Business Plan for Building Footprints in North Carolina

Statewide Mapping Advisory Committee

Working Group for Building Footprints

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North Carolina
Geographic Information Coordinating Council

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EXECUTIVE SUMMARY

This business case outlines the importance of an up-to-date statewide building footprint GIS dataset and a recommended technical approach on how to efficiently maintain it to represent current building geometry with sufficient accuracy and to populate relevant attributes. The official sponsor of this business case and subsequent charter is the Geographic Information Coordinating Council (GICC). The Statewide Mapping Advisory Committee (SMAC), acting through the GICC, initiated the Working Group for Building Footprints (WGBF) to create this plan and outline a realistic approach to achieve an updated and maintainable framework dataset. This data would support and supply other framework datasets with required information and meet the business needs for many different state agencies, local governments, and private businesses.

This plan documents the strategic importance to state, local, and federal stakeholders. In doing so, it justifies the investment and effort required to develop this data set. It outlines a common base framework of attributes and geometry that will then enable additional attribution of the building footprints to meet individual business needs. Finally, the case aligns with the Sponsor's directives to develop and support, update, and maintain framework datasets to ensure it meets the needs of stakeholders.

<table>
<tr><th colspan="3">PRIORITY USE CASES</th><th>BENEFICIARIES</th></tr>
<tr><td>Disaster relief damage estimation and recovery assistance, accurate risk assessment, disaster recovery and resiliency planning</td><td>Identifying, inventorying, analyzing, and managing real property assets, including historic preservation</td><td>Targeted state, federal, and local grant funding opportunities including NC Broadband</td><td rowspan="3">12 State Agencies
All Local Government
3 Framework datasets
3 Federal Agencies
4 Programs/Applications</td></tr>
<tr><td>Insurance assessments and fire risk visualization, mitigation, response, and ratings assessments</td><td>Election confidence and voter information</td><td>Tax assessment & planning</td></tr>
<tr><td>NextGen 911 completeness assessment & 911 initial unit response plans</td><td>NCDOT Early Right of Way Relocation/Acquisition cost feasibility, Project prioritization, project planning potential impacts and visualizations</td><td>U.S. Census validation of housing units for 2030 Census & Annual State & Federal Population Estimates</td></tr>
</table>

Table 1: Use Case Summary

The GICC recognizes the integration potential between building footprints and the other framework datasets including parcels, addresses and municipal boundaries among other use cases. This plan initially identifies 17 organizations, including federal agencies, state agencies, local governments, and private enterprises, that would benefit from this data set. Each of their use cases, along with their set of core attributes, has been documented. Appendix A, Table 5 provides details for each agency. Table 1 summarizes the priority use cases.

Building footprints have been identified as a framework GIS dataset that can serve many different business cases across both government and the private sector. In the past, North Carolina Emergency Management (NCEM), within the Department of Public Safety, has created a statewide building footprints layer to meet the needs of the Floodplain Mapping Program and to perform damage assessments following hurricanes and other events. The dataset was initially derived from orthoimagery and was not updated for more than five years after creation. Recent attempts to update the dataset involved incorporating new buildings from LiDAR and any available Microsoft building footprint data. Keeping this data current has been an ongoing issue due to a lack of funding and the absence of a structured maintenance plan. Therefore, the SMAC discussed the need to develop a plan for updating and maintaining an authoritative building footprint dataset that can be leveraged by all stakeholders.

This Plan assumes a collaborative effort of joint responsibility for developing geometry, core attribution, tools, best practices, and standard operating procedures for continual maintenance to prevent the data from becoming obsolete. The plan leverages artificial intelligence (AI) and deep learning models for extraction of features from orthoimagery products that facilitate continued maintenance compared to manually intensive past efforts. Constraints include statewide end-user support for continual maintenance, potential funding, staffing, and lack of methods for mass attribution.

The primary and most fundamental assumption is the North Carolina 911 Board's Orthoimagery Program (Ortho Program) will continue. The Ortho Program collects new imagery on a four-year refresh cycle. This consistent refresh creates an opportunity to update the building footprints from the imagery products each year and establishes a maintenance schedule for keeping this valuable dataset current.

BUSINESS CASE AND PURPOSE

North Carolina's existing building footprint data layer was produced by NCEM and therefore focuses on emergency recovery and response. It was used for the first-time during Hurricane Matthew (2016) to analyze extensive damages from wind and flooding. These damage estimates were used to justify the fastest federal disaster declaration in FEMA history (to that date). Additionally, the Flood Inundation Mapping and Alert Network (FIMAN) relies on accurate building footprints to provide advanced flood warning, thus saving lives. However, extensive growth within the state in the last decade has resulted in missing data and outdated attributes. While the FIMAN system remains functional, its reliability continues to decrease due to the lack of consistent building footprint maintenance. This single reason alone provides justification for new investment.

The existing dataset has approximately 5 million features, but it is estimated that between 400,000 and 900,000 buildings are missing statewide from the original dataset due to new development, expansion of buildings, and changes in the landscape since the original data collection. In addition, existing attributes fail to meet the needs of all stakeholders, including the original data producer. These data gaps not only reduce the accuracy of damage estimates, thereby potentially reducing the expediency of recovery funds distribution, they also endanger lives by decreasing the reliability of the predictions of the FIMAN system. However, the need for this data extends beyond emergency response into other programs and industries, such as broadband expansion, resiliency analysis, transportation, and addressing. Addresses and building use type are examples of updates needed by a broad coalition of stakeholders. Appendix A, Table 5 documents the complete stakeholder use case for a current inventory of need.

Advancements in technology, such as AI and deep learning models have enabled more efficient feature extraction from imagery and/or lidar and should greatly reduce the amount of labor required to maintain a building footprint dataset. Consequently, certain implementation risks are inherent. If any of the following items are not defined by a plan, do not have commitment or backing, or diminish over time, they should be considered as risks, and methods and workflows must be put in place to mitigate these risks. **The WGBF has made a preliminary conclusion that funding and labor to perform QC on the data and compile attributes are the immediate identified risks.** The following are other important considerations.

