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2010 CENSUS PLANNING MEMORANDA SERIES

No. 184

MEMORANDUM FOR The Distribution List

From: Arnold Jackson *[signed]*
Acting Chief, Decennial Management Division

Subject: 2010 Census Address Canvassing Quality Profile

Attached is the 2010 Census Address Canvassing Quality Profile. The Quality Process for the 2010 Census Test Evaluations, Experiments, and Assessments was applied to the methodology development and review process. The report is sound and appropriate for completeness and accuracy.

If you have questions about this report, please contact RJ Marquette at (301) 763-2987.

Attachment

2010 Census
Address Canvassing Quality Profile

U.S. Census Bureau standards and quality process procedures were applied throughout the creation of this report.

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Executive Summary

This report provides the results of the 2010 Census Address Canvassing Quality Control Program which was conducted in the United States and Puerto Rico. The initial census address list was updated by the Address Canvassing Operation to ensure completeness and accuracy. Census questionnaires were mailed or delivered by the U.S. Census Bureau to these updated addresses after Address Canvassing.

The software and hardware developed for the 2008 Census Dress Rehearsal was utilized for the 2010 Census, although changes (some major) were made to the software functionality after the 2008 Census Dress Rehearsal. The Address Canvassing software allowed production listers to update, verify, add, or delete address information, as well as capture map spots and Global Positioning System coordinates for all structures. It also allowed for Quality Control listers to conduct a Dependent Quality Control check of the production listers' work and to perform Delete Verification activities.

The goal of the Address Canvassing Quality Control Program has always been to confirm that production listers correctly verify and update the address list and census maps. This goal was accomplished in the 2010 Census through the following Quality Control activities:

- Initial Observation
- Dependent Quality Control Check
- Map Feature Quality Check
- Delete Verification and Final Delete Verification

Address Canvassing Quality Control Program Procedures

An **Initial Observation** was performed to ensure the accuracy of the work completed by production and Quality Control listers. The Crew Leader or Crew Leader Assistant accompanied a lister or Quality Control lister to confirm that he or she understood the Address Canvassing procedures or Address Canvassing Quality Control procedures in his or her first Assignment Areas. If there were problems with the Initial Observation, the Crew Leader or Crew Leader Assistant was able to provide on-the-job training immediately. The form D-1222(AC), or the *Observation Checklist*, documented this activity.

A **Dependent Quality Control check** was completed by a separate Quality Control staff. For each Assignment Area, the hand-held computer software selected a random address record as the starting point for the quality control check. The Quality Control lister performed the quality check on the production lister's completed work by verifying the randomly selected "starting" address plus a sample string of addresses beyond the starting address in that Assignment Area. Due to budgetary constraints, only three percent of the addresses in Address Canvassing were checked during the Dependent Quality Control check (instead of the original plan for five percent). If an Assignment Area failed the Dependent Quality Control check, a Quality Control Recanvass was conducted for the entire Assignment Area to identify and correct all errors in the Assignment Area.

Quality Control listers conducted the **Map Feature Quality Check** during the Dependent Quality Control to review the quality of the census maps. Only a single map feature update was

evaluated to check for added or deleted streets in an Assignment Area. Spatial accuracy of features was not verified in the Quality Control process.

Delete Verification was performed by the Quality Control lister to confirm or reject addresses deleted or marked as a duplicate by the production lister. A different Quality Control lister performed a **Final Delete Verification,** using procedures similar to the Delete Verification operation, for any deletes or duplicates introduced by the Quality Control lister.

Address Canvassing Quality Control Results (Hand-Held Computer)

The majority of the observed production listers and the Quality Control listers (88.30 percent and 81.47 percent, respectively) passed the Initial Observation. However, since the observations were completed on paper forms, we only received 99,284 usable observation forms (11,847 forms were removed due to various errors). Of the 99,284 forms, we received 77,466 forms (76.13 percent of production listers completing at least one Assignment Area) for production listers and 21,818 forms (66.37 percent of Quality Control listers completing at least one Assignment Area) for Quality Control listers. The Crew Leaders recorded failure to list ground to hand-held computer as the most common error during the observations. The listers should have looked for units on the ground and then updated the address information in the hand-held computer based on the ground truth, not the other way.

There were 159,494,710 address records in the final Address Canvassing universe. This included 141,822,612 addresses that were originally sent out to the hand-held computers, plus another 17,672,098 that were added by the production listers and Quality Control listers during the operation. Approximately three percent of the address records were included in Dependent Quality Control. Of all the 733,636 Assignment Areas in Address Canvassing, 8.43 percent failed the Dependent Quality Control check. This resulted in 13,365,216 address records designated for recanvassing.

The production listers marked 25,444,238 address records as delete or duplicate addresses. The Quality Control lister was supposed to check every delete or duplicate address record in Delete Verification. However, there were 1,114 (less than 0.01 percent) delete or duplicate address records that did not have a Quality Control lister action code, indicating they did not go through Delete Verification. During Delete Verification, the Quality Control lister agreed with the production lister the majority (94.75 percent) of the time.

A total of 783,125 address records were flagged as Final Delete Verification cases. Of those, 565 (0.07 percent) of the address records should not have been flagged as Final Delete Verification cases. That is, either the production lister marked them as a delete or duplicate, and the Quality Control lister took action on them during Delete Verification, or the address records were not marked as a delete or duplicate at all. Conversely, there were eight (less than 0.01 percent) address records that should have been flagged for Final Delete Verification, but were not, possibly due to a bug in the software. During Final Delete Verification, the Quality Control listers agreed 90.53 percent of the time.

Large Block Results

Due to technical limitations with the hand-held computer used for Address Canvassing, blocks over a certain size (initially set to 1,000 units but later increased to 2,000 units) were sent to a special "large block" listing operation. The Large Block Operation used software on laptop computers to complete the listing. Note, the laptop software was designed to work only with tabulation blocks (as opposed to the collection blocks Address Canvassing used), so the large blocks sent to the special operation were converted to tabulation blocks, making the results between Address Canvassing and the Large Block Operation difficult to compare.

The Quality Control listers examined 2,061,979 addresses (which includes Dependent Quality Control, Delete Verification, and Recanvass) of the 3,994,548 addresses listed during the Large Block Operation. Due to data limitations, we were unable to establish how many addresses were only checked during the Dependent Quality Control check. All 12,829 tabulation blocks listed during the Large Block Operation were checked.

A total of 923,512 addresses (98.43 percent) of the 938,286 addresses marked for deletion were checked during the Large Block Operation. The Quality Control listers confirmed the deletion of 895,008 (95.39 percent) units.

Recommendations to consider

- **Automate the Initial Observations on the hand-held computers or on laptops to ensure all forms are captured and to minimize data problems and eliminate duplicate forms, incomplete forms, and incorrect forms.**

- **Improve training to emphasize proper procedures; in particular, canvassing from ground to the hand-held computer. This was the most frequently reported problem on the Initial Observation reports in both the 2008 Census Dress Rehearsal and 2010 Census Address Canvassing operations.**

- **Consider updates to the Quality Control Program, such as:**

    - **Reviewing improved sampling methods for the Dependent Quality Control check to ensure accurate representation of units within each Assignment Area.**

    - **Conducting independent Quality Control options where the Quality Control lister is not given the production lister's results in advance and only lists addresses he or she encounters in the field, to reduce the influence of the production lister's work on the Quality Control lister's work. This would require an adjudication process within the Quality Control Program.**

- **Establish software and hardware testing procedures during the design phase. Perform robust software testing to ensure the requirements are met and to prevent unforeseen changes to the Address Canvassing Operation (such as the technical limitation to work "large blocks" using the hand-held computer).**

Recommendations suggested during headquarters field observations:

- **Improve staff training by providing more oversight from the Crew Leaders on practice blocks and feedback between listers and Crew Leaders.**

- **Research methods to make training more interactive by utilizing the hand-held computer.**

1 Introduction

1.1 *Scope*

The purpose of the 2010 Address Canvassing (AC) Quality Profile is to provide the results of the 2010 AC Quality Control (QC) program, as well as recommendations for future census operations.

1.2 *Intended Audience*

The intended audience of this report includes program managers and staff responsible for planning the 2020 Census and mid-decade tests.

2 Background

The decennial census is vital for our nation's political and economic decisions and determines how federal and state funding is to be distributed among local communities. Census data are critical for planning the allocation of federal funds of more than $400 billion annually. Governments and industries use information from the data for services, infrastructure, emergency preparedness, disaster recovery decisions, and much more.

The 2010 Census was conducted throughout the United States and Puerto Rico[1]. The questionnaire consisted of ten questions requiring about ten minutes to complete. The 2010 Census involved many operations and began with the AC Operation. AC was the second largest operation of the 2010 Census behind Nonresponse Followup.

2.1 *Address Canvassing Operation*

The AC Operation was implemented to improve the completeness and accuracy of the initial census address list. The U.S. Census Bureau then used the updated addresses resulting from AC to mail or deliver census questionnaires. To conduct AC, the AC universe was split into collection blocks, which were then grouped into Assignment Areas (AAs) for operational convenience. The AAs were intended to contain about three days worth of work, but that goal was not always achieved due to large subdivisions or apartment buildings.

The 2006 Census Test used listing and mapping software built in-house on hand-held computers (HHCs). The Address List Development Operations Implementation Team (ALD OIT) planned and implemented the address canvassing operation in the 2008 Census Dress Rehearsal. For the 2008 Census Dress Rehearsal, we again used HHCs, but replaced the in-house solution with entirely new software and hardware created as part of the Field Data Collection Automation (FDCA) contract by the Harris Corporation.

Due to many issues during the 2008 Census Dress Rehearsal and after Harris Corporation had time to revise the software, the Census Bureau conducted an Operational Field Test (OFT) of the

[1] The Decennial Census is also conducted in the Island Areas consisting of Guam, American Samoa, the Commonwealth of the Northern Mariana Islands, and the United States Virgin Islands. The Island Areas are not part of the American Community Survey and do not complete the stateside U. S. Census 2010 Form (Form D-61). Address Canvassing is not conducted in the Island Areas.

HHCs in December 2008. The purpose of the OFT was to ensure end users were satisfied with the usability, workability, and performance of the Operations Control System (OCS) and the HHC hardware and software. The results of that test indicated that only minor changes were required before fielding the HHCs in the 2010 Census AC Operation. The operation was scheduled to run from April 6, 2009 until July 17, 2009. The AC Operation of the 2008 Census Dress Rehearsal and the 2008 OFT were invaluable tests for conducting a successful 2010 Census AC.

The HHCs offered several advantages over paper listing operations, such as the collection of Global Positioning System (GPS) coordinates for living quarters (LQs). In addition, the automated data collection eliminated the need to ship binders of address lists and the keying of those binders, saving time and money. For an example from a paper operation, a completed listing binder has to be given to the Crew Leader (CL), then to the Local Census Office (LCO), who then gives it to a Quality Control (QC) CL, who then finally gives it to a QC lister. This process can easily introduce several days of lag. With the HHCs, when the lister finished an AA, both the CL and LCO would see it completed usually within minutes, and it could be on the QC CL and QC lister's HHCs within hours.

However, the HHC was not perfect. In particular, during testing, we found that blocks with a large number of housing units caused the HHC's performance to slow to unacceptable speeds. To alleviate this issue, we began sending the affected blocks to the Demographic Area Address Listing (DAAL) operation, which relies on the Automated Listing and Mapping Instrument (ALMI) running on laptop computers. Initially, blocks with more than 1,000 housing units were sent to DAAL, but after Harris implemented various software improvements in the HHC, we were able to increase this minimum to 2,000 units. This component of the AC Operation became known as the "Large Block" Operation. The Large Block Operation was tested successfully during the OFT described above.

2.2 *Quality Control Program*

The objective of the AC QC program was to ensure that the production listers correctly verified and updated the address list and census maps. This objective was accomplished during the 2010 Census through the following QC activities:

- Initial Observation
- Map Feature Quality Check (MFQC)
- Dependent Quality Control (DQC) Check
- Delete Verification (DV) and Final Delete Verification (FDV)

These QC activities were carried out by a staff separate from those doing the production work. A QC field check was required to be done on every AA.

2.2.1 Initial Observation

The purpose of the Initial Observation was to ensure that the lister (both production and QC) had a general understanding of the AC or AC QC procedures. To maximize the effectiveness of the Initial Observation, the CLs or Crew Leader Assistants (CLAs) conducted this observation while listers were working in their first AAs.

The Initial Observation occurred early in the AC Operation and allowed the CL or CLA to become aware of any problems listers were having before they were too far along in their work. The listers' ability to comprehend and apply training concepts in a real-life field setting was demonstrated in the Initial Observation stage.

The Initial Observation involved a CL or CLA accompanying each lister while he or she canvassed his or her first AA. A CL or CLA reviewed procedures with the lister during the observation for tasks performed incorrectly or tasks the CL or CLA was unable to observe.

The *Observation Checklist, Form D-1222 (AC)* (See Attachments A1 and A2*)* was used by the CL or CLA to facilitate this review. This form provided a reminder to the observer of common critical mistakes, and it served as documentation for administrative purposes.

2*.2.1a Control Information for the Observation Checklist*

The CL or CLA filled in the following information at the top of the *Observation Checklist:*

Lister Name
Lister Applicant Identification Number (ID)
Type of Observation (Production or QC)
Observer Name
Date of Observation
Number of Listings Observed
CL District number
LCO Number

2*.2.1b Performing the Observation*

A. At the beginning of a lister's first assignment (the first AA canvassed), the CL or CLA observed the lister verify/update address and map information for at least 10 consecutive addresses on the ground or for two hours, whichever occurred first. The CL or CLA also observed the lister contact a respondent (if possible).

   - If the lister was unable to complete a check of 10 addresses within two hours, the CL or CLA was instructed to evaluate the lister's performance on the addresses completed in the two hours.
   - Before beginning the observation, we encouraged the CL or CLA to review the *Observation Checklist* with the lister as a reminder of the steps involved.

B. The CL or CLA recorded the results of the observation in Sections A and B of the *Observation Checklist*. All listers were observed on the tasks given in Section A and QC listers were also observed on the tasks in Section B.

C. The CL or CLA entered a check mark in the appropriate column under "1st Observation." He or she:

- entered a check under "Y" if the lister performed the task correctly during the observation,
- entered a check under "N" if the lister performed the task incorrectly during the observation (the CL or CLA should have discussed the proper procedure with the lister before observing the next address), or
- entered a check under "N/A" if the task was not observed during the observation. To ensure the lister understands the procedure for unobserved tasks, the CL or CLA should have discussed the proper procedure with the lister.

D. The CL or CLA entered notes he or she felt were relevant to his or her observation of the lister, being as specific as possible. Notes were required for any task not performed correctly, indicating the problem(s) and how the CL or CLA attempted to resolve it.

2.2.1c Outcome of Observation

A. At the end of the observation, the CL or CLA evaluated the lister's ability to do the job by marking (X) in one of the three options in Section C of the *Observation Checklist*. The CL or CLA marked one of the following:

Satisfactory: By the end of observation, lister understood and followed procedures.

Unsatisfactory: By the end of observation, lister did NOT understand and/or follow procedures.

Other: For example, the employee resigned before the observation could take place.

B. The CL or CLA should not have entered an 'Unsatisfactory' result on the Observation Checklist until he or she had discussed the situation with his or her supervisor. The CL or CLA should have marked (X) 'Unsatisfactory' only if his or her supervisor instructed him or her to fail the lister.

C. If the supervisor instructed the CL or CLA to conduct a second observation, the CL or CLA did not enter a result for the first observation. The CL or CLA scheduled a second observation as soon as possible after the first observation. Using the same copy of the checklist the CL or CLA used for the first observation, he or she:

- Entered the date of the second observation
- Entered tally marks in Columns "Y," "N," and "N/A" under '2nd Observation'

D. Once the CL or CLA completed the second observation, he or she marked either 'Satisfactory,' 'Unsatisfactory' (only if instructed to do so by his or her supervisor), or 'Other' to indicate the outcome of the second observation.

E. Only one checklist was to be completed for each lister. A second observation was to be recorded on the same checklist used for that lister's first observation. The CL or CLA should have recorded one overall observation result. If the CL or CLA was conducting a second observation, he or she was to wait until it was completed before entering a result in Section C.

F. The CL or CLA completed the *Observation Checklist* per his or her supervisor's instructions. The CL or CLA returned the *Observation Checklist(s)* to the office as soon as he or she had completed the observation(s). All *Observation Checklists* were required to be returned to the office within 10 days of the lister's first assignment.

2.2.2 Map Features Update Quality Control

Production listers performed two equally important jobs: they updated the address list and they updated census maps. The map updates did not go through a formal QC. However, if the production lister added or deleted one or more features (streets), the QC lister would randomly check one update as described in section 2.2.2a, called the Map Feature QC (MFQC). The single map feature update QC was performed concurrently with the QC checks that were a part of the DQC. Verification of spatial accuracy was not included, only verification that the added/deleted feature existed or not.

The HHC randomly selected an added or deleted map feature in the AA for the QC lister to verify. The HHC software selected a starting point for DQC in the same block as the selected feature. The MFQC was skipped entirely by the HHC if there were no added or deleted map features in the AA, and, in that case, the DQC random start point was chosen from a randomly selected block in the AA.

2.2.2a Conducting the Map Feature Update Quality Control

The QC lister invoked the software on the HHC to find out where to begin the MFQC. The QC lister traveled to the location of the added or deleted feature to conduct the QC of map feature updates.

Upon arrival at the location where the feature was added or deleted, the QC lister commenced the QC process. A pop-up on the HHC screen inquired whether or not the street feature was added or deleted correctly.

If the QC lister verified the added street, he or she should have selected "yes," indicating that the street was added correctly. If the QC lister verified that the street was appropriately deleted, he or she should have selected "yes," indicating that the street was deleted correctly. Conversely, the QC lister should have chosen "no" if he or she could not verify the added street or did not believe the street should have been deleted. If the QC lister chose "no," these were tally errors only and did not count against the lister when the DQC pass/fail decision was made.

2.*2.2b Special Situations*

If there were no added/deleted map features in an AA, the software skipped the MFQC and selected a random DQC start in a random block within the AA.

The software selected the DQC random start in a different block if there were not any address records in the block containing the randomly selected added/deleted map feature.

If the randomly selected added/deleted map feature was a block boundary, the software selected one of the two involved blocks at random, then selected the DQC random start address within that same block.

If the AA did not contain LQs (or only deleted LQs), but it did contain a map feature update, the MFQC was performed. The software then began the DQC in the same block as the selected map feature. For more information on this scenario, see Section 2.2.3d.

2.*2.3 Dependent Quality Control Check*

The DQC was designed to detect significant errors and provide an evaluation of each work assignment. Every AA was checked in the DQC. The QC lister's task during the DQC was to compare what they found on the ground to what was on the address list.

For each AA a QC lister was assigned, they checked a sample of addresses beginning with the address randomly selected by the software. The QC lister would begin with the randomly selected address and work from the ground to the address list, ensuring what they found on the ground was reflected on the address list. The sample size was based on the number of addresses in the AA, and the software notified the QC lister when enough addresses had been checked. It is important to understand that the QC sample was designed to be representative of the entire AA. If the QC sample contained errors, then it was assumed that there were about the same rate of errors in the remainder of the AA. Consequently, if the QC sample failed, then the entire AA failed and was recanvassed (See Attachment C for list of errors).

2.*2.3a Selecting the DQC Sample*

The DQC sample was designed based on an **Average Outgoing Quality Limit (AOQL)** plan. The AOQL is defined as the worst quality of address data we would expect, and that the operations' sponsor determines as "worst acceptable" quality in advance of the operation, over all AAs after the AC operation was completed (including production, QC, and recanvassing). An AOQL plan is a sample design that ensures a pre-determined AOQL.

The DQC starting address record was selected at random to minimize bias, though the starting unit could not be a unit marked as a delete or duplicate. Units that were marked as delete or duplicate are checked during Delete Verification (described in section 2.2.4, below), and they did not count toward the DQC sample size. If the

MFQC was performed, the DQC starting address was in the same block as the selected map feature to save on travel costs.

The 2010 Census budget allowed for a three percent sample of addresses over all AAs (Marquette and Haas, 2008). The sample size was determined before the DQC lister started work on the AA. Any addresses added by the production lister were included in the total AA size for purposes of calculating the sample size, but units added by the QC lister were not.

The allowable critical errors were set to achieve the lowest AOQL that was practical, given the three percent sample size budgeted for the operation. The selected plan for the 2010 AC operation had an overall weighted average AOQL of 8.1 percent for critical errors.

An overall weighted average AOQL of 22.6[2] percent for noncritical errors was established by setting the number of allowable noncritical errors at 0.5 percent of the upper bound of the AA size range, with a minimum of one allowable error.

The DQC algorithm for the 2010 AC operation is summarized in Table 2.1 including sample size, critical/noncritical error tolerances, and critical/noncritical AOQLs.

Table 2.1: 2010 Census AC DQC Algorithm

# of eligible addresses in AA (x)	DQC Sample	Allowable Critical Errors	Critical AOQL	Allowable Noncritical Errors	Noncritical AOQL
x <= 50	2	0	15.1%	1	26.7%
50< x <=100	3	0	10.6%	1	16.2%
100< x <=150	5	0	6.7%	1	10.7%
150< x <=175	5	0	6.7%	1	9.2%
175< x <=200	6	0	5.7%	1	8.3%
200< x <=275	8	0	4.3%	1	5.9%
275< x <=500	15	0	2.4%	3	7.9%
500< x <=1000	30	1	2.8%	5	6.4%
x > 1000	45	2	3.0%	8	7.9%

The weighted average AOQL over all AA sizes for critical errors is 8.1 percent and the weighted average AOQL for noncritical errors is 22.6 percent. For AAs with no eligible addresses, see section 2.2.3c.

2.2.3b *Performing DQC on AAs with at least one address*

The QC lister viewed the automatically selected random start address record that the HHC displayed. The QC lister would locate that unit on the ground, then compare its address information to the information displayed on the HHC and enter the appropriate action (e.g., verify, change, delete). If the QC lister disagreed with the production lister, an error was recorded (see Section 2.2.3c for more details).

[2] The difference in the Noncritical AOQL values in this profile and in the Address Canvassing QC Plan is due to a failure to update the 2010 Address Canvassing with the correct Noncritical AOQL after the sampling plan was changed.

Using normal canvassing procedures, the QC lister then performed a quality check on the next string of addresses that appeared on the ground. The quality check was carried out using the same procedures that were used for the starting point address. The QC lister repeated this process on the required number of addresses using the same procedures (with exceptions described below). The required number of addresses varied based on the number of address records in the AA. The software gave the QC lister a message when they completed the required number of addresses in the DQC sample and indicated whether the AA passed or failed DQC.

The QC listers attempted to interview a respondent, the same as the production listers, by knocking on doors if either the house number was not posted or the Living Quarters (LQ) was a multi-unit structure. The purpose of the courtesy knock was to inform anyone who was present in the unit why the QC lister was there and to ask about additional LQs.

The procedures in A through K below describe the general flow of the QC lister's work:

A. The QC lister invoked the software on the HHC and launched the QC program from a button on the main menu.

B. The QC lister selected the AA to work.

C. The software selected the starting address record for DQC randomly.

D. The QC lister activated the block that contained "QC Start" in the status column of the 'AC Quality Control' screen.

E. If a feature was added or deleted by the production lister, the QC lister performed the MFQC, described in Section 2.2.2a. The HHC skipped the MFQC if no features were added or deleted by the production lister.

F. The QC lister tapped on the screen where the starting address was displayed and viewed the original address record with any modifications the production lister made to the address record highlighted.

G. The QC lister located the housing unit on the ground and compared the address that they found on the ground to the address that was listed in the HHC.

H. Based on what the QC lister saw, they selected the **Accept** or **Reject** button within the "Review Address" screen.

    1. The QC lister selected **Accept** if he or she agreed with the AC lister.
    2. The QC lister selected **Reject** if he or she disagreed with the AC lister.

I. If the QC lister chose **Accept**, he or she reviewed the map spot associated with the address record on the Block Map. The QC lister looked at the associated map spot (labeled with its map spot number) and determined if it was in the correct

location on the map. If the map spot placement was correct, the QC lister selected **Accept** and QC was finished for this address record. If the map spot placement was not correct, the QC lister would select the **Reject** button and re-collect the map spot using standard map spot placement procedures.

J. If the QC lister chose **Reject**, the software launched an "Edit Address" screen that displayed the Master Address File (MAF) version of the address record on the top of the screen and the AC production lister's (modified) version of the address record on the bottom of the screen. If the unit was added by the AC production lister, the QC lister only saw the AC production lister's address information.

1. The QC lister could choose to edit the original address record or the AC production lister's address record.
2. The QC lister made the necessary changes to the address record (using the same editing procedures as used for production listing).
3. The QC lister then looked at the associated map spot (labeled with its map spot number) and determined if it was in the correct place on the map.
4. If the map spot placement was correct, the QC lister selected **Accept** and QC was finished for this address record.
5. If the map spot placement was not correct, the QC lister would:
   a. select the **Reject** button, and
   b. re-collect the map spot using standard map spot placement procedures.
6. Behind the scenes, the HHC determined the appropriate error type to assign using the AC DQC Errors table in Attachment A.

