large components, as shown in Figure 2.

Figure 2

#### Reengineering Address Canvassing



12. First, the Census Bureau will conduct a one-hundred percent canvass of the entire nation's addresses in the office during In-Office Address Canvassing. To ensure an accurate address list, the agency will continually update the address list and maps based on data from multiple sources, including the U.S. Postal Service, tribal, state, and local governments, aerial imagery, and third-party data providers.

13. Second, the Census Bureau will conduct an in-field canvass of areas that require a field work component during In-Field Address Canvassing. A good example of where In-Field Address Canvassing will occur is in an urban area that may have multi-unit structures, making it difficult to determine how many housing units are within each building. Another example includes rural areas where it may be hard to differentiate between housing units versus outbuildings (e.g., barns and toolsheds). Based on recent research and testing, the Census Bureau estimates that In-Field Address Canvassing will occur for 25 percent of the addresses in the nation.

14. Third, the Census Bureau will conduct an on-going Master Address File Coverage Study. This will include in-field canvassing of 20,000 census blocks per year to assess the accuracy of the Master Address File and validate in-office techniques.

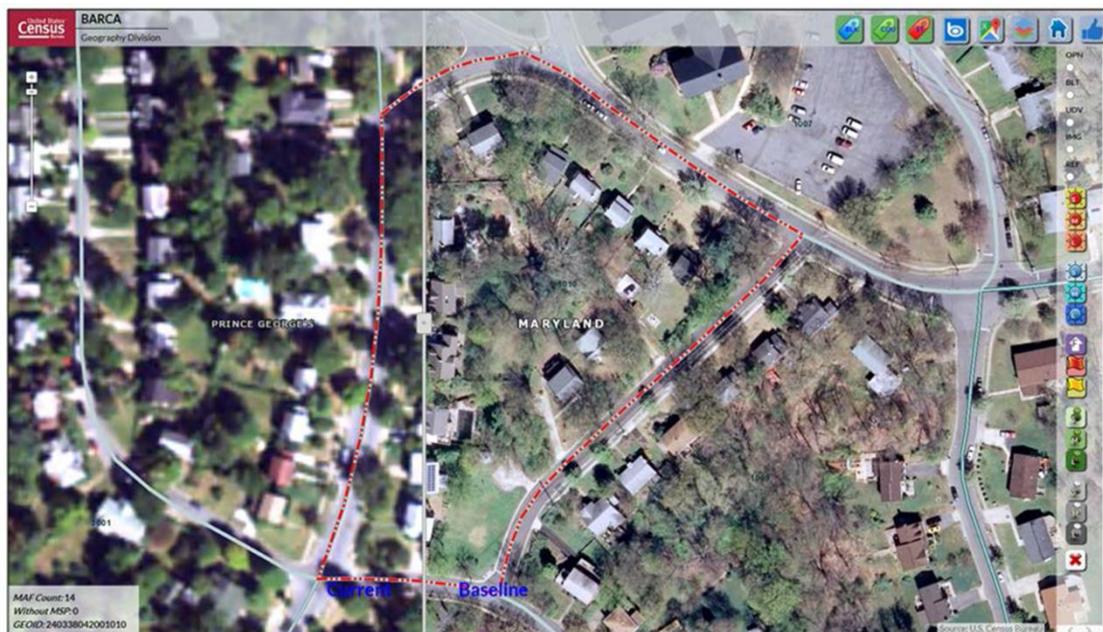
## IV. Implementation

15. The Census Bureau began In-Office Address Canvassing in September 2015 as the first official 2020 Census operation. Again, this is an in-office review of one-hundred percent of the nation's addresses. Using a combination of aerial imagery, and administrative and programmatic data, Census Bureau analysts can identify where change is occurring in the address base on the ground.

16. In-Office Address Canvassing has two stages, Interactive Review and Active Block Resolution. Both use internally developed software, called the Block Assessment, Research, and Classification Application (BARCA), to help detect change. As illustrated in Figure 3, the BARCA displays information to assist analysts in identifying and classifying residential change. The information includes aerial imagery, address counts for each census block, points representing addresses, roads, parcel boundary layers (where available), and a variety of tools and flags to record work.