- Local government engagement is necessary for attribute accuracy, and additional engagement through building permits and flood certificates could improve geometry and attributes.
- Without a coordinated effort involving agreements with each party involved in maintenance, data are not maintained either on a regular schedule, or consistently across all geographic areas (e.g., a single county).
- Guidelines must be clear for attribute requirements, maintenance methodology, and task assignment.
- Lack of funding or staffing could result in maintaining a mixed set of historically, fully populated attributes and new features with minimally identified requirements.
- Changes must be maintained from the existing dataset to the updated dataset to include:
    - Maintenance of existing building unique identifier
    - Defined methods to crosswalk a new footprint against existing in terms of attribution and geometry
    - Confidence of mass existing attributes transfer
    - Accountability for assigning an address to the correct footprint where multiple footprints exist on any given property

TECHNICAL APPROACH

This Plan identifies an AI deep learning approach to extract building footprints from either orthoimagery or LiDAR products as the means to accomplish the goals of this effort. Due to the consistent cycle of updates from the Ortho Program, the focus of the technical processes will be to use these imagery products instead of LiDAR. However, if a regular LiDAR collection becomes available in the future, the plan could also be applied to those products to achieve the same result. Nonetheless, LiDAR serves as a value-added means for quality control as well as a source to derive elevation and height attributes. The Plan assumes the Ortho Program collects 6-inch, 4-band (RGBIR) orthoimagery products for approximately a quarter of the state per year. This enables a consistent refresh cycle of new orthoimagery for every region in the state every four years. This creates an opportunity to update the building footprints from the imagery products each year and establishes a maintenance schedule for keeping this valuable dataset current.

With the increased availability of AI and deep learning models for extraction of features from orthoimagery products, the technical capabilities for creating building footprints from the orthoimagery collected each year are more suited for performing maintenance than with past technical solutions. For this reason, from the business perspective, the decision to implement is favorable. Figure 1 demonstrates the workflow for extracting new building footprints from orthoimagery products from the Ortho Program. This workflow includes steps for updating training samples and fine-tuning the deep learning model using the existing footprint dataset and the most recent orthoimagery. Performing these steps to fine-tune the model to North Carolina, instead of using out of the box models, will ensure the model is tailored to the

resolution, radiometry, and geography of the North Carolina orthoimagery. The expected result is better initial object detection.
However, with many AI and deep learning solutions, manual quality control and data cleanup tasks will still need to be implemented to ensure that a high-quality and complete dataset is ultimately produced. The level of effort for these manual tasks will present the biggest challenge

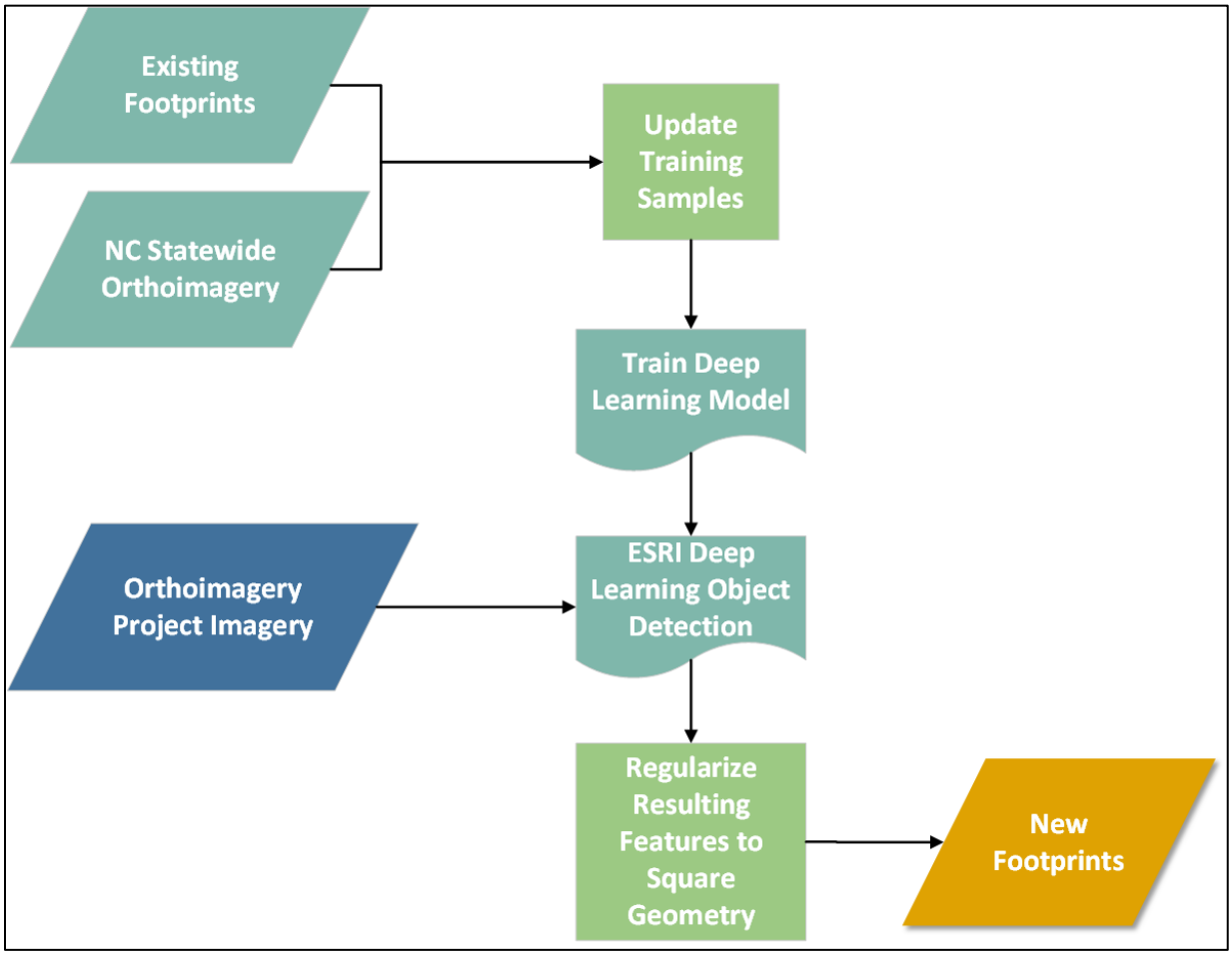

Figure 1: Process diagram for creating new building footprints from the NC Orthoimagery Program

