REUSE AND REVITALIZATION IN JACKSONVILLE: APPENDICES

APPENDIX A: DETAILS ON THE METHODOLOGICAL APPROACH

This project involved bringing together datasets from many different sources, "fitting" that data into a custom grid geography, and running spatial regression models to test the relationships between characteristics of the built fabric and social, cultural, and economic vitality at the grid square level. This appendix provides a more detailed accounting of the methodological approach taken in this work.

Data Collection

The bulk of the data used in this project came from governmental sources, though some select data was obtained from non-governmental entities. The research team collected data through a combination of simple web searches of publicly accessible open data platforms (e.g., U.S. Census Bureau, U.S. Geological Survey, Florida Geographic Data Library, etc.), requests to city and county departments and intergovernmental agencies, and targeted collection from non-governmental websites and publications such as *Jacksonville Magazine.*

The native geographies of the data in this project varied from spatial points (e.g., latitudinal and longitudinal coordinates and street addresses for businesses, etc.) to census block groups. For a detailed accounting of the data used in this project, including information on data sources and native geographies, please refer to the Data Catalog in Appendix B.

Data Aggregation and Development of Metrics

Given that the data used in this project uses a variety of native geographies, the research team opted to "fit" the data to a custom 200-meter-by-200 meter grid. This builds on the research methodology established in the Preservation Green Lab's 2014 *Older, Smaller, Better* research report, which was validated by the peer-reviewed Journal of the American Planning Association in early 2016, and was later extended and expanded for the 2016 *Atlas of ReUrbanism*.

After laying the geometric grid over the Jacksonville city geography, data was aggregated and distilled from native geometric units into the grid squares. Point-based data was mapped and spatially joined to the grid. U.S. census block and block group geographies were overlaid over the grid, and values associated with each block or block group were distributed into grid squares according to the proportion of the census geography that lay in each grid square. For instance, if 40% of a census block was in a given grid square, the research team multiplied the values associated with that census block by 0.40 and added the adjusted values into appropriate grid square data fields. This approach operates on the assumption that the spatial distribution of data was perfectly consistent across the geographic spatial units. Though the assumption may not hold in all cases, this approach to distributing data into the grid geography was ultimately the best available option.

This research aimed to test the role that older, smaller buildings in Jacksonville play in fostering community vitality. Key measures were developed to identify these qualities in the city's built fabric. The project's measure of building age focused on the median year of construction of all buildings in each grid square. Age diversity was measured by calculating the standard deviation of the years of construction of all buildings in each grid square, and the measure of granularity is equal to the count of the number of buildings that lay in each square. In order to place the relative age, age diversity, and granularity in context with the complete set of buildings in Jacksonville, these measures were nor-

malized according to Jacksonville's overall building stock. This involved transforming the units for each measure into z values, which point to each grid square's number of standard deviations above or below that square's respective city average for these key measures. Finally, to test the overall effect of building age, age diversity, and granularity, the research team created a composite "Character Score" measure that combined the z values for each measure in each grid square.

Spatial Regression Analysis

In an effort to strengthen the performance of statistical models, select grid squares were excluded from regression models for specific research questions. For all analyses, grid squares that did not have data for each independent variable were excluded. For instance, grid squares that did not have data for building age or a count of buildings or parcels were excluded.

For analyses of most livability metrics, all grid squares with at least one complete building record were included. For analyses of economic vitality, grid squares without commercial activity were excluded. For instance, analyses of job density included only grid squares with at least one private sector job and at least 50 commercial square feet.

In order to account for spatial dependence in the study's statistical models, the research team employed spatial regression models in *GeoDa*. In addition to measure of character, control measures for private investment in the grid square's buildings and median income were included. The measure of private investment was equal to the sum of all dollars spent on development projects in a grid square between 2011 and 2015. Median income was measured using the U.S. Census Bureau records for median income that corresponded to each grid square.

The research team developed and ran one model that used the composite "Character Score" alongside these control measures. A second model was used that included the z scores for each component measure alongside the control variables (median building age, diversity of building age, and granularity). In each of the spatial regression models, the research team employed a spatial weight matrix based on first-order Queen contiguity.

