

**American Housing Survey**

**Components of Inventory Change and  
Rental Dynamics Analysis:  
Virginia Beach-Norfolk-Newport News,  
1998–2011**

*Prepared For:*

**U.S. Department of Housing & Urban Development  
Office of Policy Development & Research**

*Prepared By:*

**Frederick J. Eggers & Fouad Moumen  
Econometrica, Inc.  
Bethesda, MD**

**Contract No. C-CHI-01030  
Order No. CHI-T0002  
Project No. 1053-002**

**May 2015**

# Table of Contents

<b>Executive Summary .....</b>	<b>iv</b>
<b>1. Introduction.....</b>	<b>1</b>
<b>2. Special Issues: Virginia Beach-Norfolk-Newport News.....</b>	<b>2</b>
<b>3. Changes to the Housing Stock: 1998–2011 .....</b>	<b>4</b>
<b>4. Components With Atypical Losses or Additions .....</b>	<b>6</b>
<b>5. Rental Market Dynamics: 1998–2011 .....</b>	<b>11</b>
<b>6. Summary of Housing Market Changes: Virginia Beach-Norfolk-Newport News Metropolitan Area, 1998–2011.....</b>	<b>13</b>
<b>Appendix A: CINCH and Rental Dynamics Methodology .....</b>	<b>A-1</b>
<b>Appendix B: CINCH and Rental Dynamics Tables .....</b>	<b>B-1</b>

## List of Tables

Table 1: Disposition of 1998 Virginia Beach Housing Units in 2011 .....	4
Table 2: Sources for 2011 Virginia Beach Housing Stock.....	5
Table 3: Sectors Experiencing Atypical Loss Rates in Virginia Beach, 1998–2011.....	6
Table 4: Sectors Experiencing Atypical Rates of Addition in Virginia Beach, 1998–2011.....	9
Table 5: Summary of Forward-Looking Rental Dynamics for Virginia Beach .....	12
Table 6: Summary of Backward-Looking Rental Dynamics for Virginia Beach.....	13
Forward-Looking Table A: Housing Characteristics, Virginia Beach .....	B-6
Forward-Looking Table B: Unit Quality, Virginia Beach.....	B-9
Forward-Looking Table C: Occupant Characteristics, Virginia Beach.....	B-11
Forward-Looking Table D: Income and Housing Cost, Virginia Beach .....	B-13
Backward-Looking Table A: Housing Characteristics, Virginia Beach.....	B-15
Backward-Looking Table B: Unit Quality, Virginia Beach .....	B-18
Backward-Looking Table C: Occupant Characteristics, Virginia Beach .....	B-20
Backward-Looking Table D: Income and Housing Cost, Virginia Beach .....	B-22
Forward-Looking Rental Dynamics Table 1: Counts, 1998–2011, Virginia Beach (All Numbers in Thousands).....	B-24
Forward-Looking Rental Dynamics Table 2: Row Percentages, 1998–2011, Virginia Beach	B-24
Backward-Looking Rental Dynamics Table 1: Counts, 1998–2011, Virginia Beach (All Numbers in Thousands).....	B-25
Backward-Looking Rental Dynamics Table 2: Row Percentages, 1998–2011, Virginia Beach..... .....	B-25

## List of Figures

Figure A-1: How the Housing Inventory Changes .....	A-1
---	-----

## ***Executive Summary***

Components of Inventory Change (CINCH) is a tool used by housing analysts to study how the housing inventory changes over time. One typically thinks of the housing stock as evolving through two mechanisms—the construction of new units and the demolition of old units. While new construction and losses through demolition and natural disasters are the primary means by which the housing stock changes, CINCH shows that there are other important engines of change.

This report describes how the housing stock in the Virginia Beach-Norfolk-Newport News metropolitan area changed between 1998 and 2011, with particular emphasis on affordable rental housing. The study uses data from the American Housing Survey, which collected detailed information on housing units in Virginia Beach and on their occupants in both 1998 and 2011.

In 1998 the Virginia Beach-Norfolk-Newport News metropolitan area contained 632,100 housing units, including vacant units. By 2011 the number of housing units had increased to 695,200. Part of this increase was due to a redefinition of the metropolitan area that added Surry County in Virginia. We estimate that the 2011 count of housing units for the metropolitan area as defined in 1998 would be 692,300. This represents an overall increase of 9.5 percent, which translates to an average annual increase of 0.7 percent over the 13-year period.

Between 1998 and 2011, 14,100 units left the housing stock. Of these, 8,000 are clearly permanent losses—the original unit is gone, and major construction would be required to replace it with a new unit. Another 1,900 are temporary losses—the original unit needs repairs or is being used for other purposes. These units may or may not return to the housing stock. Finally, there were 4,200 units that left the housing stock either permanently or temporarily for “other” reasons, a category that encompasses a wide variety of situations.

In the period between the 1998 and the 2011 AHS surveys, 115,700 units were added to the housing stock. Ninety-six percent of these additions were newly constructed units. The 2011 AHS did track move-ins of mobile homes in Virginia Beach, a factor that accounted for 700 new units. No new units were formed from the conversion or merger of 1998 units. We classified 1,100 units as recovered because these units had been in the housing stock at some point but were classified in 1998 as nonresidential (500) or uninhabitable (600). Finally, 2,400 units were added in other unclassified ways.

The Virginia Beach-Norfolk-Newport News metropolitan area lost 2.2 percent of all 1998 housing units by 2011; additions between 1998 and 2011 represent 16.7 percent of the 2011 housing stock. Losses and additions varied across portions of the Virginia Beach housing market defined by the characteristics of the unit or its occupants. We observed the following patterns, which were both atypical of the overall housing stock and statistically significant:

- Units that were vacant in 1998 had a high loss rate.
- Newer units (built 1985–1994) had low loss rates, while older units (1930–1939) had a high loss rate.

- Single-family detached units had a low loss rate. Units in multiunit structures had a high loss rate, particularly units in 2- to 4-unit buildings and buildings with 2 floors.
- Small units (5 rooms or 1 bedroom) had high loss rates; large units (7 to 8 rooms or 4 or more bedrooms) had low loss rates.
- Units that reported moderate physical problems in 1998 had high loss rates.
- Units occupied by White householders in 1998 had low loss rates; units occupied by Black householders had high loss rates.
- Units occupied in 1998 by households on welfare had high loss rates.
- Units that were owner-occupied in 1998 had low loss rates; units that were renter-occupied had high loss rates.
- Among both owner-occupied and renter-occupied units, subgroups with higher monthly housing costs or with higher earning households had lower loss rates.
- Single-family attached units had a high rate of addition.
- Several significant results seem consistent with an area where tourism is important, specifically the high rates of addition for seasonal units, units requiring wells and septic systems, 1-room units, units with no bedrooms, and units lacking complete kitchen facilities.
- While units in multiunit structures had a lower-than-average rate of addition, the rates of addition were high for units in large buildings (20 or more units or 3 to 6 floors).
- With the exception of the 1-room units, the rates of addition seemed to be directly related to the size of the unit: the larger the unit, the higher the rate of addition.
- Units occupied in 2011 by householders 75 years old or older had a low rate of addition; units with children had a higher-than-average rate of addition.
- Owner-occupied units in 2011 had a higher-than-average rate of addition. Within owner-occupied units, the rate of addition is below average except for units with high monthly housing costs (\$1,250) and units with high-income owners (\$100,000 or more); these two groups had very high rates of addition.
- Renter-occupied units in 2011 had a lower-than-average rate of addition. Within renter-occupied units, the rate of addition is below average except for units with high monthly housing costs (\$1,250) and units with high-income renters (\$100,000 or more); these two groups had very high rates of addition.

The 1998 rental stock in Virginia Beach-Norfolk-Newport News was on the borderline of being affordable and not being affordable. Of the 240,600 rental units in 1998, 71,000 were extremely low rent or very low rent units. In addition, 52,500 units were non-market; that is, they were either assisted or offered for no cash rent. These three categories accounted for 51.3 percent of the 1998 rental stock. The three highest rent categories comprised 10.1 percent of the rental stock. Moves to a less affordable category (sometimes called gentrification) exceeded moves to a more affordable category (sometimes called filtration)—35.6 percent of all 1998 units compared to 14.6 percent. By 2011, 24.9 percent of the 240,600 rental units in 1998 were no longer in the rental stock. The largest proportion of these losses was due to changes in tenure.

The rental stock in Virginia Beach-Norfolk-Newport News was less affordable in 2011 than in 1998. Of the 262,000 rental units in 2011, 40,900 were extremely low rent or very low rent units. In addition, 39,100 units were non-market; that is, they were either assisted or offered for no cash rent. These three categories accounted for 30.5 percent of the 2011 rental stock. The three highest rent categories comprised 22.1 percent of the rental stock. Moves from a more affordable category (sometimes called gentrification) exceeded moves from a less affordable category (sometimes called filtration)—31.0 percent of all 2011 units compared to 12.7 percent. Of the 262,000 rental units in 2011, 34.4 percent were not rental in 1998). The largest proportion of these gains was due to changes in tenure.

# Components of Inventory Change and Rental Dynamics Analysis: Virginia Beach-Norfolk-Newport News, 1998–2011

## 1. Introduction

This report describes how the housing stock in the Virginia Beach-Norfolk-Newport News metropolitan area changed between 1998 and 2011, with particular emphasis on affordable rental housing. The study uses data from the American Housing Survey (AHS), which collected detailed information on housing units in Virginia Beach and on their occupants in both 1998 and 2011.<sup>1</sup>

As part of its Components of Inventory Change (CINCH) program, the U.S. Department of Housing and Urban Development (HUD) has funded, for a number of years, similar studies of metropolitan areas to document changes in the American housing stock. These studies have traditionally included an assessment of changes in the rental housing market called rental dynamics. This paper is one of 29 metropolitan CINCH studies based on the information provided by the 2011 AHS.<sup>2</sup>

CINCH reports present both forward-looking analysis (what happened to the 1998 units by 2011) and backward-looking analysis (where the 2011 units came from in terms of 1998).<sup>3</sup> This paper repeats the analysis contained in the most recent CINCH and rental dynamics studies, but its organization differs from that of previous reports.

- Section 2 discusses data and related issues that affect the CINCH and rental dynamics analysis for Virginia Beach.
- Section 3 explains the changes in the housing stock between 1998 and 2011 in terms of losses to the housing stock through demolitions or the other ways units can leave the housing stock and additions through new construction and other means.
- Section 4 looks at components of the housing stock that experienced losses or additions markedly different from the overall patterns of losses and additions.

---

<sup>1</sup> Since 1973, the U.S. Department of Housing and Urban Development (HUD) and the Census Bureau have conducted an extensive survey of the American housing stock called the American Housing Survey (AHS). The AHS has two components: a national survey that, since 1985, has collected data every 2 years on the entire U.S. housing stock and a metropolitan component that, since 1985, has collected data at various times on the housing stock of 45 metropolitan areas. Both the national and metropolitan components use the same sample of housing units in successive surveys, making it possible to observe changes in units over time. The initial samples have been augmented in later years to account for units added by new construction or other means.

<sup>2</sup> HUD also funds CINCH studies of survey-to-survey changes in the national stock. At the national level, the Rental Dynamics studies are published separately. For a complete list of all CINCH studies, see <http://www.huduser.org/portal/datasets/cinch.html>.

<sup>3</sup> The forward-looking analysis was previously presented to HUD in December 2013. The data needed to produce the backward-looking analysis did not become available until after the allowed period of performance of the contract under which the previous report was completed.

- Section 5 breaks the rental housing stock into eight affordability categories and tracks what happened to units in each of those categories between 1998 and 2011.
- Section 6 summarizes the changes to the housing stock of the Virginia Beach metropolitan area between 1998 and 2011.

The paper concludes with two appendices that contain analyses and data found in the body of previous CINCH reports.