K. The QC lister moved to the next housing unit <u>on the ground</u>, then located that unit in the HHC (working from the ground to the HHC). The QC lister followed steps G through K for that unit, and repeated these steps with succeeding housing units until the HHC indicated the AA was finished with DQC and presented a pass or fail decision.

The software did not allow the QC lister to mark an AA complete until:

- The AA passed and all the addresses in the sample were completed (and all DV units were completed), or
- The AA failed and all addresses in the block were recanvassed.

Once the sample was completed, if the AA passed DQC, the software would automatically prevent the QC lister from accessing any additional records, with the exception of address records requiring Delete Verification.

2.2.3c Performing DQC on AAs with no eligible addresses

When the QC lister found an AA without any eligible addresses (there were not any addresses listed in the AA, or all listed addresses were DV addresses):

1. The HHC selected a random start block. The MFQC was performed as usual if there were added/deleted features in the AA.

2. The HHC notified the DQC lister with a pop-up stating, "No addresses in block. Check manuals for procedures." The QC lister then clicked "OK" to clear the pop-up.

3. The QC lister canvassed the entire AA (or up to 30 miles) to verify there were not any additional addresses to add. The QC lister performed DV on any DV addresses in the AA.

    a. If the QC lister added an address that the production lister missed, the AA failed DQC and the QC lister was notified and informed to recanvass the entire AA. (This was the standard message that appeared when an AA failed DQC.)

    b. If the QC lister did not add an address when he or she marked the AA complete, the HHC informed the QC lister that the AA passed DQC and he or she should perform DV in the remainder of the AA. (This was the standard message that appeared when an AA passed DQC.)

The QC lister was not able to open any other blocks in the AA until the pass/fail decision was made, which was consistent with the normal work flow of DQC.

2.*2.3d Outcome of the DQC*

The HHC software recorded one of the three errors listed below if the QC lister disagreed with the production lister:

- **Critical Error** – defined as an error involving the data capture of the address and/or the ability to locate it. These errors had a significant adverse effect such as missing an address that should have been added or deleting an address incorrectly.
- **Noncritical Error** - an error that was considered not as significant, such as a misspelled street name or an omitted unit designation.
- **Tally Error** – an error that had the least significance, such as change in physical description or name change of a Group Quarters. Note that Tally Errors were captured and stored for evaluation purposes and did not contribute to any pass/fail decisions for AAs in the DQC operation.

The HHC determined if the error was critical or noncritical by means of the AC QC Errors table (refer to Attachment C). Tally errors were included on the QC Errors table for research purposes, but they were not a factor in any pass/fail decisions for AAs in the DQC operation.

The sample size of each AA was based on the AA size and is provided in the DQC algorithm table shown in Table 2.1 in Section 2.2.3a. Addresses marked as deletes or duplicates by the production lister (i.e., DV units) were excluded from the sample size

determination. The DQC continued until the QC lister checked the required number of addresses (sample size).

After the required number of DQC addresses was completed by the QC lister, the software calculated the total number of critical and noncritical errors. This information was used to determine if an AA passed or failed DQC.

The QC lister was informed by the software if an AA failed and directed to conduct QC Recanvass on the remainder of the AA. The software limited the QC lister to rechecking addresses in the AA requiring DV if the AA passed DQC.

2.2.4 Delete Verification and Final Delete Verification

The Census Bureau required that all units marked as a delete or duplicate be verified by a second lister in order to reduce the possibility of erroneously removing existing units from the address list. Each unit marked as a delete or duplicate by a production lister was verified by the QC lister. Similarly, units marked as a delete or duplicate by a QC lister (when the production lister indicated the unit was valid) were verified by an FDV lister.

The QC lister performed DV to verify address records marked as a delete or duplicate by the production lister. Address records that were in the DV universe were not eligible for DQC, although the DQC lister worked any DV units he or she encountered on the ground during the DQC string. These DV units did not count toward completion of DQC or toward the pass/fail decision. The QC lister worked any remaining DV units in the AA if the AA passed the DQC. If the AA failed the DQC, the DQC lister performed the QC Recanvass and DV concurrently.

A different QC lister performed the FDV to verify address records marked as a delete or duplicate for the first time by the QC lister. These address records, or "first time deletes," were *not* marked as delete or duplicate by the production lister. The only units available to be worked during FDV were first-time deletes or duplicates marked by the QC lister, the process being similar to the one in DV, except no other units could be edited.

A unit that was verified (either confirmed as a delete or duplicate, or reinstated) during the DV did *not* go to the FDV.

2.2.4a Performing Delete Verification

The QC lister was able to see the blocks that contained delete or duplicate records on the block list and he or she was also able to view the specific addresses that required DV on the address lists. The 2010 Census AC Operation did not link duplicate units. Therefore, the QC lister was not able to identify the survivor unit linked to a delete or duplicate (see section 2.3.2 for more information).

The QC lister followed the steps listed below when a record in the address list was marked as a delete or duplicate.

1. The QC lister selected and reviewed the unit and attempted to locate the unit on the ground in the block.
2. The QC lister selected one of two actions: **Accept** or **Reject**.

    a. The QC lister selected **Accept** if he or she agreed with the production lister and was not able to locate the unit on the ground in the block.

    b. The QC lister selected **Reject** if he or she disagreed with the production lister and believed the housing unit existed in the block.

3. If **Accept**, no further action was taken.

4. If the QC lister chose **Reject**, the software launched an "Edit Address" screen that listed the address record. The QC lister made the appropriate changes (including changing the address status if necessary) to the address record (using the same editing procedures as the production lister) and reviewed the placement of the map spot.

5. For address records that were reinstated by the QC lister and had existing map spot information (this information would have been supplied by the MAF):

    a. If the map spot was correct, the QC lister selected **Accept** and completed work for this address record.

    b. If the map spot was not correct, the QC lister would:

        i. Select the **Reject** button, and
        ii. Re-collect the map spot using standard map spot placement procedures.

6. If the unit did not have map spot information when it was deleted, the QC lister was prompted to spot the unit on the map.

The QC lister looked for DV units (both deletes and duplicates) on the street the unit was listed on based on the address information on the record in the HHC. The QC lister also looked at the units around the corner to check for units that appeared to be on another street but had an address on the first street. This inspection maximized the likelihood of finding errors while limiting canvassing, thus keeping costs in check. The QC listers did not canvass entire blocks in their attempt to locate DV units.

2.2.4b Outcome of the Delete Verification

All errors discovered during DV were corrected since DV was a 100 percent check. A pass/fail decision and recanvass were not necessary. The OCS DQC reports did not reflect any errors associated with DV addresses.

Addresses marked by the QC lister as deletes or duplicates that were not marked as deletes or duplicates by the production lister, in other words "first time deletes or duplicates," went to FDV, which is described in Section 2.2.5a.

2.2.5a Performing Final Delete Verification

The FDV was performed by a QC lister who did not work on the production listing, DQC, DV, and/or QC Recanvass for that AA. During FDV, the HHC only allowed the QC lister to verify units that were deleted or marked duplicate for the first time by the QC lister (either during DQC or QC Recanvass). The FDV lister followed the same procedures described in Section 2.2.4a, parts A and B, to complete the FDV.

2.2.5b Outcome of the Final Delete Verification

Any errors found in address records during FDV were corrected since all of the first time deletes or duplicates identified by the QC lister were checked during FDV. A pass/fail decision was not made and recanvass was unnecessary.

2.3 *Operational Issues*

Some operational issues occurred during the 2010 AC; however, we do not believe these issues affected the quality of the data. A brief description of each issue is provided below:

2.3.1 Slow Software Issue in DQC

Some QC listers could not complete the DQC portion of their work due to a backlog of AAs with many housing units in them, including a large number of DV units. The backlog caused the HHC software to drastically slow down, especially on passed AAs, and was referred to as the "spinning beach ball" problem. This name referred to the graphic on the HHC that indicated to the user that the HHC was processing. Upon identification of the root of the problem, Harris deployed a patch for the HHC software in order to improve performance. We observed a noticeable decrease in the DQC check failure rate beginning April 28, 2009 shortly after the patch was issued and began to investigate. After many analyses, we determined that there were insufficient data to conclude that the decline in DQC fail rate on April 28, 2009 was due to a change in error definitions or a problem with the automated pass/fail algorithm following the software patch. Instead, the investigation revealed that because the "spinning beach ball" problem was primarily affecting AAs that passed the DQC, the DQC failure rate was artificially inflated because mostly failed AAs were being processed. The software patch allowed previously delayed, passed AAs to finally complete processing, which led the DQC fail rate to decrease accordingly. For more information on the "spinning beach ball" analysis, refer to Decennial Statistical Studies Division (DSSD) 2010 Decennial Census Memorandum Series No. F-13, "Analysis of the Sudden Drop in Dependent Quality Control Check Failure Rates During the 2010 Census Address Canvassing Operation" (Marquette and Haas, 2009).

2.3.2 Duplicate Linking Issue

Based on experiences in the 2008 Census Dress Rehearsal AC, the Census Bureau removed the requirements for linking duplicate addresses from the HHC functionality. Unfortunately, without this link, a lister could identify all records representing a single LQ as a duplicate, thus removing the unit from the address list erroneously (instead of leaving one good unit, usually called a "survivor").

The root of the problem was that without duplicate linking, the QC lister had no easy way to determine what the production lister thought the surviving unit was. Furthermore, since we only contacted respondents in limited situations, the probability of the QC lister getting the correct information decreased.

Several options were considered to address these problems. The options and their advantages and disadvantages are described below. Except for the "reinstate duplicate link" option, none of the options were likely to catch all Duplicate units.

1. Reinstate duplicate linking. This was unworkable due to problems encountered during the 2008 Census Dress Rehearsal AC – in particular, the sheer amount of time required by the software to perform the task. The Census Bureau felt it was very unlikely that the problems with linking duplicates would be fixed for 2010.

2. Remove duplicate verification from the DV workload. Since duplicates are removed from the census universe, we felt programs like Local Update of Census Addresses feedback would be adversely impacted. This would also negatively impact other census operations.

3. Have the QC listers use the map spot to locate the survivor unit. The QC lister would attempt to locate the unit marked as a duplicate. If he or she found the unit on the ground, he or she would use the map on the HHC to look for a map spot that could be that unit. They would use the HHC's "Identify" feature to review the address information for that spot. If the unit they started with appeared to be a duplicate of the unit they found, they would accept the duplicate. If the unit was clearly not a duplicate, they would reject the duplicate and reinstate the unit. If they were not sure, they would mark "Don't Know" on the handheld and move to the next unit. Units marked as "Don't Know" would remain duplicates, under the assumption that the lister did the work to understand the duplicate situation.

   If the QC lister could not find a map spot for a survivor unit, he or she would search the address list to find potential candidates for survivor units and make the same decision as described in the previous paragraph (accept, reject and edit, unknown).

   We rejected this solution for a multitude of reasons:
   a. It would be difficult to train this procedure because the QC lister would have to become a detective. Training costs would increase and may cause the trainees to focus on this issue instead of more-frequently-used DQC procedures.

b. We were concerned the QC listers would spend too much time attempting to resolve these units, distorting the QC production rate and driving up costs.
c. We felt some QC listers would simply click "Don't Know" for those units.

4. Have the QC lister attempt to locate the unit on the ground and make a decision based on their success or failure. If the QC lister cannot find the unit, he or she marks it as a Delete (instead of a Duplicate). If the QC lister does find the unit on the ground, he or she first checks whether there is another record in their DV assignment that matches this unit.
    a. If the QC lister does not find a matching unit in the DV assignment, he or she confirms the Duplicate status of the unit.
    b. If the QC lister does find a matching unit in the DV assignment, he or she changes the appropriate status of the unit.

    The purpose of the check for a second record was to catch cases where the lister marked *both* records as a duplicate, thereby removing a good unit from the list. In previous tests with the duplicate link, we prevented this issue. Without the duplicate link, there was no way to automatically detect this situation.

    We chose this option for the following reasons:
    - It was easy to train on this procedure, so the impacts to the training budget were nominal. Further, simplifying the procedure helped to ensure that it was performed correctly in the field.
    - It should have caught some of the worst problems, in particular the situation where a lister marked all records of a good unit as Duplicate.

2.4 *Objective of report*

This 2010 AC Quality Control Profile presents a summary of results from the 2010 AC QC and DV/FDV operations. The Results Section of the report contains the summary of these statistics. The Methodology Section presents the methodology used to analyze the QC data from the Initial Observation, the DQC, and the DV/FDV procedures. The Limitations Section presents problems or deviations from planned operations that may affect results or other aspects of the quality profile that may influence or adversely affect the ability to generalize or interpret results. There is a summary of findings along with recommendations for future AC QC programs.

2.5 *Large Block Operation*

Due to technical limitations within the HHC, collection blocks with a large number of units decreased the performance of the HHC. Those blocks required an excessive amount of time to complete. To deal with these affected "large blocks," the blocks were sent to the DAAL program, which uses the ALMI on laptop computers. The ALMI is not designed to handle the type of addresses used in Puerto Rico, so the Large Block Operation was limited to the continental United States, Alaska, and Hawaii.

There were two groups of blocks sent to DAAL: pre-identified large blocks (i.e., they already had a large number of addresses in them in the MAF) and field-identified large blocks (the lister discovered blocks with a large number of addresses during listing).

Collection blocks with more than 1000 addresses were included in the pre-identified group and sent directly to the DAAL program. However, after the deadline for pre-identified large blocks had passed, the performance of the HHC was improved to the point where it would be able to adequately handle blocks of up to 2000 addresses. Therefore, we instructed the LCOs to send only field-identified blocks containing 2000 addresses or more to the Large Block Operation.

When collection blocks were sent to the Large Block Operation, they were first converted into tabulation blocks because the ALMI was not designed to use collection blocks. In general, tabulation blocks are geographically smaller than collection blocks and a tabulation block may cross a collection block boundary. In some instances, the tabulation blocks may have overlapped a portion of a collection block, which led to data being collected for some addresses in both the AC Operation and the Large Block Operation (in this case, the information collected in the AC Operation took precedence over data collected in the Large Block Operation; further discussion of this is beyond the scope of this document). Also, since tabulation blocks are generally smaller, the blocks sent to the ALMI were not necessarily "large" as previously defined.

Using the ALMI, Field Representatives (FRs) listed these blocks, and the results were returned to the Regional Offices and on to headquarters. Most FRs were staff who already worked for the Census Bureau on other surveys, but some people were hired specifically for the Large Block Operation. Although Initial Observations were performed, we kept no records of these.

The QC of the Large Block Operation was analogous to that of the HHC listing operation. A sample of units in every tabulation block was selected for QC. We selected a random starting point, and then the Senior Field Representatives (SFRs) verified that unit and the next several units on the ground. The sampling table used was the same as it was for the HHCs. The SFRs were given the information on the starting unit, sample size, and pass/fail information via the notes for the case.

If the block failed QC, the SFR would immediately re-list the remainder of the block. If the block passed QC, the SFR would perform DV on the block. There was no provision in place to handle FDV.

The ALMI had several notable differences from the HHC:

- The ALMI condensed the error list into fewer categories. For example, a changed house number in the HHC could result in one of four different error categories in the HHC, depending on the situation, but in the ALMI, a changed house number was recorded in the same error category regardless of the situation.
- The errors recorded by the software were similar, but not identical. See Attachment D for more information.
- The severity of errors (critical, noncritical, tally) was different for some error categories. For example, if a unit added by the lister was changed to uninhabitable by the checker, the HHC recorded this as a noncritical error. The ALMI recorded the same situation as a critical error. The table in Attachment D also gives these differences.

- Certain errors in the ALMI could be marked as "non-chargeable." For example, if the lister misspelled the street name in multiple units, the error would be marked "chargeable" the first time it was discovered, then non-chargeable thereafter. Although our instructions were to make everything chargeable errors, the checkers could mark something as non-chargeable and not count it against the lister.

3 Methodology

This section will discuss the methodology used to analyze the QC data from AC Initial Observations, DQC, and the DV/FDV.

3.1 *Initial Observation Data Files*

For each AC lister, the observer recorded Initial Observations of the lister's work via the *Observation Checklist, Form D-1222 (AC)* for the United States or the *Observation Checklist, Form D-1222 (PR)* for Puerto Rico (refer to Attachment A and B, respectively). Census keyed 111,131 Observation Checklist forms. This keying was performed according to the keying QC plan.

The objective of the keying QC was to guarantee that the final keyed data error (AOQL) was no more than one percent of keyed fields. QC keyers verified initial keyers' data by independently keying all fields in a systematically-selected ten-percent sample of forms in the batch. Any differences between the initial keyer's and QC keyer's data files were reviewed by an adjudicator, corrected, and assigned the appropriate error code. Verification was at 100-percent if the sample size was less than 50 keyed fields or if the supervisor deemed it to be the most efficient way of handling the batch. The overall requirement of no more than one percent AOQL was assured if each individual batch was 100-percent verified or used a suitable set of sampling parameters.

An error occured when a production data capture field was keyed incorrectly, not keyed according to procedure, or missed. When the number of production keying errors found in the adjudication was greater than the acceptance number for a sampled batch, the batch failed QC. If the rate of chargeable errors (made by the keyer) was greater than the acceptance number for the batch, then the keyer failed QC, and his or her supervisor took the appropriate action to improve the keyer's work. The acceptance number depended on the batch and sample size, which were specified in the AOQL plan. For a more detailed explanation of 2010 Census Key-From-Paper Operations and the details of the AOQL plan, refer to the DSSD 2010 Decennial Census Memorandum Series No. F-11, "Quality Control Specifications for the 2010 Census Key-From-Paper Operations" (Marquette and Chaar, 2009).

3.2 *DQC and DV Data Files*

The data completed by the production and QC listers were transmitted and stored in a database managed by the Field Data Collection and Automation (FDCA) contractor. DSSD was given a completed AC assessment and quality profile data file.

3.3 *Large Block Data Files*

All of the data for the Large Block portion of this analysis were delivered to DSSD from the Technologies Management Office (TMO) via methods already in place for DAAL. We stored metadata about each block and information on the errors found during QC in a database, from which our analysis was conducted.

Information about the remaining units (i.e., those without errors and those that were not checked) was compiled from update files returned as part of the usual process. We concatenated the files and removed any duplicate records. The file created from this process did not exactly match the file given to Geography Division (GEO) for updating the MAF due to post-processing that occurs during the GEO update file creation. We used the file without GEO's processing changes because we were interested in the field results.

4 Limitations

This section will discuss the assumptions and limitations for this report.

4.1 *Initial Observation Limitations*

- **Duplicate Forms** – We removed 11,847 forms from our analysis. Some of the forms were duplicates, while others were incomplete. In general, we kept the observation form with the earliest date.

  For some duplicate forms, we were able to determine that a second observation had been completed on a separate form. We combined these into one form for analysis.

- **Incomplete, Incorrect, and Inconsistent Forms –** Section 5.1.1 describes the breakdown of these in detail.

4.2 *DQC Sample Size Limitations*

- Due to budgetary constraints, we adjusted the DQC sample size from five percent in 2008 AC to three percent for 2010. This changed the weighted average AOQL for critical errors from 5.5 percent in 2008 to 8.1 percent in 2010.

- During analysis, AAs that contained one or more delete or duplicate addresses worked during DQC had to be excluded from our sample size verification calculations because the software marked them as being worked in DQC rather than DV. This limitation only impacts our attempts to verify the correct sample size was used in the instrument.

4.3 *Large Block Limitations*

- Due to the design of the ALMI, we have no way of knowing which units were checked as part of the QC. The ALMI was designed to have the user work the entire block at once, so the partial-block QC method limits our available information.

- The starting unit, sample size, DV, and pass/fail decision were not enforced by the software. In particular, we have some evidence from observations that SFRs checking blocks would go "above and beyond" by checking additional units beyond the specified sample if they saw something suspicious. If the checkers did that and found something incorrect, they may have failed the block and recanvassed it. Due to data limitations, we are unable to distinguish this scenario from one where the SFR completed only the intended sample and failed the block.

- Due to a programming error, the sample size for the Large Block QC was increased by one. We discovered this during the operation, but chose to leave it in place to simplify the analysis, since the additional costs were minimal.

- The pass/fail decision in the field was made based on a report intended for other purposes (due to time limitations, we could not change it). This report would sometimes be cluttered with other errors that did not count toward the pass/fail decision, possibly leading to confusion over whether the block passed or failed.

5 Results

In this section, we present summary statistics pertaining to the following QC operations: Initial Observation, DQC, DV, and FDV. While interpreting these results, keep in mind the Large Block Operation used tabulation blocks, while the HHC Operation used collection blocks grouped into AAs. In general, tabulation blocks are smaller than collection blocks and can cross collection block boundaries. The result tables for Regional Census Centers (RCCs) are located in Attachment E for the Initial Observation and AC HHC results and Attachment F for Large Block Operation results.

5.1 *Address Canvassing Hand-Held Computer Results*

5.1.1 Initial Observation Results

The purpose of the Initial Observation was to ensure the listers had a general understanding of the AC procedures. After training was completed, the CLs/CLAs were supposed to accompany each lister while he or she was canvassing his or her first AA.

5.1.1.1 Initial Observation Coverage

We received 111,131 Initial Observation forms from the field. A substantial amount of data cleaning was required prior to classifying a form as production or QC. This included date editing, removing the applicant ID from the end of some lister names, and removing special characters and spaces in the applicant ID field.

We removed 11,847 forms due to various problems, such as duplicate forms or data problems. Table 5.1 displays the distribution of these forms.

Of the 6,859 duplicate forms based on applicant ID field, we selected the observation form with the earliest observation date captured. The 184 forms with a blank observation type field were excluded from the final analysis since we

could not determine if they were completed for production or QC listers. Additionally, we excluded 865 forms containing both production and QC data on the same form and 240 forms where the type of observation indicated did not correspond with the data keyed in the task fields. There were 3,699 forms with a blank in the applicant ID field. We removed these because of the possibility of duplication. This resulted in 99,284 forms eligible for the remaining analysis.

Table 5.1: Classification of Initial Observation Forms

Number of forms received:			111,131
Total number of forms removed:			11,847
	Duplicate forms[1]:	6,859	
	No observation type marked and no task fields:	184	
	Containing both production and QC data:	865	
	Observation type did not match the task fields:	240	
	Blank applicant ID:	3,699	
Resulting number of forms analyzed:			99,284

[1]Some listers may have worked on both production and QC and thus legitimately have two observation forms. These were not deleted.
Data Source: AC Initial Observation Forms and FDCA Assessment File

Of the 99,284 forms, we found:

- 77,466 were for production listers; this is 76.13 percent of the 101,752 listers who completed at least one production AA.
- 21,818 were for QC listers; this is 66.37 percent of the of 32,872 QC listers who completed at least one QC assignment.

There were a total of 2,412 production forms and 816 QC forms with missing applicant IDs.

We received fewer forms than we expected given the number of listers that worked in AC. Table 5.2 shows the number and percent of missing forms for the different types of observations.

Listers who worked on both production and QC should legitimately have two observation forms (these are not considered duplicates). However, there were 1,012 listers who worked on both production and QC but had only one form that covered both production and QC.

Table 5.2: Missing Forms by Type of Initial Observation

	Total	Production Listers	QC Listers
Listers who completed at least one assignment (production or QC)	134,624	101,752	32,872
Observation Forms[1]	99,284	77,466	21,818
Percent of Forms missing[2]	26.25%	23.87%	33.63%

[1]These totals include listers that worked both production and QC.
[2]Some of these may be explained by the blank forms described in Table 5.1.

There were 134,624 production and QC listers who completed at least one AA, so we expected an equivalent number of observation forms. There are several possibilities that could explain the difference between the total number of Initial

Observation forms and total number of listers who completed at least one assignment:

- LCOs may have been unable to complete an observation form for enumerators that resigned early in the operation.
- The forms could have been lost in the mail or at the Census Bureau's National Processing Center (NPC).
- Another observation form from a different operation may have been used in error, such as the Census Coverage Measurement form.
- An Initial Observation form may not have been keyed because of a lack of critical data.

We received one set of 66 and another set of 41 observation forms from NPC that were filled out on Census Coverage Measurement Observation Checklists. There were also 20 forms with the back page of QC lister data and notes filled out but had a missing front page. The front of the observation form contains critical information that is not repeated on the back, such as the enumerator ID, so we were unable to analyze these forms.

5.1.1.2 Final Outcome of the Initial Observations

The majority (88.30 percent) of the production listers passed the first Initial Observation as well as the second Initial Observation (81.49 percent). There were 459 production listers who failed the first observation and did not receive a second observation. There were 9.82 percent of production first observation forms and 12.87 percent of production second observation forms without a result marked.

Most (81.47 percent) of the QC listers passed the first Initial Observation. Of the QC listers who were observed for a second time, 73.52 percent passed that second observation. There were 3,638 of the 21,818 total QC Initial Observation forms that did not have a final outcome. More information on the outcomes can be found in Table 5.3.