for successfully completing the work outlined in this plan. Figure 2 outlines a workflow to identify change in the existing statewide building footprint dataset by using the outputs from Figure 1. In summary, Figure 2 considers at least four significant workflows:

1. Identifying new structures
2. Modifying existing structures
3. Removing demolished structures
4. Providing attribution for new or modified footprints

The workflow for modifying existing structures requires analyzing specific thresholds for identifying change. These thresholds change based on the original size of the structure. A smaller structure will require a larger percentage of change to necessitate an update, but a larger structure will require a smaller percentage since a small percent of a large original number will still represent a large structural change. These thresholds will also need to be large enough to account for slight differences in the extracted footprints due to building lean being present in different years of

orthoimagery. The exact figures to use for the diminishing size thresholds that will identify change in the existing footprints will need to be determined through a thorough proof of concept.

The Working Group also decided to assess a minimum square footage threshold for inclusion in the primary building footprint dataset. This will improve usability and performance for most use cases outlined in the plan. Structures smaller than 800 square feet would be converted into a point layer to reduce the volume of outbuildings and other structures that are non-essential to most business uses. However, the secondary layer could be leveraged by any organization needing to satisfy additional requirements.

Table 2 outlines primary attributes of the statewide dataset required by most business uses. Structures that have been demolished or are no longer present in the imagery should not have their geometry removed but should have the [REMOVED] and [REMOVED_YR] attributes updated to reflect that it is no longer visible in the imagery and what year this occurred. Other attributes, such as occupancy type, year built, square footage, etc. can be derived from the

Field	Potential Source	Data Type	Description
BLDG_ID	Generated	Text	Primary key
PID	Statewide Parcels	Text	Tax Parcel Identification Number.
OCCUP_TYPE	Statewide Parcels	Text	Occupancy Type e.g., single family, religious, industrial, mobile, multifamily, etc.
BUILD_TYPE	Statewide Parcels	Text	HAZUS Building Construction Type i.e., wood, steel, concrete, etc.
YEAR_BUILT	Statewide Parcels	Text	Year the structure was built.
HTD_SQ_FT	Statewide Parcels	Long	Heated square footage.
NUM_STORY	Statewide Parcels	Text	Number of stories.
IMAGE_YEAR	NC Orthoimagery	Text	The year that the imagery was flown from which the building footprint was derived.
REMOVED	Generated	Integer	Has this building been removed (i.e. a demolished structure)? 0 = No, 1 = Yes.
REMOVED_YR	Generated	Integer	If the REMOVED field contains a 1, this field denotes the year in which the structure was removed.
ADDRESS	AddressNC	Text	911 Address

Table 2: Primary attributes identified by most use cases

county tax records or statewide parcel dataset. The address for the structure should be derived from the AddressNC dataset since it is the authoritative statewide address dataset and is maintained through the NextGen 911 systems across the state. Optional attributes identified by the business use cases are outlined in Appendix A - Table 6 based on business uses and

demonstrate the fully attributed data that might be required by any given agency. The working group recommends that the proposed building footprint dataset be limited to a core set of common attributes required by all stakeholders but also allow agencies to leverage their business-specific data using relational databases or other data sources. It should be noted the bulk of attributes would be required NCEM for hazard risk, FIMAN, Floodrisk Information System (FRIS), etc.