- Appendix A explains the CINCH and rental dynamics methodologies.
- Appendix B contains the detailed CINCH and rental dynamics tables found in previous reports.

National economic conditions shaped in important ways the changes observed in this report. The 1998–2011 period began toward the end of the longest recorded business cycle (March 1991 to November 2001), encompassed a vigorous expansion (November 2001 to December 2007), included the recent harsh recession (December 2007 to June 2009), and ended with a period of lackluster recovery.

## ***2. Special Issues: Virginia Beach-Norfolk-Newport News***

Metropolitan areas are composed of counties or townships that are interrelated economically. The Office of Management and Budget periodically adjusts the composition of metropolitan areas as the economic relationships among counties change. In some cases, the AHS retains the metropolitan boundaries in effect when the original metropolitan sample was drawn; in other cases, the AHS will adjust the original sample to correspond to the new definition of the metropolitan area. A change in sample boundaries will affect the interpretation of CINCH analysis and its precision. The absolute sample size available to study changes between surveys determines how reliably the observed changes are measured.

### **Geography**

In 1998 the Virginia Beach-Norfolk-Newport News metropolitan area contained 632,100 housing units, including vacant units. By 2011 the number of housing units had increased to 695,200. Part of this increase was due to a redefinition of the metropolitan area that added Surry County in Virginia. Using the American Community Survey (2011, 5-year data) at the county level, we estimate that the 2011 count of housing units for the metropolitan area as defined in 1998 would be 692,300. This represents an overall increase of 9.5 percent, which translates to an average annual increase of 0.7 percent over the 13-year period.

The change in the geographical definition of Virginia Beach-Norfolk-Newport News affects the interpretation of the information presented in this report. Our analysis applies only to that portion of the metropolitan area that was common to the Virginia Beach metropolitan area as defined in both 1998 and 2011, but the application to the common area is not precise, as explained in Appendix A.



## **Sample size**

Both CINCH and rental dynamics require that, if a sample unit is in both the 1998 and 2011 housing stock, it must be interviewed in both surveys to be included in the analysis. Other analytical requirements also limit effective sample size. There are 2,713 sample units that were common to the 1998 and 2011 AHS Virginia Beach surveys and satisfied all the analytical requirements.<sup>4</sup> Between 1998 and 2011, 100 sample units in the common area meeting the analytical requirements were lost to the stock; thus, the forward-looking analysis is based on a maximum of 2,813 sample units. Between 1998 and 2011, 476 sample units meeting the analytical requirements were added to the AHS to represent additions to the stock throughout the metropolitan area as defined in 2011; thus, the backward-looking analysis is based on a maximum of 3,189 sample units. In the forward-looking analysis, the average weight of a sample unit is approximately 225 units; in the backward-looking analysis, the average weight of a sample unit is approximately 218 units.

## **Data reliability**

All CINCH analysis relies on two AHS variables: NOINT (why there was no interview), which, among other things, explains why a unit is temporarily or permanently out of the stock, and REUAD (why unit added), which explains why a sample unit entered the sample. Both variables require some detective work on the part of Census Bureau staff, and the longer the period between surveys, the more difficult the detective work. At the national level, the AHS data are collected every 2 years, so it is relatively easy to determine why a unit has been removed from or added to the sample. In the case of Virginia Beach-Norfolk-Newport News, 13 years separate the 2011 sample from the 1998 sample. As a result, explaining the loss or addition of sample units is very challenging. This report is part of a series that compares the housing stock in 2011 to the housing stock of 7 metropolitan areas in 1998, 12 metropolitan areas in 2002, 8 metropolitan areas in 2004, and 2 metropolitan areas in 2009. We compared the pattern of changes across the 29 areas studied in these reports to the changes recorded between 2009 and 2011 at the national level. With respect to losses, the patterns are reasonably similar except for the role played by the movement of mobile homes. Mobile home move-outs are much more important in explaining losses at the national level. At both the national and metropolitan levels, the “other” category accounts for one-fifth to one-quarter of the losses. With respect to additions, new construction accounts for 72 percent of all additions at the national level but 94 percent at the metropolitan level. We suspect that data issues downplay the importance of “means other than new construction” at the metropolitan level.

---

<sup>4</sup> The 1998 AHS surveyed 4,861 units in the Virginia Beach metropolitan area; 3,480 of these units were in the 2011 AHS public use file (PUF). Of the 1,381 sample units no longer in the survey, 163 were legitimate temporary or permanent losses to the housing stock and were considered for the analysis. The remaining 1,218 cases are coded as “sample reduction for the current survey year” with no further explanation.

### 3. Changes to the Housing Stock: 1998–2011

#### Losses between 1998 and 2011

One typically thinks of the housing stock evolving through two mechanisms: the construction of new units and the demolition of old units. While new construction and losses through demolition and natural disasters are the primary means by which the housing stock changes, CINCH shows that there are other important engines of change.

Table 1 reports that between 1998 and 2011, 14,100 units left the housing stock.<sup>5</sup> Of these, 8,000 are clearly permanent losses—the original unit is gone, and major construction would be required to replace it with a new unit. Another 1,900 are temporary losses—the original unit needs repairs or is being used for other purposes. These units may or may not return to the housing stock. Finally, there were 4,200 units that left the housing stock either permanently or temporarily for “other” reasons, a category that encompasses a wide variety of situations.

**Table 1: Disposition of 1998 Virginia Beach Housing Units in 2011<sup>6</sup>**

Present in 1998	632,100
1998 units present in 2011	618,000
<b>Units no longer in the stock</b>	<b>14,100</b>
1998 units lost due to conversion/merger	1,200
1998 house or mobile home moved out	0
1998 units lost through demolition or disaster	6,900
<b>Permanent losses</b>	<b>8,000</b>
1998 units changed to nonresidential use	600
1998 units badly damaged or condemned	1,300
<b>Temporary losses</b>	<b>1,900</b>
<b>1998 units lost in other ways</b>	<b>4,200</b>

Demolitions and natural disasters accounted for 6,900 of the permanent losses, while mergers and conversions contributed another 1,200 permanent losses. “Conversion” is the terminology used in the AHS for the splitting of a unit into two or more units. The movement of a mobile home or house is considered a permanent loss because a housing unit is the combination of land and capital. While movement preserves the capital, it dissolves the union of capital and land that formed the original unit; therefore, the movement of a mobile home is considered a permanent loss. Unfortunately, the 2011 AHS survey in Virginia Beach did not track mobile home move-outs, probably because the long time between surveys makes it difficult to determine whether the current mobile home was the same mobile home as in 1998.

Sometimes houses are used for business purposes. Such commercial use or the use of a house for a group home is considered a change to a nonresidential use. Badly damaged units may be repaired, left in an unusable state, or demolished.

<sup>5</sup> With the caveats noted in Appendix A, this analysis applies to the area common to both the 1998 and 2011 definitions of the metropolitan area.

<sup>6</sup> Numbers may not add consistently due to rounding. Counts were rounded to the nearest hundred.

Appendix B contains four forward-looking tables that break the overall stock into more than 100 subgroups, such as single-family detached houses or units occupied by Black householders in 1998. For each subgroup, these tables detail how many of the 1998 units in that subgroup are in the same subgroup in 2011, have moved into another subgroup, or have left the stock and how they left the stock. Section 4 looks across the Appendix B forward-looking tables and focuses on those subgroups that lost an unusually high or an unusually low number of units over the 1998–2011 period.

## Additions between 1998 and 2011

Table 2, together with the backward-looking Appendix B tables, provides a great deal of information on additions to the housing stock between 1998 and 2011.<sup>7</sup>

**Table 2: Sources for 2011 Virginia Beach Housing Stock<sup>8</sup>**

2011 housing stock	694,500
2011 units present in 1998	578,800
<b>Total additions to stock</b>	<b>115,700</b>
Units added by new construction	111,400
House or mobile home moved in	700
Units added by conversion/merger	0
<b>New or reconstructed units</b>	<b>112,100</b>
Units added from nonresidential use	500
Units added from temporary losses	600
<b>Recovered units</b>	<b>1,100</b>
<b>Units added in other ways</b>	<b>2,400</b>

In the period between the 1998 and the 2011 AHS surveys, 115,700 units were added to the housing stock. Ninety-six percent of these additions were newly constructed units. The 2011 AHS did track move-ins of mobile homes in Virginia Beach, a factor that accounted for 700 new units. Also, no new units were formed from the conversion or merger of 1998 units.

We classified 1,100 units as recovered because these units had been in the housing stock at some point but were classified in 1998 as nonresidential (500) or uninhabitable (600). Finally, 2,400 units were added in other unclassified ways.

Appendix B contains four backward-looking tables that break the overall stock into more than 100 subgroups. For each subgroup, these tables detail how many of the 2011 units in that subgroup were in the same subgroup in 2011, have moved from another subgroup, or are new additions to the stock. Section 4 looks across the Appendix B backward-looking tables and focuses on those subgroups that gained an unusually high or an unusually low number of units over the 1998–2011 period.

<sup>7</sup> With the caveats noted in Appendix A, this analysis applies to the area common to both the 1998 and 2011 definitions of the metropolitan area. Inconsistencies between Tables 1 and 2 result from a combination of (1) changes in metropolitan boundaries, (2) changes in control housing counts between censuses, and (3) different weights.

<sup>8</sup> Numbers may not add consistently due to rounding. Counts were rounded to the nearest hundred.

#### 4. Components With Atypical Losses or Additions

The Virginia Beach-Norfolk-Newport News metropolitan area lost 2.2 percent of all 1998 housing units by 2011, but the loss rate varied across sectors of the stock. For example, the occupied housing stock lost 1.9 percent of its units between 1998 and 2011.

We examined all of the components of the 1998 Virginia Beach housing stock contained in the four forward-looking tables in Appendix B to identify subgroups with unusual loss rates. Forward-Looking Table A reports information on all units in the stock; Table 3 lists subgroups from Table A with loss rates statistically different than the loss rate of the overall stock. Forward-Looking Tables B, C, and D describe important characteristics of occupied units and their residents; Table 3 lists subgroups from those tables with loss rates statistically different than the loss rate of occupied units. We also employed judgment in selecting among components with statistically different loss rates. In general, we looked for subgroups with loss rates less than half or more than double the benchmark rate, but we listed other subgroups if their inclusion illustrated interesting patterns within loss rates. Finally, Table 3 includes the loss rates for four key segments of the housing market—occupied units, vacant units, owner-occupied units, and renter-occupied units—even if their loss rates are not statistically different.

**Table 3: Sectors Experiencing Atypical Loss Rates in Virginia Beach, 1998–2011<sup>9</sup>**

Characteristics	Present in 1998	Total lost	Percent lost
<i>Housing stock</i>	632,100	14,100	2.2%
<i>Occupancy status</i>			
Occupied	564,000	10,500	1.9%
Vacant	61,600	3,200	5.2% **
<i>Units in structure</i>			
1, detached	384,500	4,900	1.3% **
2 to 4	48,200	3,300	6.8% ***
<i>Year built</i>			
1990–1994	59,000	100	0.2% ***
1985–1989	87,600	900	1.1% *
1930–1939	16,500	1,300	7.8% *
<i>Rooms</i>			
5	132,800	4,800	3.6% *
7	93,100	1,100	1.2% *
8	72,200	300	0.4% ***
<i>Bedrooms</i>			
1	50,200	2,300	4.6% *
4 or more	125,800	600	0.5% ***
<i>Multiunit structures</i>	141,100	6,100	4.3% **
<i>Stories in structure</i>			
2	92,700	4,400	4.7% **

<sup>9</sup> Two conditions were necessary for a housing sector to appear in Table 3, one mathematical and one judgmental: (1) the difference between the sector’s loss rate and the benchmark rate had to have been statistically significant at the 10-percent level, and (2) the difference had to be interesting. Counts are rounded to the nearest hundred.