Table 5.3: Observation Outcomes for Address Canvassing Listers

Type of Lister	1st Observation		2nd Observation	
Production Listers	Number	Percent	Number	Percent
Satisfactory	61,978	88.30	5,932	81.49
Unsatisfactory	459	0.65	222	3.05
Other	861	1.23	188	2.58
Blank	6,889	9.82	937	12.87
Total	**70,187**	**100.00**	**7,279**	**100.00**
QC Listers	Number	Percent	Number	Percent
Satisfactory	16,396	81.47	1,244	73.52
Unsatisfactory	186	0.92	70	4.14
Other	269	1.34	15	0.89
Blank	3,275	16.27	363	21.45
Total	**20,126**	**100.00**	**1,692**	**100.00**

Data Source: AC Initial Observation Forms

There were 937 production and QC listers that had an unsatisfactory 1st (2nd if applicable) Initial Observation. Of these, 813 had notes on the form and 848 were terminated according to the data from Decennial Applicant, Personnel, and Payroll System. There were 89 listers that were retrained as a result of an unsatisfactory first or second Initial Observation.

5.1.1.3 Summary of the Errors Committed by Listers during Initial Observations

Table 5.4 presents a summary of errors reported during the Initial Observation of the production listers. Consistent with the low failure rates for production listers (0.65 percent) in the first observation, there were relatively few errors reported on the Initial Observation forms. The most frequent error was that the production lister did not canvass from ground to HHC. This was also reported in the 2008 Census Dress Rehearsal AC as a problem.

Table 5.4: Number of Production Listers who Committed Errors during Initial Observations

	1st Observation		2nd Observation	
Task lister failed to perform or perform correctly	**Count**	**%**	**Count**	**%**
Canvassed in correct block.	1,229	1.59	171	0.22
Canvassed from ground to HHC	2,054	2.65	283	0.37
Used appropriate introductory statement or brief interview	1,681	2.17	167	0.22
Showed census identification and provided a copy of the Confidentiality Notice to each respondent	1,759	2.27	136	0.18
Attempted to contact building manager or other knowledgeable person at each multi-unit structure	724	0.93	110	0.14
Did not attempt contact at non-residential structures and structures with no indication of LQs	1,062	1.37	164	0.21
Entered the correct address status for each address	607	0.78	112	0.14
Selected the appropriate structure type	741	0.96	150	0.19
Made appropriate updates to the location/mailing address	836	1.08	165	0.21
Added missing LQs and/or Deleted nonexistent or duplicate LQs	939	1.21	206	0.27
Followed correct procedures when collecting map spots	1,793	2.31	238	0.31
Did not look at the HHC device while driving	1,691	2.18	206	0.27
Made updates to street features on the map	962	1.24	183	0.24

Data Source: AC Initial Observation Forms

Table 5.5 shows that the CLs/CLAs reported few errors for the QC. Three tasks that QC listers had the greatest number of errors in were looking at the HHC while driving, not showing census identification and providing a copy of the confidentiality notice to each respondent, and not canvassing from ground to HHC.

Table 5.5: Number of QC Listers who Committed Errors during Initial Observations

	1st Observation		2nd Observation	
Task lister failed to perform or perform correctly	**Count**	**%**	**Count**	**%**
Canvassed in correct block.	214	0.98	25	0.11
Canvassed from ground to HHC	603	2.76	65	0.30
Used appropriate introductory statement or brief interview	529	2.42	37	0.17
Showed census identification and provided a copy of the Confidentiality Notice to each respondent	746	3.42	54	0.25
Attempted to contact building manager or other knowledgeable person at each multi-unit structure	239	1.10	24	0.11
Did not attempt contact at non-residential structures and structures with no indication of LQs	287	1.32	27	0.12
Entered the correct address status for each address	134	0.61	21	0.10
Selected the appropriate structure type	104	0.48	17	0.08
Made appropriate updates to the location/mailing address	127	0.58	17	0.08
Added missing LQs and/or Deleted nonexistent or duplicate LQs	151	0.69	29	0.13
Followed correct procedures when collecting map spots	314	1.44	46	0.21
Did not look at the HHC device while driving	753	3.45	73	0.33
Made updates to street features on the map	187	0.86	24	0.11
Located correct starting address	286	1.31	38	0.17
Followed rules of canvassing while conducting DQC and Recanvass	570	2.61	67	0.31
Correctly accepted or rejected address records	241	1.10	36	0.17
Verified/updated the correct addresses according to QC procedures	166	0.76	35	0.16
For added or rejected addresses:	33	0.15	8	0.04
Selected the appropriate address status	113	0.52	22	0.10
Selected the appropriate structure type	111	0.51	15	0.07
Made appropriate entries to the location/mailing address	117	0.54	14	0.06
Verified street feature updates on the map	183	0.84	28	0.13
Accepted or rejected map spot for each address	117	0.54	25	0.11

Data Source: AC Initial Observation Forms
Note: The "For added or rejected addresses:" line in Section B was not grayed out on the form and should not have been marked.

5.1.2 DQC Results

Once a production lister completed an AA, he/she transmitted the work to OCS, and then the AA was transmitted to a QC lister. The HHC selected the DQC starting unit and

determined the sample size based on the number of address records in the AA after production. Every AA was included in the DQC.

5.1.2.1 DQC Workload

There were a total of 159,494,710 address records in the AC universe[3]. This included 141,822,612 addresses that were originally sent out to the HHCs and 17,672,098 addresses added by the listers or the QC listers. Of the 5,545,590 (3.48 percent) address records worked in the DQC, less than one percent (9,088 address records) were deletes and duplicates that should have been worked during DV. Overall, there were 25,444,238 address records that the production lister marked as a delete or duplicate, however only 25,412,511 were flagged as DV cases. All address records marked as a delete or duplicate should have been worked during DV, so there was either an issue with initially flagging DV cases in the HHC or in identifying cases that were worked during DV in the post-processing.

There were 13,365,216 (8.38 percent) recanvassed address records. FDV had the smallest workload with only 783,125 (0.49 percent) flagged address records, including 565 records erroneously sent to FDV. These records were originally deleted by the production lister and then the delete was confirmed by the QC lister. FDV cases should only have been records deleted first by the QC lister. The remaining 115,156,088 (72.20 percent) records were not worked during QC.

Table 5.6: Allocation of the Address Canvassing Universe

Phase Worked	Address Records	
	Count	Percent
Production Only	115,156,088	72.20
Production and DQC	5,545,590	3.48
Production and DV	25,412,511	15.93
Production and Recanvass	13,365,216	8.38
Production, DQC or Recanvass, and FDV	783,125	0.49
Flagged for Large Block Operation[1]	15,305	0.00
Total[2]	**159,494,710**	**100.00**

Data Source: FDCA Address File
[1]Although some of these units were worked in production, the information was discarded in favor of the results from the Large Block Operation.
[2]These counts do not sum to the total because the units worked in FDV were also worked in another phase of QC.

There were 101,752 production listers and 32,872 QC listers who worked on the AC Operation. All 733,636 AAs the production listers canvassed were checked

[3] The universe also includes 15,305 addresses that were marked for the Large Block Operation. Although some of these were actually completed in production, their results were discarded in favor of the results from the Large Block Operation.

during DQC. Table 5.7 shows 61,843 (8.43 percent) AAs failed DQC. About 40 percent of the production listers, or 40,889 listers canvassed an AA that failed DQC.

Table 5.7: How many AAs Failed Dependent Quality Control?

	Count	Percent
Passed AAs	671,793	91.57
Failed AAs	61,843	8.43
Total AAs	**733,636**	**100.00**

Data Source: FDCA DQC File

Table 5.8 presents the frequency of the number of AAs that failed DQC by the number of production listers. Of the 101,752 production listers that performed work, 40.18 percent failed the DQC at least once. More specifically, 26.82 percent of the listers had only one AA fail DQC and 8.97 percent had only two of their AAs fail DQC. The most unfavorable situation that transpired was the one lister who had 22 AAs that failed DQC. There is no reasonable explanation for the situations where a small number of listers had large numbers of their AAs fail the DQC. Fortunately, it was a relatively rare occurrence. Over 96 percent of the listers who had AAs fail the DQC had three or fewer AAs fail the DQC.

Table 5.8: Frequency of Number of Failed AAs by Production Listers

Number of Failed AAs *n*	Number of Listers with *n* Failed AAs	Percent of Total Listers (x)
1	27,294	26.82
2	9,129	8.97
3	2,916	2.87
4	900	0.88
5	347	0.34
6	151	0.15
7	67	0.07
8	31	0.03
9	23	0.02
10	15	0.01
11	5	0.00
12	2	0.00
13	1	0.00
14	3	0.00
17	1	0.00
18	2	0.00
19	1	0.00
22	1	0.00
Total	**40,889**	**40.18**

Data Source: FDCA DQC File

5.1.2.2 DQC Sample Size and Error Calculations

For statistical purposes, the DQC starting address record was selected at random and the starting address record was not a delete or duplicate. We designed the

sampling to select approximately three percent of the total address records over all AAs. The appropriate DQC sample size was determined by the number of address records in each AA. For more details on the DQC sample selection, see Section 2.2.3a.

As shown in Table 5.9, the sample size for DQC was correct for 99.66 percent of the 713,761 AAs with at least one address[4]. We found 259 (0.04 percent) of the AAs appeared to be undersampled, and 2,138 (0.30 percent) of the AAs appeared to be oversampled.

Within the undersampled AAs, we found that 77 AAs contained no units marked as being in DQC. We are unable to ascertain why this is, but since the 77 AAs have a pass/fail decision and related information, we believe that they did in fact go through QC and somehow the address-level QC data for these units were lost. We were unable to find anything unique about these AAs that would help explain the discrepancy.

We are also unable to explain the remaining undersampled AAs. Harris indicated they had to manually edit some AAs after the DQC was complete, which contributed to the appearance of undersampling in some AAs, but there is no list of the AAs they had to edit, nor do we have an estimate of the number of AAs they had to edit.

For the oversampled AAs, we were unable to ascertain the exact cause of the oversampling. Harris informed of us of a bug in the software that caused oversampling in some situations, but we do not know how many AAs were affected by the bug before it was fixed during the operation. An oversampled AA increases costs but does not reduce quality.

Table 5.9: Dependent Quality Control Sample Size for AAs

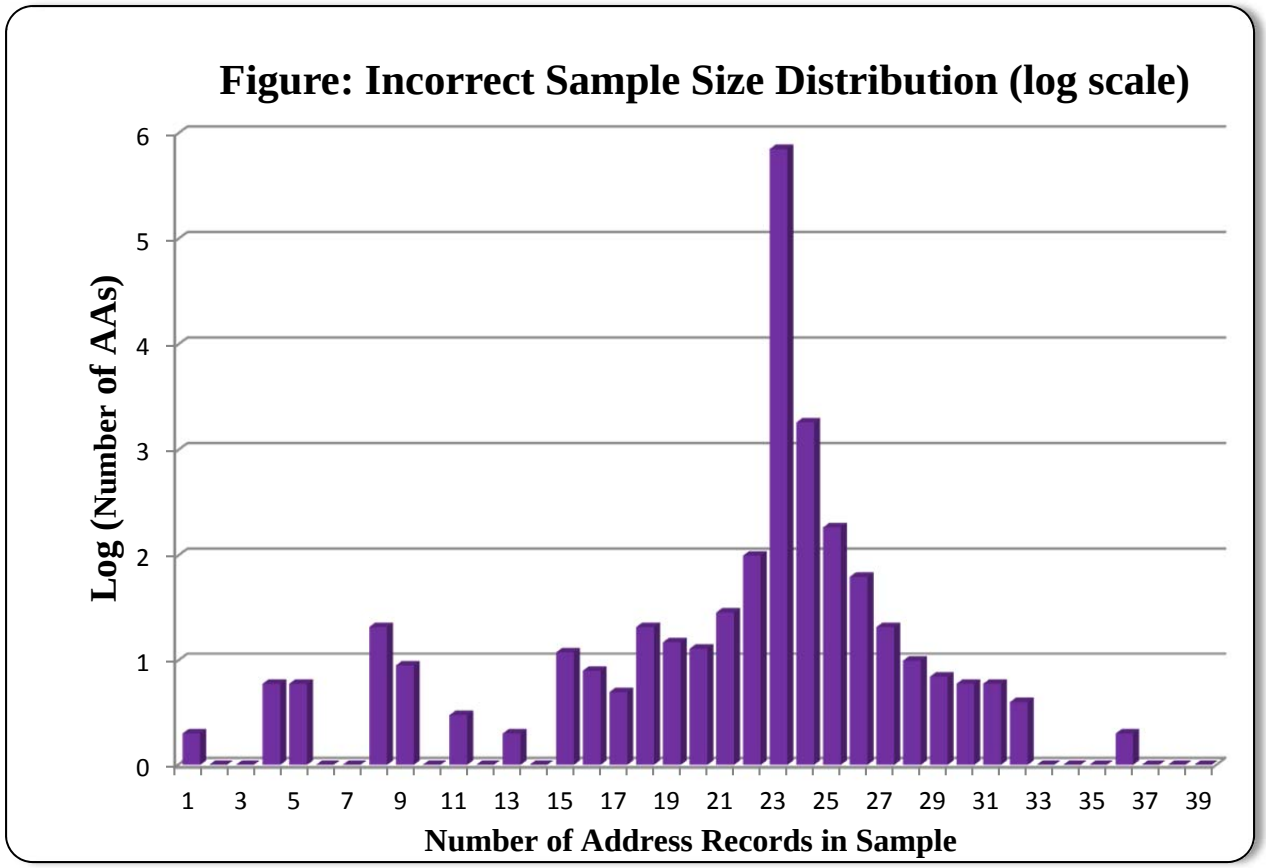
	Count	Percent
Undersampled AAs (too few units)	259	0.04
AAs with the Correct Sample Size	711,364	99.66
Oversampled AAs (too many units)	2,138	0.30
Total AAs*	**713,761**	**100.00**

Data Source: FDCA Assessment File
*A total of 19,875 AAs were excluded from this table because they contained no units eligible for DQC.

[4] Note: We excluded the AAs with zero units because the sampling procedures were different. For AAs with zero units, we instructed the listers to canvass for 30 miles. If we included these units and the QC lister added a unit, it would show up as an oversampled unit. These AAs are also excluded in the illustration.

The illustration shows that most of the sample size errors (both positive and negative) were within ten address records. A log scale is used for display purposes. This illustration gives a closer view of the distribution, which has a wide range of AAs and a small range of sample size errors.

There were 259 AAs with an under sample range from one to 45 address records and 2,138 AAs with an over sample range from one to 31. The largest possible sample size was specified to be 45 address records according to the AOQL plan. The sample size errors are skewed and do not appear to have a pattern.



Data Source: FDCA Assessment File

5.1.2.3 DQC Error Rates

Incoming and Outgoing Error Rates

This section describes the Incoming and Outgoing Error Rates for DQC. The "incoming error rate" is intended to estimate the **unit-level** error rate we are seeing before the QC takes place (i.e., If we did not do QC, what would the error rate of the data be?).

The "outgoing error rate" is intended to estimate the error rate after the QC corrections (including DQC and Recanvass). Since we do not check every unit, there will be some error remaining in the listings that are delivered to the MAF.

Since we are attempting to estimate the effectiveness of the DQC and Recanvass only, all calculations exclude units in DV. This means that the outgoing error rates we present here do not reflect the actual unit-level error rate of the listings that are sent to the MAF, which would be lower due to additional corrections made during DV.

Incoming Sample Error Rate (ISER)

The Incoming Sample Error Rate (ISER) is the error rate of the sampled units before correction. It is the weighted average of the error rates over all AAs, or the number of sample units with one or more errors in all AAs divided by the number of units in DQC in all AAs. The ISER for 2010 AC was 1.87 percent, with a standard deviation of 0.000043.

Outgoing Error Rate (OER)

We have two methods to calculate the Outgoing Error Rate, a biased and an unbiased method. We include the biased estimator to use for comparison to other operations that are unable to calculate the unbiased estimate due to data limitations (the unbiased estimator requires information about the errors found during Recanvass, which is not available for other operations).

Biased method

For failed AAs, we assume there are no errors remaining in the AA after the Recanvass is complete. For a passed AA, we split the units into two groups. Group one contains the units that were in DQC and were checked and corrected, while group two contains the units that were not checked at all; and we assume the two groups have equivalent error rates. The bias arises from this assumption; that is, group one and group two do not in reality necessarily have the same error rates[5]. The biased OER for 2010 AC was 1.79 percent, with a standard deviation of 0.000042.

Unbiased method

We subtract out the "fix rate" (that is, the sum of all errors corrected, whether in DQC or Recanvass, divided by the total number of units in all AAs) from the ISER. The unbiased OER was 0.88 percent, with a standard deviation of 0.000042. This indicates the QC operations (DQC and Recanvass) improved the unit-level critical error rate from 1.87 percent to 0.88 percent, a 52.94 percent improvement in the data quality.

The low incoming and outgoing error rates may be due to automation preventing errors from occurring in the first place. For example, an action was required by

[5] The bias is introduced when we examine only AAs that passed. The DQC plan will tend to make the incorrect pass/fail decision about AAs that have an actual error rate very near the planned AOQL. When we examine both passed and failed AAs, the effect of the incorrect decisions is canceled out. However, since we are only examining AAs that passed, a bias exists in the error rate estimate.

the HHC on every unit included in the AC universe and the instrument included automated edits that prevented many data quality errors, such as blank entries for critical address fields. In past censuses, missing entries for critical fields would not have been detected and corrected until DQC, resulting in much higher error rate estimates. Also, some of those missing entries may not have been detected in QC and would have persisted in the data, resulting in much higher outgoing error rates.

5.1.2.4 DQC Error Types

Table 5.10 summarizes the critical errors found within the production listers' work. To verify the programming of the HHC, we recalculated the errors based on the changes to the address records made by the QC listers. The errors are presented as the errors reported in the data file and the errors that we recalculated.

Table 5.10: Address Canvassing Dependent Quality Control Critical Errors

Error Number	Error Types		Total Critical Errors Reported		Total Critical Errors Recalculated	
			Number	Percent	Number	Percent
	Lister Action Code	*QC lister Action Code*				
1	-	HU Add	29,665	0.53	29,669	0.54
2	-	Other Living Quarter (OLQ) Add	829	0.01	829	0.01
3	HU Add	Does Not Exist	17,003	0.31	17,004	0.31
4	OLQ Add	Does Not Exist	516	0.01	516	0.01
5	HU Correction	Does Not Exist	9,466	0.17	9,471	0.17
6	HU Correction	Duplicate	1,443	0.03	1,443	0.03
9	OLQ Correction	Does Not Exist	405	0.01	405	0.01
10	OLQ Correction	Duplicate	62	0.00	62	0.00
13	HU Verified	Does Not Exist	30,543	0.55	30,545	0.55
14	HU Verified	Duplicate	3,120	0.06	3,120	0.06
17	OLQ Verified	Does Not Exist	716	0.01	716	0.01
18	OLQ Verified	Duplicate	108	0.00	108	0.00
31	Nonresidential	HU/OLQ Correction	724	0.01	724	0.01
32	Nonresidential	HU/OLQ Verified	1,029	0.02	1,029	0.02
35	Nonresidential	Uninhabitable	93	0.00	93	0.00
38	Uninhabitable	Does Not Exist	693	0.01	693	0.01
39	Uninhabitable	Duplicate	31	0.00	31	0.00
	Editing Errors					
49	Location Condition (COND), Residence (RES), Military Barracks	Blank to Nonblank	52	0.00	52	0.00
78	Location Urbanization Name	Blank to Nonblank	465	0.01	465	0.01
80	Location Area Name 1	Blank to Nonblank	1,027	0.02	1,027	0.02

Data Source: FDCA Address File
Note: "Verified" means that the unit was found in the field and there were no changes to the address record.

The largest (103,046 records, 1.86 percent) noncritical error was "AC Map Spot Rejected in QC." The second largest (29,826 records, 0.54 percent) noncritical error was "Location Street Name Nonblank to Different," which could have occurred when a lister made a minor change, such as changing Main St. to Main Street.

Table 5.11: Address Canvassing Dependent Quality Control Noncritical Errors

Error Number	Error Types		Total Noncritical Errors Reported		Total Noncritical Errors Recalculated	
			Number	Percent	Number	Percent
	Lister Action Code	*QC lister Action Code*				
7	HU Correction	Nonresidential	833	0.02	833	0.02
8	HU Correction	Uninhabitable	881	0.02	881	0.02
11	OLQ Correction	Nonresidential	130	0.00	130	0.00
12	OLQ Correction	Uninhabitable	35	0.00	35	0.00
15	HU Verified	Nonresidential	1,842	0.03	1,843	0.03
16	HU Verified	Uninhabitable	2,354	0.04	2,354	0.04
19	OLQ Verified	Nonresidential	104	0.00	104	0.00
20	OLQ Verified	Uninhabitable	12	0.00	12	0.00
33	Nonresidential	Does Not Exist	1,954	0.04	1,955	0.04
34	Nonresidential	Duplicate	186	0.00	186	0.00
36	Uninhabitable	HU/OLQ Correction	496	0.01	496	0.01
37	Uninhabitable	HU/OLQ Verified	1,050	0.02	1,050	0.02
40	Uninhabitable	Nonresidential	57	0.00	57	0.00
70	HU Add	Uninhabitable	726	0.01	727	0.01
71	OLQ Add	Uninhabitable	8	0.00	8	0.00
	Stateside & Puerto Rico					
42	Location House Number Blank to Nonblank (Observed)		2,871	0.05	6,163	0.11
44	Location House Number Nonblank to Changed (Observed)		7,041	0.13	932	0.02
45	Location Street Name Unnamed to Different		443	0.01	443	0.01
46	Location Street Name Nonblank to Different		29,826	0.54	29,830	0.54
47	Location Unit Identifier Blank to Nonblank		4,840	0.09	4,841	0.09
51	Location Complex Identifier Blank to Nonblank		107	0.00	37	0.00
63	Added Type of LQ (Housing Unit to OLQ)		1,230	0.02	1,236	0.02
64	Added Type of LQ (OLQ to Housing Unit)		472	0.01	472	0.01
72	Location Carretera Blank to Nonblank		305	0.01	306	0.01
73	Location Carretera Nonblank to Different		243	0.00	243	0.00
74	Location Ramal Blank to Nonblank		35	0.00	35	0.00
75	Location Ramal Nonblank to Different		49	0.00	49	0.00
	Map Spot Errors					
67	AC Map Spot Rejected in QC		103,046	1.86	-	-

Data Source: FDCA Adderss File

Note: Categories will not sum to the total since address records can have multiple changes. We could not recalculate the Map Spot errors because there was only one Map Spot variable and thus could only calculate it once.

Table 5.12 shows the number and the type of tally errors. Tally errors that occurred the most frequently were Structure Type errors, with 0.54 percent that were errors due to a change from a single unit structure to a multi-unit structure and 0.44 percent that were due to a changed from a multi-unit structure to a single-unit structure. The most common editing error had 15,187 records with a physical description changed from blank to nonblank.

Table 5.12: Address Canvassing Dependent Quality Control Tally Errors

Error Number	Error Types	Total Tally Errors Reported	
		Number	Percent
	Editing Errors (Stateside)		
41	Location House Number Blank to Nonblank (Not Observed)	4,179	0.08
43	Location House Number Nonblank to Changed (Not Observed)	6,736	0.12
48	Location Unit Identifier Nonblank to Changed	12,352	0.22
50	Location Apartment Complex (COND, RES, Military Barracks) Nonblank to Changed	265	0.00
52	Location Complex Identifier Nonblank to Changed	91	0.00
53	Location Zip Code Blank to Nonblank	1,435	0.03
54	Location Zip Code Nonblank to Changed	4,602	0.08
55	Physical Description Blank to Nonblank	15,187	0.27
56	Physical Description Nonblank to Changed	9,083	0.16
57	Mailing Address Unavailable to Same as Location Address (includes PO Box)	366	0.01
58	Mailing Address Unavailable to Nonblank (includes PO Box)	1,845	0.03
59	Mailing Address Nonblank to Changed (includes PO Box)	3,656	0.07
60	GQ/OLQ Name Blank to Nonblank	4,407	0.08
61	GQ/OLQ Name Nonblank to Changed	3,276	0.06
76	Location KM/HM Blank to Nonblank	358	0.01
77	Location KM/HM Nonblank to Blank	73	0.00
79	Location Urbanization Name Non Blank to Changed	1,005	0.02
81	Location Area Name 1 Non Blank to Changed	1,280	0.02
82	Location Area Name 2 Blank to Nonblank	549	0.01
83	Location Area Name 2 Non Blank to Changed	501	0.01
	Structure Type Errors (Stateside and Puerto Rico)		
65	Structure Type Single to Multi	30,121	0.54
66	Structure Type Multi to Single	24,242	0.44

Data Source: FDCA Address File
Note: Categories will not sum to the total since address records can have multiple changes

5.1.2.5 AOQL Results

The sample was designed to achieve an overall weighted AOQL of 8.1 percent for critical errors, and 22.6 percent for noncritical errors. The AOQL is defined as the worst quality of address data we would expect across all of the AAs after the production listing, DQC and recanvassing were completed. The 2010 Census AC AOQL algorithm was designed based on the 2010 Census budget and the AA

workload size distribution from a previous census test. It was designed to allow varying AOQLs based on the AA workload sizes.

