Appendix C: Selected Methodology

The 2018 Statewide Housing Assessment reports on housing characteristics and highlights current challenges of overcrowding, affordability, energy use and structural condition of homes throughout Alaska. It also estimates future housing needs caused by population growth and an anticipated boom among the senior population. It builds on work that Alaska Housing Finance Corporation (AHFC) commissioned Cold Climate Housing Research Center (CCHRC) to do in a 2014 Housing Assessment.

Data from the U.S. Census Bureau's 2010–2014 American Community Survey (ACS), the Alaska Department of Labor and the Alaska Retrofit Information System (ARIS) database form the basis of the 2018 Statewide Housing Assessment. ACS data provides information on total housing units, household size, home age, occupancy, overcrowding, housing costs and affordability. ARIS rating data provide information on energy use and efficiency, energy costs, building envelope characteristics, air tightness, ventilation and rates of participation in energy programs. Alaska Department of Labor data provides information on current population, projected population growth, unemployment rates and housing construction since 2000. Where it is available, data are reported at the census area, regional and state level.

For methodology of secondary sources used in this report, please see the documentation from the original authors.

ARIS Estimate Methodology

ARIS contains energy ratings and assessments produced as homes are evaluated under AHFC's Home Energy Rebate Program or Weatherization Assistance Program or receive a new construction certification through AHFC's Building Energy Efficiency Standard (BEES). Home evaluations include energy ratings using AHFC's AKWarm modeling software to characterize basic features and construction type in addition to their energy performance. Data from ratings are uploaded into ARIS. Data for this study were retrieved from ARIS in April 2016. At that time, ARIS contained data from more than 112,800 Home Energy Rebate Program ratings and weatherization assessments gathered from either pre- or post-energy retrofitted homes or from new construction certifications (BEES). These ratings and assessments cover more than 85,800 units at unique addresses. This number represents approximately 28 percent of Alaska's roughly 303,417 total housing units [1] and

[1] Per the U.S. Census Bureau, "a housing unit is a house, an apartment, a group of rooms, or a single room occupied or intended for occupancy as separate living quarters. Separate living quarters are those in which the occupants do not live and eat with other persons in the structure and which have direct access from the outside of the building or through a common hall."

approximately 34 percent of Alaska's occupied housing stock. ARIS rating data provide information about energy use and efficiency, energy costs, air tightness, ventilation and rates of participation in energy programs.

The combination of ARIS data and census information from the 2010–2014 ACS five-year estimates provides a unique tool to assess Alaska's current housing stock.

While the ACS dataset of the U.S. Census Bureau already contained estimates for all housing units in Alaska on a number of metrics, it was necessary to use the ARIS data to derive meaningful energy metrics. This required using data on audited housing units to derive energy data for the housing units that had not received an audit. This process included the following general steps: (1) download and clean the data, (2) calculate energy metrics, (3) stratify the data by audit type and by decade built by region, and (4) create weighted averages for each region.

Data were first downloaded from the ARIS database and cleaned. The cleaning process consisted of three parts: (1) removing duplicate records, (2) removing records for which essential data fields were missing and (3) removing records where data were outside of reasonable upper or lower limits. For example, records with zero energy use were removed, as were records for single-family buildings with more than 12 bedrooms, as these generally can be attributed to incorrect data input.

Then energy metrics were calculated for each energy audit conducted. Total annual energy use, energy use per square foot (EUI), the home heating index (HHI) and indoor air quality risk flags were calculated from available data. Energy costs for the modeled energy usage were normalized to a base year of 2017 using the January 2017 fuel price library found in AkWarm. Using this method, total annual energy costs and energy costs per square foot were calculated for each housing unit with an audit.

Data were then stratified both by audit type and decade built. Due to the differences in the programs, Home Energy Rebate Program audits, Weatherization Assistance Program audits, and audits conducted for BEES certification were separated. Additionally, the pre- and post-retrofit audits for both the Home Energy Rebate and Weatherization Assistance programs were separated. Within each of these five audit types, data were stratified into categories by decade built. This was done because the energy use of residential buildings is correlated with the decade in which the home was built, as building energy efficiency technology has changed over time.[2]

Weighted averages for each energy metric were then calculated using the stratified data. BEES audits, Home Energy Rebate post-retrofit audits, and Weatherization Assistance post-

[2] U.S. Energy Information Administration. (2009). Residential Energy Consumption Statistics.

retrofit audits were all assumed to represent currently existing buildings, as the vast majority of these audits have been completed since 2008. The energy characteristics for the remainder of the housing stock in Alaska were estimated using the Home Energy Rebate and Weatherization Assistance program pre-retrofit audits. The average of these audits was assumed to be representative of homes built in the same decade in the same region. Finally, a weighted average for each energy metric for homes built in each decade was calculated by taking the units with a BEES or post-retrofit audit, adding the extrapolated pre-retrofit audits and then dividing by the total number of units. This process was repeated for every census area and ANCSA region in Alaska.

Housing Gap Estimates

The housing gap estimates were created through a combination of three data sources: the current and projected population growth from the Alaska Department of Labor, the overcrowding rates and average household size from the 2010–2014 ACS five-year estimates and the new construction rates from 2000 to 2015 provided by the Alaska Department of Labor.

The overcrowding gap was used as the baseline current housing unit need: it assumes that for every currently overcrowded unit (as estimated in the ACS data), one new additional unit would need to be constructed.

The projected new construction by 2020 and 2025 was calculated by taking the average of the most recent five years of new construction from the Department of Labor data for each region. These regional five-year averages were then linearly projected into the future. To estimate the additional housing demand due to population growth over that same time period, the increase in population as projected by the Department of Labor was divided by the average household size from the ACS. Comparing the projected new construction to the projected housing need from population growth led to the estimates of housing deficits or surpluses for each region.