Using the statistical packages included in *GeoDa*, the research team ran OLS regression models and Moran's I diagnostic tests for spatial autocorrelation. In most instances, the Moran's I test showed significant spatial autocorrelation, which posed a significant threat to the validity of the OLS model, so Lagrange-Multiplier diagnostic tests were also run to test for residual spatial dependence. Based on the results of the Lagrange tests, the research team opted to use either spatial lag or spatial error models, depending on whether the tests pointed to the presence of "lag" across neighboring grid squares or statistical "error" in measures that vary across space in larger clusters. In a few instances, spatial autocorrelation was not an issue and a simple OLS regression model was sufficient.

As suggested by Luc Anselin and his colleagues at the University of Chicago's Center for Spatial Data Science, the research team tested the relative performance of the spatial lag and spatial error models against the performance of the original OLS regression model by comparing the respective Wald statistics, likelihood ratios, and Lagrange multiplier scores. In many cases, these tests did not fall in the expected order ($LM \leq LR \leq W$), indicating possible misspecification of the model. Given the large size of the project's dataset and some underlying non-normality and heteroskedasticity in the metrics data, the research team was confident that the models were reliable, though this could warrant further exploration. Future research may include additional spatial variables to strengthen the models further.

Anselin, L. (2005). *Exploring spatial data with GeoDa: A workbook.* Urbana, IL: Center for Spatially Integrated Social Science.

Vitality Metric = *a(Character Score) + b(median income) +c(construction dollars) + d(weighted spatial lag or spatial error term) + error*

Vitality Metric = *a(z-standardized building age) + b(z-standardized diversity of building age) + c(z-standardized granularity of built fabric) + d(median income) + e(construction dollars)+ f(weighted spatial lag or spatial error term) + error*

APPENDIX B: DATA SOURCES

BUILDING CHARACTERISTICS AND OTHER INDEPENDENT VARIABLES

METRICS	UNITS	DATA SOURCE AND VINTAGE	NATIVE GEOGRAPHY OF DATA	NOTES
Median year built	Median calculated from age of properties in parcel file	Florida Department of Revenue (2014)	Parcel	
Diversity of building age	Standard deviation calculated from age of properties in parcel file	Florida Department of Revenue (2014)	Parcel	
Granularity	Number of parcels and partial parcels per grid square	Florida Department of Revenue (2014)	Parcel	
Character Score	Combined z-standardized median building age, diversity of building age, and granularity values	Florida Department of Revenue (2014)	Grid square	
Commercial square feet	Sum of built square feet for all commercial properties	Florida Department of Revenue (2014)	Parcel	
Investment in new nonstruction and AAR to existing nuildings	Sum of permit valuation data for all permits pulled between 2011 and 2015 within each grid square	City of Jacksonville Planning and Development Department (2011-2015)	Point	
Median household income	Median household income	U.S. Census Bureau / American Community Survey (2014)	Census tract	

LIVABILITY

METRICS	UNITS	DATA SOURCE AND VINTAGE	NATIVE GEOGRAPHY OF DATA	NOTES
Percent tree canopy	Percent of block shaded by tree canopy	U.S. Geological Survey (2015)	Census block	
Top *Jacksonville Magazine* restaurants	Addresses of top-rated restaurants	*Jacksonville Magazine* (2016)	Address point	
Civic Commons spaces	Locations of civic, community, cultural, and fraternal centers	University of Florida GeoPlan Center (2015)	Point	
Religious centers	Locations of churches, mosques, synagogues, and other religious centers	University of Florida GeoPlan Center (2015)	Point	

INVESTMENT IN BUILDINGS

METRICS	UNITS	DATA SOURCE AND VINTAGE	NATIVE GEOGRAPHY OF DATA	NOTES
Investment in alterations, additions, and repairs to existing buildings	Sum of permit valuation data for all addition, alteration, and repair permits pulled between 2011 and 2015 within each grid square	City of Jacksonville Planning and Development Department (2011-2015)	Point	
Count of new construction and demolition permits	Count of all new construction and demolition permits issued between 2011 and 2015 within each grid square	City of Jacksonville Planning and Development Department (2011-2015)	Point	