At the end of the AC Operation, we recalculated the weighted AOQL based on the actual distribution of AA sizes. We achieved an actual weighted AOQL of 7.21 percent for critical errors and 21.88 percent for noncritical errors. Our QC design provided controls such that the worst quality we could achieve across all AAs was 7.21 percent for critical errors and 21.88 percent for noncritical errors.

5.1.2.6 Map Feature Errors

A map feature error was collected if the QC lister could not verify an added street or did not believe a street should have been deleted. These are tally errors only and did not count against the lister when the DQC pass/fail decision was made. QC listers found 12,865 (1.75 percent) AAs with an erroneously added feature and 33,796 (4.61 percent) AAs with an erroneously deleted feature.

5.1.2.7 Average Lag Times

The average time lag between when the production AAs were completed and the DQC for those AAs were started in the field (production check-in to DQC check-out) was 4.65 days. The average time lag between when the production AAs were completed and the DQC and Recanvass for those AAs were completed in the field (production check-in to DQC check-in) was 7.72 days. Listers took an average of 7.49 days to complete production AAs in the field (production check-out to production check-in). The average time it took to complete the DQC and Recanvass on AAs in the field (DQC check-out to DQC check-in) was 3.07 days. Table 5.13 provides a summary of these time lags. The time lags are consistent with what we would expect, and as a general rule we attempt to minimize them as much as possible.

Table 5.13: Address Canvassing Time Lags

Start Time	End Time	Average Time Lag (days)
Production check-in	DQC check-out	4.65
Production check-in	DQC and Recanvass check-in	7.72
Production check-out	Production check-in	7.49
DQC check-out	DQC check-in	3.07

Data Source: FDCA DQC File

5.1.3 Delete Verification Results

DV provided confirmation of all AC deletes and duplicate addresses, so that we could confidently exclude all those confirmed delete and duplicate addresses from the questionnaire delivery and subsequent census operations.

Table 5.14 displays the outcome for each address worked during DV. The production listers marked 25,444,238 address records as a delete or duplicate address. The QC lister was supposed to check every deleted/duplicate address record in DV. However, there were 1,114 (less than 0.01 percent) deleted/duplicate address records that did not have a

QC lister action code, indicating they did not go through DV. There were also 55 records that were erroneously sent to DV.

The QC lister agreed with the production lister the majority (94.75 percent) of the time. The production lister deleted approximately three percent of the address records because they could not locate the address. The QC lister found the address record during DV and either verified or corrected it.

Table 5.14: Delete Verification Outcome

Outcome Types		Total DV Outcome	
		Number	Percent
Lister Action Code	*QC lister Action Code*		
Does Not Exist	-	942	0.00
Does Not Exist	HU Verified	475,811	1.87
Does Not Exist	HU Correction	199,267	0.78
Does Not Exist	Does Not Exist	20,017,211	78.67
Does Not Exist	Nonresidential	26,606	0.10
Does Not Exist	Duplicate	202,079	0.79
Does Not Exist	Uninhabitable	14,241	0.06
Does Not Exist	OLQ Verified	11,899	0.05
Does Not Exist	OLQ Correction	6,337	0.02
Duplicate	-	172	0.00
Duplicate	HU Verified	60,251	0.24
Duplicate	HU Correction	38,843	0.15
Duplicate	Does Not Exist	287,957	1.13
Duplicate	Nonresidential	3,642	0.01
Duplicate	Duplicate	4,092,176	16.08
Duplicate	Uninhabitable	1,546	0.01
Duplicate	OLQ Verified	3,678	0.01
Duplicate	OLQ Correction	1,580	0.01
Total Delete Verification Universe		**25,444,238**	**100.00**

Data Source: FDCA Address File

5.1.4 Final Delete Verification Results

Address records marked as a delete or duplicate for the first time by a QC lister were to be sent to a different QC lister for FDV. According to these requirements, 782,568 address records should have gone to FDV. Only eight (less than 0.01 percent) of the 782,568 address records did not go to FDV.

Table 5.15 presents the FDV workload. There were a total of 783,125 address records sent to FDV, of which 565 (0.07 percent) records were erroneously sent to FDV.

Table 5.15: Final Delete Verification Workload

Final Delete Verification Workload	Expected	Actual
Total records sent correctly to FDV	782,568	782,560
Total records erroneously sent to FDV	-	565
Total Final Delete Verification Workload	782,568	783,125

Data Source: FDCA Address File

Table 5.16 displays the outcomes of the FDV for the cases that should have been sent. The QC lister who conducted the FDV agreed with the QC lister who marked the address record as a delete or duplicate for the first time most (90.53 percent) of the time. Even though the production lister did not agree with these QC listers, this gives us more assurance that the address record is a true delete or duplicate.

Table 5.16: Final Delete Verification Outcome

Outcome Types		Total FDV Outcome Number	Percent
QC Action Code	*FDV Lister Action Code*		
Does Not Exist	HU Verified	39,450	5.04
Does Not Exist	HU Correction	12,064	1.54
Does Not Exist	Does Not Exist	625,687	79.95
Does Not Exist	Nonresidential	1,101	0.14
Does Not Exist	Duplicate	7,709	0.99
Does Not Exist	Uninhabitable	1,283	0.16
Does Not Exist	OLQ Verified	913	0.12
Does Not Exist	OLQ Correction	366	0.05
Duplicate	HU Verified	3,986	0.51
Duplicate	HU Correction	1,495	0.19
Duplicate	Does Not Exist	4,829	0.62
Duplicate	Nonresidential	234	0.03
Duplicate	Duplicate	82,808	10.58
Duplicate	Uninhabitable	89	0.01
Duplicate	OLQ Verified	458	0.06
Duplicate	OLQ Correction	88	0.01
Total Final Delete Verification Universe		**782,560**	**100.00**

Data Source: FDCA Address File

5.2 *Large Block Results*

5.2.1 DQC Results

The Large Block Operation employed 1,687 listers nationally and all of those listers were checked as part of the Large Block QC. The listers worked 3,994,548 units during the Large Block Operation, of which 2,061,979 (51.62 percent)[6] were examined as part of DQC, DV, or Recanvass. The housing units were spread among 12,829 blocks, all of which were selected and checked.

Of the 12,829 blocks listed, 3,152 (24.57 percent) were re-listed completely, implying they failed DQC. However, as mentioned in the limitations section of this profile, we

[6] Note the 51.62 percent is *not* the DQC sample rate – it includes all phases of the QC program. We cannot distinguish the actual sample rate with the data we have.

have some evidence the QC listers were going "above and beyond" and completely listed some smaller blocks unnecessarily or failed blocks after checking units beyond the sample. Either of these scenarios would inflate the number of blocks that appear to have failed.

Table 5.17 describes the errors found during the Large Block Operation. The most common error was "unit should not have been listed in block," which means the lister added a unit that did not exist or failed to delete a unit that did not exist.

Table 5.17: Large Block Dependent Quality Control Critical Errors

Error Types	Total Critical Errors Reported	
	Number	Percent
Error Description		
Unit (not in a multi-unit structure) missed	14,229	0.69
Unit (in a multi-unit structure) missed	39,039	1.89
Unit incorrectly deleted	28,301	1.37
Unit should not have been listed in block	97,989	4.75
Unit had street name misspelled	19,244	0.93
Unit had incorrect street name	16,085	0.78
Unit had incorrect house number	7,997	0.39
Unit is a duplicate of another unit	8,763	0.42
Unit added by lister has incorrect ZIP code	1,992	0.10
Unit should have been merged with another	1,104	0.05

Data Source: Large Block dataset

The Large Block Operation achieved an 8.35 percent AOQL for critical errors and a 23.44 percent AOQL for noncritical errors.

The average time lag between listing completion and QC completion (which includes DV and Recanvass) is 35.55 days, with a standard deviation of 10.47 days. This is higher than expected due to issues with the software that delayed the QC operation for several weeks.

5.2.2 Delete Verification Results for the Large Block Operation

During DV for the Large Block Operation, the listers marked 938,286 units for deletion. All of those should have been checked as part of DV, but 923,512 units (98.43 percent) actually were checked, leaving 14,774 (1.57 percent) unchecked.

Of the 938,286 units that should have been in DV, 895,008 (95.39 percent) were confirmed deletions. The next most common action taken by the QC lister during DV was moving the unit, which they did to 19,156 (2.04 percent) of the units checked.

6 Related Evaluations, Experiments and/or Assessments

A detailed summary of the AC Operation can be found in the 2010 Census Operational Assessment for AC (Schneider et al., c. 2011). The Assessment provides details about what happened during the 2010 Census AC operation and information for the ALD OIT, stakeholders, and decision-makers. This information includes suggested improvements for achieving a successful AC Operation in future censuses. The data reported in this assessment are essential for 2020 Census planning.

7 Conclusions and Recommendations

In this section, we will summarize the outcome of the 2010 AC QC program and provide recommendations for improving the 2020 AC QC program.

7.1 *Conclusions*

We found:

- The majority of the observed production listers and the QC listers (88.30 percent and 81.47 percent, respectively) passed the Initial Observation.

- Since the observations were completed on paper forms, we only received 99,284 usable observation forms (11,847 forms were removed due to various errors). Of the 99,284 forms, we received 77,466 forms (76.13 percent of production listers completing at least one AA) for production listers and 21,818 forms (66.37 percent of QC listers completing at least one AA) for QC listers.

- The CLs recorded failure to list ground to hand-held computer as the most common error during the observations. The listers should have looked for units on the ground and then updated the address information in the hand-held computer based on the ground truth, not the other way.

- There were 159,494,710 address records in the AC universe. This includes 141,822,612 addresses that were originally sent out to the HHCs, plus another 17,672,098 that were added by the listers and QC listers during the operation.

- We sampled approximately three percent of the address records for DQC.

- Of the 733,636 Assignment Areas, 8.43 percent failed the DQC. This resulted in 13,365,216 address records designated for recanvassing.

- The incoming unit-level error rate (e.g., the error level before QC was conducted) was 1.87 percent.

- The outgoing unit-level error rate (e.g., the error level after QC and Recanvass was completed) was 0.88 percent.

- The production listers marked 25,444,238 address records as delete or duplicate addresses. The software was supposed to ensure every delete or duplicate address record was checked in DV. However, there were 1,114 (less than 0.01 percent) delete or duplicate address records that do not have a QC lister action code, indicating they did not go through DV. During DV, the QC lister agreed with the production lister the majority (94.75 percent) of the time.

- Only 782,568 address records should have gone to FDV. Of those, eight (less than 0.01 percent) did not. There were a total of 783,125 address records sent to FDV, including 565 (0.07 percent) records erroneously sent to FDV. During FDV, the QC listers agreed 90.53 percent of the time.

- The QC listers examined 2,061,979 units (which includes DQC, DV, and Recanvass) of the 3,994,548 units listed during the Large Block Operation. Due to data limitations, we were unable to establish how many units were only checked during the DQC. All 12,829 tabulation blocks listed during the Large Block Operation were checked.

- A total of 923,512 units (98.43 percent) of the 938,286 units marked for deletion were checked during the Large Block Operation. The QC listers confirmed the deletion of 895,008 (95.39 percent) units.

7.2 *Recommendations*

Our recommendations to improve the quality of the AC Operation and the address data for future tests and censuses are:

- Automate the Initial Observations on the HHCs or on laptops to ensure all forms are captured and to minimize data problems and eliminate duplicate forms, incomplete forms, and incorrect forms.

- Improve training to emphasize proper procedures; in particular, canvassing from ground to the hand-held computer. This was the most frequently reported problem on the Initial Observation reports in both the 2008 Census Dress Rehearsal and 2010 Census AC operations.

- Consider updates to the QC Program, such as:

    - Reviewing improved sampling methods for the DQC to ensure accurate representation of units within each AA.

    - Conducting independent Quality Control options where the Quality Control lister is not given the production lister's results in advance and only lists addresses he or she encounters in the field, to reduce the influence of the production lister's work on the Quality Control lister's work. This would require an adjudication process within the Quality Control Program.

- Establish software and hardware testing procedures during the design phase. Perform robust software testing to ensure the requirements are met and to prevent unforeseen

changes to the AC Operation (such as the technical limitation to work "large blocks" using the HHC).

Recommenations suggested during headquarters field observations:

- Improve staff training by providing more oversight from the CLs on practice blocks and feedback between listers and CLs.

- Research methods to make training more interactive by utilizing the HHC.

8 Acknowledments

Thanks to RJ Marquette for his assistance with SAS programs, comments on the report, and the Large Block analysis. Thanks to Heather Parks for her assistance with SAS programs, feedback, and fact checking on the report. Thanks to Demetra Lytras for her assistance with various SAS questions and Christine Tomaszewski for her assistance with formatting.

9 References

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Attachment A: *Observation Checklist,* Form D-1222 (AC)

This report contains information, the release of which is protected by the Privacy Act of 1974, and is for authorized uses only.

Form D-1222(AC) U.S. DEPARTMENT OF COMMERCE Economics and Statistics Administration U.S. CENSUS BUREAU **OBSERVATION CHECKLIST** **Address Canvassing** **2010 Census**	**IDENTIFICATION ITEMS** **1.** Lister Name: **3.** Type of Observation [X]: Production: _____ QC: _____	**2.** Applicant ID

	4. Observer Name:	**5.** Date [Month/Day]:	**6.** No. Listings Observed:	**7.** CLD No:	**8.** LCO No:
1st Observation		/			
2nd Observation		/			

SAFETY & SECURITY REMINDERS

- As required by law, use a seatbelt while driving
- Protect all Title 13 data or any medium that may contain personally identifiable information
- Any lost or stolen medium containing Title 13 data or personally identifiable information must be reported as soon as possible according to the instructions in your manuals

GENERAL INSTRUCTIONS

- Use this checklist to evaluate and document overall performance of enumerators/listers as you observe them in the field
- As you are observing, keep in mind the tasks listed
- For every task listed, mark "**X**" in the appropriate column:
  - **Y** -> Yes, task observed and performed correctly
  - **N** -> No, task observed but not performed correctly (discuss proper procedure before observing next address)
  - **N/A** -> Not Applicable, task not observed (discuss proper procedure at the end of observation)
- Use **Section A** to record performance for Production Listers
- Use **Sections A and B** to record performance for QC Listers
- Record observation results in **Section C** for Production and QC Listers

Section A -- OBSERVATION PERFORMANCE (Production and QC Listers)	1st Observation			2nd Observation		
Tasks:	**Y**	**N**	**N/A**	**Y**	**N**	**N/A**
1. Canvassed in correct block						
2. Canvassed from ground to HHC						
3. Used appropriate introductory statement or brief interview						
4. Showed Census identification and provided a copy of the Privacy Act Notice to each respondent						
5. Attempted to contact building manager or other knowledgeable person at each multi-unit structure						
6. Did not attempt contact at non-residential structures and structures with no indication of LQs						
7. Entered the correct address status for each address						
8. Selected the appropriate structure type						
9. Made appropriate updates to the location/mailing address						
10. Added missing LQs / Deleted nonexistent or duplicate LQs						
11. Map spotted in the correct location on the map						
12. Did not look at the HHC device while driving						
13. Made updates to street features on the map						
Section B -- ADDITIONAL TASKS (For QC Listers Only)						
14. Located correct starting address						
15. Followed rules of canvassing while conducting DQC and Recanvass						
16. Correctly accepted or rejected address records.						
17. Verified/updated the correct addresses according to QC procedures						
18. For added or rejected addresses:						
a. Selected the appropriate structure type						
b. Made appropriate updates to the location address						
c. Made appropriate entries to the location/mailing address						
19. Verified street feature updates on the map						
20. Accepted or rejected map spot for each address						
21. Followed correct procedures when collecting map spots						

Section C -- OBSERVATION RESULT

- Rate "**Satisfactory"** if the lister demonstrated a good overall understanding of the tasks
- If you believe the lister did **NOT** demonstrated a good overall understanding of the tasks, contact your immediate supervisor to discuss action to be taken (retraining, 2nd observation, mark "Unsatisfactory", etc)
  - **Do not mark "Unsatisfactory"** unless instructed by your supervisor
- **Other** - can be used if the enumerator/lister has resigned before you could observe him/her in the field
- **Notes** are required detailing procedural problems observed and actions to be taken

[ ] Satisfactory -- By the end of observation, lister understands and follows procedures.
[ ] Unsatisfactory -- By the end of observation, lister does NOT understand or follow procedures. (Notes required to explain)
[ ] Other -- for example, employee resigned before observation could take place. (Notes required to explain)

NOTES

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Attachment B: *Observation Checklist,* Form D-1222 (PR)

Este informe contiene información que está protegida por la Ley de Privacidad de 1974 (Título 5 del Código de los EE.UU., Sección 552a). La Ley de Privacidad exige que se tomen medidas de protección adecuadas para garantizar la seguridad y la confidencialidad de esta información. Esta información está limitada al uso autorizado por parte de personas que necesiten tener conocimiento sobre esta información.

Formulario D-1222(AD) PR (6-14-2009)

DEPARTAMENTO DE COMERCIO DE LOS EE.UU.
Administración de Economía y Estadística
NEGOCIADO DEL CENSO DE LOS EE.UU.

LISTA DE COTEJO PARA OBSERVACIÓN
Verificación de Direcciones
Censo 2010 - Puerto Rico

INFORMACIÓN DE IDENTIFICACIÓN

1. Nombre del Alistador:
2. ID del Solicitante
3. Tipo de Observación [X]: Producción: ____ QC: ____

	4. Nombre del Observador:	5. Fecha [Mes/Día]:	6. Núm. de Listados Observados:	7. Núm. de CLD:
1ra Observación		/		
2da Observación		/		8. Núm. de LCO:

RECORDATORIOS DE SEGURIDAD

- Utilice el cinturón de seguridad al conducir, tal como lo exige la ley.
- Proteja todos los datos cobijados bajo el Título 13 o cualquier medio que pueda contener información de identificación personal.
- Debe informar lo antes posible la pérdida o el robo de cualquier medio que contenga datos protegidos por el Título 13 o información de identificación personal, según se indica en las instrucciones de los manuales.

INSTRUCCIONES GENERALES

- Utilice esta lista de cotejo para evaluar y documentar el desempeño general de los enumeradores/alistadores al observar su trabajo en el campo.
- Al realizar la observación, tenga presente las tareas listadas.
- Marque con una "**X**" la columna correspondiente para cada tarea listada:
  - **S** -> Sí, la tarea se observó y se llevó a cabo correctamente.
  - **N** -> No, la tarea se observó, pero no se llevó a cabo correctamente (discuta el procedimiento correcto antes de observar la próxima dirección).
  - **N/A** -> No Aplica, no se observó la tarea (discuta el procedimiento correcto al final de la observación).
- Utilice la **Sección A** para anotar el desempeño de los Alistadores de Producción.
- Utilice la **Sección B** para anotar el desempeño de los Alistadores de QC (al dorso).
- Anote el resultado de la observación de los Alistadores de Producción y de QC en la **Sección C.**

Sección A -- OBSERVACIÓN DEL DESEMPEÑO (Alistadores de Producción)

Tareas	1ra Observación			2da Observación		
	S	N	N/A	S	N	N/A
1. Verificó dirección en el bloque correcto.						
2.Verificó dirección desde el sitio en la Computadora de Mano (HHC).						
3. Utilizó la introducción y la entrevista breve adecuadas.						
4. Mostró su identificación del Censo y le entregó un Aviso de Confidencialidad a cada						
5. Intentó comunicarse con el gerente del edificio o con otra persona que tenía conocimiento en cada una de las estructuras de unidades múltiples.						
6. No intentó establecer contacto en las estructuras no residenciales y en las estructuras que no dan indicios de ser alojamientos (LQ).						
7. Anotó el estatus correcto de cada dirección.						
8. Seleccionó el tipo de estructura correcto.						
9. Hizo las actualizaciones correctas a la dirección física/dirección postal.						
10. Añadió los LQ que faltaban / Borró los LQ que no existían o que estaban repetidos.						
11. Siguió los procedimientos correctos al recopilar los puntos en el mapa.						
12. No verificó la HHC mientras conducía.						
13. Actualizó las características de las calles en el mapa.						

Sección C -- RESULTADOS DE LA OBSERVACIÓN

- Califique como "**Satisfactorio**" si el alistador demostró tener una buena comprensión general de sus tareas.
- Si usted entiende que el alistador **NO** demostró tener una buena comprensión general de sus tareas, comuníquese con su supervisor de inmediato para
  - **No marque como "No Satisfactorio"** a menos que su supervisor se lo indique.

Otro - puede utilizarse si el enumerador/alistador ha renunciado antes de que usted lo pudiera observar en el campo.

- Las **Notas** son necesarias para detallar los problemas que se han observado con los procedimientos y las medidas que se deben tomar (al dorso).

[ ] **Satisfactorio** -- Al finalizar la observación, el alistador comprende y sigue los procedimientos.

[ ] **No satisfactorio** -- Al finalizar la observación, el alistador no comprende ni sigue los procedimientos. (Las Notas son necesarias para abundar)

[ ] **Otro** -- por ejemplo, el empleado renunció antes de que se pudiera llevar a cabo la observación. (Las Notas son necesarias para explicar)

Sección B – OBSERVACIÓN DEL DESEMPEÑO (Alistadores de Control de Calidad (QC))						
Tareas	1ra Observación			2da Observación		
	S	**N**	**N/A**	**S**	**N**	**N/A**
1. Verificó dirección en el bloque correcto.						
2.Verificó dirección del sitio en la Computadora Manual (HHC).						
3. Utilizó la introducción y la entrevista breve adecuadas.						
4. Mostró su identificación del Censo y le entregó un Aviso de Confidencialidad a cada respondedor.						
5. Intentó comunicarse con el gerente del edificio o con otra persona que tenía conocimiento en cada una de las estructuras de unidades múltiples.						
6. No intentó establecer contacto en las estructuras no residenciales y en las estructuras que no dan indicios de ser alojamientos (LQ).						
7. Anotó el estatus correcto de cada dirección.						
8. Seleccionó el tipo de estructura correcto.						
9. Hizo las actualizaciones correctas a la dirección física\dirección postal.						
10. Añadió los LQ que faltaban / Borró los LQ que no existían o que estaban repetidos.						
11. Siguió los procedimientos correctos al recopilar los puntos en el mapa.						
12. No verificó la HHC mientras conducía.						
13. Actualizó las características de las calles en el mapa.						
14. Localizó la dirección de inicio correcta.						
15. Siguió las reglas de verificación de direcciones mientras llevaba a cabo el Control de Calidad Dependiente (DQC) y la Revisión de la Verificación de Direcciones.						
16. Aceptó o rechazó correctamente los archivos de direcciones.						
17. Verificó/actualizó las direcciones correctas de acuerdo a los procedimientos de QC.						
18. En las direcciones añadidas o rechazadas:						
a. Seleccionó el tipo de estructura correcto.						
b. Hizo las actualizaciones correctas a la dirección del lugar						
c. Hizo las anotaciones correctas a la dirección física.						
19. Verificó las actualizaciones hehas a las características de las calles en el mapa.						
20. Aceptó o rechazó puntos en el mapa de cada dirección.						
NOTAS						

Attachment C: Address Canvassing DQC Errors

This table gives the Lister and QC Action Codes and how the error was categorized in the HHC (including error codes). This list includes both United States and Puerto Rico errors.