<b>Characteristics</b>	<b>Present in 1998</b>	<b>Total lost</b>	<b>Percent lost</b>
<i>Moderate problems</i>	21,600	1,900	8.7% **
<i>Race and ethnicity</i>			
White	384,200	3,600	0.9% **
White Non-Hispanic	375,100	3,600	1.0% **
Black	158,200	6,500	4.1% ***
Black Non-Hispanic	156,300	6,200	3.9% ***
<i>Income sources of families and primary individuals</i>			
Public assistance or public welfare	21,800	1,400	6.5% *
<i>Tenure</i>			
Owner-occupied	353,600	2,600	0.7% ***
Renter-occupied	210,400	7,800	3.7% ***
<i>Renter monthly housing costs</i>			
Less than \$350	24,100	2,000	8.3% **
\$350 to \$599	83,800	3,300	3.9% *
<i>Renter household income</i>			
\$15,000 to \$29,999	70,200	3,600	5.1% ***
<i>Owner monthly housing costs</i>			
\$350 to \$599	69,600	500	0.7% **
\$800 to \$1,249	105,900	200	0.2% ***
<i>Owner household income</i>			
\$15,000 to \$29,999	59,600	400	0.7% **
\$30,000 to \$49,999	87,500	700	0.8% **
\$50,000 to \$99,999	120,900	700	0.6% ***

\* Statistically different from either all units or all occupied units, as appropriate, at the 10-percent level.

\*\* Statistically different from either all units or all occupied units, as appropriate, at the 5-percent level.

\*\*\* Statistically different from either all units or all occupied units, as appropriate, at the 1-percent level.

Table 3 identifies loss rates that were both atypical of the overall housing stock and statistically significant:

- Units that were vacant in 1998 had a high loss rate.
- Newer units (built 1985–1994) had low loss rates, while older units (1930–1939) had a high loss rate.
- Single-family detached units had a low loss rate. Units in multiunit structures had a high loss rate, particularly units in 2- to 4-unit buildings and buildings with 2 floors.
- Small units (5 rooms or 1 bedroom) had high loss rates; large units (7 to 8 rooms or 4 or more bedrooms) had low loss rates.
- Units that reported moderate physical problems in 1998 had high loss rates.
- Units occupied by White householders in 1998 had low loss rates; units occupied by Black householders had high loss rates.

- Units occupied in 1998 by households on welfare had high loss rates.
- Units that were owner-occupied in 1998 had low loss rates; units that were renter-occupied had high loss rates.
- Among both owner-occupied and renter-occupied units, subgroups with higher monthly housing costs or with higher earning households had lower loss rates.

The 115,700 additions reported in Table 2 represent 16.7 percent of the 2011 housing stock. The rate of addition varied by the characteristics of the housing. Additions represented 16.4 percent of occupied units.

We examined all of the components of the 1998 Virginia Beach housing stock contained in the four backward-looking tables in Appendix B to identify subgroups with unusual addition rates. Backward-Looking Table A reports information on all units in the stock; Table 4 lists subgroups from Table A with addition rates statistically different than the addition rate of the overall stock. Backward-Looking Tables B, C, and D describe important characteristics of occupied units and their residents; Table 4 lists subgroups from those tables with addition rates statistically different than the addition rate of occupied units. We also employed judgment in selecting among components with statistically different addition rates. In general, we looked for subgroups with addition rates less than half or more than double the benchmark rate, but we listed other subgroups if their inclusion illustrated interesting patterns within addition rates. Finally, Table 4 includes the addition rates for four key segments of the housing market—occupied units, vacant units, owner-occupied units, and renter-occupied units—even if their addition rates are not statistically different.

**Table 4: Sectors Experiencing Atypical Rates of Addition in Virginia Beach, 1998–2011<sup>10</sup>**

Characteristics	Present in 2011	Total additions	Percent additions
<i>Housing stock</i>	694,500	115,700	16.7%
<i>Occupancy status</i>			
Occupied	630,700	103,400	16.4%
Vacant	59,000	10,600	18.0%
Seasonal	4,800	1,600	34.2% ***
<i>Units in structure</i>			
1, attached	87,500	18,500	21.1% **
2 to 4	43,800	2,600	6.0% ***
5 to 9	50,100	2,000	3.9% ***
20 to 49	12,600	4,000	32.0% **
50 or more	13,700	5,300	38.8% ***
Manufactured/mobile home	17,900	900	5.0% ***
<i>Rooms</i>			
1	2,300	1,800	78.5% ***
3	34,000	2,900	8.4% ***
4	114,400	11,000	9.6% ***
5	144,600	16,500	11.4% ***
8	86,500	19,400	22.4% ***
9	38,800	12,700	32.8% ***
10 or more	18,200	8,200	45.3% ***
<i>Bedrooms</i>			
None	2,700	1,800	65.7% ***
1	47,600	4,200	8.9% ***
2	178,300	20,300	11.4% ***
3	289,400	40,300	13.9% **
4 or more	176,500	49,200	27.9% ***
<i>Multiunit structures</i>	156,800	19,500	12.4% ***
<i>Stories in structure</i>			
1	17,100	1,200	7.1% ***
2	94,000	3,400	3.6% ***
3	34,400	10,300	29.8% ***
4 to 6	6,300	4,200	66.7% ***
7 or more	5,100	400	7.6% *
<i>Lacking complete kitchen facilities</i>	11,700	2,800	24.2% ***
<i>Water</i>			
Well serving 1 to 5 units	41,400	8,300	20.2% ***
<i>Sewer</i>			
Septic tank/cesspool	50,400	10,400	20.6% ***
<i>Moderate problems</i>	18,200	2,000	11.0% ***
Kitchen	11,700	2,800	24.2% ***
<i>Age of householder</i>			
75 or older	54,300	5,100	9.4% ***

<sup>10</sup> Two conditions were necessary for a housing sector to appear in Table 4, one mathematical and one judgmental: (1) the difference between the sector's addition rate and the benchmark rate had to have been statistically significant at the 10-percent level, and (2) the difference had to be interesting. Counts are rounded to the nearest hundred.

Characteristics	Present in 2011	Total additions	Percent additions
<i>Children in household</i>			
Some	204,400	40,400	19.8% **
<i>Tenure</i>			
Owner-occupied	397,400	77,100	19.4% **
Renter-occupied	233,300	26,300	11.3% ***
<i>Renter monthly housing costs</i>			
Less than \$350	16,500	1,200	7.4% ***
\$350 to \$599	12,600	900	6.9% ***
\$600 to \$799	32,800	2,300	6.9% ***
\$800 to \$1,249	102,100	6,700	6.6% ***
\$1,250 or more	61,600	14,500	23.5% ***
<i>Renter household income</i>			
Less than \$15,000	38,600	3,300	8.6% ***
\$15,000 to \$29,999	64,100	3,900	6.1% ***
\$30,000 to \$49,999	58,400	5,600	9.6% ***
\$100,000 or more	14,400	3,900	27.4% *
<i>Owner monthly housing costs</i>			
Less than \$350	14,800	800	5.2% ***
\$350 to \$599	56,100	3,800	6.8% ***
\$600 to \$799	35,100	3,600	10.2% **
\$1,250 or more	216,500	57,400	26.5% ***
<i>Owner household income</i>			
Less than \$15,000	29,100	3,300	11.4% *
\$15,000 to \$29,999	43,900	4,100	9.3% ***
\$100,000 or more	105,400	31,900	30.3% ***

\* Statistically different from either all units or all occupied units, as appropriate, at the 10-percent level.

\*\* Statistically different from either all units or all occupied units, as appropriate, at the 5-percent level.

\*\*\* Statistically different from either all units or all occupied units, as appropriate, at the 1-percent level.

Table 4 identifies rates of addition that were both atypical of the overall housing stock and statistically significant:

- Single-family attached units had a high rate of addition.
- Several significant results seem consistent with an area where tourism is important, specifically the high rates of addition for seasonal units, units requiring wells and septic systems, 1-room units, units with no bedrooms, and units lacking complete kitchen facilities.
- While units in multiunit structures had a lower-than-average rate of addition, the rates of addition were high for units in large buildings (20 or more units or 3 to 6 floors).
- With the exception of the 1-room units, the rates of addition seemed to be directly related to the size of the unit: the larger the unit, the higher the rate of addition.
- Units occupied in 2011 by householders 75 years old or older had a low rate of addition; units with children had a higher-than-average rate of addition.



- Owner-occupied units in 2011 had a higher-than-average rate of addition. Within owner-occupied units, the rate of addition is below average except for units with high monthly housing costs (\$1,250) and units with high-income owners (\$100,000 or more); these two groups had very high rates of addition.
- Renter-occupied units in 2011 had a lower-than-average rate of addition. Within renter-occupied units, the rate of addition is below average except for units with high monthly housing costs (\$1,250) and units with high-income renters (\$100,000 or more); these two groups had very high rates of addition.

## **5. Rental Market Dynamics: 1998–2011**

Rental market dynamics focuses on the supply of rental housing and how that supply changes over time. Rental dynamics analysis has many of the features of CINCH analysis. A key step in rental dynamics analysis is to separate the rental stock into classes or strata based on how affordable the units are. This paper uses eight categories:

- Non-market: Either no cash rent or a subsidized rent.
- Extremely low rent: Affordable to renters with incomes less than or equal to 30 percent of local area median income.
- Very low rent: Affordable to renters with incomes greater than 30 percent but less than or equal to 50 percent of local area median income.
- Low rent: Affordable to renters with incomes greater than 50 percent but less than or equal to 60 percent of local area median income.
- Moderate rent: Affordable to renters with incomes greater than 60 percent but less than or equal to 80 percent of local area median income.
- High rent: Affordable to renters with incomes greater than 80 percent but less than or equal to 100 percent of local area median income.
- Very high rent: Affordable to renters with incomes greater than 100 percent but less than or equal to 120 percent of local area median income.
- Extremely high rent: Affordable to renters with incomes greater than 120 percent of local area median income.

For each category, “affordable” is defined as a gross-rent-to-income ratio of 30 percent or less for the higher of the incomes that define the boundaries for that category.<sup>11</sup> The categories are

---

<sup>11</sup> Gross rent is equal to rent plus utilities.

defined relative to area median income; therefore, the boundaries of the categories will change as area median income changes.

Table 5 summarizes what happened to the 1998 rental units by how affordable they were in 1998. It is based on Forward-Looking Rental Dynamics Table 1 in Appendix B, which traces in more detail where these units wound up in 2011.

**Table 5: Summary of Forward-Looking Rental Dynamics for Virginia Beach**

Affordability categories	1998 rental units	To more affordable categories in 2011	In same affordability category in both years	To less affordable categories in 2011	1998 rental units non-rental in 2011
Non-market	52,500	NA	34.2%	43.1%	22.7%
Extremely low rent	6,300	14.5%	3.5%	50.8%	31.1%
Very low rent	64,700	8.8%	20.2%	49.9%	21.0%
Low rent	41,700	17.7%	16.4%	43.0%	23.0%
Moderate rent	51,100	23.9%	36.2%	13.0%	26.9%
High rent	21,400	33.3%	14.6%	9.4%	42.8%
Very high rent	2,000	44.9%	11.1%	44.0%	0.0%
Extremely high rent	900	0.0%	0.0%	NA	0.0%
Total	240,600	14.6%	24.9%	35.6%	24.9%

The 1998 rental stock in Virginia Beach-Norfolk-Newport News was on the borderline of being affordable and not being affordable. Of the 240,600 rental units in 1998, 71,000 were extremely low rent or very low rent units. In addition, 52,500 units were non-market; that is, they were either assisted or offered for no cash rent. These three categories accounted for 51.3 percent of the 1998 rental stock. The three highest rent categories comprised 10.1 percent of the rental stock. Moves to a less affordable category (sometimes called gentrification) exceeded moves to a more affordable category (sometimes called filtration)—35.6 percent of all 1998 units compared to 14.6 percent.