PRIVATE SECTOR JOBS AND JOBS CHARACTERISTICS

METRICS	UNITS	DATA SOURCE AND VINTAGE	NATIVE GEOGRAPHY OF DATA	NOTES
Density of private jobs	Count of private-sector jobs	U.S. Census Bureau – LEHD Data (2014)	Census block	
Density of jobs in new businesses	Count of private-sector jobs in businesses launched in the previous year	U.S. Census Bureau – LEHD Data (2014)	Census block	
Percent of private-sector jobs in new businesses	Count of private-sector jobs in businesses launched in the previous year divided by total count of private sector jobs	U.S. Census Bureau – LEHD Data (2014)	Census block	
Density of jobs in small businesses	Count of private-sector jobs in businesses with less than 20 employees	U.S. Census Bureau – LEHD Data (2014)	Census block	
Percent of private-sector jobs in small businesses	Count of private-sector jobs in businesses with less than 20 employees divided by total count of private sector jobs	U.S. Census Bureau – LEHD Data (2014)	Census block	
Density of jobs in creative industries	Count of private-sector jobs in arts, entertainment, and recreation (NAICS sector 71); information (NAICS sector 51); and professional, scientific, and technical services (NAICS sector 54) industries	U.S. Census Bureau – LEHD Data (2014)	Census block	
Percent of jobs that are in creative industries	Count of private-sector jobs in arts, entertainment, and recreation (NAICS sector 71); information (NAICS sector 51); and professional, scientific, and technical services (NAICS sector 54) industries, divided by total count of private sector jobs	U.S. Census Bureau – LEHD Data (2014)	Census block	

BUSINESS DENSITY AND OWNERSHIP CHARACTERISTICS

METRICS	UNITS	DATA SOURCE AND VINTAGE	NATIVE GEOGRAPHY OF DATA	NOTES
Density of businesses	Count of businesses located in each grid square	Dunn & Bradstreet (2016)	Point	
Density of women and minority-owned businesses	Count of women and minority-owned businesses	Dunn & Bradstreet (2016)	Point	
Percent of businesses with women and minority ownership	Count of women and minority-owned businesses, divided by total count of businesses per grid square	Dunn & Bradstreet (2016)	Point	

RESIDENTIAL DENSITY

METRICS	UNITS	DATA SOURCE AND VINTAGE	NATIVE GEOGRAPHY OF DATA	NOTES
Population density - Residents	Total population per grid square	U.S. Census Bureau (2010)	Census block	
Population density - Housing units	Total count of housing units per grid square	U.S. Census Bureau (2010)	Census block	
Vacancy rate	Count of vacant housing units divided by total count of housing units per grid square	U.S. Census Bureau (2010)	Census block	
Change in population density - Residents	Change in total population per grid square	U.S. Census Bureau (2000; 2010)	Census block	
Change in population density - Housing units	Change in total count of housing units per grid square, 2000 to 2010	U.S. Census Bureau (2000; 2010)	Census block	
Change in vacancy rate	Change in count of vacant housing units divided by total count of housing units per grid square, 2000 to 2010	U.S. Census Bureau (2000; 2010)	Census block	

RESIDENTIAL DIVERSITY METRICS

METRICS	UNITS	DATA SOURCE AND VINTAGE	NATIVE GEOGRAPHY OF DATA	NOTES
Median age of residents	Median age of residents	U.S. Census Bureau (2010)	Census block	
Percent of the population age 18-34	Count of residents age 18-34 divided by total population per grid square	U.S. Census Bureau (2010)	Census block	
Diversity of age of residents	Index calculated on a 0-100 scale using proportions of population from the following age groups: 0-17, 18-34, 35-49, 50-64, 65+. An equal distribution of all groups is equal to 100. Presence of only one group is equal to 0.	U.S. Census Bureau (2010)	Census block	Calculated by the Preservation Green Lab using census data
Racial and ethnic diversity	Index calculated on a 0-100 scale using proportions of population from the following racial and ethnic groups: Non-Hispanic white, non-Hispanic African-American, non-Hispanic Asian, Hispanic, and all other races and ethnicities. An equal distribution of all groups is equal to 100. Presence of only one group is equal to 0.	U.S. Census Bureau (2010)	Census block	Calculated by the Preservation Green Lab using census data
Percent of the population that is Hispanic or non-white	Count of all Hispanic or non-White residents divided by the total population per grid square	U.S. Census Bureau (2010)	Census block	
Change in vacancy rate	Change in count of vacant housing units divided by total count of housing units per grid square, 2000 to 2010	U.S. Census Bureau (2000; 2010)	Census block	