IMPLEMENTATION REQUIREMENTS

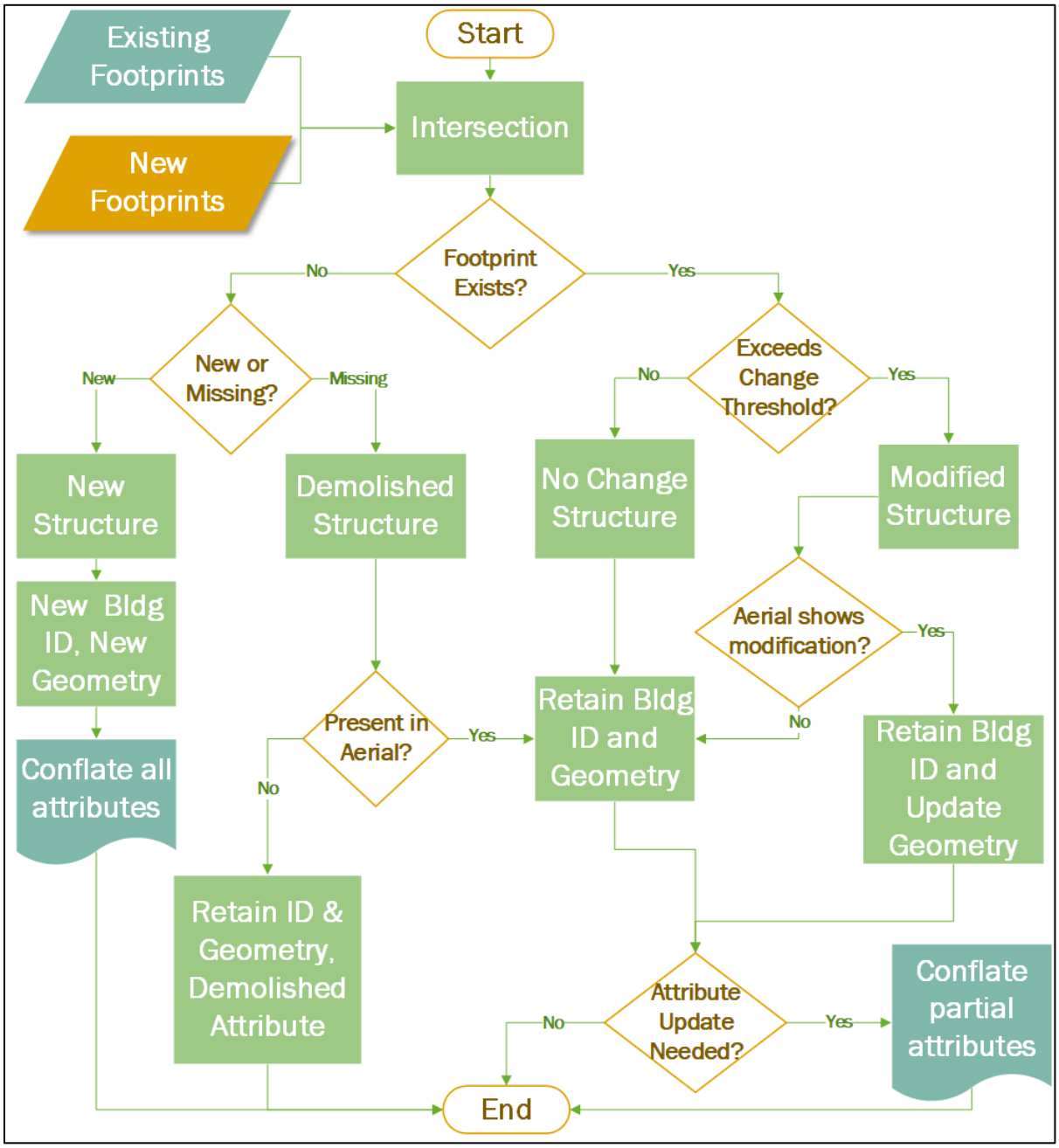

Figure 2: Process diagram for using new footprints to update the existing statewide building footprints dataset.

Implementation of this business plan must consider various technical aspects of the data, as well as workflows for creating and maintaining it. North Carolina is well situated to undertake this effort due to an existing yearly collection of new orthoimagery products along with an existing statewide building footprint layer that can be used as a starting point for this work. Improvements in AI and deep learning models represent a major improvement in the ability and speed with which this type of work can be completed. A proof of concept for implementing these models at county scale will validate the approach of this business plan.

The approach described thus far can be summarized by two major items: geometry updates and attribution. Populating the required attributes and consistently maintaining the data are critical to meeting the business uses outlined by this document and represent the highest project implementations risks. **The quality control and manual editing of the data that continues to be required, even when using automated feature extraction processes, represents the largest obstacle to completing the work outlined in this plan**. Contracting or additional staffing will be needed to address this specific workflow.

Table 3 presents the overall implementation requirements with an identified approach as seven workflow categories where tasks 1 and 2 are required for only initial implementation. Tasks 3 through 7 would be required for each yearly update. Important considerations for approval and successful implementation of this business plan are also defined. The implementing organization should work with the stakeholders to delegate responsibility and tasking for these items. It should also consider the implementation risks and how to minimize these risks.

<table>
<tr><th colspan="2">IMPLEMENTATION RISKS</th><th>REQUIREMENTS</th></tr>
<tr><th colspan="2">RISKS</th><th>TECHNICAL</th></tr>
<tr><td colspan="2">1. Funding mechanism
2. Maintenance
3. Attribution</td><td rowspan="4">1. Current high-resolution imagery
a. OR LiDAR (8PPM minimum)
2. Existing statewide footprints from NCEM
3. Artificial intelligence (AI) deep learning models
4. Proof of concept
5. Statewide Framework Datasets for attribution
a. AddressNC
b. Parcels</td></tr>
<tr><th colspan="2">APPROACH</th></tr>
<tr><th>TASKS</th><th>WORKFLOW</th></tr>
<tr><td>1. Data collection
2. Proof of concept for one county
3. Deep Learning/AI feature extraction of geometry
4. Geometry enhancement
5. Geometry Quality Control / Manual clean-up
6. Attribution
7. Maintenance</td><td>1. Identifying new structures
2. Modifying existing structures
3. Removing demolished structures
4. Attribution for new or modified footprints
5. Update attributes for existing footprints</td></tr>
<tr><th colspan="2">CONSIDERATIONS</th><th>ADMINISTRATIVE</th></tr>
<tr><td colspan="2">1. Ownership
2. System architecture
3. External applications dependencies
4. End-user permissions and access
5. Centralization
6. Data Migration
7. Data sourcing</td><td>1. Temp staffing and/or contracted vendor
2. Funding
3. Interagency agreements
4. Local government engagement</td></tr>
</table>

Table 3: Implementation Requirements

CONCLUSIONS AND RECOMMENDATIONS

The Ortho Program has a well-established procedure of collecting a quarter of the state each year to maintain a four-year refresh cycle. The Working Group for Building Footprints recommends following this same cycle to extract and update a quarter of the state's building footprints each year from the newly available orthoimagery. The current orthoimagery cycle map is shown in Figure 4 of Appendix A. It is understood that there may be a need to initially update the coastal and eastern piedmont regions due to the critical nature of having updated building footprints for upcoming hurricane seasons. However, the intent and recommendation of this business plan is to extract building footprints from each subsequent phase of the Ortho Program to enable the workflows outlined in this plan for updating the existing NCEM building footprint dataset.