By 2011, 24.9 percent of the 240,600 rental units in 1998 were no longer in the rental stock (59,900 units). The largest proportion of these losses was due to changes in tenure, with 42,300 rental units becoming owner-occupied or vacant for sale in 2011. Another 7,200 units became seasonal units, units occupied by persons with usual residence elsewhere, or units used for migratory workers. Finally, 10,300 rental units were no longer in the housing stock in 2011. Some of these losses were permanent; that is, the units were demolished or destroyed. Some losses were potentially reversible, such as units being used for nonresidential purposes. Forward-Looking Rental Dynamics Table 2 shows how the movement out of the rental stock varied across the affordability categories. Forward-Looking Rental Dynamics Table 2 shows how the movement out of the rental stock varied across the affordability categories.

Table 6 summarizes where the 2011 rental units came from, with respect to 1998, by how affordable they were in 2011. It is based on Backward-Looking Rental Dynamics Table 1 in Appendix B, which traces in more detail the origin of these units.

The rental stock in Virginia Beach-Norfolk-Newport News was less affordable in 2011 than in 1998. Of the 262,000 rental units in 2011, 40,900 were extremely low rent or very low rent units.

In addition, 39,100 units were non-market; that is, they were either assisted or offered for no cash rent. These three categories accounted for 30.5 percent of the 2011 rental stock. The three highest rent categories comprised 22.1 percent of the rental stock. Moves from a more affordable category (sometimes called gentrification) exceeded moves from a less affordable category (sometimes called filtration)—31.0 percent of all 2011 units compared to 12.7 percent.

**Table 6: Summary of Backward-Looking Rental Dynamics for Virginia Beach**

Affordability categories	2011 rental units	From more affordable categories in 1998	In same affordability category in both years	From less affordable categories in 1998	2011 rental units non-rental in 1998
Non-market	39,100	NA	45.3%	30.0%	24.7%
Extremely low rent	8,000	27.5%	2.8%	33.8%	36.0%
Very low rent	32,900	11.3%	37.2%	19.7%	31.9%
Low rent	46,200	48.1%	13.9%	17.0%	21.0%
Moderate rent	77,800	46.1%	22.4%	5.4%	26.0%
High rent	36,700	33.2%	8.5%	1.1%	57.3%
Very high rent	14,600	20.5%	1.5%	0.0%	78.0%
Extremely high rent	6,700	29.5%	0.0%	NA	70.5%
Total	262,000	31.0%	21.9%	12.7%	34.4%

Of the 262,000 rental units in 2011, 34.4 percent were not rental in 1998 (90,100 units). The largest proportion of these gains was due to changes in tenure, with 49,800 rental units having been owner-occupied or vacant for sale in 1998. Another 9,200 units had been seasonal units, units occupied by persons with usual residence elsewhere, or units used for migratory workers. Finally, 31,100 rental units had not been in the housing stock in 1998. Of these, 27,700 were added by new construction and 3,400 by other means. Backward-Looking Rental Dynamics Table 2 shows how the movement into the rental stock varied across the affordability categories.

## **6. Summary of Housing Market Changes: Virginia Beach-Norfolk-Newport News Metropolitan Area, 1998–2011**

In 1998 the Virginia Beach-Norfolk-Newport News metropolitan area contained 632,100 housing units, including vacant units. By 2011 the number of housing units had increased to 695,200. Part of this increase was due to a redefinition of the metropolitan area that added Surry County in Virginia. We estimate that the 2011 count of housing units for the metropolitan area as defined in 1998 would be 692,300. This represents an overall increase of 9.5 percent, which translates to an average annual increase of 0.7 percent over the 13-year period.

The change in the geographical definition of Virginia Beach-Norfolk-Newport News affects the interpretation of the information presented in this report. Our analysis applies only to that portion of the metropolitan area that was common to the Virginia Beach metropolitan area as defined in both 1998 and 2011.

Between 1998 and 2011, 14,100 units left the housing stock. Of these, 8,000 are clearly permanent losses—the original unit is gone, and major construction would be required to replace it with a new unit. Another 1,900 are temporary losses—the original unit needs repairs or is

being used for other purposes. These units may or may not return to the housing stock. Finally, there were 4,200 units that left the housing stock either permanently or temporarily for “other” reasons, a category that encompasses a wide variety of situations. Demolitions and natural disasters accounted for 6,900 of the permanent losses, while mergers and conversions contributed another 1,200 permanent losses. The 2011 AHS survey in Virginia Beach did not track mobile home move-outs.

In the period between the 1998 and 2011 AHS surveys, 115,700 units were added to the housing stock. Ninety-six percent of these additions were newly constructed units. The 2011 AHS did track move-ins of mobile homes in Virginia Beach, a factor that accounted for 700 new units. No new units were formed from the conversion or merger of 1998 units. We classified 1,100 units as recovered because these units had been in the housing stock at some point but were classified in 1998 as nonresidential (500) or uninhabitable (600). Finally, 2,400 units were added in other unclassified ways.

The Virginia Beach-Norfolk-Newport News metropolitan area lost 2.2 percent of all 1998 housing units by 2011; additions between 1998 and 2011 represent 16.7 percent of the 2011 housing stock. Losses and additions varied across portions of the Virginia Beach housing market defined by the characteristics of the unit or its occupants. We observed the following patterns, which were both atypical of the overall housing stock and statistically significant:

- Units that were vacant in 1998 had a high loss rate.
- Newer units (built 1985–1994) had low loss rates, while older units (1930–1939) had a high loss rate.
- Single-family detached units had a low loss rate. Units in multiunit structures had a high loss rate, particularly units in 2- to 4-unit buildings and buildings with 2 floors.
- Small units (5 rooms or 1 bedroom) had high loss rates; large units (7 to 8 rooms or 4 or more bedrooms) had low loss rates.
- Units that reported moderate physical problems in 1998 had high loss rates.
- Units occupied by White householders in 1998 had low loss rates; units occupied by Black householders had high loss rates.
- Units occupied in 1998 by households on welfare had high loss rates.
- Units that were owner-occupied in 1998 had low loss rates; units that were renter-occupied had high loss rates.
- Among both owner-occupied and renter-occupied units, subgroups with higher monthly housing costs or with higher earning households had lower loss rates.
- Single-family attached units had a high rate of addition.

- Several significant results seem consistent with an area where tourism is important, specifically the high rates of addition for seasonal units, units requiring wells and septic systems, 1-room units, units with no bedrooms, and units lacking complete kitchen facilities.
- While units in multiunit structures had a lower-than-average rate of addition, the rates of addition were high for units in large buildings (20 or more units or 3 to 6 floors).
- With the exception of the 1-room units, the rates of addition seemed to be directly related to the size of the unit: the larger the unit, the higher the rate of addition.
- Units occupied in 2011 by householders 75 years old or older had a low rate of addition; units with children had a higher-than-average rate of addition.
- Owner-occupied units in 2011 had a higher-than-average rate of addition. Within owner-occupied units, the rate of addition is below average except for units with high monthly housing costs (\$1,250) and units with high-income owners (\$100,000 or more); these two groups had very high rates of addition.
- Renter-occupied units in 2011 had a lower than average rate of addition. Within renter-occupied units, the rate of addition is below average except for units with high monthly housing costs (\$1,250) and units with high-income renters (\$100,000 or more); these two groups had very high rates of addition.

The 1998 rental stock in Virginia Beach-Norfolk-Newport News was on the borderline of being affordable and not being affordable. Of the 240,600 rental units in 1998, 71,000 were extremely low rent or very low rent units. In addition, 52,500 units were non-market; that is, they were either assisted or offered for no cash rent. These three categories accounted for 51.3 percent of the 1998 rental stock. The three highest rent categories comprised 10.1 percent of the rental stock. Moves to a less affordable category (sometimes called gentrification) exceeded moves to a more affordable category (sometimes called filtration)—35.6 percent of all 1998 units compared to 14.6 percent. By 2011, 24.9 percent of the 240,600 rental units in 1998 were no longer in the rental stock (59,900 units). The largest proportion of these losses was due to changes in tenure, with 42,300 rental units becoming owner-occupied or vacant for sale in 2011.

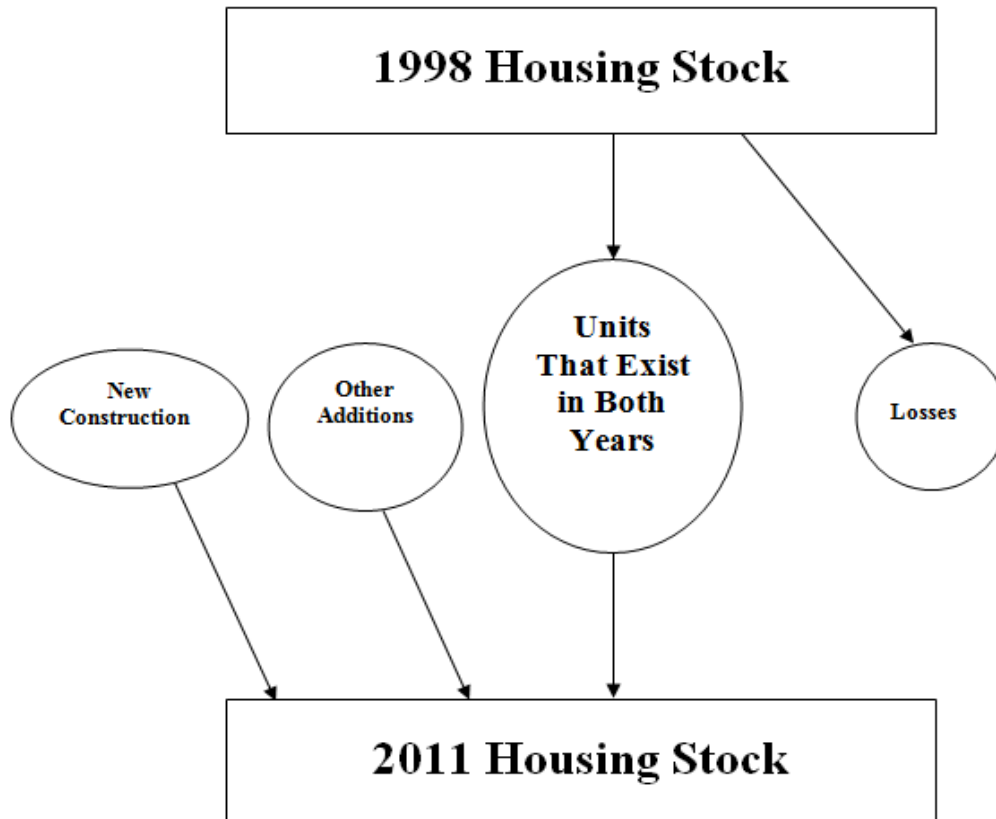
The rental stock in Virginia Beach-Norfolk-Newport News was less affordable in 2011 than in 1998. Of the 262,000 rental units in 2011, 40,900 were extremely low rent or very low rent units. In addition, 39,100 units were non-market; that is, they were either assisted or offered for no cash rent. These three categories accounted for 30.5 percent of the 2011 rental stock. The three highest rent categories comprised 22.1 percent of the rental stock. Moves from a more affordable category (sometimes called gentrification) exceeded moves from a less affordable category (sometimes called filtration)—31.0 percent of all 2011 units compared to 12.7 percent. Of the 262,000 rental units in 2011, 34.4 percent were not rental in 1998 (90,100 units). The largest proportion of these gains was due to changes in tenure, with 49,800 rental units having been owner-occupied or vacant for sale in 1998.

## Appendix A: CINCH and Rental Dynamics Methodology

### Overview

Components of Inventory Change (CINCH) is a tool used by housing analysts to study how the housing inventory changes over time. Figure 1 illustrates how the inventory evolves.