APPENDIX C: COMPLETE FINDINGS

FINDINGS: LIVABILITY METRICS

METRICS	MEDIAN BLDG AGE	DIVERSITY BLDG AGE	GRANULARITY	CHARACTER SCORE
Percent tree canopy	6.796	1.225	6.552	11.037
Top *Jacksonville Magazine* restaurants	0.700	2.125	1.101	99
Civic Commons spaces	0.784	6.001	-1.375	3.410
Religious centers	2.727	12.508	9.229	16.109

LIVABILITY METRICS *Cells highlighted in green show support for the hypothesis that areas with older, smaller buildings and greater diversity of building age support positive livability findings. Cells highlighted in red counter this hypothesis with a significant result in the opposite direction. Cells highlighted in yellow indicate that no significant link was found between that predictor variable and the specific livability measure.*

The findings from this research show a clear, statistically significant link between key measures of livability and the presence of older, smaller buildings and mixed-age blocks.

Using a raster data set of tree coverage, the research team was able to link the percent tree canopy throughout Jacksonville to aspects of built character. The research team found that areas with older, smaller buildings and a fine-grained mix of old and new buildings have significantly greater percent tree canopy.

The research team also analyzed the relationship between Jacksonville's most beloved restaurants and characteristics of the built environment. Using a list of top restaurants from *Jacksonville Magazine*, we collected and geocoded the locations of all listed establishments. The research team found that areas of Jacksonville that have a greater mix of old and new buildings are significantly more likely to have top-ranked restaurants.

The research team also found that areas with a greater mix of old and new buildings are more likely to host civic commons spaces. Civic Commons spaces include public and private establishments that allow for civic interaction and provide space for a city's residents to gather: community and fraternal associations; community centers and libraries; veteran's, women's, and youth organizations; aquariums, zoos, arboreta, planetariums, and gardens; theaters, performing arts centers museums, and arts councils.

Lastly, the research team analyzed the relationship between religious institutions and building characteristics. There are significantly more religious centers—churches, mosques, temples, and synagogues—in areas with older, smaller, and mixed-age buildings.

FINDINGS: ECONOMIC VITALITY METRICS

The research team analyzed a wide range of measures of economic vitality in this study, including data on the total number of private-sector jobs, as well as counts of jobs in small businesses, new businesses, and creative industries. Using a non-governmental dataset, the research team also analyzed the count of businesses, count of women and minority-owned businesses, and percentage of businesses with women and/or minority ownership. The research team also analyzed the percent of all jobs represented by jobs in small businesses, new businesses, and creative industries.

The findings of this analysis suggest that areas of Jacksonville with older, smaller buildings and mixed-age blocks perform as well as areas with larger, newer buildings, and in many instances, the older and historic sections of the city outperform areas with relatively large, new commercial buildings. Complete findings include:

Private Sector Jobs (Overall)

As an aggregate count, areas with smaller buildings and high Character Scores have significantly fewer private sector jobs than areas with larger mixed-use and commercial buildings.

Jobs in New Businesses

As an aggregate count, areas with smaller buildings have significantly fewer jobs in new businesses. Areas with high Character Scores and smaller buildings have significantly higher percentages of jobs in new businesses, however, when compared to areas of low Character Scores.

Jobs in Small Businesses

This research strongly supports the hypothesis that areas with older, smaller buildings and a mix of old and new buildings foster small businesses. Whether measured as aggregate counts of jobs or as a percentage of all jobs per grid square, high Character Score areas as well as areas with lower median building age outperform areas of Jacksonville with larger, newer buildings.

Jobs in Creative Industries

This research finds some support for the hypothesis that areas with older, smaller buildings and a mix of old and new buildings act as hubs of jobs in creative industries. As an aggregate count, areas with smaller buildings and high Character Scores have significantly fewer jobs in creative industries, though this is tempered by significantly greater aggregate counts of jobs in creative industries in areas with high concentrations of buildings. There are also significantly higher proportions of these jobs (as a percentage of all private-sector jobs) in areas with high Character Scores.

Women and Minority-Owned Businesses

The research team find a similar pattern in the analysis for the locations of women and minority-owned businesses: these businesses are concentrated in areas with a diverse mix of fairly large old and new buildings.