Lister Action Code	QC Lister Action Code	HHC Category (and error code)
-	HU Add	Critical (1)
-	OLQ Add	Critical (2)
HU Add	Does Not Exist	Critical (3)
OLQ Add	Does Not Exist	Critical (4)
HU Correction	Does Not Exist	Critical (5)
HU Correction	Duplicate	Critical (6)
HU Correction	Nonresidential	Noncritical (7)
HU Correction	Uninhabitable	Noncritical (8)
OLQ Correction	Does Not Exist	Critical (9)
OLQ Correction	Duplicate	Critical (10)
OLQ Correction	Nonresidential	Noncritical (11)
OLQ Correction	Uninhabitable	Noncritical (12)
HU Verified	Does Not Exist	Critical (13)
HU Verified	Duplicate	Critical (14)
HU Verified	Nonresidential	Noncritical (15)
HU Verified	Uninhabitable	Noncritical (16)
OLQ Verified	Does Not Exist	Critical (17)
OLQ Verified	Duplicate	Critical (18)
OLQ Verified	Nonresidential	Noncritical (19)
OLQ Verified	Uninhabitable	Noncritical (20)
Does Not Exist	HU/OLQ Correction	DV-Tally (21)
Does Not Exist	HU/OLQ Verified	DV-Tally (22)
Does Not Exist	Duplicate	DV-Tally (23)
Does Not Exist	Nonresidential	DV-Tally (24)
Does Not Exist	Uninhabitable	DV-Tally (25)
Duplicate	HU/OLQ Correction	DV-Tally (26)
Duplicate	HU/OLQ Verified	DV-Tally (27)
Duplicate	Does Not Exist	DV-Tally (28)
Duplicate	Nonresidential	DV-Tally (29)
Duplicate	Uninhabitable	DV-Tally (30)
Nonresidential	HU/OLQ Correction	Critical (31)
Nonresidential	HU/OLQ Verified	Critical (32)
Nonresidential	Does Not Exist	Noncritical (33)
Nonresidential	Duplicate	Noncritical (34)
Nonresidential	Uninhabitable	Critical (35)
Uninhabitable	HU/OLQ Correction	Noncritical (36)
Uninhabitable	HU/OLQ Verified	Noncritical (37)
Uninhabitable	Does Not Exist	Critical (38)
Uninhabitable	Duplicate	Critical (39)

Lister Action Code	QC Lister Action Code	HHC Category (and error code)
Uninhabitable	Nonresidential	Noncritical (40)
HU Add	Uninhabitable	Critical (70)
OLQ Add	Uninhabitable	Critical (71)
Editing Errors		
Location House Number Blank to Nonblank (Not Observed)		Tally (41)
Location House Number Blank to Nonblank (Observed)		Noncritical (42)
Location House Number Nonblank to Changed (Not Observed)		Tally (43)
Location House Number Nonblank to Changed (Observed)		Noncritical (44)
Location Street Name Unnamed to Different		Noncritical (45)
Location Street Name Nonblank to Different		Noncritical (46)
Location Unit Identifier Blank to Nonblank		Noncritical (47)
Location Unit Identifier Nonblank to Changed		Tally (48)
Location Apartment Complex (COND, RES, Military Barracks) Blank to Nonblank		Critical (49)
Location Apartment Complex (COND, RES, Military Barracks) Nonblank to Changed		Tally (50)
Location Complex Identifier Blank to Nonblank		Noncritical (51)
Location Complex Identifier Nonblank to Changed		Tally (52)
Location Zip Code Blank to Nonblank		Tally (53)
Location Zip Code Nonblank to Changed		Tally (54)
Physical Description Blank to Nonblank		Tally (55)
Physical Description Nonblank to Changed		Tally (56)
Mailing Address Unavailable to Same as Location Address (includes PO Box)		Tally (57)
Mailing Address Unavailable to Nonblank (includes PO Box)		Tally (58)
Mailing Address Nonblank to Changed (includes PO Box)		Tally (59)
GQ/OLQ Name Blank to Nonblank		Tally (60)
GQ/OLQ Name Nonblank to Changed		Tally (61)
Added Type of LQ (Housing Unit to OLQ)		Noncritical (63)
Added Type of LQ (OLQ to Housing Unit)		Noncritical (64)
Location Carretera Blank to Nonblank		Noncritical (72)
Location Carretera Nonblank to Different		Noncritical (73)
Location Ramal Blank to Nonblank		Noncritical (74)
Location Ramal Nonblank to Different		Noncritical (75)
Location KM/HM Blank to Nonblank		Tally (76)
Location KM/HM Nonblank to Blank		Tally (77)
Location Urbanization Name Blank to Nonblank		Critical (78)
Location Urbanization Name Nonblank to Changed		Tally (79)
Location Area Name 1 Blank to Nonblank		Critical (80)
Location Area Name 1 Nonblank to Changed		Tally (81)
Location Area Name 2 Blank to Nonblank		Tally (82)
Location Area Name 2 Nonblank to Changed		Tally (83)

Structure Type Errors	
Structure Type Single to Multi	Tally (65)
Structure Type Multi to Single	Tally (66)
Map Spot Errors	
Manual Map spot Location	Noncritical (67)
Feature Update Errors	
Added feature does not exist	Tally (68)
Deleted feature does exist	Tally (69)

Attachment D: Differences in Error Categories between the HHC and the ALMI

This table gives the description of the error and how the error was categorized in the HHC and the ALMI, where they are different. This table also gives the error codes for the HHC and the ALMI for reference. This list excludes errors specific to Puerto Rico since the ALMI was not designed for use in Puerto Rico and the Large Block Operation was not conducted there.

Tally errors are a special case. There are three categories:

- There were some tally errors in the HHC that are recorded as critical or noncritical errors in the ALMI. These are included on the list below.
- There were other tally errors in the HHC that were not recorded as errors at all in the ALMI. We excluded these from the list below, since they did not count toward a pass/fail decision in either instrument.
- The DV-related errors in the HHC were all recorded as tally errors as well (since DV was designed to check every housing unit marked as a delete or duplicate, there was no need for a pass/fail decision). Since the ALMI did not have a DV component, it recorded these situations as critical errors. These errors are included on the list below and denoted as "DV-Tally."

Error Description	HHC Category (and error code)	ALMI Category (and error code)
Housing Unit (HU) added by lister is changed to uninhabitable by checker	Noncritical (70)	Critical (C-1)
Other Living Quarters (OLQ) added by lister is changed to uninhabitable by checker	Noncritical (71)	Critical (C-1)
HU corrected by the lister changed to nonresidential by the checker	Noncritical (7)	Critical (C-1)
HU corrected by the lister changed to uninhabitable by the checker	Noncritical (8)	Critical (C-1)
OLQ corrected by the lister changed to nonresidential by the checker	Noncritical (11)	Critical (C-1)
OLQ corrected by the lister changed to uninhabitable by the checker	Noncritical (12)	Critical (C-1)
HU verified by the lister changed to nonresidential by the checker	Noncritical (15)	Critical (C-1)
HU verified by the lister changed to uninhabitable by the checker	Noncritical (16)	Critical (C-1)
OLQ verified by the lister changed to nonresidential by the checker	Noncritical (19)	Critical (C-1)
OLQ verified by the lister changed to uninhabitable by the checker	Noncritical (20)	Critical (C-1)
Lister indicated unit does not exist but checker reinstated it and corrected it	DV-Tally (21)	Critical (U-3)
Lister indicated unit does not exist but checker reinstated it and verified it	DV-Tally (22)	Critical (U-3)

Error Description	HHC Category (and error code)	ALMI Category (and error code)
Lister indicated unit does not exist but checker reinstated it and marked it uninhabitable	DV-Tally (25)	Critical (U-3)
Lister indicated unit was a duplicate but checker reinstated it and corrected it	DV-Tally (26)	Critical (U-3)
Lister indicated unit was a duplicate but checker reinstated it and verified it	DV-Tally (27)	Critical (U-3)
Lister indicated unit was a duplicate but checker reinstated it and marked it uninhabitable	DV-Tally (30)	Critical (U-3)
Lister marked unit as nonresidential but checker indicated it does not exist	Noncritical (33)	none
Lister marked unit as nonresidential but checker marked it as duplicate	Noncritical (34)	none
Lister marked unit as uninhabitable but checker corrected it [making it a valid HU/OLQ]	Noncritical (36)	Critical (U-3)
Lister marked unit as uninhabitable but checker verified it [as a valid HU/OLQ]	Noncritical (37)	Critical (U-3)
Lister marked a unit as uninhabitable but checker marked it nonresidential	Noncritical (40)	Critical (C-1)
Checker changed location house number from blank to filled (lister interviewed someone)	Tally (41)	Critical (C-4)
Checker changed location house number from blank to filled (lister completed by observation)	Noncritical (42)	Critical (C-4)
Checker changed location house number; filled to filled (lister interviewed someone)	Tally (43)	Critical (C-4)
Checker changed location house number; filled to filled (lister completed by observation)	Noncritical (44)	Critical (C-4)
Checker changed location street name from unnamed to filled	Noncritical (45)	Critical (C-2 or C-3)
Checked changed location street name from filled to different	Noncritical (46)	Critical (C-2 or C-3)
Checker changed location unit identifier from blank to filled	Noncritical (47)	none
Checker changed location apartment complex from blank to filled	Critical (49)	none
Checker changed location complex identifier from blank to filled	Noncritical (51)	none
Checker changed location ZIP code from blank to filled	Tally (53)	Critical (C-6)
Checker changed location ZIP code from filled to different	Tally (54)	Critical (C-6)
HU added by lister changed to OLQ by checker	Noncritical (63)	none
OLQ added by lister changed to HU by checker	Noncritical (64)	none
Checker changed the manual map spot location	Noncritical (67)	Tally (N-3)

Attachment E: Regional Census Center Tables (non-Large Block)

Table E.1a: Classification of Initial Observation Forms for Boston, MA RCC

Number of forms received:			10,723
	Duplicate forms[1]:	661	
	No observation type marked and no task fields:	25	
	Containing both production and QC data:	60	
	Observation type did not match the task fields:	17	
	Blank applicant ID:	215	
Total number of forms removed:			978
Resulting number of forms analyzed:			9,745

[1]Some listers may have worked on both production and QC and thus legitimately have two observation forms. These were not deleted.
Data Source: Address Canvassing Initial Observation Forms and FDCA Assessment File

Table E.1b: Classification of Initial Observation Forms for New York, NY RCC

Number of forms received:			4,491
	Duplicate forms[1]:	213	
	No observation type marked and no task fields:	10	
	Containing both production and QC data:	69	
	Observation type did not match the task fields:	7	
	Blank applicant ID:	134	
Total number of forms removed:			433
Resulting number of forms analyzed:			4,058

[1]Some listers may have worked on both production and QC and thus legitimately have two observation forms. These were not deleted.
Data Source: Address Canvassing Initial Observation Forms and FDCA Assessment File

Table E.1c: Classification of Initial Observation Forms for Philadelphia, PA RCC

Number of forms received:			5,957
	Duplicate forms[1]:	197	
	No observation type marked and no task fields:	9	
	Containing both production and QC data:	50	
	Observation type did not match the task fields:	16	
	Blank applicant ID:	172	
Total number of forms removed:			444
Resulting number of forms analyzed:			5,513

[1]Some listers may have worked on both production and QC and thus legitimately have two observation forms. These were not deleted.
Data Source: Address Canvassing Initial Observation Forms and FDCA Assessment File

Table E.1d: Classification of Initial Observation Forms for Detroit, MI RCC

Number of forms received:			6,752
	Duplicate forms[1]:	216	
	No observation type marked and no task fields:	9	
	Containing both production and QC data:	26	
	Observation type did not match the task fields:	10	
	Blank applicant ID:	170	
Total number of forms removed:			431
Resulting number of forms analyzed:			6,321

[1]Some listers may have worked on both production and QC and thus legitimately have two observation forms. These were not deleted.
Data Source: Address Canvassing Initial Observation Forms and FDCA Assessment File

Table E.1e: Classification of Initial Observation Forms for Chicago, IL RCC

Number of forms received:			7,814
	Duplicate forms[1]:	414	
	No observation type marked and no task fields:	5	
	Containing both production and QC data:	50	
	Observation type did not match the task fields:	6	
	Blank applicant ID:	194	
Total number of forms removed:			669
Resulting number of forms analyzed:			7,145

[1]Some listers may have worked on both production and QC and thus legitimately have two observation forms. These were not deleted.
Data Source: Address Canvassing Initial Observation Forms and FDCA Assessment File

Table E.1f: Classification of Initial Observation Forms for Kansas City, KS RCC

Number of forms received:			8,234
	Duplicate forms[1]:	346	
	No observation type marked and no task fields:	14	
	Containing both production and QC data:	88	
	Observation type did not match the task fields:	26	
	Blank applicant ID:	319	
Total number of forms removed:			793
Resulting number of forms analyzed:			7,441

[1]Some listers may have worked on both production and QC and thus legitimately have two observation forms. These were not deleted.
Data Source: Address Canvassing Initial Observation Forms and FDCA Assessment File

Table E.1g: Classification of Initial Observation Forms for Seattle, WA RCC

Number of forms received:			7,337
	Duplicate forms[1]:	439	
	No observation type marked and no task fields:	16	
	Containing both production and QC data:	61	
	Observation type did not match the task fields:	6	
	Blank applicant ID:	199	
Total number of forms removed:			721
Resulting number of forms analyzed:			6,616

[1]Some listers may have worked on both production and QC and thus legitimately have two observation forms. These were not deleted.
Data Source: Address Canvassing Initial Observation Forms and FDCA Assessment File

Table E.1h: Classification of Initial Observation Forms for Charlotte, NC RCC

Number of forms received:			9,606
	Duplicate forms[1]:	315	
	No observation type marked and no task fields:	10	
	Containing both production and QC data:	70	
	Observation type did not match the task fields:	14	
	Blank applicant ID:	260	
Total number of forms removed:			669
Resulting number of forms analyzed:			8,937

[1]Some listers may have worked on both production and QC and thus legitimately have two observation forms. These were not deleted.
Data Source: Address Canvassing Initial Observation Forms and FDCA Assessment File

Table E.1i: Classification of Initial Observation Forms for Atlanta, GA RCC

Number of forms received:			9,799
	Duplicate forms[1]:	664	
	No observation type marked and no task fields:	12	
	Containing both production and QC data:	48	
	Observation type did not match the task fields:	25	
	Blank applicant ID:	183	
Total number of forms removed:			932
Resulting number of forms analyzed:			8,867

[1]Some listers may have worked on both production and QC and thus legitimately have two observation forms. These were not deleted.
Data Source: Address Canvassing Initial Observation Forms and FDCA Assessment File

Table E.1j: Classification of Initial Observation Forms for Dallas, TX RCC

Number of forms received:			9,778
	Duplicate forms[1]:	868	
	No observation type marked and no task fields:	13	
	Containing both production and QC data:	90	
	Observation type did not match the task fields:	9	
	Blank applicant ID:	266	
Total number of forms removed:			1,246
Resulting number of forms analyzed:			8,532

[1]Some listers may have worked on both production and QC and thus legitimately have two observation forms. These were not deleted.
Data Source: Address Canvassing Initial Observation Forms and FDCA Assessment File

Table E.1k: Classification of Initial Observation Forms for Denver, CO RCC

Number of forms received:			7,559
	Duplicate forms[1]:	596	
	No observation type marked and no task fields:	9	
	Containing both production and QC data:	51	
	Observation type did not match the task fields:	14	
	Blank applicant ID:	216	
Total number of forms removed:			886
Resulting number of forms analyzed:			6,673

[1]Some listers may have worked on both production and QC and thus legitimately have two observation forms. These were not deleted.
Data Source: Address Canvassing Initial Observation Forms and FDCA Assessment File

Table E.1l: Classification of Initial Observation Forms for Los Angeles, CA RCC

Number of forms received:			7,986
	Duplicate forms[1]:	1,143	
	No observation type marked and no task fields:	5	
	Containing both production and QC data:	58	
	Observation type did not match the task fields:	20	
	Blank applicant ID:	160	
Total number of forms removed:			1,386
Resulting number of forms analyzed:			6,600

[1]Some listers may have worked on both production and QC and thus legitimately have two observation forms. These were not deleted.
Data Source: Address Canvassing Initial Observation Forms and FDCA Assessment File

Table E.2a: Type of Initial Observation for Boston, MA RCC

	Total	Production Listers	QC Listers
Listers who completed at least one assignment (production or QC)	12,494	9,756	2,738
Observation Forms	9,745	7,612	2,133
Percent of Forms missing	22.00%	21.98%	22.10%

Table E.2b: Type of Initial Observation for New York, NY RCC

	Total	Production Listers	QC Listers
Listers who completed at least one assignment (production or QC)	6,246	4,849	1,397
Observation Forms	4,058	3,268	790
Percent of Forms missing	35.03%	32.60%	43.45%

Table E.2c: Type of Initial Observation for Philadelphia, PA RCC

	Total	Production Listers	QC Listers
Listers who completed at least one assignment (production or QC)	10,026	7,843	2,183
Observation Forms	5,513	4,297	1,216
Percent of Forms missing	45.01%	45.21%	44.30%

Table E.2d: Type of Initial Observation for Detroit, MI RCC

	Total	Production Listers	QC Listers
Listers who completed at least one assignment (production or QC)	10,883	8,122	2,761
Observation Forms	6,321	5,044	1,277
Percent of Forms missing	41.92%	37.90%	53.75%

Table E.2e: Type of Initial Observation for Chicago, IL RCC

	Total	Production Listers	QC Listers
Listers who completed at least one assignment (production or QC)	10,273	7,950	2,323
Observation Forms	7,145	5,590	1,555
Percent of Forms missing	30.45%	29.69%	33.06%

Table E.2f: Type of Initial Observation for Kansas City, KS RCC

	Total	Production Listers	QC Listers
Listers who completed at least one assignment (production or QC)	11,047	8,600	2,447
Observation Forms	7,441	6,140	1,301
Percent of Forms missing	32.64%	28.60%	46.83%

Table E.2g: Type of Initial Observation for Seattle, WA RCC

	Total	Production Listers	QC Listers
Listers who completed at least one assignment (production or QC)	10,737	8,435	2,302
Observation Forms	6,616	5,266	1,350
Percent of Forms missing	41.36%	37.57%	41.36%

Table E.2h: Type of Initial Observation for Charlotte, NC RCC

	Total	Production Listers	QC Listers
Listers who completed at least one assignment (production or QC)	14,863	10,889	3.974
Observation Forms	8,937	7,240	1,697
Percent of Forms missing	39.87%	33.51%	57.30%

Table E.2i: Type of Initial Observation for Atlanta, GA RCC

	Total	Production Listers	QC Listers
Listers who completed at least one assignment (production or QC)	14,655	10,729	3,926
Observation Forms	8,867	6,861	2,006
Percent of Forms missing	39.50%	36.05%	48.90%

Table E.2j: Type of Initial Observation for Dallas, TX RCC

	Total	Production Listers	QC Listers
Listers who completed at least one assignment (production or QC)	11,962	9,190	2,772
Observation Forms	8,532	6,517	2,015
Percent of Forms missing	28.67%	29.09%	27.31%

Table E.2k: Type of Initial Observation for Denver, CO RCC

	Total	Production Listers	QC Listers
Listers who completed at least one assignment (production or QC)	12,673	9,356	3,317
Observation Forms	6,673	5,150	1,523
Percent of Forms missing	47.34%	44.96%	54.09%

Table E.2l: Type of Initial Observation for Los Angeles, CA RCC

	Total	Production Listers	QC Listers
Listers who completed at least one assignment (production or QC)	8,765	6,033	2,732
Observation Forms	6,600	4,606	1,994
Percent of Forms missing	24.70%	23.65%	27.01%

Table E.3: Observation Outcomes by Regional Census Center

	Boston		New York		Philadelphia		Detroit	
Production Listers	**1st Obs**	**2nd Obs**	**1st Obs**	**2nd Obs**	**1st Obs**	**2nd Obs**	**1st Obs**	**2nd Obs**
Satisfactory	5,776	935	2,692	213	3,365	340	4,206	223
Unsatisfactory	37	20	34	9	21	10	22	11
Other	137	32	70	3	26	1	29	2
Blank	548	127	222	25	475	59	485	66
Total	**6,498**	**1,114**	**3,018**	**250**	**3,887**	**410**	**4,742**	**302**
QC Listers	**1st Obs**	**2nd Obs**	**1st Obs**	**2nd Obs**	**1st Obs**	**2nd Obs**	**1st Obs**	**2nd Obs**
Satisfactory	1,572	257	621	61	780	85	1,004	25
Unsatisfactory	17	10	11	1	9	4	7	2
Other	45	1	3	0	19	0	6	0
Blank	218	13	77	16	273	46	216	17
Total	**1,852**	**281**	**712**	**78**	**1,081**	**135**	**1,233**	**44**

Data Source: Address Canvassing Initial Observation Forms

Table E.3: Observation Outcomes by Regional Census Center

	Chicago		Kansas City		Seattle		Charlotte	
Production Listers	**1st Obs**	**2nd Obs**	**1st Obs**	**2nd Obs**	**1st Obs**	**2nd Obs**	**1st Obs**	**2nd Obs**
Satisfactory	4,549	495	5,130	248	4,334	426	5,971	517
Unsatisfactory	14	20	32	14	26	12	36	21
Other	23	1	20	0	42	1	70	3
Blank	423	65	682	14	365	60	539	83
Total	**5,009**	**581**	**5,864**	**276**	**4,767**	**499**	**6,616**	**624**
QC Listers	**1st Obs**	**2nd Obs**	**1st Obs**	**2nd Obs**	**1st Obs**	**2nd Obs**	**1st Obs**	**2nd Obs**
Satisfactory	1,281	55	944	60	1,045	90	1,290	65
Unsatisfactory	15	5	11	4	15	6	17	6
Other	16	0	7	1	8	2	19	0
Blank	162	21	255	19	160	24	260	40
Total	**1,474**	**44**	**1,217**	**84**	**1,228**	**122**	**1,586**	**111**

Table E.3: Observation Outcomes by Regional Census Center

	Atlanta		Dallas		Denver		Los Angeles	
Production Listers	**1st Obs**	**2nd Obs**	**1st Obs**	**2nd Obs**	**1st Obs**	**2nd Obs**	**1st Obs**	**2nd Obs**
Satisfactory	5,321	658	5,031	732	3,997	317	3,937	325
Unsatisfactory	65	29	45	22	21	12	40	18
Other	115	3	69	2	49	134	20	1
Blank	570	100	489	127	567	53	247	18
Total	**6,071**	**790**	**5,634**	**883**	**4,634**	**516**	**4,244**	**362**
QC Listers	**1st Obs**	**2nd Obs**	**1st Obs**	**2nd Obs**	**1st Obs**	**2nd Obs**	**1st Obs**	**2nd Obs**
Satisfactory	1,509	100	1,611	102	1,108	69	1,554	170
Unsatisfactory	19	7	20	3	13	1	8	18
Other	28	6	31	0	20	0	27	5
Blank	309	28	215	33	274	38	201	11
Total	**1,865**	**141**	**1,877**	**138**	**1,415**	**108**	**1,790**	**204**

Table E.4: Number of Production Listers who Committed Errors during Initial Observations by Regional Census Center

	Boston		New York		Philadelphia		Detroit	
Task lister failed to perform or perform correctly	**1st Obs**	**2nd Obs**	**1st Obs**	**2nd Obs**	**1st Obs**	**2nd Obs**	**1st Obs**	**2nd Obs**
Canvassed in correct block.	102	26	63	4	63	6	54	6
Canvassed from ground to HHC	151	33	105	10	105	10	86	9
Used appropriate introductory statement or brief interview	149	19	108	10	66	7	116	6
Showed Census identification and provided a copy of the Confidentiality Notice to each respondent	154	19	142	10	83	11	110	4
Attempted to contact building manager or other knowledgeable person at each multi-unit structure	83	12	50	8	32	2	54	17
Did not attempt contact at non-residential structures and structures with no indication of LQs	131	21	78	28	32	10	40	14
Entered the correct address status for each address	71	15	35	3	24	4	29	6
Selected the appropriate structure type	74	26	54	8	33	2	47	4
Made appropriate updates to the location/mailing address	83	15	56	9	47	8	48	6
Added missing LQs and/or Deleted nonexistent or duplicate LQs	69	22	66	12	43	6	55	18
Followed correct procedures when collecting map spots	168	35	138	7	93	9	95	6
Did not look at the HHC device while driving	105	40	42	17	58	9	71	4
Made updates to street features on the map	104	24	57	17	73	18	53	20

Data Source: Address Canvassing Initial Observation Forms

Table E.4: Number of Production Listers who Committed Errors during Initial Observations by Regional Census Center

	Chicago		Kansas City		Seattle		Charlotte	
Task lister failed to perform or perform correctly	**1st Obs**	**2nd Obs**	**1st Obs**	**2nd Obs**	**1st Obs**	**2nd Obs**	**1st Obs**	**2nd Obs**
Canvassed in correct block.	87	15	72	3	56	7	144	23
Canvassed from ground to HHC	102	27	113	8	119	19	214	31
Used appropriate introductory statement or brief interview	83	8	83	5	122	16	149	18
Showed Census identification and provided a copy of the Confidentiality Notice to each respondent	98	9	119	2	113	11	152	16
Attempted to contact building manager or other knowledgeable person at each multi-unit structure	41	4	57	4	40	7	51	7
Did not attempt contact at non-residential structures and structures with no indication of LQs	53	7	47	5	58	5	109	31
Entered the correct address status for each address	34	10	31	4	32	8	48	9
Selected the appropriate structure type	54	10	42	8	50	5	73	17
Made appropriate updates to the location/mailing address	46	13	51	9	53	10	85	22
Added missing LQs and/or Deleted nonexistent or duplicate LQs	42	16	59	8	58	15	75	23
Followed correct procedures when collecting map spots	121	23	76	5	89	19	167	27
Did not look at the HHC device while driving	106	8	132	14	105	8	210	25
Made updates to street features on the map	47	8	61	7	51	12	80	17

Table E.4: Number of Production Listers who Committed Errors during Initial Observations by Regional Census Center