**Figure A-1: How the Housing Inventory Changes**



In the context of Figure A-1, the U.S. Census Bureau provides estimates for both rectangles (the 1998 and 2011 housing stocks) and one oval (units added through new construction between 1998 and 2011). No one estimates the other three ovals: the number of units that belong to both the 1998 and 2011 housing stock, units lost to the housing stock between 1998 and 2011, and other additions to the housing stock between 1998 and 2011.

While losses and other additions are small relative to the overall stock, they encompass important features of how housing markets evolve. Housing units are “clumps” of physical capital associated with specific plots of land, and the housing inventory is the aggregation of these capital-land combinations. New construction creates new clumps, and—like all capital—some “clumps” depreciate and disappear. However, housing units undergo other interesting changes. Losses can be either permanent or temporary. Units destroyed by natural disasters or intentionally demolished are permanent losses. Temporary losses include units that are used for

nonresidential purposes and units that are uninhabitable because of structural defects that can be repaired. Additions can result from restoring units that were uninhabitable or converting nonresidential structures into residential structures.

In addition to determining the size of each oval, housing analysts find information about the characteristics of the units in the different ovals useful. Interesting characteristics include structure type, age of the unit, size of the unit, location by region, location by metropolitan status, tenure, household size and composition, resident income, and resident race and ethnicity.

CINCH analysis has three goals:<sup>12</sup>

- To provide an estimate for all six components of Figure A-1.
- To disaggregate losses and other additions into relevant component parts.
- To characterize the units that survive from one period to the next and the units that are added or lost between periods.

The AHS has four features that make CINCH analysis possible:

- Each unit has weights that can be used to estimate its share of the overall stock.
- The AHS tracks new construction and the various types of losses and other additions.
- The AHS has detailed information about the characteristics of each unit and its occupants.
- The AHS tracks the same unit from one period to the next so that changes in status and characteristics can be observed directly.

Housing analysts and policymakers are particularly interested in what happens to affordable rental housing units. Rental dynamics is a form of CINCH analysis that classifies the rental housing stock by affordability level and tracks the evolution of the rental housing stock by affordability class.

---

<sup>12</sup> Previous CINCH analyses have distinguished between the “status” of a unit with respect to the housing stock (e.g., existing as a nonresidential structure) and the “characteristics” of the unit or its occupants (e.g., rental vs. owner-occupied, or race of householder). This report uses this same distinction. Also adopting previous CINCH terminology, Appendix A will refer to the more recent AHS survey year, 2011, as the current year and the previous AHS survey year, 1998, as the base year.

## Why the analysis needs to be separated into two components

It would be possible to list for every AHS sample unit its status and characteristics in both 1998 and 2011. In some cases, there may be no status, (e.g., not yet constructed in 1998) or no characteristics (e.g., no race of householder for vacant units), but with this understanding such a listing would still be possible. From the listing, one could construct an exact accounting of the movement of units among the various statuses and characteristics between 1998 and 2011.

The exact accounting would apply only to AHS sample observations, roughly a 1-in-500 picture of the housing stock at the metropolitan level. To obtain estimates of the magnitude of actual changes in the housing stock, one needs to apply weights to the sampled units. When weights are applied, the accounting will no longer be exact because units have different weights in different years.<sup>13</sup> For example, the exact accounting might show that 2,500 sample units that were rental in 1998 became owner-occupied or vacant for sale in 2011. To estimate the number of units in the national housing stock that were rental in 1998 and became owner-occupied in 2011, one would need to apply weights. However, using 1998 weights would produce a different estimate than using 2011 weights. There is no conceptual reason to favor the answer using 1998 weights over the answer using 2011 weights. The choice of weights depends upon how the intended analysis will be used.

For this reason, previous CINCH analyses have distinguished between:

1. *Forward-looking analysis*; that is, starting with the base-year stock (1998) and determining the status and characteristics of *those* units in the current year (2011). The goal is to explain what happened to the units comprising the housing stock in the base year. Forward-looking analysis takes the housing stock as given in the base year and looks at the destination of these units in the current year.
2. *Backward-looking analysis*; that is, starting from the current year (2011) stock and determining the status and characteristics of *those* units in the base year (1998). The goal here is to explain where the units comprising the current year housing stock came from. Backward-looking analysis takes the current-year housing stock as given and looks at the source of these units, either in the base year or in new construction or other additions.

---

<sup>13</sup> The Census Bureau assigns both a pure weight (the inverse of the probability of selection) and a final weight to each AHS observation. The final weights are designed to sum up to independent estimates of the total housing stock. The pure weights will vary over observations within a given AHS survey because of stratification in drawing the sample. Generally, pure weights do not vary across survey years. The final weights will differ over observations within a given AHS because the Census Bureau makes adjustments for various factors affecting the sample. The final weights of a given observation will also vary between AHS surveys because of changes in the housing stock.



## Why changes in geography boundaries affect CINCH analysis

The analysis in this report applies only to that portion of the metropolitan area that was common to the metropolitan area as defined in both 1998 and 2011, and the application to the common area is not precise for the following reasons:

- For forward-looking analysis (1998 to 2011), we observe only those sample units in the geography common to both 1998 and 2011. Thus the observed changes correctly apply only to the common area. However, the forward-looking weights are based by necessity on the entire 1998 geography. Since the common area is smaller than the 1998 geography, the counts are overestimates for the common area.
- For the backward-looking analysis (2011 from 1998), we observe (a) sample units that were in the common area in 1998 and are still in the stock in 2011, (b) sample units representing additions to the stock throughout the metropolitan area as newly defined, and (c) sample units that represent housing existing in 1998 in the added portion of the metropolitan area. We can eliminate (c) and try to focus the analysis on the common area, but there are two problems. The backward-looking weights are based by necessity on the entire 2011 geography. Since the common area is smaller than the 2011 geography, the counts are overestimates for the common area. Moreover, we cannot determine which newly added sample units in (b) represent the common area and which represent the added portion of the metropolitan area. Therefore, additions are overestimated with respect to the common area.

## ***Appendix B: CINCH and Rental Dynamics Tables***

### **Contents**

This appendix contains 12 detailed CINCH and rental dynamics tables that have been featured in previous reports. There are:

- Four forward-looking CINCH tables that track changes to the 1998 housing stock in 2011 by various characteristics of the units or their occupants.
- Four backward-looking CINCH tables that track where the 2011 housing stock originated by various characteristics of the units or their occupants.
- Two forward-looking rental dynamics tables (one with counts and one with percentages) that track by affordability category what happened to the 1998 rental stock by 2011.
- Two backward-looking rental dynamics tables (one with counts and one with percentages) that track by affordability category where the 2011 rental stock came from with respect to 1998.

Appendix B begins with an explanation of how to read the tables.

### **How to read CINCH tables**

Rows and columns serve different purposes in CINCH tables. The rows identify classes of units to be analyzed. The columns trace those units either forward or backward. All counts are rounded to the nearest hundred.

The forward-looking tables report what happened to the 1998 housing stock by 2011. There are three possible dispositions of 1998 units:

- Units that continue to exist in 2011 with the same characteristics (or serving the same market).
- Units that continue to exist in 2011 but with different characteristics (or serving a different market).
- Units that were lost to the stock in 2011.

The backward-looking tables report where the 2011 housing stock came from in reference to 1998. There are three possible sources of 2011 units:

- Units that existed in 1998 with the same characteristics (or serving the same market).

- Units that existed in 1998 but with different characteristics (or serving a different market).
- Units that are additions to the housing stock between 1998 and 2011.

Since the essence of the CINCH analysis is in the columns, we will explain the columns in detail.

### ***Columns Common to Both Forward-Looking and Backward-Looking Tables***

The first and last columns contain the row numbers, which are identical for the same tables in the forward-looking and backward-looking sets. Columns A through D set up the analysis and track units that exist in both periods.

- Column A specifies the characteristic that defines the subset of the stock that is being tracked forward or backward in a particular row, for example, occupied units or units built from 1990 through 1994.
- Column B gives the CINCH estimate of the number of units that satisfy two conditions: (a) being part of the housing stock in the relevant year (1998 for the forward-looking tables and 2011 for the backward-looking tables) and (b) satisfying the condition in column A.
- Column C is the CINCH estimate of the number of units from column B that (a) are also part of the housing stock in the other year and (b) continue to belong to the subset defined by column A.
- Column D is the CINCH estimate of the number of units from column B that (a) are also part of the housing stock in the other year but (b) no longer belong to the subset defined by column A. In some cases, the analysis will not allow a unit to change characteristics between the base year and the other year. Examples include type of structure, year built, and number of stories; these characteristics are considered impossible or unlikely to change.

### ***Columns Unique to Forward-Looking Tables***

In the forward-looking tables, columns E through J track what happened to units that were lost from 1998 to 2011.

- Column E is the CINCH estimate of the number of units from column B that are not in the 2011 housing stock because they were merged with other units or converted into multiple units.
- Column F is the CINCH estimate of the number of houses or manufactured homes from column B that were moved out during the period. In most cases, these units were relocated rather than destroyed. The AHS considers them “losses” because a housing unit is a combination of land and capital, and a move breaks that specific combination to

create a new combination at a different location. For this reason, manufactured houses that move from one lot to another are treated as both losses and additions.<sup>14</sup>

- Column G is the CINCH estimate of the number of units from column B that became nonresidential at the end of the period. For example, a real estate firm, a tax preparation office, a palm reader, or some other business might buy or rent a house to use for business rather than residential purposes.<sup>15</sup>
- Column H is the CINCH estimate of the number of units from column B that were demolished or were destroyed by fires or natural disasters by 2011.
- Column I is the CINCH estimate of the number of units from column B that in 2011 were condemned or were no longer usable for housing because of extensive damage.
- Column J is the CINCH estimate of the number of units from column B that were lost by 2011 for other reasons.

The columns form a closed system. Column B counts the number of units tracked; columns C through J account for all the possible outcomes. Therefore, column B minus the sum of columns C through J always equals zero, except for rounding.

### ***Columns Unique to Backward-Looking Tables***

In backward-looking tables, columns E through J track where units came from that are part of the housing stock in 2011 but were not part of the 1998 housing stock.

- Column E is the CINCH estimate of the number of units from column B that were created by the merger or conversion of other units.
- Column F estimates the number of houses or mobile homes from column B that were moved in during the period. For many of the metropolitan areas in the 2011 AHS survey, information on movements was not collected.
- Column G is the CINCH estimate of the number of units from column B that had been nonresidential in 1998.
- Column H is the CINCH estimate of the number of units from column B that were newly constructed between 1998 and 2011. Note: Generally, in Backward-Looking Table A, there will be units in column H with year-built data substantially earlier than the survey year. There are three explanations for this apparent inconsistency. (1) With the exception of manufactured houses, presence in column H is determined by information from the

---

<sup>14</sup> The AHS does not track what happens to a house or mobile home that is moved off of a lot that is part of the AHS sample, and does not inquire about the previous history of a unit that is moved on to a lot that is part of the AHS sample.

<sup>15</sup> If the owner or tenant both lives in a unit and conducts business out of the unit, the AHS considers the unit to be residential. Nonresidential, therefore, means strictly no residential use.

Census Bureau indicating that the unit entered the sample from a listing of new construction; the Census Bureau may be mistaken. (2) Year built is based on information from the respondent; the respondent may be mistaken. (3) An older unit may have undergone substitution renovation that required a new construction permit, but the respondent may have given the original construction date rather than the renovation date. The extent of major renovation occurring in many established neighborhoods throughout the country makes (3) a likely possibility.

- Column I is the CINCH estimate of the number of units from column B that were added by 2011 from units that were structurally unsound in 1998.<sup>16</sup>
- Column J is the CINCH estimate of the number of units from column B that were added by 2011 from units that had been temporarily lost to the stock in 1998 for reasons “not classified” or were newly added by “other” means.

In some metropolitan areas, the AHS surveys do not report data for all the rows in the tables in this appendix. The columns for those rows are left blank.