METRICS	MEDIAN BLDG AGE	DIVERSITY BLDG AGE	GRANULARITY	CHARACTER SCORE
Density of private jobs (2014)	-4.491	1.660	0.220	-2.947
Density of private jobs in new business (2014)	-1.981	0.740	1.722	-0.100
Percent of private sector jobs in new businesses (2014)	-0.369	0.266	4.685	3.468
Density of jobs in small businesses (2014)	-2.012	1.768	9.039	6.258
Percent of private sector jobs in small businesses (2014)	8.978	-0.231	16.942	15.714
Density of jobs in creative industries (2014)	-2.277	1.772	2.707	1.179
Percent of jobs that are in creative industries (2014)	0.807	1.298	2.789	3.855
Density of women and minority-owned businesses (2016)	-2.096	2.072	8.440	5.950
Percent of businesses with women and minority ownership (2016)	0.522	2.821	7.589	8.318

ECONOMIC VITALITY METRICS

Cells highlighted in green show support for the hypothesis that areas with older, smaller buildings and greater diversity of building age support positive livability findings. Cells highlighted in red counter this hypothesis with a significant result in the opposite direction. Cells highlighted in yellow indicate that no significant link was found between that predictor variable and the specific livability measure.

FINDINGS: RESIDENTIAL DENSITY

Finally, the research team analyzed links between data on residential density and demographic diversity from the decennial census and key characteristics of the built environment. The research team compared the population characteristics of areas of Jacksonville with older, smaller buildings and mixed-age blocks to areas with predominantly large, new buildings.

Population Density and Vacancy Rates

Our findings relating residential density and vacancy rates to building age, diversity of building age, and granularity are mixed. Though high Character Score areas had significantly higher vacancy rates in 2010, these areas had higher density in terms of both count of residents and count of housing units. They also saw significantly greater declines in population density between 2000 and 2010, relative to areas with newer buildings, as well as higher vacancy rates. Areas of low median building age and high building age diversity were associated with lower population and housing density, but higher vacancy rates in 2010. High granularity scores—indicating that there are higher counts of smaller buildings in the area—were associated with significantly greater population and housing unit density in 2010, as well as greater gains in vacancy rates between 2000 and 2010.

METRICS	MEDIAN BLDG AGE	DIVERSITY BLDG AGE	GRANULARITY	CHARACTER SCORE
Population density - Residents (2010)	-3.472	-7.458	25.35	9.405
Population density - Housing units (2010)	-2.573	-8.120	26.121	10.195
Vacancy rate (2010)	2.450	5.901	-0.766	5.204
Change in population density - Residents (2000-2010)	-9.411	0.572	-0.974	-8.461
Change in population density - Housing units (2000-2010)	-7.914	-1.988	0.656	-6.349
Change in vacancy rate (2000-2010)	2.526	-1.382	2.527	0.984

RESIDENTIAL DENSITY METRICS
Cells highlighted in green show support for the hypothesis that areas with older, smaller buildings and greater diversity of building age support positive livability findings. Cells highlighted in red counter this hypothesis with a significant result in the opposite direction. Cells highlighted in yellow indicate that no significant link was found between that predictor variable and the specific livability measure.

FINDINGS: RESIDENTIAL DIVERSITY

Population Diversity

As with population density, our findings related to population diversity are mixed. In 2010, areas of Jacksonville with older buildings had significantly older residents, lower proportions of residents between the age of 18 and 34, less racial and ethnic diversity, and fewer people of color. High Character scores are associate with similar findings. However, in 2010, areas with high Character Scores and older median building age had significantly greater diversity of residents in terms of the population makeup by age group. Areas of high granularity also contained higher racial and ethnic diversity than less dense areas of the city.

METRICS	MEDIAN BLDG AGE	DIVERSITY BLDG AGE	GRANULARITY	CHARACTER SCORE
Median age of residents (2010)	5.169	0.727	-1.915	11.0173
Percent of the population age 18-34 (2010)	-6.569	-2.122	-3.131	-5.657
Diversity of age of residents (2010)	3.783	-5.391	20.539	13.217
Racial and ethnic diversity (2010)	0.592	-0.825	4.747	-3.408
Percent of the population that is Hispanic or non-white (2010)	-7.539	2.868	2.749	-3.052

RESIDENTIAL DIVERSITY METRICS *Cells highlighted in green show support for the hypothesis that areas with older, smaller buildings and greater diversity of building age support positive livability findings. Cells highlighted in red counter this hypothesis with a significant result in the opposite direction. Cells highlighted in yellow indicate that no significant link was found between that predictor variable and the specific livability measure.*