	Atlanta		Dallas		Denver		Los Angeles	
Task lister failed to perform or perform correctly	**1st Obs**	**2nd Obs**	**1st Obs**	**2nd Obs**	**1st Obs**	**2nd Obs**	**1st Obs**	**2nd Obs**
Canvassed in correct block.	212	37	98	20	55	5	72	8
Canvassed from ground to HHC	388	53	216	35	95	13	111	13
Used appropriate introductory statement or brief interview	189	24	187	22	108	11	104	9
Showed Census identification and provided a copy of the Confidentiality Notice to each respondent	172	14	179	15	98	8	125	8
Attempted to contact building manager or other knowledgeable person at each multi-unit structure	66	11	68	9	47	9	40	11
Did not attempt contact at non-residential structures and structures with no indication of LQs	97	8	126	12	54	3	65	2
Entered the correct address status for each address	87	13	66	12	29	6	46	7
Selected the appropriate structure type	76	16	58	22	33	5	70	11
Made appropriate updates to the location/mailing address	115	23	58	20	47	7	60	9
Added missing LQs and/or Deleted nonexistent or duplicate LQs	153	28	100	23	48	11	55	12
Followed correct procedures when collecting map spots	256	39	170	30	87	9	111	10
Did not look at the HHC device while driving	232	30	211	26	100	4	74	5
Made updates to street features on the map	97	24	107	16	61	5	49	2

Table E.5: Number of QC Listers who Committed Errors during Initial Observations by Regional Census Center

	Boston		New York		Philadelphia		Detroit	
Task lister failed to perform or perform correctly	**1st Obs**	**2nd Obs**	**1st Obs**	**2nd Obs**	**1st Obs**	**2nd Obs**	**1st Obs**	**2nd Obs**
Canvassed in correct block.	12	3	9	0	13	4	4	0
Canvassed from ground to HHC	69	9	18	1	27	4	28	2
Used appropriate introductory statement or brief interview	65	6	18	1	20	2	30	5
Showed Census identification and provided a copy of the Confidentiality Notice to each respondent	95	8	30	0	31	4	33	3
Attempted to contact building manager or other knowledgeable person at each multi-unit structure	21	4	2	1	10	0	14	1
Did not attempt contact at non-residential structures and structures with no indication of LQs	34	2	9	1	9	2	10	0
Entered the correct address status for each address	14	2	4	2	14	3	3	0
Selected the appropriate structure type	13	2	3	1	6	3	4	0
Made appropriate updates to the location/mailing address	21	3	5	2	9	2	4	0
Added missing LQs and/or Deleted nonexistent or duplicate LQs	14	6	11	0	9	3	2	0
Followed correct procedures when collecting map spots	29	6	9	2	19	5	16	2
Did not look at the HHC device while driving	73	6	4	0	13	4	41	5
Made updates to street features on the map	21	4	6	1	6	2	8	0
Located correct starting address	28	6	7	1	17	7	19	2
Followed rules of canvassing while conducting DQC and Recanvass	57	7	17	1	27	9	26	2
Correctly accepted or rejected address records	19	3	7	1	14	3	6	0
Verified/updated the correct addresses according to QC procedures	16	3	3	2	13	2	7	0
For added or rejected addresses:	1	2	1	0	2	0	0	0
Selected the appropriate address status	10	2	2	1	9	4	6	0
Selected the appropriate structure type	13	2	2	0	6	2	4	0
Made appropriate entries to the location/mailing address	9	3	4	1	12	1	5	0
Verified street feature updates on the map	24	5	7	1	14	1	5	0
Accepted or rejected map spot for each address	15	5	2	1	9	2	7	2

Data Source: Address Canvassing Initial Observation Forms

Table E.5: Number of QC Listers who Committed Errors during Initial Observations by Regional Census Center

	Chicago		Kansas City		Seattle		Charlotte	
Task lister failed to perform or perform correctly	**1st Obs**	**2nd Obs**	**1st Obs**	**2nd Obs**	**1st Obs**	**2nd Obs**	**1st Obs**	**2nd Obs**
Canvassed in correct block.	14	2	11	2	19	0	16	3
Canvassed from ground to HHC	38	2	23	4	47	6	32	4
Used appropriate introductory statement or brief interview	37	1	19	4	43	3	27	4
Showed Census identification and provided a copy of the Confidentiality Notice to each respondent	53	2	38	4	57	6	40	1
Attempted to contact building manager or other knowledgeable person at each multi-unit structure	10	1	17	1	17	2	16	2
Did not attempt contact at non-residential structures and structures with no indication of LQs	14	1	18	1	14	3	20	2
Entered the correct address status for each address	4	1	7	0	8	1	10	2
Selected the appropriate structure type	3	1	6	0	7	0	5	5
Made appropriate updates to the location/mailing address	4	0	6	1	7	0	6	2
Added missing LQs and/or Deleted nonexistent or duplicate LQs	5	2	7	1	5	1	9	4
Followed correct procedures when collecting map spots	13	1	13	1	24	5	21	5
Did not look at the HHC device while driving	50	2	48	6	43	4	82	13
Made updates to street features on the map	6	1	10	2	10	1	16	1
Located correct starting address	20	0	17	3	17	1	23	4
Followed rules of canvassing while conducting DQC and Recanvass	30	3	23	3	48	3	44	7
Correctly accepted or rejected address records	12	4	16	2	19	1	21	8
Verified/updated the correct addresses according to QC procedures	8	3	10	2	11	0	15	4
For added or rejected addresses:	1	0	4	0	2	0	2	1
Selected the appropriate address status	4	2	3	0	6	0	10	3
Selected the appropriate structure type	3	0	5	0	9	0	8	4
Made appropriate entries to the location/mailing address	5	0	5	0	4	0	11	3
Verified street feature updates on the map	10	1	5	3	12	0	18	4
Accepted or rejected map spot for each address	3	1	6	2	9	4	10	3

Table E.5: Number of QC Listers who Committed Errors during Initial Observations by Regional Census Center

	Atlanta		Dallas		Denver		Los Angeles	
Task lister failed to perform or perform correctly	**1st Obs**	**2nd Obs**	**1st Obs**	**2nd Obs**	**1st Obs**	**2nd Obs**	**1st Obs**	**2nd Obs**
Canvassed in correct block.	21	3	21	3	13	1	22	3
Canvassed from ground to HHC	80	8	45	7	35	1	80	10
Used appropriate introductory statement or brief interview	44	1	36	1	44	0	79	6
Showed Census identification and provided a copy of the Confidentiality Notice to each respondent	70	2	61	5	48	0	89	13
Attempted to contact building manager or other knowledgeable person at each multi-unit structure	25	3	30	2	18	3	22	3
Did not attempt contact at non-residential structures and structures with no indication of LQs	29	2	52	1	20	6	14	4
Entered the correct address status for each address	19	3	12	1	7	1	13	1
Selected the appropriate structure type	10	0	8	1	6	0	15	2
Made appropriate updates to the location/mailing address	18	3	14	1	3	0	9	0
Added missing LQs and/or Deleted nonexistent or duplicate LQs	25	5	11	3	9	2	12	1
Followed correct procedures when collecting map spots	54	3	24	4	15	1	35	6
Did not look at the HHC device while driving	126	14	83	5	45	1	31	4
Made updates to street features on the map	24	5	26	3	12	2	15	1
Located correct starting address	33	7	26	1	21	0	19	4
Followed rules of canvassing while conducting DQC and Recanvass	79	10	47	5	34	0	53	10
Correctly accepted or rejected address records	33	4	15	2	17	0	26	5
Verified/updated the correct addresses according to QC procedures	22	6	13	3	8	0	14	5
For added or rejected addresses:	4	2	3	0	2	0	6	3
Selected the appropriate address status	15	3	13	0	7	0	10	4
Selected the appropriate structure type	12	1	11	0	8	0	14	4
Made appropriate entries to the location/mailing address	15	1	12	1	6	0	11	2
Verified street feature updates on the map	20	6	25	3	6	1	14	2
Accepted or rejected map spot for each address	17	2	11	1	5	0	8	1

Table E.6. Allocation of the Address Canvassing Universe by RCC

Category	Number of Addresses (Percent of Units in Category for each RCC)					
Region:	Boston	New York	Philadelphia	Detroit	Chicago	Kansas City
Production Only	9,685,203 (70.84%)	5,931,588 (77.41%)	8,803,431 (73.36%)	9,236,303 (74.25%)	9,477,638 (76.15%)	9,597,716 (75.72%)
Production and DQC	467,819 (3.42%)	285,272 (3.72%)	421,731 (3.51%)	446,501 (3.59%)	455,816 (3.66%)	444,411 (3.51%)
Production and DV	2,221,793 (16.25%)	676,953 (8.83%)	1,767,026 (14.72%)	1,730,906 (13.91%)	1,528,555 (12.28%)	1,884,159 (14.86%)
Production and Recanvass	1,297,254 (9.49%)	768,959 (10.03%)	1,008,653 (8.40%)	1,025,370 (8.24%)	984,036 (7.91%)	749,001 (5.91%)
Production, DQC or Recanvass, and FDV	61,668 (0.45%)	41,339 (0.54%)	70,197 (0.58%)	36,130 (0.29%)	44,569 (0.36%)	39,736 (0.31%)
Flagged for Large Block Operation[1]	0 (0.00%)	0 (0.00%)	0 (0.00%)	283 (0.00%)	0 (0.00%)	0 (0.00%)
Region Total[2]	13,672,069 (100.00%)	7,662,772 (100.00%)	12,000,841 (100.00%)	12,439,363 (100.00%)	12,446,045 (100.00%)	12,675,287 (100.00%)
Region:	Seattle	Charlotte	Atlanta	Dallas	Denver	Los Angeles
Production Only	9,119,236 (75.79%)	12,809,857 (70.03%)	12,377,984 (65.53.%)	11,347,390 (71.17%)	8,754,592 (69.86%)	8,015,150 (73.46%)
Production and DQC	438,686 (3.65%)	605,687 (3.31%)	607,819 (3.22%)	528,699 (3.32%)	455,882 (3.64%)	387,267 (3.55%)
Production and DV	1,508,562 (12.54%)	3,556,989 (19.45%)	3,938,750 (20.85%)	2,848,636 (17.87%)	2,201,536 (17.57%)	1,548,646 (14.19%)
Production and Recanvass	962,349 (8.00%)	1,319,047 (7.21%)	1,958,908 (10.37%)	1,213,701 (7.61%)	1,118,615 (8.93%)	959,323 (8.79%)
Production, DQC or Recanvass, and FDV	35,611 (0.30%)	84,428 (0.46%)	159,071 (0.84%)	84,597 (0.53%)	83,031 (0.66%)	42,748 (0.39%)
Flagged for Large Block Operation[1]	3,201 (0.03%)	157 (0.00%)	5,740 (0.03%)	5,495 (0.03%)	429 (0.00%)	0 (0.00%)
Region Total[2]	12,032,034 (100.00%)	18,291,737 (100.00%)	18,889,201 (100.00%)	15,943,921 (100.00%)	12,531,054(100.00%)	10,910,386 (100.00%)

Data Source: FDCA Address File

[1]Although some of these units were worked in production, the information was discarded in favor of the results from the Large Block Operation.

[2]These counts do not sum to the total because the units worked in FDV were also worked in another phase of QC.

Table E.7. Number of AAs passed and failed in DQC operation

Regional Census Center	Number of AAs passed (Percent of AAs in RCC)	Number of AAs failed (Percent of AAs in RCC)	Number of AAs checked
Boston, MA	52,681 (89.42%)	6,232 (10.58%)	58,913 (100.00%)
New York, NY	23,618 (89.84%)	2,671 (10.16%)	26,289 (100.00%)
Philadelphia, PA	49,787 (91.42%)	4,672 (8.58%)	54,459 (100.00%)
Detroit, MI	46,864 (91.40%)	4,409 (8.60%)	51,273 (100.00%)
Chicago, IL	53,869 (92.81%)	4,176 (7.19%)	58,045 (100.00%)
Kansas City, KS	70,797 (94.08%)	4,458 (5.92%)	75,255 (100.00%)
Seattle, WA	53,459 (92.55%)	4,301 (7.45%)	57,760 (100.00%)
Charlotte, NC	70,452 (92.06%)	6,077 (7.94%)	76,529 (100.00%)
Atlanta, GA	58,366 (88.57%)	7,532 (11.43%)	65,898 (100.00%)
Dallas, TX	63,007 (91.66%)	5,733 (8.34%)	68,740 (100.00%)
Denver, CO	90,471 (91.94%)	7,926 (8.06%)	98,397 (100.00%)
Los Angeles, CA	38,422 (91.57%)	3,656 (8.69%)	42,078 (100.00%)
Total	**671,793 (91.31%)**	**61,843 (8.43%)**	**733,636 (100.00%)**

Data Source: FDCA Address File

Table E.8: Dependent Quality Control Sample Size for AAs by RCC

Regional Census Center	Number/percent of AAs Undersampled (too few units)	Number/percent of AAs with Correct Sample Size	Number/percent of AAs Oversampled (too many units)	Total Number of AAs Sampled
Boston, MA	18 (0.03%)	57,861 (99.67%)	174 (0.30%)	58,053 (100.00%)
New York, NY	9 (0.03%)	26,057 (99.79%)	47 (0.18%)	26,113 (100.00%)
Philadelphia, PA	31 (0.06%)	53,567 (99.65%)	158 (0.29%)	53,756 (100.00%)
Detroit, MI	10 (0.02%)	50,633 (99.70%)	143 (0.28%)	50,786 (100.00%)
Chicago, IL	9 (0.02%)	56,700 (99.72%)	152 (0.27%)	56,861 (100.00%)
Kansas City, KS	19 (0.03%)	73,803 (99.76%)	155 (0.21%)	73,977 (100.00%)
Seattle, WA	16 (0.03%)	54,977 (99.72%)	136 (0.25%)	55,129 (100.00%)
Charlotte, NC	24 (0.03%)	74,874 (99.60%)	274 (0.36%)	75,172 (100.00%)
Atlanta, GA	51 (0.08%)	63,542 (99.38%)	346 (0.54%)	63,939 (100.00%)
Dallas, TX	20 (0.03%)	67,393 (99.65%)	216 (0.32%)	67,629 (100.00%)
Denver, CO	38 (0.04%)	91,514 (99.76%)	182 (0.20%)	91,734 (100.00%)
Los Angeles, CA	14 (0.03%)	40,443 (99.58%)	155 (0.38%)	40,612 (100.00%)
Total	**259 (0.04%)**	**711,364 (99.66%)**	**2,138 (0.30%)**	**713,761* (100.00%)**

Data Source: FDCA Address File

*A total of 19,875 AAs were excluded from this table because they contained no units eligible for DQC.

Table E.9 Dependent Quality Control Critical Errors by RCC

Error Types	Number of Critical Errors Reported (Percent of Units Checked in each RCC)											
Error Description Region:	Boston	New York	Philadelphia	Detroit	Chicago	Kansas City	Seattle	Charlotte	Atlanta	Dallas	Denver	Los Angeles
QC Lister Action: HU Add	2,629 (0.56%)	1,451 (0.51%)	2,264 (0.54%)	1,673 (0.37%)	1,779 (0.39%)	1,846 (0.42%)	2,907 (0.66%)	2,964 (0.49%)	4,866 (0.80%)	2,702 (0.51%)	2,778 (0.61%)	1,806 (0.47%)
QC Lister Action: OLQ Add	53 (0.01%)	10 (0.00%)	55 (0.01%)	63 (0.01%)	46 (0.01%)	62 (0.01%)	62 (0.01%)	80 (0.01%)	151 (0.02%)	64 (0.01%)	93 (0.02%)	90 (0.02%)
Lister Action: HU Add, QC Lister Action: HU Does Not Exist	1,161 (0.25%)	727 (0.25%)	1,425 (0.34%)	730 (0.16%)	874 (0.19%)	1,004 (0.23%)	1,334 (0.30%)	1,674 (0.28%)	3,222 (0.53%)	1,874 (0.35%)	1,817 (0.40%)	1,161 (0.30%)
Lister Action: OLQ Add, QC Lister Action: OLQ Does Not Exist	24 (0.01%)	1 (0.00%)	45 (0.01%)	33 (0.01%)	24 (0.01%)	28 (0.01%)	37 (0.01%)	57 (0.01%)	119 (0.02%)	51 (0.01%)	68 (0.01%)	29 (0.01%)
Lister Action: HU Correction, QC Lister Action: HU Does Not Exist	741 (0.16%)	786 (0.28%)	664 (0.16%)	408 (0.09%)	625 (0.14%)	612 (0.14%)	537 (0.12%)	1,088 (0.18%)	1,367 (0.22%)	924 (0.17%)	1,280 (0.28%)	434 (0.11%)
Lister Action: HU Correction, QC Lister Action: Duplicate	221 (0.05%)	200 (0.07%)	122 (0.03%)	69 (0.02%)	86 (0.02%)	110 (0.02%)	65 (0.01%)	100 (0.02%)	134 (0.02%)	118 (0.02%)	131 (0.03%)	87 (0.02%)
Lister Action: OLQ Correction, QC Lister Action: OLQ Does Not Exist	18 (0.00%)	18 (0.01%)	112 (0.03%)	9 (0.00%)	9 (0.00%)	25 (0.01%)	33 (0.01%)	21 (0.00%)	51 (0.01%)	58 (0.01%)	30 (0.01%)	21 (0.01%)
Lister Action: OLQ Correction, QC Lister Action: OLQ Duplicate	10 (0.00%)	6 (0.00%)	4 (0.00%)	5 (0.00%)	1 (0.00%)	0 (0.00%)	3 (0.00%)	2 (0.00%)	19 (0.00%)	3 (0.00%)	4 (0.00%)	5 (0.00%)
Lister Action: HU Verified[1], QC Lister Action: HU Does Not Exist	1,946 (0.42%)	1,759 (0.62%)	3,030 (0.72%)	1,977 (0.44%)	2,231 (0.49%)	1,975 (0.44%)	1,543 (0.35%)	3,189 (0.53%)	5,216 (0.86%)	2,855 (0.54%)	3,114 (0.68%)	1,708 (0.44%)
Lister Action: HU Verified, QC Lister Action: HU Duplicate	444 (0.09%)	470 (0.16%)	364 (0.09%)	185 (0.04%)	268 (0.06%)	148 (0.03%)	142 (0.03%)	246 (0.04%)	298 (0.05%)	160 (0.03%)	227 (0.05%)	168 (0.04%)
Lister Action: OLQ Verified, QC Lister Action: OLQ Does Not Exist	48 (0.01%)	26 (0.01%)	57 (0.01%)	57 (0.01%)	43 (0.01%)	66 (0.01%)	85 (0.02%)	58 (0.01%)	108 (0.02%)	91 (0.02%)	44 (0.01%)	33 (0.01%)
Lister Action: OLQ Verified, QC Lister Action: OLQ Duplicate	4 (0.00%)	5 (0.00%)	1 (0.00%)	2 (0.00%)	24 (0.01%)	17 (0.00%)	19 (0.00%)	1 (0.00%)	11 (0.00%)	5 (0.00%)	15 (0.00%)	4 (0.00%)
Lister Action: Nonresidential, QC Lister Action: HU/OLQ Correction	78 (0.02%)	54 (0.02%)	59 (0.01%)	47 (0.01%)	40 (0.01%)	46 (0.01%)	54 (0.01%)	55 (0.01%)	98 (0.02%)	57 (0.01%)	85 (0.02%)	51 (0.01%)
Lister Action: Nonresidential, QC Lister Action: HU/OLQ Verified	74 (0.02%)	60 (0.02%)	74 (0.02%)	61 (0.01%)	95 (0.02%)	63 (0.01%)	79 (0.02%)	102 (0.02%)	135 (0.02%)	97 (0.02%)	113 (0.02%)	76 (0.02%)
Lister Action: Nonresidential, QC Lister Action: Uninhabitable	5 (0.00%)	1 (0.00%)	5 (0.00%)	14 (0.00%)	5 (0.00%)	6 (0.00%)	2 (0.00%)	6 (0.00%)	8 (0.00%)	15 (0.00%)	23 (0.01%)	3 (0.00%)
Lister Action: Uninhabitable, QC Lister Action: Does Not Exist	25 (0.01%)	25 (0.01%)	34 (0.01%)	38 (0.01%)	33 (0.01%)	40 (0.01%)	17 (0.00%)	64 (0.01%)	97 (0.02%)	142 (0.03%)	129 (0.03%)	49 (0.01%)
Lister Action: Uninhabitable, QC Lister Action: Duplicate	1 (0.00%)	0 (0.00%)	5 (0.01%)	9 (0.00%)	4 (0.00%)	1 (0.00%)	1 (0.00%)	2 (0.00%)	0 (0.00%)	2 (0.00%)	6 (0.00%)	0 (0.00%)

Table E.9 Dependent Quality Control Critical Errors by RCC

Error Types	**Number of Critical Errors Reported (Percent of Units Checked in each RCC)**											
Error Description Region:	Boston	New York	Philadelphia	Detroit	Chicago	Kansas City	Seattle	Charlotte	Atlanta	Dallas	Denver	Los Angeles
Location COND, RES, Military Barracks changed to non-blank	28 (0.01%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	1 (0.00%)	16 (0.00%)	2 (0.00%)	0 (0.00%)	5 (0.00%)
Location Urbanization Name changed from blank to non-blank	465 (0.10%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)
Location Area Name 1changed from blank to non-blank	1,027 (0.22%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)
Number of Units Checked in RCC:	467,819	285,272	421,731	446,501	455,816	444,411	438,686	605,687	607,819	528,699	455,882	387,267

Data Source: FDCA Address File
Note 1: “Verified” means that the unit was found in the field and there were no changes to the address record.

Table E.10 Dependent Quality Control Recalculated Critical Errors by RCC

Error Types	Number of Critical Errors Recalculated (Percent of Units Checked in each RCC)											
Error Description Region:	Boston	New York	Philadelphia	Detroit	Chicago	Kansas City	Seattle	Charlotte	Atlanta	Dallas	Denver	Los Angeles
QC Lister Action: HU Add	2,630 (0.56%)	1,451 (0.51%)	2,264 (0.54%)	1,673 (0.37%)	1,779 (0.39%)	1,846 (0.42%)	2,908 (0.66%)	2,964 (0.49%)	4,866 (0.80%)	2,702 (0.51%)	2,779 (0.61%)	1,807 (0.47%)
QC Lister Action: OLQ Add	53 (0.01%)	10 (0.00%)	55 (0.01%)	63 (0.01%)	46 (0.01%)	62 (0.01%)	62 (0.01%)	80 (0.01%)	151 (0.02%)	64 (0.01%)	93 (0.02%)	90 (0.02%)
Lister Action: HU Add, QC Lister Action: HU Does Not Exist	1,161 (0.25%)	727 (0.25%)	1,425 (0.34%)	730 (0.16%)	874 (0.19%)	1,004 (0.23%)	1,334 (0.30%)	1,675 (0.28%)	3,222 (0.53%)	1,874 (0.35%)	1,817 (0.40%)	1,161 (0.30%)
Lister Action: OLQ Add, QC Lister Action: OLQ Does Not Exist	24 (0.01%)	1 (0.00%)	45 (0.01%)	33 (0.01%)	24 (0.01%)	28 (0.01%)	37 (0.01%)	57 (0.01%)	119 (0.02%)	51 (0.01%)	68 (0.01%)	29 (0.01%)
Lister Action: HU Correction, QC Lister Action: HU Does Not Exist	741 (0.16%)	786 (0.28%)	664 (0.16%)	408 (0.09%)	625 (0.14%)	612 (0.14%)	537 (0.12%)	1,089 (0.18%)	1,367 (0.22%)	924 (0.17%)	1,284 (0.28%)	434 (0.11%)
Lister Action: HU Correction, QC Lister Action: Duplicate	22 (0.05%)	200 (0.07%)	122 (0.03%)	69 (0.02%)	86 (0.02%)	110 (0.02%)	65 (0.01%)	100 (0.02%)	134 (0.02%)	118 (0.02%)	131 (0.03%)	87 (0.02%)
Lister Action: OLQ Correction, QC Lister Action: OLQ Does Not Exist	18 (0.00%)	18 (0.01%)	112 (0.03%)	9 (0.00%)	9 (0.00%)	25 (0.01%)	33 (0.01%)	21 (0.00%)	51 (0.01%)	58 (0.01%)	30 (0.01%)	21 (0.01%)
Lister Action: OLQ Correction, QC Lister Action: OLQ Duplicate	10 (0.00%)	6 (0.00%)	4 (0.00%)	5 (0.00%)	1 (0.00%)	0 (0.00%)	3 (0.00%)	2 (0.00%)	19 (0.00%)	3 (0.00%)	4 (0.00%)	5 (0.00%)
Lister Action: HU Verified[1], QC Lister Action: HU Does Not Exist	1,946 (0.42%)	1,759 (0.62%)	3,030 (0.72%)	1,977 (0.44%)	2,232 (0.49%)	1,976 (0.44%)	1,543 (0.35%)	3,189 (0.53%)	5,216 (0.86%)	2,855 (0.54%)	3,114 (0.68%)	1,708 (0.44%)
Lister Action: HU Verified, QC Lister Action: HU Duplicate	444 (0.09%)	470 (0.16%)	364 (0.09%)	185 (0.04%)	268 (0.06%)	148 (0.03%)	142 (0.03%)	246 (0.04%)	298 (0.05%)	160 (0.03%)	227 (0.05%)	168 (0.04%)
Lister Action: OLQ Verified, QC Lister Action: OLQ Does Not Exist	48 (0.01%)	26 (0.01%)	57 (0.01%)	57 (0.01%)	43 (0.01%)	66 (0.01%)	85 (0.02%)	58 (0.01%)	108 (0.02%)	91 (0.02%)	44 (0.01%)	33 (0.01%)
Lister Action: OLQ Verified, QC Lister Action: OLQ Duplicate	4 (0.00%)	5 (0.00%)	1 (0.00%)	2 (0.00%)	24 (0.01%)	17 (0.00%)	19 (0.00%)	1 (0.00%)	11 (0.00%)	5 (0.00%)	15 (0.00%)	4 (0.00%)
Lister Action: Nonresidential, QC Lister Action: HU/OLQ Correction	78 (0.02%)	54 (0.02%)	59 (0.01%)	47 (0.01%)	40 (0.01%)	46 (0.01%)	54 (0.01%)	55 (0.01%)	98 (0.02%)	57 (0.01%)	85 (0.02%)	51 (0.01%)
Lister Action: Nonresidential, QC Lister Action: HU/OLQ Verified	74 (0.02%)	60 (0.02%)	74 (0.02%)	61 (0.01%)	95 (0.02%)	63 (0.01%)	79 (0.02%)	102 (0.02%)	135 (0.02%)	97 (0.02%)	113 (0.02%)	76 (0.02%)
Lister Action: Nonresidential, QC Lister Action: Uninhabitable	5 (0.00%)	1 (0.00%)	5 (0.00%)	14 (0.00%)	5 (0.00%)	6 (0.00%)	2 (0.00%)	6 (0.00%)	8 (0.00%)	15 (0.00%)	23 (0.01%)	3 (0.00%)
Lister Action: Uninhabitable, QC Lister Action: Does Not Exist	25 (0.01%)	25 (0.01%)	34 (0.01%)	38 (0.01%)	33 (0.01%)	40 (0.01%)	17 (0.00%)	64 (0.01%)	97 (0.02%)	142 (0.03%)	129 (0.03%)	49 (0.01%)
Lister Action: Uninhabitable, QC Lister Action: Duplicate	1 (0.00%)	0 (0.00%)	5 (0.01%)	9 (0.00%)	4 (0.00%)	1 (0.00%)	1 (0.00%)	2 (0.00%)	0 (0.00%)	2 (0.00%)	6 (0.00%)	0 (0.00%)

Table E.10 Dependent Quality Control Recalculated Critical Errors by RCC

Error Types	Number of Critical Errors Recalculated (Percent of Units Checked in each RCC)											
Error Description Region:	Boston	New York	Philadelphia	Detroit	Chicago	Kansas City	Seattle	Charlotte	Atlanta	Dallas	Denver	Los Angeles
Location COND, RES, Military Barracks changed to non-blank	28 (0.01%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	1 (0.00%)	16 (0.00%)	2 (0.00%)	0 (0.00%)	5 (0.00%)
Location Urbanization Name changed from blank to non-blank	465 (0.10%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)
Location Area Name 1changed from blank to non-blank	1,027 (0.22%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)
Number of Units Checked in RCC:	467,819	285,272	421,731	446,501	455,816	444,411	438,686	605,687	607,819	528,699	455,882	387,267

Data Source: FDCA Address File

Note 1: "Verified" means that the unit was found in the field and there were no changes to the address record.