Attribution of the core set of fields outlined in Table 2 are critical to meeting the initial needs of the data when updating the geometry from the orthoimagery. Stakeholders will then populate any additional fields for specific uses of the data to support their specific business needs. For attributes that are derived from other data (i.e. Parcels and Addresses), there may be attributes that are not standardized across all counties, causing issues when attributing new or existing structures. It will be necessary to provide outreach and education to the local and county creators of this data through other GICC committees and working groups, such as the Working Group for Seamless Parcels, to continue to improve the attribution of these other datasets that directly impact the quality of the building footprint attributes.

To estimate the level of effort and cost of updating each region of the state, housing unit change from the 2020 U.S. Census was analyzed to identify what parts of the state saw the most change. Figure 3 below clearly demonstrates that the Eastern Piedmont region, which includes the Raleigh-Durham metropolitan area, and the Southern Piedmont and Mountains, which includes Charlotte, experienced a much larger change between 2010 and 2020 in relation to the other two regions. These two regions account for 75% of the new housing units in that span.

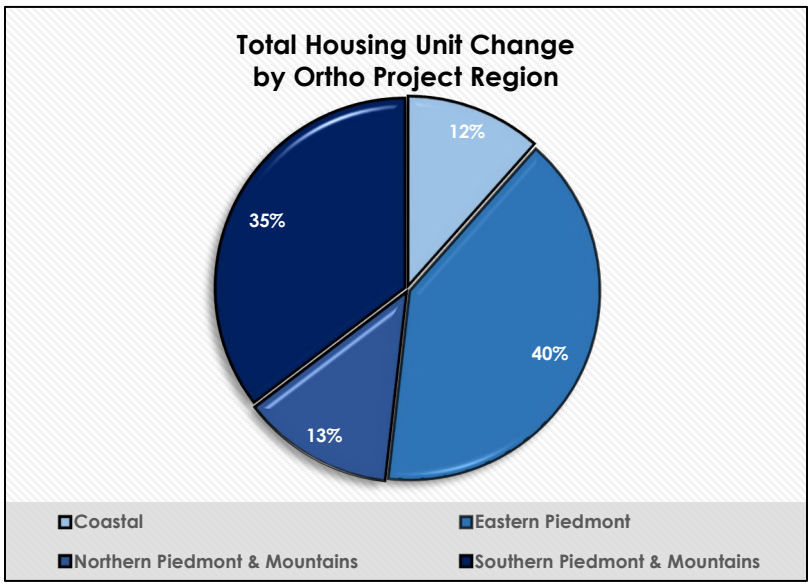

Figure 3: Percent of Total Statewide Housing Unit Change per Ortho Project Area based on the change in housing unit figures between the 2010 and 2020 U.S. Census.

While the goal of this business plan is not to determine budgetary requirements of updating the building footprint data, it is still important to highlight that the cost of updating certain regions of

the state may have different costs associated with the work relative to other regions depending on the magnitude of change taking place.

The phased approach to next steps after adoption of this business plan are outlined in Table 4. These steps would initially focus on conducting a Proof of Concept consisting of multiple counties to test out specifications that could then be put into a formal scope of work for subsequent projects outlined in the remaining phases of the table. It is critical that the scope of work be thorough and concise. A written scope of work will allow future projects to be consistent across the state whether the work is being performed by internal State staff, by contracted staff, or by private vendors.

Phase	Name	Description
1a	Data Collection	Collect existing statewide building footprint data and orthoimagery necessary for proof of concept and remainder of phase 1 updates.
1b	Proof of Concept	Perform a proof-of-concept project in one or two coastal counties to update existing building footprints and outline clear specifications for scope of work items to use in future updates.
1c	Coastal and Eastern Piedmont Feature Extraction	Use orthoimagery products from 2020 and 2021 orthoimagery projects to extract building footprints using Deep Learning & AI models.
1d	Coastal and Eastern Piedmont Geometry QC	Intersect new extracted footprints with the existing feature in the statewide building footprints dataset to update geometry.
1e	Coastal and Eastern Piedmont Attribution	Populate primary attributes for new and updated features.
2a	2022 Northern Piedmont & Mountains Initiation	Collect existing statewide building footprint data and new orthoimagery products from the 2022 orthoimagery project.
2b	2022 Northern Piedmont & Mountains Feature Extraction	Use orthoimagery products from 2022 orthoimagery project to extract building footprints using Deep Learning & AI models.
2c	2022 Northern Piedmont & Mountains Geometry QC & Attribution	Intersect new extracted footprints with the existing feature in the statewide building footprints dataset to update geometry.
2d	2022 Northern Piedmont & Mountains Attribution	Populate primary attributes for new and updated features.
3a	2023 Southern Piedmont & Mountains Initiation	Collect existing statewide building footprint data and new orthoimagery products from the 2023 orthoimagery project.
3b	2023 Southern Piedmont & Mountains Feature Extraction	Use orthoimagery products from 2023 orthoimagery project to extract building footprints using Deep Learning & AI models.
3c	2023 Southern Piedmont & Mountains Geometry QC & Attribution	Intersect new extracted footprints with the existing feature in the statewide building footprints dataset to update geometry.
3d	2023 Southern Piedmont & Mountains Geometry QC & Attribution	Populate primary attributes for new and updated features.
4	**Continue Yearly Data Maintenance**	**Apply approach from first 3 phases to subsequent orthoimagery projects to continue a 4-year refresh cycle of the statewide building footprints.**