### **How to read rental dynamics tables**

Forward-Looking Rental Dynamics Table 1 details by affordability category how the rental units in the 1998 housing stock relate to the 2011 housing stock. Column A estimates the number of units in each affordability category in 1998. Columns B through L explain where the 1998 rental units fit into the 2011 housing stock.

- If the units are still rental in 2011, they will be counted in columns B through I, depending upon how affordable they are in 2011.
- If the units have become owner-occupied or for vacant for sale, they will be counted in column J.
- Seasonal units, units that are not the primary residence of their occupants, units used for migratory workers, and units that are vacant but not for rent or sale are counted in column K.
- Column L counts 1998 units that are not in the 2011 housing stock; these can be either temporary or permanent losses to the stock.

The sum of columns B through L equals column A, except for rounding.

Forward-Looking Rental Dynamics Table 2 presents the same information as Table 1, but columns B through L are now percentages of column A. Columns B through L sum to 100 percent in each row.

---

<sup>16</sup> These units had codes that identified them as “occupancy prohibited” or “interior exposed to the elements.”

Backward-Looking Rental Dynamics Table 1 details by affordability category where the rental units in the 2011 housing stock came from with respect to the 1998 housing stock. Column A estimates the number of units in each affordability category in 2011. Columns B through L explain where the 2011 rental units originated.

- If the units were rental in 1998, they will be counted in columns B through I, depending upon how affordable they are in 1998.
- If the units were owner-occupied or for vacant for sale, they will be counted in column J.
- Seasonal units, units that are not the primary residence of their occupants, units used for migratory workers, and units that are vacant but not for rent or sale in 1998 are counted in column K.
- Column L counts rental units that were newly constructed between 1998 and 2011.
- Column M counts rental units that were added to the housing stock after 1998 by other means.

The sum of columns B through M equals column A, except for rounding.

Backward-Looking Rental Dynamics Table 2 presents the same information as Table 1, but columns B through M are now percentages of column A. Columns B through M sum to 100 percent in each row.

These four Rental Dynamics Tables look only at the endpoints of the 13-year period; for example, a unit that is low rent in 1998 and moderate rent in 2011 might have been high rent, owned, or out of the stock at points in between the two surveys. These tables do not track the path of rental units between 1998 and 2011.

**Forward-Looking Table A: Housing Characteristics, Virginia Beach**

	A	B	C	D	E	F	G	H	I	J	
Row	Characteristics	Present in 1998	1998 units present in 2011	Change in characteristics	1998 units lost due to conversion/merger	1998 house or mobile home moved out	1998 units changed to nonresidential use	1998 units lost through demolition or disaster	1998 units badly damaged or condemned	1998 units lost in other ways	Row
1	Housing stock	632,100	618,000	0	1,200	0	600	6,900	1,300		1
	Occupancy status										
2	Occupied	564,000	498,600	54,800	700	0	100	6,200	800		2
3	Vacant	61,600	9,800	48,600	500	0	400	600	400		3
4	Seasonal	6,500	2,500	3,600	0	0	0	100	0		4
	Units in structure										
5	1, detached	384,500	379,700	0	0	0	100	2,200	700		5
6	1, attached	81,900	78,700	0	300	0	0	1,900	100		6
7	2 to 4	48,200	44,900	0	600	0	0	1,300	300		7
8	5 to 9	42,700	41,500	0	0	0	0	700	100		8
9	10 to 19	31,800	30,800	0	300	0	100	600	0		9
10	20 to 49	18,400	17,600	0	0	0	300	100	0		10
11	50 or more										11
12	Manufactured/mobile home	24,600	24,600	0	0	0	0	0	0		12

	A	B	C	D	E	F	G	H	I	J	
Row	Characteristics	Present in 1998	1998 units present in 2011	Change in characteristics	1998 units lost due to conversion/merger	1998 house or mobile home moved out	1998 units changed to nonresidential use	1998 units lost through demolition or disaster	1998 units badly damaged or condemned	1998 units lost in other ways	Row
	Year built										
16	1995–1999	32,600	32,300	0	0	0	300	0	0		16
17	1990–1994	59,000	58,800	0	0	0	0	0	0		17
18	1985–1989	87,600	86,600	0	0	0	0	400	100		18
19	1980–1984	64,600	63,700	0	0	0	100	300	100		19
20	1975–1979	55,700	54,300	0	0	0	0	800	100		20
21	1970–1974	65,900	64,600	0	200	0	0	300	300		21
22	1960–1969	96,200	94,300	0	400	0	100	600	100		22
23	1950–1959	74,900	71,900	0	300	0	0	1,700	300		23
24	1940–1949	50,300	48,300	0	100	0	0	1,100	100		24
25	1930–1939	16,500	15,200	0	0	0	0	1,000	0		25
26	1920–1929	10,200	9,900	0	0	0	0	300	0		26
27	1919 or earlier	18,700	18,000	0	200	0	0	400	0		27
	Rooms										
28	1	200	0	200	0	0	0	0	0		28
29	2	1,800	400	1,400	0	0	0	0	0		29
30	3	41,800	24,700	15,500	200	0	0	700	300		30
31	4	126,600	78,200	44,200	100	0	400	1,800	200		31
32	5	132,800	67,500	60,600	400	0	0	2,800	300		32
33	6	119,600	58,700	58,800	100	0	100	800	400		33
34	7	93,100	46,500	45,400	300	0	0	600	100		34
35	8	72,200	35,900	36,000	0	0	0	100	0		35
36	9	27,200	11,100	16,200	0	0	0	0	0		36
37	10 or more	16,600	5,300	11,300	0	0	0	0	0		37



	A	B	C	D	E	F	G	H	I	J	
Row	Characteristics	Present in 1998	1998 units present in 2011	Change in characteristics	1998 units lost due to conversion/merger	1998 house or mobile home moved out	1998 units changed to nonresidential use	1998 units lost through demolition or disaster	1998 units badly damaged or condemned	1998 units lost in other ways	Row
	Bedrooms										
38	None	500	200	200	0	0	0	0	0		38
39	1	50,200	37,100	10,700	200	0	100	1,000	300		39
40	2	187,400	145,300	36,400	300	0	300	3,000	400		40
41	3	268,300	210,600	52,200	600	0	100	2,600	400		41
42	4 or more	125,800	97,400	27,800	200	0	0	300	100		42
43	Multiunit structures	141,100	135,000	0	900	0	400	2,700	500		43
	Stories in structure										
44	1	17,200	16,800	0	0	0	0	300	0		44
45	2	92,700	88,300	0	700	0	0	2,000	500		45
46	3	31,200	29,900	0	200	0	400	400	0		46
47	4 to 6										47
48	7 or more										48

**Forward-Looking Table B: Unit Quality, Virginia Beach**

	A	B	C	D	E	F	G	H	I	J	
Row	Characteristics	Present in 1998	1998 units present in 2011	Change in characteristics	1998 units lost due to conversion/merger	1998 house or mobile home moved out	1998 units changed to nonresidential use	1998 units lost through demolition or disaster	1998 units badly damaged or condemned	1998 units lost in other ways	Row
1	Occupied units	564,000	498,600	54,800	700	0	100	6,200	800	2,700	1
2	With complete kitchen	557,000	486,100	60,900	700	0	100	5,900	800	2,500	2
3	Lacking complete kitchen facilities	7,000	0	6,600	0	0	0	300	0	100	3
4	With complete plumbing	556,400	485,800	60,400	700	0	100	6,000	800	2,500	4
5	Lack some plumbing	7,600	0	7,300	0	0	0	100	0	200	5
6	No hot piped water	400	0	400	0	0	0	0	0	0	6
7	No bathtub/shower	200	0	200	0	0	0	0	0	0	7
8	No flush toilet	200	0	200	0	0	0	0	0	0	8
9	No exclusive use	7,200	0	6,900	0	0	0	100	0	200	9
	Water										
10	Public/private water	522,800	460,000	52,700	700	0	100	5,900	800	2,500	10
11	Well serving 1 to 5 units	40,900	31,200	9,300	0	0	0	300	0	100	11
12	Other water source	200	0	200	0	0	0	0	0	0	12
	Sewer										
13	Public sewer	506,000	444,200	52,100	700	0	100	5,900	700	2,300	13
14	Septic tank/cesspool	57,800	37,600	19,300	0	0	0	300	100	400	14
15	Other	200	0	200	0	0	0	0	0	0	15

	A	B	C	D	E	F	G	H	I	J	
Row	Characteristics	Present in 1998	1998 units present in 2011	Change in characteristics	1998 units lost due to conversion/merger	1998 house or mobile home moved out	1998 units changed to nonresidential use	1998 units lost through demolition or disaster	1998 units badly damaged or condemned	1998 units lost in other ways	Row
16	Severe problems	11,300	200	10,500	0	0	0	400	0	200	16
17	Plumbing	7,600	0	7,300	0	0	0	100	0	200	17
18	Heating	3,500	0	3,200	0	0	0	300	0	0	18
19	Electric	200	0	200	0	0	0	0	0	0	19
20	Upkeep	400	0	400	0	0	0	0	0	0	20
21	Moderate problems	21,600	400	19,200	200	0	0	1,100	200	400	21
22	Plumbing	2,900	0	2,500	200	0	0	300	0	0	22
23	Heating	3,300	200	2,600	0	0	0	300	0	200	23
24	Kitchen	7,000	0	6,600	0	0	0	300	0	100	24
25	Upkeep	10,300	400	9,000	200	0	0	300	200	300	25

**Forward-Looking Table C: Occupant Characteristics, Virginia Beach**

	A	B	C	D	E	F	G	H	I	J	
Row	Characteristics	Present in 1998	1998 units present in 2011	Change in characteristics	1998 units lost due to conversion/merger	1998 house or mobile home moved out	1998 units changed to nonresidential use	1998 units lost through demolition or disaster	1998 units badly damaged or condemned	1998 units lost in other ways	Row
1	Occupied units	564,000	498,600	54,800	700	0	100	6,200	800	2,700	1
	Age of householder										
2	Under 65	467,100	349,600	108,700	700	0	100	4,900	700	2,300	2
3	65 to 74	56,700	3,800	52,200	0	0	0	700	0	0	3
4	75 or older	40,200	9,300	29,800	0	0	0	600	100	400	4
	Children in household										
5	Some	234,500	90,000	139,200	400	0	100	2,700	600	1,400	5
6	None	329,500	220,900	103,300	300	0	0	3,500	300	1,300	6
	Race and ethnicity										
7	White	384,200	294,500	86,000	400	0	0	2,000	300	1,000	7
8	Hispanic	9,100	2,900	6,200	0	0	0	0	0	0	8
9	Non-Hispanic	375,100	277,400	94,000	400	0	0	2,000	300	1,000	9
10	Black	158,200	99,300	52,400	200	0	100	3,900	600	1,700	10
11	Hispanic	1,900	200	1,400	0	0	0	100	0	200	11
12	Non-Hispanic	156,300	96,900	53,300	200	0	100	3,800	600	1,500	12
13	American Indian or Alaska Native alone	1,300	400	900	0	0	0	0	0	0	13
14	Asian or Pacific Islander	12,300	4,400	7,800	0	0	0	100	0	0	14
16	Other	8,000	0	7,700	100	0	0	100	0	0	16
17	Hispanic or Latino (any race)	16,200	4,200	11,500	100	0	0	100	0	200	17

	A	B	C	D	E	F	G	H	I	J	
Row	Characteristics	Present in 1998	1998 units present in 2011	Change in characteristics	1998 units lost due to conversion/merger	1998 house or mobile home moved out	1998 units changed to nonresidential use	1998 units lost through demolition or disaster	1998 units badly damaged or condemned	1998 units lost in other ways	Row
	Income sources of families and primary individuals										
18	Wages and salaries	455,500	321,000	125,800	700	0	0	5,300	700	2,000	18
20	Dividends, interest, or rent	194,700	58,400	134,700	0	0	0	1,200	100	300	20
21	Public assistance or public welfare	21,800	1,500	18,900	100	0	0	1,000	100	200	21