Table E.11 Dependent Quality Control Noncritical Errors by RCC

Error Types	Number of Noncritical Errors Reported (Percent of Units Checked in each RCC)											
Error Description Region:	Boston	New York	Philadelphia	Detroit	Chicago	Kansas City	Seattle	Charlotte	Atlanta	Dallas	Denver	Los Angeles
Lister Action: HU Correction, QC Lister Action: Nonresidential	95 (0.02%)	82 (0.03%)	67 (0.02%)	38 (0.01%)	70 (0.02%)	47 (0.01%)	72 (0.02%)	84 (0.01%)	60 (0.01%)	55 (0.01%)	107 (0.02%)	56 (0.01%)
Lister Action: HU Correction, QC Lister Action: Uninhabitable	95 (0.02%)	44 (0.02%)	32 (0.01%)	58 (0.01%)	33 (0.01%)	137 (0.03%)	31 (0.01%)	60 (0.01%)	53 (0.01%)	144 (0.03%)	160 (0.04%)	34 (0.01%)
Lister Action: OLQ Correction, QC Lister Action: Nonresidential	6 (0.00%)	2 (0.00%)	16 (0.00%)	6 (0.00%)	14 0.00%)	4 (0.00%)	9 (0.00%)	2 (0.00%)	20 (0.00%)	17 (0.00%)	21 (0.00%)	13 (0.00%)
Lister Action: OLQ Correction, QC Lister Action: Uninhabitable	0 (0.00%)	1 (0.00%)	0 (0.00%)	0 (0.00%)	1 (0.00%)	0 (0.00%)	0 (0.00%)	30 (0.00%)	0 (0.00%)	0 (0.00%)	2 (0.00%)	1 (0.00%)
Lister Action: HU Verified[1], QC Lister Action: Nonresidential	136 (0.03%)	154 (0.05%)	238 (0.06%)	92 (0.02%)	163 (0.04%)	120 (0.03%)	127 (0.03%)	171 (0.03%)	204 (0.03%)	187 (0.04%)	154 (0.03%)	96 (0.02%)
Lister Action: HU Verified, QC Lister Action: Uninhabitable	167 (0.04%)	116 (0.04%)	251 (0.06%)	304 (0.07%)	157 (0.03%)	178 (0.04%)	126 (0.03%)	253 (0.04%)	277 (0.05%)	323 (0.06%)	151 (0.03%)	51 (0.01%)
Lister Action: OLQ Verified, QC Lister Action: Nonresidential	7 (0.00%)	1 (0.00%)	5 (0.00%)	2 (0.00%)	7 (0.00%)	4 (0.00%)	12 0.00%)	21 (0.00%)	13 (0.00%)	12 (0.00%)	11 (0.00%)	9 (0.00%)
Lister Action: OLQ Verified, QC Lister Action: Uninhabitable	0 (0.00%)	3 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	1 (0.00%)	1 (0.00%)	1 (0.00%)	3 (0.00%)	3 (0.00%)	0 (0.00%)
Lister Action: Nonresidential, QC Lister Action: Does Not Exist	111 (0.02%)	43 (0.02%)	141 (0.03%)	73 (0.02%)	121 (0.03%)	124 (0.03%)	151 (0.03%)	192 (0.03%)	317 (0.05%)	157 (0.03%)	268 (0.06%)	256 (0.07%)
Lister Action: Nonresidential, QC Lister Action: Duplicate	14 (0.00%)	9 (0.00%)	15 (0.00%)	10 (0.00%)	8 (0.00%)	20 (0.00%)	18 (0.00%)	17 (0.00%)	7 (0.00%)	30 (0.01%)	25 (0.01%)	13 (0.00%)
Lister Action: Uninhabitable, QC Lister Action: HU/OLQ Correction	57 (0.01%)	15 (0.01%)	34 (0.01%)	44 (0.01%)	44 (0.01%)	39 (0.01%)	20 (0.00%)	53 (0.01%)	33 (0.01%)	69 (0.01%)	66 (0.01%)	22 (0.01%)
Lister Action: Uninhabitable, QC Lister Action: HU/OLQ Verified	49 (0.01%)	28 (0.01%)	86 (0.02%)	122 (0.03%)	115 (0.03%)	83 (0.02%)	36 (0.01%)	90 (0.01%)	122 (0.02%)	197 (0.04%)	81 (0.02%)	41 (0.01%)
Lister Action: Uninhabitable, QC Lister Action: Nonresidential	3 (0.00%)	2 (0.00%)	4 (0.00%)	6 (0.00%)	7 (0.00%)	8 (0.00%)	2 (0.00%)	4 (0.00%)	4 (0.00%)	7 (0.00%)	9 (0.00%)	1 (0.00%)
Location House Number Blank to Nonblank (Observed)	276 (0.06%)	10 (0.00%)	199 (0.05%)	208 (0.05%)	135 (0.03%)	383 (0.09%)	192 (0.04%)	357 (0.06%)	297 (0.05%)	353 (0.07%)	369 (0.08%)	92 (0.02%)
Location House Number Nonblank to Changed (Observed)	941 (0.20%)	266 (0.09%)	487 (0.12%)	430 (0.10%)	465 (0.10%)	528 (0.12%)	529 (0.12%)	685 (0.11%)	887 (0.15%)	606 (0.11%)	857 (0.19%)	360 (0.09%)
Location Street Name Unnamed to Different	226 (0.05%)	0 (0.00%)	19 (0.00%)	14 (0.00%)	7 (0.00%)	19 (0.00%)	12 (0.00%)	31 (0.01%)	23 (0.00%)	26 (0.00%)	64 (0.01%)	2 (0.00%)
Location Street Name Nonblank to Different	5,379 (1.15%)	319 (0.11%)	1,135 (0.27%)	1,895 (0.42%)	1,258 (0.28%)	1,911 (0.43%)	1,965 (0.45%)	2,099 (0.35%)	3,011 (0.50%)	2,047 (0.39%)	6,687 (1.47%)	2,120 (0.55%)

Table E.11 Dependent Quality Control Noncritical Errors by RCC

Error Types	Number of Noncritical Errors Reported (Percent of Units Checked in each RCC)											
Error Description Region:	Boston	New York	Philadelphia	Detroit	Chicago	Kansas City	Seattle	Charlotte	Atlanta	Dallas	Denver	Los Angeles
Location Unit Designation Blank to Nonblank	870 (0.19%)	460 (0.16%)	351 (0.08%)	267 (0.06%)	227 (0.05%)	247 (0.06%)	364 (0.08%)	368 (0.06%)	511 (0.08%)	349 (0.07%)	458 (0.10%)	368 (0.10%)
Location Complex Identifier Blank to Nonblank	37 (0.01%)	0 (0.00%)	0 (0.00%)	2 (0.00%)	0 (0.00%)	2 (0.00%)	0 (0.00%)	17 (0.00%)	4 (0.00%)	1 (0.00%)	2 (0.00%)	42 (0.01%)
Added Type of LQ (Housing Unit to OLQ)	56 (0.01%)	42 (0.01%)	111 (0.03%)	64 (0.01%)	56 (0.01%)	88 (0.02%)	106 (0.02%)	49 (0.01%)	214 (0.04%)	60 (0.01%)	303 (0.07%)	81 (0.02%)
Added Type of LQ (OLQ to Housing Unit)	47 (0.01%)	6 (0.00%)	31 (0.01%)	22 (0.00%)	18 (0.00%)	49 (0.01%)	23 (0.01%)	48 (0.01%)	95 (0.02%)	70 (0.01%)	48 (0.01%)	15 (0.00%)
Noncritical AC Mapspot rejected in QC	7,941 (1.70%)	1,954 (0.68%)	7,197 (1.71%)	13,205 (2.96%)	8,466 (1.86%)	5,071 (1.14%)	7,356 (1.68%)	9,531 (1.57%)	13,512 (2.22%)	9,955 (1.88%)	9,968 (2.19%)	8,890 (2.30%)
HU Added address changed to Uninhabitable	53 (0.01%)	33 (0.01%)	36 (0.01%)	33 (0.01%)	29 (0.01%)	86 (0.02%)	39 (0.01%)	63 (0.01%)	84 (0.01%)	113 (0.02%)	133 (0.03%)	24 (0.01%)
OLQ Added address changed to Uninhabitable	1 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	1 (0.00%)	1 (0.00%)	0 (0.00%)	1 (0.00%)	3 (0.00%)	1 (0.00%)
Location Carretera changed from Blank to Nonblank	305 (0.07%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)
Location Carretera changed from Nonblank to Different	243 (0.05%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)
Location Ramal changed from Blank to Nonblank	35 (0.01%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)
Location Ramal changed from Nonblank to Different	49 (0.01%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)
Number of Units Checked in RCC:	467,819[3]	285,272	421,731	446,501	455,816	444,411	438,686	605,687	607,819	528,699	455,882	387,267

Data Source: FDCA Address File

Note1: Percentages were calculated based on the total number of units checked in the RCC.

Note2: "Verified" means that the unit was found in the field and there were no changes to the address record.

Note3: Categories will not sum to the total since address records can have multiple changes. We could not recalculate the Map Spot errors because there was only one Map Spot variable and thus could only calculate it once.

Table E.12 Dependent Quality Control Recalculated Noncritical Errors by RCC

Error Types	Number of Noncritical Errors Recalculated (Percent of Units Checked in each RCC)											
Error Description Region:	Boston	New York	Philadelphia	Detroit	Chicago	Kansas City	Seattle	Charlotte	Atlanta	Dallas	Denver	Los Angeles
Lister Action: HU Correction, QC Lister Action: Nonresidential	95 (0.02%)	82 (0.03%)	67 (0.02%)	38 (0.01%)	70 (0.02%)	47 (0.01%)	72 (0.02%)	84 (0.01%)	60 (0.01%)	55 (0.01%)	107 (0.02%)	56 (0.01%)
Lister Action: HU Correction, QC Lister Action: Uninhabitable	95 (0.02%)	44 (0.02%)	32 (0.01%)	58 (0.01%)	33 (0.01%)	137 (0.03%)	31 (0.01%)	60 (0.01%)	53 (0.01%)	144 (0.03%)	160 (0.04%)	34 (0.01%)
Lister Action: OLQ Correction, QC Lister Action: Nonresidential	6 (0.00%)	2 (0.00%)	16 (0.00%)	6 (0.00%)	14 0.00%)	4 (0.00%)	9 (0.00%)	2 (0.00%)	20 (0.00%)	17 (0.00%)	21 (0.00%)	13 (0.00%)
Lister Action: OLQ Correction, QC Lister Action: Uninhabitable	0 (0.00%)	1 (0.00%)	0 (0.00%)	0 (0.00%)	1 (0.00%)	0 (0.00%)	0 (0.00%)	30 (0.00%)	0 (0.00%)	0 (0.00%)	2 (0.00%)	1 (0.00%)
Lister Action: HU Verified[1], QC Lister Action: Nonresidential	136 (0.03%)	154 (0.05%)	238 (0.06%)	92 (0.02%)	163 (0.04%)	120 (0.03%)	127 (0.03%)	171 (0.03%)	205 (0.03%)	187 (0.04%)	154 (0.03%)	96 (0.02%)
Lister Action: OLQ Verified, QC Lister Action: Uninhabitable	167 (0.04%)	116 (0.04%)	251 (0.06%)	304 (0.07%)	157 (0.03%)	178 (0.04%)	126 (0.03%)	253 (0.04%)	277 (0.05%)	323 (0.06%)	151 (0.03%)	51 (0.01%)
Lister Action: OLQ Verified, QC Lister Action: Nonresidential	7 (0.00%)	1 (0.00%)	5 (0.00%)	2 (0.00%)	7 (0.00%)	4 (0.00%)	12 0.00%)	21 (0.00%)	13 (0.00%)	12 (0.00%)	11 (0.00%)	9 (0.00%)
Lister Action: OLQ Verified, QC Lister Action: Uninhabitable	0 (0.00%)	3 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	1 (0.00%)	1 (0.00%)	1 (0.00%)	3 (0.00%)	3 (0.00%)	0 (0.00%)
Lister Action: Nonresidential, QC Lister Action: Does Not Exist	111 (0.02%)	43 (0.02%)	141 (0.03%)	73 (0.02%)	121 (0.03%)	124 (0.03%)	151 (0.03%)	192 (0.03%)	317 (0.05%)	157 (0.03%)	269 (0.06%)	256 (0.07%)
Lister Action: Nonresidential, QC Lister Action: Duplicate	14 (0.00%)	9 (0.00%)	15 (0.00%)	10 (0.00%)	8 (0.00%)	20 (0.00%)	18 (0.00%)	17 (0.00%)	7 (0.00%)	30 (0.01%)	25 (0.01%)	13 (0.00%)
Lister Action: Uninhabitable, QC Lister Action: HU/OLQ Correction	57 (0.01%)	15 (0.01%)	34 (0.01%)	44 (0.01%)	44 (0.01%)	39 (0.01%)	20 (0.00%)	53 (0.01%)	33 (0.01%)	69 (0.01%)	66 (0.01%)	22 (0.01%)
Lister Action: Uninhabitable, QC Lister Action: HU/OLQ Verified	49 (0.01%)	28 (0.01%)	86 (0.02%)	122 (0.03%)	115 (0.03%)	83 (0.02%)	36 (0.01%)	90 (0.01%)	122 (0.02%)	197 (0.04%)	81 (0.02%)	41 (0.01%)
Lister Action: Uninhabitable, QC Lister Action: Nonresidential	3 (0.00%)	2 (0.00%)	4 (0.00%)	6 (0.00%)	7 (0.00%)	8 (0.00%)	2 (0.00%)	4 (0.00%)	4 (0.00%)	7 (0.00%)	9 (0.00%)	1 (0.00%)
Location House Number Blank to Nonblank (Observed)	613 (0.13%)	21 (0.01%)	406 (0.10%)	457 (0.10%)	271 (0.06%)	851 (0.19%)	391 (0.09%)	820 (0.14%)	570 (0.09%)	708 (0.13%)	859 (0.19%)	196 (0.05%)
Location House Number Nonblank to Changed (Observed)	932 (0.20%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)
Location Street Name Unnamed to Different	226 (0.05%)	0 (0.00%)	19 (0.00%)	14 (0.00%)	7 (0.00%)	19 (0.00%)	12 (0.00%)	31 (0.01%)	23 (0.00%)	26 (0.00%)	64 (0.01%)	2 (0.00%)
Location Street Name Nonblank to Different	5,380 (1.15%)	319 (0.11%)	1,135 (0.27%)	1,895 (0.42%)	1,258 (0.28%)	1,911 (0.43%)	1,965 (0.45%)	2,099 (0.35%)	3,011 (0.50%)	2,047 (0.39%)	6,689 (1.47%)	2,121 (0.55%)

Table E.12 Dependent Quality Control Recalculated Noncritical Errors by RCC

Error Types	Number of Noncritical Errors Recalculated (Percent of Units Checked in each RCC)											
Error Description Region:	Boston	New York	Philadelphia	Detroit	Chicago	Kansas City	Seattle	Charlotte	Atlanta	Dallas	Denver	Los Angeles
Location Unit Designation Blank to Nonblank	870 (0.19%)	460 (0.16%)	351 (0.08%)	267 (0.06%)	227 (0.05%)	247 (0.06%)	364 (0.08%)	368 (0.06%)	511 (0.08%)	350 (0.07%)	458 (0.10%)	368 (0.10%)
Location Complex Identifier Blank to Nonblank	37 (0.01%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	17 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)
Added Type of LQ (Housing Unit to OLQ)	56 (0.01%)	42 (0.01%)	111 (0.03%)	64 (0.01%)	56 (0.01%)	88 (0.02%)	106 (0.02%)	49 (0.01%)	214 (0.04%)	60 (0.01%)	309 (0.07%)	81 (0.02%)
Added Type of LQ (OLQ to Housing Unit)	47 (0.01%)	6 (0.00%)	31 (0.01%)	22 (0.00%)	18 (0.00%)	49 (0.01%)	23 (0.01%)	48 (0.01%)	95 (0.02%)	70 (0.01%)	48 (0.01%)	15 (0.00%)
HU Added address changed to Uninhabitable	53 (0.01%)	33 (0.01%)	36 (0.01%)	33 (0.01%)	29 (0.01%)	86 (0.02%)	39 (0.01%)	63 (0.01%)	85 (0.01%)	113 (0.02%)	133 (0.03%)	24 (0.01%)
OLQ Added address changed to Uninhabitable	1 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	1 (0.00%)	1 (0.00%)	0 (0.00%)	1 (0.00%)	3 (0.00%)	1 (0.00%)
Location Carretera changed from Blank to Nonblank	306 (0.07%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)
Location Carretera changed from Nonblank to Different	243 (0.05%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)
Location Ramal changed from Blank to Nonblank	35 (0.01%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)
Location Ramal changed from Nonblank to Different	49 (0.01%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)
Number of Units Checked in RCC:	467,819[2]	285,272	421,731	446,501	455,816	444,411	438,686	605,687	607,819	528,699	455,882	387,267

Data Source: FDCA Address File

Note1: "Verified" means that the unit was found in the field and there were no changes to the address record.

Note2: Categories will not sum to the total since address records can have multiple changes. We could not recalculate the Map Spot errors because there was only one Map Spot variable and thus could only calculate it once.

Table E.13 Dependent Quality Control Tally Errors by RCC

Error Types	Number of Tally Errors Reported (Percent of Units Checked in each RCC)											
Error Description Region:	Boston	New York	Philadelphia	Detroit	Chicago	Kansas City	Seattle	Charlotte	Atlanta	Dallas	Denver	Los Angeles
Location House Number changed from Blank to Nonblank (Not Observed)	432 (0.09%)	14 (0.00%)	269 (0.06%)	308 (0.07%)	179 (0.04%)	585 (0.13%)	281 (0.06%)	561 (0.09%)	337 (0.06%)	451 (0.09%)	626 (0.14%)	136 (0.04%)
Location House Number changed from Nonblank to Changed (Not Observed)	1,167 (0.25%)	339 (0.12%)	439 (0.10%)	336 (0.08%)	348 (0.08%)	471 (0.11%)	545 (0.12%)	651 (0.11%)	751 (0.12%)	612 (0.12%)	675 (0.15%)	402 (0.10%)
Location Unit Identifier Changed from Nonblank to Changed	2,154 (0.46%)	1,847 (0.65%)	1,111 (0.26%)	555 (0.12%)	1,204 (0.26%)	470 (0.11%)	714 (0.16%)	698 (0.12%)	1,222 (0.20%)	724 (0.14%)	902 (0.20%)	751 (0.19%)
Location COND/RES/Military Barracks Changed from Nonblank to Changed	253 (0.05%)	0 (0.00%)	0 (0.00%)	2 (0.00%)	0 (0.00%)	0 (0.00%)	1 (0.00%)	3 (0.00%)	0 (0.00%)	1 (0.00%)	4 (0.00%)	1 (0.00%)
Location Complex Identifier Nonblank to Changed	71 (0.02%)	0 (0.00%)	0 (0.00%)	1 (0.00%)	0 (0.00%)	0 (0.00%)	1 (0.00%)	13 (0.00%)	0 (0.00%)	1 (0.00%)	1 (0.00%)	3 (0.00%)
Location Zip Code Blank to Nonblank	38 (0.01%)	5 (0.00%)	84 (0.02%)	150 (0.03%)	48 (0.01%)	257 (0.06%)	57 (0.01%)	147 (0.02%)	88 (0.01%)	182 (0.03%)	351 (0.08%)	28 (0.01%)
Location Zip Code Nonblank to Changed	368 (0.08%)	88 (0.03%)	227 (0.05%)	298 (0.07%)	645 (0.14%)	230 (0.05%)	383 (0.09%)	239 (0.04%)	559 (0.09%)	406 (0.08%)	931 (0.20%)	228 (0.06%)
Physical Description Blank to Nonblank	1,692 (0.36%)	626 (0.22%)	1,053 (0.25%)	1,074 (0.24%)	959 (0.21%)	918 (0.21%)	1,228 (0.28%)	1,315 (0.22%)	1,688 (0.28%)	1,877 (0.36%)	1,593 (0.35%)	1,164 (0.30%)
Physical Description Changed from Uninhabitable to Verified[1]	1,743 (0.37%)	165 (0.06%)	469 (0.11%)	437 (0.10%)	348 (0.08%)	753 (0.17%)	693 (0.16%)	758 (0.13%)	671 (0.11%)	1,002 (0.19%)	1,615 (0.35%)	429 (0.11%)
Mailing Address (includes PO Box) Changed from Unavailable to Same as Location Address	366 (0.08%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)
Mailing Address (includes PO Box) Changed from Unavailable to Nonblank	1,087 (0.23%)	41 (0.01%)	28 (0.01%)	122 (0.03%)	25 (0.01%)	133 (0.03%)	23 (0.01%)	38 (0.01%)	50 (0.01%)	56 (0.01%)	211 (0.05%)	31 (0.01%)
Mailing Address (includes PO Box) Changed from Nonblank to Changed	3,029 (0.65%)	2 (0.00%)	49 (0.01%)	51 (0.01%)	51 (0.01%)	118 (0.03%)	49 (0.01%)	35 (0.01%)	35 (0.01%)	58 (0.01%)	154 (0.03%)	25 (0.01%)
GQ/OLQ Name Blank to Nonblank	272 (0.06%)	183 (0.06%)	286 (0.07%)	233 (0.05%)	292 (0.06%)	352 (0.08%)	541 (0.12%)	271 (0.04%)	790 (0.13%)	335 (0.06%)	613 (0.13%)	239 (0.06%)
GQ/OLQ Name Nonblank to Changed	275 (0.06%)	167 (0.06%)	235 (0.06%)	188 (0.04%)	365 (0.08%)	240 (0.05%)	248 (0.06%)	301 (0.05%)	393 (0.06%)	332 (0.06%)	343 (0.08%)	189 (0.05%)
Structure Type Single to Multi	3,233 (0.69%)	1,264 (0.44%)	1,632 (0.39%)	2,362 (0.53%)	2,189 (0.48%)	1,642 (0.37%)	3,010 (0.69%)	2,868 (0.47%)	4,588 (0.75%)	1,843 (0.35%)	2,599 (0.57%)	2,891 (0.75%)
Structure Type Multi to Single	2,715 (0.58%)	1,310 (0.46%)	1,459 (0.35%)	1,898 (0.43%)	1,973 (0.43%)	1,256 (0.28%)	2,321 (0.53%)	1,864 (0.31%)	3,062 (0.50%)	1,850 (0.35%)	1,873 (0.41%)	2,661 (0.69%)

Table E.13 Dependent Quality Control Tally Errors by RCC

Error Types	Number of Tally Errors Reported (Percent of Units Checked in each RCC)											
Error Description Region:	Boston	New York	Philadelphia	Detroit	Chicago	Kansas City	Seattle	Charlotte	Atlanta	Dallas	Denver	Los Angeles
Location KM/HM Blank to Nonblank	358 (0.08%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)
Location KM/HM Nonblank to Blank	73 (0.02%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)
Location Urbanization Name Nonblank to Changed	1,005 (0.21%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)
Location Area Name 1 Nonblank to Changed	1,280 (0.27%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)
Location Area Name 2 Blank to Nonblank	549 (0.12%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)
Location Area Name 2 Nonblank to Changed	501 (0.11%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)
Total Units Checked in RCC:	467,819	285,272	421,731	446,501	455,816	444,411	438,686	605,687	607,819	528,699	455,882	387,267

Data Source: FDCA Address File

Note 1: "Verified" means that the unit was found in the field and there were no changes to the address record.