Table 4: Recommended phased approach to next steps

APPENDIX A – SUPPLEMENTARY DOCUMENTATION

NAME/AGENCY/PROJECT	NEED/BENEFIT
1. GICC – Statewide Mapping Advisory Committee	Identified as a framework dataset where the goal is to build seamless, statewide datasets for critical data layers using the most accurate, precise, and highest resolution data from agencies with program responsibility for managing these data.
2. Department of Public Safety (N.C. Floodplain Mapping Program)	The Statewide Building Footprint is used in a number of NCEM public facing applications, such as FIMAN and FRIS; river mitigation studies, such as the Lumber, Tar, Neuse; and operationally with rapid damage estimates to support joint preliminary damage assessments with FEMA and disaster declarations. They are also utilized in Recovery, mitigation, and resiliency studies. Attributes required for flood damage estimation in the FEMA Hazus Methodology include Building Replacement Value to determine reconstruction costs, First Floor Elevation to determine depth of flooding in building, and Heated Square Footage to estimate inventory losses to commercial and industrial buildings. Structure Type (Residential, Commercial, Public, etc.), Foundation Type (Pile, Slab, Basement, Crawl Space, etc.), Number of Stories, and Flood Zone (Coastal A,V or Inland) are required to determine USACE depth-damage functions. Wind functions require Roof cover type, Roof quality, Roof-deck attachment, Roof-deck age, Roof Shape, Roof Frame type, Garage doors and Shutters as attributes.
3. CGIA; AddressNC	The AddressNC Program will utilize building footprints to evaluate completeness. In coordination with parcel attributes such as use type and improved values, footprints will assess the probability of real addresses that should exist but currently do not. This will aid end-user providers with exact locations for updating their authoritative records that in turn will improve NextGen 911. Ultimately, the vision will be to establish relationships between footprints and addresses. This would serve any number of practical applications including for use by NCEM.
4. NC Broadband Infrastructure Office	Current broadband mapping is done through use of the FCC Form 477 data that reports service at a census block level bi-annually. However, the FCC is adopting new mapping requirements that will report service at a household level. Building footprints can be combined with statewide addresses and parcels to create what is termed the "serviceable location fabric" that will represent the homes and businesses that are able to be served by broadband. Having accurate building footprints with attribution on basic categories of land use will allow the creation of the fabric and will better enable policies to be directed at the exact locations that need this critical infrastructure. The federal government has provided a tremendous amount of broadband funding to the State through the American Rescue Plan Act and the Infrastructure Investment and Jobs Act. Having accurate data on the locations and buildings that currently lack adequate broadband service will

	allow those funds to be spent efficiently and in the specific locations needed.
5. NC 911 Board; NG911	NextGen 911. Through AddressNC, addresses are more comprehensive and precise in location that are tied to buildings
6. NC State Board of Elections	Election confidence and voter information
7. Local government Managers and Coordinators	Tax assessment, planning, and floodplain management
8. Dept. of Insurance State Fire and Rescue Commission	Conducts flood analysis for the Property Fire Insurance, and School Insurance Funds. NCDOI keeps inventory or all structures on each property, this includes everything under 800 sq feet. Building footprints can also be useful for the North Carolina Office of State Fire Marshal (OSFM) fire department ratings inspectors. During a fire department rating, fire ratings inspectors choose certain businesses, residences, or community buildings to test out the hydrant system. Attributes such as, building material, number of floors, and total square footage are beneficial for these inspections.
9. Dept. of Administration	A core part of the State Property Office's Real Estate Portfolio database. The building footprint is used in identifying, inventorying, analyzing, and managing real property assets, owned and leased.
10. NC Forest Service	Used by the Neighbor 2 Neighbor application for wildfire risk visualization. This enables a community to visualize the scope and scale required for engagement of partners to reduce collective wildfire risk. From a Risk Mitigation focus, building footprints would be utilized for individual building wildfire risk ratings (assessments) dependent on a multitude of attribute requirements. From a Wildfire Response focus, knowing tax values, could utilize building footprints for calculating wildfire estimates. We currently collect estimated values for threatened homes and structures, lost homes, and structures, protected homes and structures.
11. NC Office of Recovery and Resiliency	Recovery assistance and resiliency planning. critical for accurate risk assessment, disaster recovery and resiliency planning. They are used directly to estimate the impact of storms and to get federal disaster declarations expedited to assist in relief efforts
12. FEMA (within US Department of Homeland Security (DHS)	Used jointly with the NC Department of Public Safety for preliminary damage assessments and disaster declarations.
13. OSBM Demographic and Economic Analysis	Used to update US Census Bureau Master Address File to ensure complete count of population during decennial census. Potential future use as a data source for annual certified municipal and smaller area population estimates if residential housing units are identified. Housing units and change in housing units are important inputs to population estimates models. The once a decade census counts and annual state and federal

	population estimates help inform population projections and the distribution of resources (including annually more than $43.8 billion in federal funds and $1.8 billion in state funds) to regions and communities.
14. Private Sector	It is assumed private businesses utilize this statewide data for public sector clients as well as other outside uses. Individual uses may vary and input from this sector has not been received as part of this working group effort.
15. NC 911 Primary Safety Answering Points (PSAPs)	Brunswick County PSAP utilizes building footprints as a reference layer to indicate on a base map the general size and existence of a structure. Actively working towards transforming the layer into an attribute layer that will help to determine initial unit response plans by showing what type of structure is involved which ties into critical fire response incidents such as structure fires and collapses. i.e., mobile home vs. industrial warehouse. Potential work with utilizing a building footprint as a container for indoor mapping of floorplans to better map exact caller locations inside facilities such as schools. During weather events the footprints are vital for helping to distinguish impacted structures for evacuations, flooding and search and rescues.
16. NCDOT	GeoAI Training Data Study area potential impacts and minimizing impacts, occupying floodplains, indication of traffic patterns and trip generation Facility Maintenance and linking to NCDOT database of NCDOT owned structures Early Right of Way Relocation/Acquisition cost feasibility Generating visualizations during the planning process prior to surveys being completed Required attributes: Structure condition, Fuel Canopy, Number of stories, Address, Lowest Floor Elevation, Lowest adjacent grade, building materials, square footage, Age, Condition, Construction type, Use type
17. DCR - Historic Preservation Historical Resources	The existing building footprint dataset enables the State Historic Preservation Office to hone the spatial extent of field surveys; locate properties of interest not visible from the public right-of-way or which are shrouded with vegetation; identify historic buildings at flood and sea-level rise risk; and make damage assessments to those buildings in the wake of hurricanes and other disasters. Additionally, an enhanced dataset could streamline the process of finding and assessing comparable historic properties, as federally required by Section 106 of the National Historic Preservation Act of 1966. "Year built" and "ghost building" geometry are critical elements for the office; the date the building was last occupied or altered, its condemned status, and/or demolition schedule are also valuable.