**Forward-Looking Table D: Income and Housing Cost, Virginia Beach**

	A	B	C	D	E	F	G	H	I	J	
Row	Characteristics	Present in 1998	1998 units present in 2011	Change in characteristics	1998 units lost due to conversion/merger	1998 house or mobile home moved out	1998 units changed to nonresidential use	1998 units lost through demolition or disaster	1998 units badly damaged or condemned	1998 units lost in other ways	Row
1	Occupied units	564,000	498,600	54,800	700	0	100	6,200	800	2,700	1
	Tenure										
2	Owner-occupied	353,600	283,400	67,500	0	0	0	1,500	400	700	2
3	Homeownership rate	62.7%									3
4	Renter-occupied	210,400	138,000	64,500	700	0	100	4,600	400	2,000	4
	Renter monthly housing costs										
5	No cash rent	8,100	1,100	6,200	0	0	0	800	0	0	5
6	Less than \$350	24,100	7,600	14,400	0	0	0	1,600	0	400	6
7	\$350 to \$599	83,800	4,500	75,900	400	0	100	1,500	300	1,000	7
8	\$600 to \$799	59,300	2,300	55,600	300	0	0	400	100	600	8
9	\$800 to \$1,249	34,300	4,900	29,100	0	0	0	300	0	0	9
10	\$1,250 or more	900	0	900	0	0	0	0	0	0	10
	Renter household income										
11	Less than \$15,000	64,200	14,100	47,600	200	0	0	1,700	100	400	11
12	\$15,000 to \$29,999	70,200	11,900	54,600	400	0	100	1,700	100	1,300	12
13	\$30,000 to \$49,999	48,300	9,500	37,800	0	0	0	600	200	300	13
14	\$50,000 to \$99,999	24,300	3,300	20,200	100	0	0	700	0	0	14
15	\$100,000 or more	3,300	200	3,100	0	0	0	0	0	0	15

	A	B	C	D	E	F	G	H	I	J	
Row	Characteristics	Present in 1998	1998 units present in 2011	Change in characteristics	1998 units lost due to conversion/merger	1998 house or mobile home moved out	1998 units changed to nonresidential use	1998 units lost through demolition or disaster	1998 units badly damaged or condemned	1998 units lost in other ways	Row
	Owner monthly housing costs										
16	Less than \$350	67,400	5,300	61,100	0	0	0	700	0	300	16
17	\$350 to \$599	69,600	12,700	56,300	0	0	0	400	0	100	17
18	\$600 to \$799	56,500	4,000	51,700	0	0	0	300	400	100	18
19	\$800 to \$1,249	105,900	18,400	87,200	0	0	0	100	0	100	19
20	\$1,250 or more	54,300	37,100	17,300	0	0	0	0	0	0	20
	Owner household income										
21	Less than \$15,000	44,600	6,000	37,900	0	0	0	400	0	300	21
22	\$15,000 to \$29,999	59,600	8,700	50,400	0	0	0	100	300	0	22
23	\$30,000 to \$49,999	87,500	15,000	71,600	0	0	0	500	100	100	23
24	\$50,000 to \$99,999	120,900	44,100	76,100	0	0	0	400	0	300	24
25	\$100,000 or more	41,100	17,100	24,000	0	0	0	0	0	0	25

**Backward-Looking Table A: Housing Characteristics, Virginia Beach**

	A	B	C	D	E	F	G	H	I	J	
Row	2011 characteristics	Present in 2011	2011 units present in 1998	Change in characteristics	2011 units added by conversion/merger	2011 house or mobile home moved in	2011 units added from nonresidential use	2011 units added by new construction	2011 units added from temporary losses in 1998 stock	2011 units added in other ways	Row
1	Housing stock	694,500	578,800	0	0	700	500	111,400	600	2,400	1
	Occupancy status										
2	Occupied	630,700	482,700	44,500	0	700	400	99,600	600	2,000	2
3	Vacant	59,000	6,900	41,400	0	0	200	10,100	0	400	3
4	Seasonal	4,800	1,300	1,900	0	0	0	1,600	0	0	4
	Units in structure										
5	1, detached	432,300	355,400	0	0	0	0	76,100	200	600	5
6	1, attached	87,500	69,000	0	0	0	300	17,700	200	300	6
7	2 to 4	43,800	41,200	0	0	0	200	2,200	0	200	7
8	5 to 9	50,100	48,200	0	0	0	0	1,800	200	0	8
9	10 to 19	36,600	31,100	0	0	0	0	5,500	0	0	9
10	20 to 49	12,600	8,600	0	0	0	0	4,000	0	0	10
11	50 or more	13,700	8,400	0	0	0	0	4,000	0	1,300	11
12	Manufactured/mobile home	17,900	17,000	0	0	700	0	200	0	0	12



	A	B	C	D	E	F	G	H	I	J	
Row	2011 characteristics	Present in 2011	2011 units present in 1998	Change in characteristics	2011 units added by conversion/merger	2011 house or mobile home moved in	2011 units added from nonresidential use	2011 units added by new construction	2011 units added from temporary losses in 1998 stock	2011 units added in other ways	Row
	Year built										
13	2010–2014	7,700	0	0	0	0	0	7,500	0	300	13
14	2005–2009	44,900	200	0	0	0	0	44,600	0	0	14
15	2000–2004	38,800	200	0	0	0	200	38,200	200	0	15
16	1995–1999	49,800	28,500	0	0	0	200	21,100	0	0	16
17	1990–1994	55,000	54,700	0	0	0	0	0	0	200	17
18	1985–1989	80,800	80,600	0	0	0	0	0	0	200	18
19	1980–1984	60,000	60,000	0	0	0	0	0	0	0	19
20	1975–1979	52,400	51,600	0	0	700	0	0	0	0	20
21	1970–1974	60,600	60,200	0	0	0	200	0	200	0	21
22	1960–1969	89,900	88,600	0	0	0	0	0	0	1,300	22
23	1950–1959	68,700	68,700	0	0	0	0	0	0	0	23
24	1940–1949	45,300	44,900	0	0	0	0	0	200	200	24
25	1930–1939	15,000	14,700	0	0	0	0	0	0	300	25
26	1920–1929	9,400	9,400	0	0	0	0	0	0	0	26
27	1919 or earlier	16,300	16,300	0	0	0	0	0	0	0	27

	A	B	C	D	E	F	G	H	I	J	
Row	2011 characteristics	Present in 2011	2011 units present in 1998	Change in characteristics	2011 units added by conversion/merger	2011 house or mobile home moved in	2011 units added from nonresidential use	2011 units added by new construction	2011 units added from temporary losses in 1998 stock	2011 units added in other ways	Row
	Rooms										
28	1	2,300	0	500	0	0	0	300	0	1,500	28
29	2	1,400	400	900	0	0	0	0	0	0	29
30	3	34,000	23,700	7,400	0	0	200	2,700	0	0	30
31	4	114,400	70,100	33,400	0	700	300	9,500	200	200	31
32	5	144,600	63,800	64,200	0	0	0	16,500	0	0	32
33	6	139,400	56,900	57,900	0	0	0	23,600	400	500	33
34	7	115,000	44,400	51,800	0	0	0	18,500	0	200	34
35	8	86,500	34,900	32,200	0	0	0	19,400	0	0	35
36	9	38,800	10,400	15,700	0	0	0	12,700	0	0	36
37	10 or more	18,200	5,100	4,900	0	0	0	8,200	0	0	37
	Bedrooms										
38	None	2,700	200	700	0	0	0	300	0	1,500	38
39	1	47,600	35,100	8,200	0	0	200	3,800	0	200	39
40	2	178,300	132,100	25,900	0	700	300	19,000	200	0	40
41	3	289,400	201,800	47,300	0	0	0	39,400	200	700	41
42	4 or more	176,500	92,100	35,300	0	0	0	49,000	200	0	42
43	Multiunit structures	156,800	137,400	0	0	0	200	17,500	200	1,500	43
	Stories in structure										
44	1	17,100	15,800	0	0	0	200	800	0	200	44
45	2	94,000	90,600	0	0	0	0	3,200	200	0	45
46	3	34,400	24,100	0	0	0	0	9,000	0	1,300	46
47	4 to 6	6,300	2,100	0	0	0	0	4,200	0	0	47
48	7 or more	5,100	4,700	0	0	0	0	400	0	0	48

**Backward-Looking Table B: Unit Quality, Virginia Beach**

	A	B	C	D	E	F	G	H	I	J	
Row	2011 characteristics	Present in 2011	2011 units present in 1998	Change in characteristics	2011 units added by conversion/ merger	2011 house or mobile home moved in	2011 units added from nonresidential use	2011 units added by new construction	2011 units added from temporary losses in 1998 stock	2011 units added in other ways	Row
1	Occupied units	630,700	482,700	44,500	0	700	400	99,600	600	2,000	1
2	With complete kitchen	619,000	470,200	48,200	0	700	400	98,300	600	500	2
3	Lacking complete kitchen facilities	11,700	0	8,800	0	0	0	1,300	0	1,500	3
4	With complete plumbing	623,100	469,900	50,800	0	700	400	99,600	600	900	4
5	Lack some plumbing	7,600	0	6,500	0	0	0	0	0	1,100	5
6	No hot piped water	200	0	200	0	0	0	0	0	0	6
7	No bathtub/shower	400	0	200	0	0	0	0	0	200	7
8	No flush toilet	200	0	200	0	0	0	0	0	0	8
9	No exclusive use	7,200	0	6,300	0	0	0	0	0	900	9
	Water										
10	Public/private water	589,300	447,300	47,000	0	700	400	91,500	600	1,800	10
11	Well serving 1 to 5 units	41,400	28,600	4,400	0	0	0	8,100	0	300	11
12	Other water source	0	0	0	0	0	0	0	0	0	12
	Sewer										
13	Public sewer	580,100	433,000	54,000	0	700	400	89,500	600	1,800	13
14	Septic tank/cesspool	50,400	34,200	5,900	0	0	0	10,200	0	300	14
15	Other	200	0	200	0	0	0	0	0	0	15

	A	B	C	D	E	F	G	H	I	J	
Row	2011 characteristics	Present in 2011	2011 units present in 1998	Change in characteristics	2011 units added by conversion/merger	2011 house or mobile home moved in	2011 units added from nonresidential use	2011 units added by new construction	2011 units added from temporary losses in 1998 stock	2011 units added in other ways	Row
16	Severe problems	12,300	200	11,000	0	0	0	0	0	1,100	16
17	Plumbing	7,600	0	6,500	0	0	0	0	0	1,100	17
18	Heating	3,900	0	3,900	0	0	0	0	0	0	18
19	Electric	12,300	200	11,000	0	0	0	0	0	1,100	19
20	Upkeep	2,000	0	2,000	0	0	0	0	0	0	20
21	Moderate problems	18,200	400	15,800	0	0	0	1,600	0	400	21
22	Plumbing	2,000	0	2,000	0	0	0	0	0	0	22
23	Heating	1,400	200	1,200	0	0	0	0	0	0	23
24	Kitchen	11,700	0	8,800	0	0	0	1,300	0	1,500	24
25	Upkeep	7,300	400	6,600	0	0	0	300	0	0	25