Table E.14 AOQL by RCC

Region	Critical AOQL	Noncritical AOQL	Alpha1	Alpha2	Beta1	Beta2
Boston	6.70%	20.07%	14.04%	31.03%	28.21%	6.29%
New York	4.69%	15.38%	17.99%	39.18%	17.18%	2.67%
Philadelphia	6.93%	20.21%	13.61%	30.13%	29.34%	6.64%
Detroit	6.60%	20.26%	14.94%	32.78%	26.92%	6.51%
Chicago	7.20%	21.55%	13.86%	30.46%	30.05%	7.64%
Kansas City	8.38%	23.44%	10.55%	24.08%	37.10%	9.31%
Seattle	7.42%	23.23%	13.18%	29.35%	31.54%	8.32%
Charlotte	6.69%	20.32%	13.80%	31.00%	27.99%	6.39%
Atlanta	6.01%	19.44%	14.84%	33.74%	24.15%	5.31%
Dallas	6.88%	20.02%	12.76%	29.06%	29.59%	6.31%
Denver	9.61%	29.82%	8.92%	20.62%	43.76%	13.15%
Los Angeles	6.31%	20.46%	15.22%	33.90%	25.28%	6.21%
Average Over All ROs	**7.21%**	**21.88%**	**13.13%**	**29.40%**	**30.65%**	**7.56%**

Data Source: FDCA Address File

Table E.15 Time Lags by RCC (Days)

Region:	Boston	New York	Philadelphia	Detroit	Chicago	Kansas City	Seattle	Charlotte	Atlanta	Dallas	Denver	Los Angeles	Average
Average Time Lag of Production Check In to DQC Check Out	4.60	5.09	6.14	3.37	4.01	4.16	4.75	4.88	4.48	5.19	5.35	3.02	4.65
Median Time Lag of Production Check In to DQC Check Out	3.00	3.00	3.00	2.00	2.00	2.00	2.00	3.00	2.00	2.00	3.00	1.00	2.00
Average Time Lag of Production Check In to DQC Check In	7.59	8.01	8.98	7.00	6.78	7.64	7.75	7.62	7.53	8.17	8.92	5.24	7.72
Median Time Lag of Production Check In to DQC Check In	6.00	6.00	6.00	6.00	5.00	6.00	5.00	6.00	5.00	6.00	6.00	4.00	6.00
Average Time Lag of Production Check Out to Production Check In	7.81	8.44	6.47	6.60	6.39	5.66	10.28	7.23	7.71	9.79	7.59	5.94	7.49
Median of Production Check Out to Production Check In	6.00	6.00	5.00	5.00	4.00	4.00	7.00	5.00	6.00	6.00	5.00	4.00	5.00
Average Time Lag of DQC Check Out to DQC Check in	3.00	2.93	2.85	3.63	2.78	3.48	3.00	2.74	3.05	2.98	3.58	2.22	3.07
Median Time Lag of DQC Check Out to DQC Check in	1.00	1.00	1.00	2.00	1.00	2.00	1.00	1.00	1.00	1.00	2.00	1.00	1.00

Data Source: FDCA Address File

Table E.16 Delete Verification Errors by RCC

Error Types		Number of Delete Verification Errors (Percent of Units Checked in each RCC)											
Lister Action Code	Region: *QC Lister Action Code*	Boston	New York	Philadelphia	Detroit	Chicago	Kansas City	Seattle	Charlotte	Atlanta	Dallas	Denver	Los Angeles
Does Not Exist	-	21 (0.00%)	7 (0.00%)	115 (0.01%)	64 (0.00%)	32 (0.00%)	105 (0.01%)	35 (0.00%)	36 (0.00%)	464 (0.01%)	92 (0.00%)	88 (0.00%)	2 (0.00%)
Does Not Exist	HU Verified	30,403 (1.37%)	19,041 (2.85%)	38,572 (2.18%)	30,227 (1.74%)	34,654 (2.26%)	27,492 (1.46%)	26,578 (1.76%)	61,130 (1.72%)	93,646 (2.37%)	50,746 (1.78%)	36,868 (1.67%)	26,454 (1.71%)
Does Not Exist	HU Correction	17,756 (0.80%)	7,895 (1.16%)	16,082 (0.91%)	10,672 (0.62%)	13,285 (0.87%)	13,876 (0.74%)	12,420 (0.82%)	25,379 (0.71%)	31,711 (0.80%)	21,740 (0.76%)	19,219 (0.87%)	9,232 (0.60%)
Does Not Exist	Does Not Exist	1,531,019 (68.85%)	505,451 (74.59%)	1,398,746 (79.06%)	1,352,648 (78.07%)	1,227,649 (80.21%)	1,448,464 (76.81%)	1,223,026 (80.98%)	2,783,022 (78.16%)	3,311,962 (83.95%)	2,292,866 (80.36%)	1,714,778 (77.75%)	1,227,580 (79.19%)
Does Not Exist	Nonresidential	1,809 (0.08%)	638 (0.09%)	1,621 (0.09%)	1,424 (0.08%)	2,025 (0.13%)	1,493 (0.08%)	2,643 (0.18%)	3,413 (0.10%)	4,246 (0.11%)	2,558 (0.09%)	2,271 (0.10%)	2,465 (0.16%)
Does Not Exist	Duplicate	26,866 (1.21%)	8,990 (1.33%)	13,619 (0.77%)	11,707 (0.68%)	9,067 (0.59%)	12,663 (0.67%)	10,690 (0.71%)	25,855 (0.73%)	26,208 (0.66%)	22,328 (0.78%)	18,970 (0.86%)	15,116 (0.98%)
Does Not Exist	Uninhabitable	684 (0.03%)	296 (0.04%)	784 (0.04%)	1,142 (0.07%)	606 (0.04%)	1,298 (0.07%)	508 0.03%)	2,046 (0.06%)	2,795 (0.07%)	2,605 (0.09%)	1,161 (0.05%)	316 (0.02%)
Does Not Exist	OLQ Verified	669 (0.03%)	496 (0.07%)	1,624 (0.09%)	603 (0.03%)	848 (0.06%)	1,062 (0.06%)	539 (0.04%)	832 (0.02%)	2,083 (0.05%)	1,495 (0.05%)	1,210 (0.05%)	438 (0.03%)
Does Not Exist	OLQ Correction	470 (0.02%)	153 (0.02%)	637 (0.04%)	200 (0.01%)	507 (0.03%)	610 (0.03%)	293 (0.02%)	416 (0.01%)	1,207 (0.03%)	894 (0.03%)	589 (0.03%)	361 (0.02%)
Duplicate	-	3 (0.00%)	0 (0.00%)	60 (0.00%)	15 (0.00%)	12 (0.00%)	16 (0.00%)	2 (0.00%)	10 (0.00%)	17 (0.00%)	23 (0.00%)	23 (0.00%)	1 (0.00%)
Duplicate	HU Verified	6,113 (0.27%)	3,789 (0.56%)	4,671 (0.26%)	3,801 (0.22%)	4,403 (0.29%)	3,906 (0.21%)	3,320 (0.22%)	6,221 (0.17%)	8,519 (0.22%)	5,916 (0.21%)	5,415 (0.25%)	4,177 (0.27%)
Duplicate	HU Correction	7,126 (0.32%)	1,978 (0.29%)	3,046 (0.17%)	2,184 (0.13%)	2,289 (0.15%)	2,519 (0.13%)	2,257 (0.15%)	3,551 (0.10%)	3,257 (0.08%)	3,766 (0.13%)	4,920 (0.22%)	1,950 (0.13%)
Duplicate	Does Not Exist	38,350 (1.72%)	8,304 (1.23%)	16,539 (0.93%)	16,366 (0.94%)	14,109 (0.92%)	20,756 (1.10%)	15,909 (1.05%)	32,281 (0.91%)	34,831 (0.88%)	28,381 (0.99%)	28,608 (1.30%)	33,523 (2.16%)
Duplicate	Nonresidential	423 (0.02%)	243 (0.04%)	284 (0.02%)	127 (0.01%)	222 (0.01%)	194 (0.01%)	369 (0.02%)	310 (0.01%)	246 (0.01%)	345 (0.01%)	357 (0.02%)	522 (0.03%)
Duplicate	Duplicate	561,475 (25.25%)	120,237 (17.74%)	272,001 (15.37%)	301,188 (17.38%)	220,427 (14.40%)	350,690 (18.60%)	210,814 (13.96%)	615,352 (17.28%)	423,159 (10.73%)	419,045 (14.69%)	370,091 (16.78%)	227,697 (14.69%)
Duplicate	Uninhabitable	210 (0.01%)	23 (0.00%)	131 (0.01%)	123 (0.01%)	56 (0.00%)	160 (0.01%)	49 (0.00%)	200 (0.01%)	168 (0.00%)	233 (0.01%)	163 (0.01%)	30 (0.00%)
Duplicate	OLQ Verified	99 (0.00%)	86 (0.01%)	576 (0.03%)	99 (0.01%)	310 (0.02%)	304 (0.02%)	507 (0.03%)	304 (0.01%)	322 (0.01%)	213 (0.01%)	666 (0.03%)	192 (0.01%)

Table E.16 Delete Verification Errors by RCC

Error Types		Number of Delete Verification Errors (Percent of Units Checked in each RCC)											
Lister Action Code	Region: *QC Lister Action Code*	Boston	New York	Philadelphia	Detroit	Chicago	Kansas City	Seattle	Charlotte	Atlanta	Dallas	Denver	Los Angeles
Duplicate	OLQ Correction	119 (0.01%)	57 (0.01%)	31 (0.00%)	91 (0.01%)	55 (0.00%)	90 (0.00%)	241 (0.02%)	114 (0.00%)	207 (0.01%)	140 (0.00%)	245 (0.01%)	190 (0.01%)
	Number of DV Units Checked in RCC:	2,223,615	677,684	1,769,139	1,732,624	1,530,556	1,885,698	1,510,200	3,560,472	3,945,044	2,853,318	2,205,642	1,550,246

Data Source: FDCA Address File

Table E.17 Final Delete Verification Workload

Region:	Boston		New York		Philadelphia		Detroit	
Final Delete Verification Workload	**Expected**	**Actual**	**Expected**	**Actual**	**Expected**	**Actual**	**Expected**	**Actual**
Total records sent correctly to FDV	61,619	61,618	41,334	41,334	70,177	70,177	36,097	36,097
Total records erroneously sent to FDV	-	50	-	5	-	20	-	33
Total Final Delete Verification Workload	61,619	61,668	41,334	41,339	70,177	70,197	36,097	36,130

Region:	Chicago		Kansas City		Seattle		Charlotte	
Final Delete Verification Workload	**Expected**	**Actual**	**Expected**	**Actual**	**Expected**	**Actual**	**Expected**	**Actual**
Total records sent correctly to FDV	44,545	44,545	39,713	39,713	35,587	35,587	84,294	84,294
Total records erroneously sent to FDV	-	24	-	23	-	24	-	134
Total Final Delete Verification Workload	44,545	44,569	39,713	39,736	35,587	35,611	84,294	84,428

Region:	Atlanta		Dallas		Denver		Los Angeles	
Final Delete Verification Workload	**Expected**	**Actual**	**Expected**	**Actual**	**Expected**	**Actual**	**Expected**	**Actual**
Total records sent correctly to FDV	158,994	158,987	84,566	84,566	82,905	82,905	42,737	42,737
Total records erroneously sent to FDV	-	84	-	31	-	126	-	11
Total Final Delete Verification Workload	158,994	159,071	84,566	84,597	82,905	83,031	42,737	42,748

Data Source: FDCA Address File

Table E.18 Final Delete Verification Errors by RCC

Error Types		Number of Final Delete Verification Errors (Percent of Units Checked in each RCC)											
QC Lister Action Code	Region: *FDV Lister Action Code*	Boston	New York	Philadelphia	Detroit	Chicago	Kansas City	Seattle	Charlotte	Atlanta	Dallas	Denver	Los Angeles
Does Not Exist	HU Verified	2,746 (4.46%)	2,497 (6.04%)	3,388 (4.76%)	2,530 (7.01%)	3,417 (7.67%)	1,866 (4.70%)	1,385 (3.89%)	3,777 (4.48%)	8,403 (5.29%)	4,579 (5.41%)	3,129 (3.77%)	1,733 (4.06%)
Does Not Exist	HU Correction	1,132 (1.84%)	901 (2.18%)	1,333 (1.90%)	501 (1.39%)	826 (1.85%)	638 (1.61%)	436 (1.23%)	1,029 (1.22%)	1,977 (1.24%)	1,606 (1.90%)	1,022 (1.23%)	663 (1.55%)
Does Not Exist	Does Not Exist	42,108 (68.27%)	29,149 (70.52%)	57,252 (81.58%)	26,961 (74.69%)	34,368 (77.15%)	31,982 (80.53%)	28,996 (81.48%)	68,176 (80.88%)	135,658 (85.33%)	68,332 (80.80%)	69,465 (83.79%)	33,280 (77.87%)
Does Not Exist	Nonresidential	78 (0.13%)	47 (0.11%)	68 (0.10%)	57 (0.16%)	53 (0.12%)	44 (0.11%)	105 (0.30%)	87 (0.10%)	224 (0.14%)	88 (0.10%)	126 (0.15%)	124 (0.29%)
Does Not Exist	Duplicate	742 (1.20%)	1,199 (2.90%)	492 (0.70%)	499 (1.38%)	322 (0.72%)	278 (0.70%)	380 (1.07%)	721 (0.86%)	899 (0.57%)	657 (0.78%)	1,069 (1.29%)	452 (1.06%)
Does Not Exist	Uninhabitable	38 (0.06%)	35 (0.08%)	35 (0.05%)	40 (0.11%)	35 (0.08%)	38 (0.10%)	23 (0.06%)	97 (0.12%)	121 (0.08%)	753 (0.89%)	50 (0.06%)	18 (0.04%)
Does Not Exist	OLQ Verified	26 (0.04%)	19 (0.05%)	10 (0.01%)	51 (0.14%)	37 (0.08%)	45 (0.11%)	129 (0.36%)	272 (0.32%)	103 (0.06%)	60 (0.07%)	108 (0.13%)	53 (0.12%)
Does Not Exist	OLQ Correction	12 (0.02%)	3 (0.01%)	41 (0.06%)	37 (0.10%)	5 (0.01%)	46 (0.12%)	35 (0.10%)	70 (0.08%)	62 (0.04%)	35 (0.04%)	10 (0.01%)	10 (0.02%)
Duplicate	HU Verified	659 (1.07%)	322 (0.78%)	314 (0.45%)	217 (0.60%)	273 (0.61%)	269 (0.68%)	107 (0.30%)	176 (0.21%)	575 (0.36%)	217 (0.26%)	579 (0.70%)	278 (0.65%)
Duplicate	HU Correction	276 (0.45%)	153 (0.37%)	97 (0.14%)	127 (0.35%)	84 (0.19%)	92 (0.23%)	59 (0.17%)	92 (0.11%)	158 (0.10%)	112 (0.13%)	136 (0.16%)	109 (0.26%)
Duplicate	Does Not Exist	872 (1.41%)	380 (0.92%)	551 (0.79%)	198 (0.55%)	250 (0.56%)	290 (0.73%)	198 (0.56%)	364 (0.43%)	454 (0.29%)	357 (0.42%)	385 (0.46%)	530 (1.24%)
Duplicate	Nonresidential	21 (0.03%)	15 (0.04%)	64 (0.09%)	4 (0.01%)	8 (0.02%)	1 (0.00%)	14 (0.04%)	11 (0.01%)	21 (0.01%)	36 (0.04%)	22 (0.03%)	17 (0.04%)
Duplicate	Duplicate	12,936 (20.98%)	6,257 (15.14%)	6,500 (9.26%)	4,851 (13.44%)	4,785 (10.74%)	4,103 (10.33%)	3,706 (10.41%)	9,407 (11.16%)	10,297 (6.48%)	7,722 (9.13%)	6,791 (8.19%)	5,462 (12.78%)
Duplicate	Uninhabitable	17 (0.03%)	1 (0.00%)	3 (0.00%)	14 (0.04%)	3 (0.01%)	5 (0.01%)	4 (0.01%)	10 (0.01%)	15 (0.01%)	11 (0.01%)	5 (0.01%)	1 (0.00%)
Duplicate	OLQ Verified	2 (0.00%)	324 (0.78%)	12 (0.02%)	7 (0.02%)	79 (0.18%)	2 (0.01%)	7 (0.02%)	5 (0.01%)	13 (0.01%)	1 (0.00%)	2 (0.00%)	4 (0.01%)
Duplicate	OLQ Correction	3 (0.00%)	32 (0.08%)	17 (0.02%)	3 (0.01%)	0 (0.00%)	14 (0.04%)	3 (0.01%)	0 (0.00%)	7 (0.00%)	0 (0.00%)	6 (0.01%)	3 (0.01%)
	Number of FDV Units Checked in RCC:	61,618	41,334	70,177	36,097	44,545	39,713	35,587	84,294	158,987	84,566	82,905	42,737

Data Source: FDCA Address File

Attachment F: Regional Census Center Tables for Large Block Operation

Table 1. Number of listers employed and checked in Large Block Operation

Regional Census Center	Number of listers that worked	Number of listers checked
Boston	30	30
New York	118	118
Philadelphia	151	151
Detroit	38	38
Chicago	41	41
Kansas City	52	52
Seattle	87	87
Charlotte	193	193
Atlanta	437	437
Dallas	177	177
Denver	204	204
Los Angeles	159	159
Total	**1687**	**1687**

Data Source: Large Block File

Table 2. Number of units listed and checked in Large Block Operation

Regional Census Center	Number of units listed	Number/Percent of units checked
Boston	45,092	29,966 (66.46%)
New York	260,258	94,058 (36.14%)
Philadelphia	187,804	112,735 (60.03%)
Detroit	102,818	48,983 (47.64%)
Chicago	48,504	18,279 (37.69%)
Kansas City	84,349	51,045 (60.52%)
Seattle	172,420	68,852 (39.93%)
Charlotte	353,254	189,873 (53.75%)
Atlanta	1,151,415	704,529 (61.19%)
Dallas	711,956	394,991 (55.48%)
Denver	528,456	232,615 (44.02%)
Los Angeles	348,222	116,053 (33.33%)
Total	**3,994,548**	**2,061,979 (51.62%)**

Data Source: Large Block File

Table 3. Number of tabulation blocks listed, selected for DQC, and checked in Large Block Operation

Regional Census Center	Number of blocks listed	Number of blocks selected for DQC	Number of blocks checked
Boston	149	149	149
New York	343	343	343
Philadelphia	627	627	627
Detroit	332	332	332
Chicago	217	217	217
Kansas City	469	469	469
Seattle	667	667	667
Charlotte	1,734	1,734	1,734
Atlanta	3,510	3,510	3,510
Dallas	1,747	1,747	1,747
Denver	1,743	1,743	1,743
Los Angeles	1,291	1,291	1,291
Total	**12,829**	**12,829**	**12,829**

Data Source: Large Block File

Table 4. Number of blocks passed and failed in Large Block Operation

Regional Census Center	Number/percent of blocks passed	Number/percent of blocks failed	Number of blocks checked
Boston	109 (73.15%)	40 (26.85%)	149
New York	290 (84.55%)	53 (15.45%)	343
Philadelphia	394 (62.84%)	233 (37.16%)	627
Detroit	241 (72.59%)	91 (27.41%)	332
Chicago	186 (85.71%)	31 (14.29%)	217
Kansas City	346 (73.77%)	123 (26.23%)	469
Seattle	536 (80.36%)	131 (19.64%)	667
Charlotte	1,266 (73.01%)	468 (26.99%)	1,734
Atlanta	2,531 (72.11%)	979 (27.89%)	3,510
Dallas	1,256 (71.89%)	491 (28.11%)	1,747
Denver	1,388 (79.63%)	355 (20.37%)	1,743
Los Angeles	1,134 (87.84%)	157 (12.16%)	1,291
Total	**9,677 (75.43%)**	**3,152 (24.57%)**	**12,829**

Data Source: Large Block File

Table 5. Large Block Dependent Quality Control Critical Errors by RCC

Error Types	Number of Critical Errors Reported (Percent of Units Checked in each RCC)											
Error Description Region:	Boston	New York	Philadelphia	Detroit	Chicago	Kansas City	Seattle	Charlotte	Atlanta	Dallas	Denver	Los Angeles
Unit (not in a multi-unit structure) missed	72 (0.24%)	24 (0.03%)	793 (0.70%)	553 (1.13%)	3 (0.02%)	110 (0.22%)	256 (0.37%)	998 (0.53%)	6,652 (0.94%)	3,123 (0.79%)	1,146 (0.49%)	499 (0.43%)
Unit (in a multi-unit structure) missed	349 (1.16%)	2,303 (2.45%)	1,610 (1.43%)	368 (0.75%)	94 (0.51%)	137 (0.27%)	148 (0.21%)	4,645 (2.45%)	20,273 (2.88%)	4,484 (1.14%)	3,557 (1.53%)	1,071 (0.92%)
Unit incorrectly deleted	300 (1.00%)	903 (0.96%)	2,272 (2.02%)	350 (0.71%)	671 (3.67%)	529 (1.04%)	711 (1.03%)	1,941 (1.02%)	11,791 (1.67%)	5,711 (1.45%)	1,940 (0.83%)	1,182 (1.02%)
Unit should not have been listed in block	3,079 (10.27%)	5,207 (5.54%)	3,876 (3.44%)	1,522 (3.11%)	136 (0.74%)	630 (1.23%)	2,157 (3.13%)	5,098 (2.68%)	44,257 (6.28%)	20,637 (5.22%)	6,634 (2.85%)	4,756 (4.10%)
Unit had street name misspelled	591 (1.97%)	413 (0.44%)	354 (0.31%)	1,778 (3.63%)	35 (0.19%)	82 (0.16%)	376 (0.55%)	863 (0.45%)	10,058 (1.43%)	2.594 (0.66%)	1,452 (0.62%)	648 (0.56%)
Unit had incorrect street name	43 (0.14%)	6 (0.01%)	313 (0.28%)	748 (1.53%)	251 (1.37%)	151 (0.30%)	330 (0.48%)	2,229 (1.17%)	6,541 (0.93%)	3,103 (0.79%)	2,217 (0.95%)	153 (0.13%)
Unit had incorrect house number	314 (1.05%)	376 (0.40%)	553 (0.49%)	9 (0.02%)	1 (0.01%)	40 (0.08%)	44 (0.06%)	701 (0.37%)	3,594 (0.51%)	1,541 (0.39%)	399 (0.17%)	425 (0.37%)
Unit is a duplicate of another unit	239 (0.80%)	108 (0.11%)	652 (0.58%)	232 (0.47%)	10 (0.05%)	147 (0.29%)	78 (0.11%)	432 (0.23%)	3,558 (0.51%)	1,107 (0.28%)	1,472 (0.63%)	728 (0.63%)
Unit added by lister has incorrect ZIP code	0 (0.00%)	9 (0.01%)	2 (0.00%)	0 (0.00%)	0 (0.00%)	104 (0.20%)	165 (0.24%)	130 (0.07%)	317 (0.04%)	294 (0.07%)	152 (0.07%)	819 (0.71%)
Unit should have been merged with another	0 (0.00%)	14 (0.01%)	22 (0.02%)	51 (0.10%)	1 (0.01%)	0 (0.00%)	17 (0.02%)	50 (0.03%)	768 (0.11%)	129 (0.03%)	48 (0.02%)	4 (0.00%)
Total Units Checked in RO:	29,966	94,058	112,735	48,983	18,279	51,045	68,852	189,873	704,529	394,991	232,615	116,053

Source: Large Block File