Table 5: Stakeholder Matrix

Field	Potential Derived Source	Data Type	Description
PHOTOFILE	Statewide Parcels	Text	File name of digital picture taken of structure from where attributes were assessed / gathered. Naming convention should mirror BLDG_ID.
YRBUILTSRC	Statewide Parcels	Text	Year Built Attribute Source.
BLDG_VALUE	Statewide Parcels	Numeric	Building Value.
BLDVAL_SRC	Statewide Parcels	Text	Building Value Source.
HTDSQFTSRC	Statewide Parcels	Text	Heated Square Footage Source.
FOUND_TYPE	Statewide Parcels	Text	Structure Foundation Type.
BASMENT_TY	Statewide Parcels	Text	Basement Type.
NUM_UNITS	Statewide Parcels	Text	Number of Units.
MATERIALS	Statewide Parcels	Text	Structure Material
BLOCK_ID	Spatial Overlay	Text	Census Block Identification Number.
FLD_ZONE	Spatial Overlay	Text	Flood Zone.
STATIC_BFE	Spatial Overlay	Text	Is the building within a flood zone with elevations determined with Static BFE?
ISCOASTAL	Spatial Overlay	Integer	In Coastal Zone? 0 = No, 1 = Yes.
NRHD	Spatial Overlay	Integer	Is the building located within and subject to a National Register Historic District? 0=No, 1=Yes
LHD	Spatial Overlay	Integer	Is the building located within and subject to a Local Historic District? 0=No, 1=Yes
HU_MBLD_TY	HAZUS	Text	HAZUS Hurricane Model Building Types.
HU_SCHEME	HAZUS	Text	HAZUS Hurricane Region Scheme.
EQ_SCHEME	HAZUS	Text	HAZUS Earthquake Region Scheme.
EQ_MBLD_TY	HAZUS	Text	HAZUS Earthquake Model Building Types.

EQ_DES_LVL	HAZUS	Text	HAZUS Earthquake Design Level.
EQ_ZONE	HAZUS	Text	HAZUS Earthquake Zone.
FL_SCHEME	HAZUS	Text	HAZUS Flood Scheme.
ISGHOST	GENERATED	Integer	Is this building a ghost structure? 0 = No, 1 = Yes.
WIND_ZONE	N	Text	Wind Zone for Manufactured Homes Only (OCCUP_TYP = RES2) and BUILD_TYPE = MANUFHOUSING.
BLDGADJFAC	N	Numeric	Adjustment Factor for Replacement Value.
BLDGREPVAL	N	Numeric	Building Replacement Value.
CONTREPVAL	N	Numeric	Contents replacement value.
INVREPVAL	N	Numeric	Inventory replacement value.
FFE	N	Numeric	First Floor Elevation.
FFE_TYP	N	Text	Type of Survey used to obtain this FFE.
LIDAR_LAG	N	Numeric	Lowest Adjacent Grade Derived from LiDAR.
LIDAR_HAG	N	Numeric	Highest Adjacent Grade Derived from LiDAR.
RISE	N	Text	Rise of Structure i.e. high, mid, low...
ROOF_SHAPE	N	Text	Shape of the roof.
ROOF_SLOPE	N	Text	Slope of the roof.
ROOF_CV_TY	N	Text	Roof Cover Type.
ROOF_CV_QL	N	Text	Roof Cover Quality.
S2_WTR_RES	N	Text	Secondary Water Resistance?
RF_DECK_AT	N	Text	Roof Deck Attachment.
RF_DECK_AG	N	Text	Roof Deck Age.
RF_WAL_CON	N	Text	Roof Wall Connection.
RF_FRAM_TY	N	Text	Roof Frame Type.

M_RFDCK_AT	N	Text	Metal Roof Deck Attachment.
SHUTTERS	N	Text	Hurricane Shutters?
TIE_DOWNS	N	Text	Hurricane Tie Downs?
WINDOW_AR	N	Text	Window Area.
GARAGEDOOR	N	Text	Measure of Garage Door strength for houses with or without hurricane shutters.
MAS_REINFR	N	Text	Masonry Reinforcing?
JOIST_SPAC	N	Text	Roof Joist Spacing.
WINDDEBRIS	N	Text	Wind Debris.
DEFN_SPACE	N	Text	Has defensible space been created around the property in regards to protection against Wildfire?
HZFUELREDC	N	Text	Have hazardous fuels reduction measures been put into place in regards to protection against Wildfire?
IGNRESMATL	N	Text	Were ignition-resistant materials used during construction or upkeep in regards to protection against Wildfire?
EXCLUDE	N	Integer	Conflation Process, exclude feature function. 0 = No, 1 = Yes.
PIDSTATUS	N	Text	Used during the conflation process exclusively.
LPARCLSTAT	N	Text	Used during the conflation process exclusively.
ISLIMWA	N	Integer	In Limit of Moderate Wave Action (LIMWA) Zone? 0 = No, 1 = Yes.
CONDITION	N	Text	Structure Condition
FUEL_CANOPY	N	Text	Fuel Canopy
ROOF_MATERIAL	N	Text	Roof Material (fire-resistant/non-combustible)
CHIMNEY	N	Text	Chimney (present, spark arrestor, or non-existent)
ATTIC_VENTS	N	Text	Attic Vents (ridge, gable, 1/8-inch metal mesh screening)
EAVES	N	Text	Eaves (boxed, unboxed, sealed, not sealed)
GUTTERS	N	Text	Gutters (existent, no existent, clean, or filled with debris)
SIDING_COMP	N	Text	Siding Composition (fire resistant, vinyl, wood)
WINDOWS	N	Text	Windows (double pane tempered glass or single pane)