Figure 3

### The Block Assessment, Research, and Classification (BARCA) Application



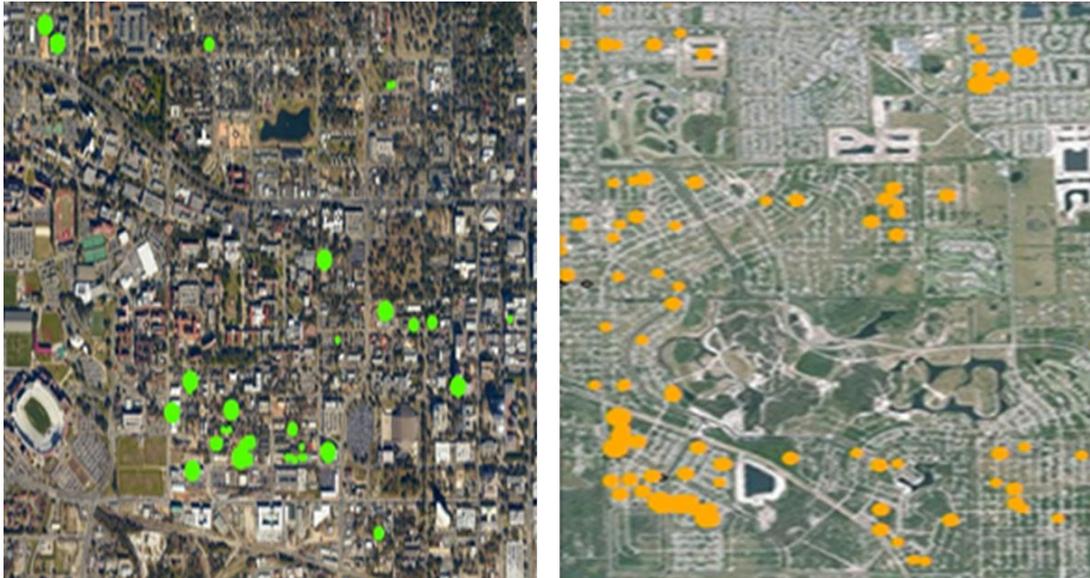
17. During Interactive Review, Census Bureau analysts compare imagery from two different points in time (at the time of the last census compared to now) to determine if there is stability or change on the landscape. At the census block level, analysts work to:

- Determine possible growth and/or decline of housing units;
- Identify possible future growth – where housing might be built;
- Identify missing or misaligned roads or boundaries;
- Determine if the census block has under-coverage or over-coverage of housing units; and
- Determine block status (is the block already fully developed, undevelopable, or open for future development).

18. This review takes approximately 90 seconds for each census block. An initial review of approximately 3 million census blocks has identified 71 percent of the blocks as stable, 19 percent as requiring further research, and 10 percent as needing updated aerial imagery or administrative data. The 19 percent of blocks classified as requiring further research are flagged with colorful pins that indicate whether there appears to be under-coverage or over-coverage of addresses in the Census Bureau's address list (see Figure 4). Those blocks move on to the second stage, Active Block Resolution.

Figure 4

**Flags Depicting Over-Coverage and Under-Coverage of Housing Units**



19. During Active Block Resolution, Census Bureau analysts use additional tools, such as administrative data from the United States Postal Service, tribal, state or local partners, or third-party data providers, to research addresses and correct the Census Bureau's address list wherever possible. This stage of In-Office Address Canvassing is more time intensive because of the additional research and time it takes to update the database. If the analyst cannot determine how to best update the database, the census block will be directed to In-Field Address Canvassing.

## V. Reengineering Address Canvassing for the 2020 Census: A New Design for the 21st Century

20. New methodologies for Address Canvassing have moved the Census Bureau into the 21st Century. Figure 5 illustrates why building a strong geographic foundation is so important to the success of the 2020 Census. The Census Bureau must:

- (a) Establish where to count – identify all the addresses where people could live;
- (b) Motivate people to respond – use the address list to send mailed materials that invite and encourage households to respond;
- (c) Count the population – use the address list and maps to send our enumerators to collect interview data from nonresponding households; and
- (d) Release census results – use the address list and geographic boundaries to process, tabulate, and disseminate census data.

21. It is legally mandated that the Census Bureau deliver apportionment counts to the President by December 31, 2020 and redistricting data to the States by April 1, 2021. It is critical that the Census Bureau deliver high quality data to the public. The innovations in census methodology and technology as related to Reengineering Address Canvassing are building a strong geographic foundation to ensure this successfully occurs for the 2020 Census.

Figure 5  
**The 2020 Census: A New Design for the 21<sup>st</sup> Century**