**Backward-Looking Table C: Occupant Characteristics, Virginia Beach**

	A	B	C	D	E	F	G	H	I	J	
Row	2011 characteristics	Present in 2011	2011 units present in 1998	Change in characteristics	2011 units added by conversion/merger	2011 house or mobile home moved in	2011 units added from nonresidential use	2011 units added by new construction	2011 units added from temporary losses in 1998 stock	2011 units added in other ways	Row
1	Occupied units	630,700	482,700	44,500	0	700	400	99,600	600	2,000	1
	Age of householder										
2	Under 65	509,300	338,700	82,500	0	700	400	84,500	600	1,800	2
3	65 to 74	67,200	3,700	53,200	0	0	0	10,300	0	0	3
4	75 or older	54,300	9,100	40,000	0	0	0	4,900	0	200	4
	Children in household										
5	Some	204,400	86,600	77,500	0	700	0	38,700	400	500	5
6	None	426,300	214,800	148,400	0	0	400	60,900	200	1,600	6
	Race and ethnicity										
7	White	417,000	282,300	62,100	0	700	400	70,100	200	1,200	7
8	Hispanic	23,700	2,800	15,500	0	0	0	5,200	0	200	8
9	Non-Hispanic	393,200	266,400	59,700	0	700	400	64,900	200	900	9
10	Black	184,000	98,100	59,100	0	0	0	25,500	400	900	10
11	Hispanic	4,100	200	3,100	0	0	0	800	0	0	11
12	Non-Hispanic	179,900	95,600	58,300	0	0	0	24,700	400	900	12
13	American Indian or Alaska Native alone	2,800	400	2,400	0	0	0	0	0	0	13
14	Asian or Pacific Islander	14,800	4,500	7,500	0	0	0	2,800	0	0	14
16	Other	12,100	0	10,800	0	0	0	1,300	0	0	16
17	Hispanic or Latino (any race)	29,100	4,100	18,800	0	0	0	5,900	0	200	17

	A	B	C	D	E	F	G	H	I	J	
Row	2011 characteristics	Present in 2011	2011 units present in 1998	Change in characteristics	2011 units added by conversion/merger	2011 house or mobile home moved in	2011 units added from nonresidential use	2011 units added by new construction	2011 units added from temporary losses in 1998 stock	2011 units added in other ways	Row
	Income sources of families and primary individuals										
18	Wages and salaries	487,000	313,300	88,600	0	700	400	82,100	200	1,600	18
20	Dividends, interest, or rent	142,400	57,300	58,400	0	0	0	26,700	0	0	20
21	Public assistance or public welfare	5,700	1,100	4,600	0	0	0	0	0	0	21

**Backward-Looking Table D: Income and Housing Cost, Virginia Beach**

	A	B	C	D	E	F	G	H	I	J	
Row	2011 characteristics	Present in 2011	2011 units present in 1998	Change in characteristics	2011 units added by conversion/ merger	2011 house or mobile home moved in	2011 units added from nonresidential use	2011 units added by new construction	2011 units added from temporary losses in 1998 stock	2011 units added in other ways	Row
1	Occupied units	630,700	482,700	44,500	0	700	400	99,600	600	2,000	1
	Tenure										
2	Owner-occupied	397,400	272,300	48,000	0	0	0	76,400	200	500	2
3	Homeownership rate	63.0%									3
4	Renter-occupied	233,300	136,600	70,400	0	700	400	23,200	400	1,500	4
	Renter monthly housing costs										
5	No cash rent	7,700	1,100	5,900	0	0	200	500	0	0	5
6	Less than \$350	16,500	8,100	7,200	0	0	0	800	0	400	6
7	\$350 to \$599	12,600	4,400	7,300	0	0	200	300	0	400	7
8	\$600 to \$799	32,800	2,200	28,300	0	700	0	1,300	200	0	8
9	\$800 to \$1,249	102,100	4,900	90,500	0	0	0	6,000	200	400	9
10	\$1,250 or more	61,600	0	47,100	0	0	0	14,300	0	200	10
	Renter household income										
11	Less than \$15,000	38,600	14,000	21,300	0	0	0	1,600	200	1,500	11
12	\$15,000 to \$29,999	64,100	11,700	48,500	0	700	0	3,200	0	0	12
13	\$30,000 to \$49,999	58,400	9,300	43,400	0	0	400	5,000	200	0	13
14	\$50,000 to \$99,999	57,800	3,300	45,000	0	0	0	9,500	0	0	14
15	\$100,000 or more	14,400	200	10,200	0	0	0	3,900	0	0	15

	A	B	C	D	E	F	G	H	I	J	
Row	2011 characteristics	Present in 2011	2011 units present in 1998	Change in characteristics	2011 units added by conversion/merger	2011 house or mobile home moved in	2011 units added from nonresidential use	2011 units added by new construction	2011 units added from temporary losses in 1998 stock	2011 units added in other ways	Row
	Owner monthly housing costs										
16	Less than \$350	14,800	5,400	8,600	0	0	0	800	0	0	16
17	\$350 to \$599	56,100	11,600	40,600	0	0	0	3,800	0	0	17
18	\$600 to \$799	35,100	3,900	27,600	0	0	0	3,600	0	0	18
19	\$800 to \$1,249	75,000	18,000	45,500	0	0	0	11,300	200	0	19
20	\$1,250 or more	216,500	36,200	122,800	0	0	0	56,900	0	500	20
	Owner household income										
21	Less than \$15,000	29,100	5,400	20,300	0	0	0	3,300	0	0	21
22	\$15,000 to \$29,999	43,900	8,100	31,700	0	0	0	3,800	0	300	22
23	\$30,000 to \$49,999	62,700	14,900	38,400	0	0	0	9,200	200	0	23
24	\$50,000 to \$99,999	156,200	43,200	84,600	0	0	0	28,100	0	300	24
25	\$100,000 or more	105,400	16,700	56,800	0	0	0	31,900	0	0	25



**Forward-Looking Rental Dynamics Table 1: Counts, 1998–2011, Virginia Beach**

Affordability categories	A Total in 1998	B Non-market in 2011	C Extremely low rent in 2011	D Very low rent in 2011	E Low rent in 2011	F Moderate rent in 2011	G High rent in 2011	H Very high rent in 2011	I Extremely high rent in 2011	J Owner- occupied in 2011	K Seasonal or related vacant in 2011	L Lost to stock in 2011
Non-market	52,500	17,900	1,800	2,500	5,400	8,900	3,400	500	200	7,700	1,600	2,600
Extremely low rent	6,300	900	200	1,400	700	700	200	200	0	900	200	800
Very low rent	64,700	4,300	1,400	13,100	17,400	13,300	900	400	200	6,200	2,700	4,600
Low rent	41,700	3,100	900	3,300	6,800	15,300	2,200	200	200	7,600	900	1,100
Moderate rent	51,100	2,500	200	2,300	7,200	18,500	6,200	200	200	11,300	1,600	900
High rent	21,400	700	700	400	1,100	4,200	3,100	1,500	500	8,600	200	300
Very high rent	2,000	0	0	200	0	200	400	200	900	0	0	0
Extremely high rent	900	500	0	400	0	0	0	0	0	0	0	0
Total	240,600	29,900	5,200	23,600	38,600	61,100	16,400	3,200	2,200	42,300	7,200	10,300

**Forward-Looking Rental Dynamics Table 2: Row Percentages, 1998–2011, Virginia Beach**

Affordability categories	A Total in 1998	B Non-market in 2011	C Extremely low rent in 2011	D Very low rent in 2011	E Low rent in 2011	F Moderate rent in 2011	G High rent in 2011	H Very high rent in 2011	I Extremely high rent in 2011	J Owner- occupied in 2011	K Seasonal or related vacant in 2011	L Lost to stock in 2011
Non-market	52,500	34.2%	3.4%	4.7%	10.2%	17.0%	6.4%	0.9%	0.4%	14.6%	3.0%	5.0%
Extremely low rent	6,300	14.5%	3.5%	22.0%	10.7%	11.0%	3.6%	3.4%	0.0%	14.0%	3.5%	13.6%
Very low rent	64,700	6.7%	2.1%	20.2%	26.9%	20.6%	1.4%	0.7%	0.3%	9.6%	4.2%	7.2%
Low rent	41,700	7.5%	2.2%	8.0%	16.4%	36.6%	5.3%	0.5%	0.5%	18.2%	2.1%	2.7%
Moderate rent	51,100	4.9%	0.5%	4.4%	14.1%	36.2%	12.2%	0.4%	0.4%	22.2%	3.1%	1.7%
High rent	21,400	3.1%	3.1%	2.1%	5.2%	19.8%	14.6%	7.2%	2.2%	40.4%	1.0%	1.4%
Very high rent	2,000	0.0%	0.0%	10.7%	0.0%	11.9%	22.2%	11.1%	44.0%	0.0%	0.0%	0.0%
Extremely high rent	900	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Total	240,600	12.4%	2.2%	9.8%	16.0%	25.4%	6.9%	1.4%	0.9%	17.6%	3.0%	4.3%

**Backward-Looking Rental Dynamics Table 1: Counts, 1998–2011, Virginia Beach**

Affordability categories	A Total in 2011	B Non-market in 1998	C Extremely low rent in 1998	D Very low rent in 1998	E Low rent in 1998	F Moderate rent in 1998	G High rent in 1998	H Very high rent in 1998	I Extremely high rent in 1998	J Owner-occupied in 1998	K Seasonal or related vacant in 1998	L New construction	M Added in other ways
Non-market	39,100	17,700	900	4,200	3,100	2,400	700	0	400	5,700	1,100	2,400	400
Extremely low rent	8,000	2,200	200	1,100	800	200	600	0	0	1,500	200	700	400
Very low rent	32,900	2,400	1,300	12,300	3,200	2,200	400	200	400	4,700	2,100	2,100	1,600
Low rent	46,200	5,100	700	16,400	6,400	6,700	1,100	0	0	6,100	1,700	1,800	200
Moderate rent	77,800	8,500	700	12,200	14,500	17,500	4,000	200	0	13,100	2,800	4,400	0
High rent	36,700	3,200	200	800	2,200	5,800	3,100	400	0	11,700	1,100	7,600	600
Very high rent	14,600	400	200	400	200	200	1,500	200	0	5,100	0	6,200	0
Extremely high rent	6,700	200	0	200	200	200	400	800	0	1,800	200	2,500	200
Total	262,000	39,700	4,200	47,600	30,600	35,300	11,800	1,800	900	49,800	9,200	27,700	3,400

**Backward-Looking Rental Dynamics Table 2: Row Percentages, 1998–2011, Virginia Beach**

Affordability categories	A Total in 2011	B Non-market in 1998	C Extremely low rent in 1998	D Very low rent in 1998	E Low rent in 1998	F Moderate rent in 1998	G High rent in 1998	H Very high rent in 1998	I Extremely high rent in 1998	J Owner-occupied in 1998	K Seasonal or related vacant in 1998	L New construction	M Added in other ways
Non-market	39,100	45.3%	2.3%	10.8%	7.9%	6.2%	1.7%	0.0%	1.1%	14.7%	2.8%	6.1%	1.1%
Extremely low rent	8,000	27.5%	2.8%	13.7%	9.7%	2.8%	7.6%	0.0%	0.0%	18.7%	2.8%	9.0%	5.5%
Very low rent	32,900	7.2%	4.0%	37.2%	9.7%	6.6%	1.3%	0.7%	1.3%	14.3%	6.5%	6.4%	4.7%
Low rent	46,200	11.0%	1.4%	35.6%	13.9%	14.6%	2.4%	0.0%	0.0%	13.2%	3.6%	3.8%	0.3%
Moderate rent	77,800	10.9%	0.9%	15.7%	18.6%	22.4%	5.1%	0.3%	0.0%	16.8%	3.6%	5.7%	0.0%
High rent	36,700	8.8%	0.4%	2.3%	5.9%	15.9%	8.5%	1.1%	0.0%	32.0%	2.9%	20.7%	1.7%
Very high rent	14,600	2.6%	1.5%	3.0%	1.5%	1.5%	10.3%	1.5%	0.0%	35.3%	0.0%	42.7%	0.0%
Extremely high rent	6,700	2.4%	0.0%	2.4%	3.3%	3.3%	6.6%	11.4%	0.0%	27.0%	3.3%	37.0%	3.2%
Total	262,000	15.1%	1.6%	18.2%	11.7%	13.5%	4.5%	0.7%	0.3%	19.0%	3.5%	10.6%	1.3%