ATTACHMENTS	N	Text	Attachments (porches, decks, steps, and landings screened with 1/8-inch metal mesh or underpinned
VERT_ATTACH	N	Text	Vertical Attachments (fences, trellises, and retaining walls)
LANDSCAPING	N	Text	Landscaping (fire resistance)
OVERHANG_LIMBS	N	Text	Overhanging Limbs (trimmed more than 10 feet)
S2S_IGNITION	N	Text	Structure to Structure Ignition Potential (within 30 feet of adjacent structure
DEFENSE_SPACE	N	Text	Perimeter (clear defensible space distance out to 100 feet)
COMBUST_HAZ	N	Text	LP Gas and other combustibles surrounding structure
DRIVEWAY_WIDTH	N	Text	Driveway Width with vertical clearance for emergency vehicle access
VISIBLE_911	N	Text	911 Address visible from both directions with 4-inch reflective numbers
HISTORIC	N	Text	Does the building have a historic designation (National Register, state Study List, Determination of Eligibility)
LOCAL_LANDMARK	N	Integer	Does the building have local landmark status? 0=No, 1=Yes
ARCH_STYLE	N	Text	What is the primary architectural style of the building
HISTORIC_USE	N	Text	What was the building's historic use, if different from OCCUP_TYPE
ARCHITECT	N	Text	Name of the building's architect or builder
LOC_INTEGRITY	N	Text	Is this the original site of the building, a moved site, or unknown
OUTBLDG_TYPE	N	Text	If the building is secondary on the parcel, what type is it
EASEMENT	N	Integer	Does the building have an easement or covenant attached to it? 0=No, 1=Easement, 2=Covenant, 3=Both
DEMO_DATE	N	Date	Date the building was removed from the site (typically demolished, but could be moved)
HOUSE_FORM	N	Text	If the building is a house, what is its general form

Table 6: Optional attributes identified by business uses

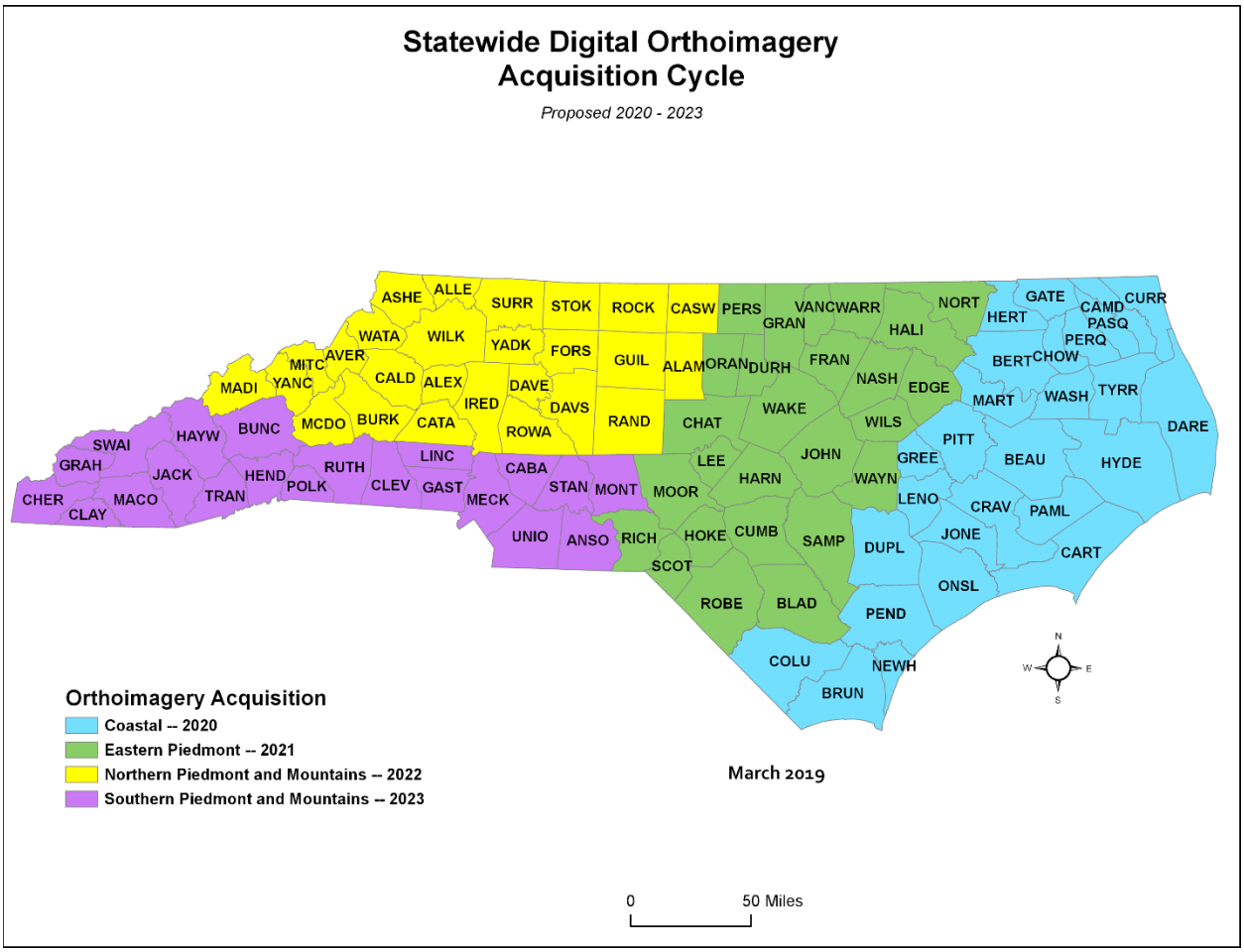

Figure 4: Current Statewide Orthoimagery Cycle