Briefing for the City of Lumberton, NC: Land Suitability Analysis for Post-Disaster Housing Relocation

Hurricane Matthew Disaster Recovery and Resilience Initiative
September 2018

Note: This Appendix complements the Technical Memo for Land Suitability Analysis and contains the relevant details and results specific to the City of Lumberton.

Overview

Hurricane Matthew's heavy rainfall in October of 2016 led to record flood levels on the Lumber River, impacting more than 870 households as well as Fifth Street, the city's main commercial corridor. The flooding also significantly damaged a number of key public facilities in south and west Lumberton including a water treatment plant, several recreational buildings, a sewer lift station, electric utility, county school and administration building, and fire station. Even before Hurricane Matthew, the Town was dealing with challenges associated with a declining and aging population, lack of affordable housing, extremely low indicators of health, residents in poverty, and difficulty in affording the management of water and sewer systems. The resilience of the City's residents and local officials has certainly been tested.

Through a long-term recovery planning process led by HMDRRI, Lumberton has established a community vision for recovery (Figure 1), been awarded a number of grants (via Community Development Block Grant – Disaster Recovery [CDBG-DR][1], the Golden Leaf Foundation, etc.) for storm drainage and flood gate projects, reconstruction, repair and

To recover and become a resilient city requires a whole community approach, collaborating with the county and neighboring jurisdictions to repair and mitigate physical infrastructure and to implement programs/initiatives that address issues of health, education, job skills, and economic development opportunities that lead to stabilization and growth in the local tax base.

Figure 1. Proposed Community Vision for Lumberton Recovery.

[1] CDBG-DR funds may supplement, but cannot duplicate, funding available from FEMA or other federal agencies. CDBG funds must be approved by Congress. These flexible grants, administered by the U.S. Department of Housing and Urban Development (HUD), can be used to assist disaster recovery and resilience efforts by local governments, states, or tribes. CDBG may be used to fund a broad range of activities so long as they meet at least one of three national objectives: 1) benefit low- and moderate- income persons, 2) help prevent or eliminate slums or blight, or 3) address urgent risks that pose a serious and immediate threat to the health and wealth of the community where other financial resources are unavailable (U.S. HUD, 2016).

relocation of facilities, and is exploring opportunities for integrating downtown revitalization and eco-tourism while working to address the immediate needs of the residents most heavily impacted by the storm.

With 47 buyout participants expected through FEMA's Hazard Mitigation Grant Program, the city is concerned about losing part of its tax base should individuals relocate outside of municipal boundaries. To minimize this loss, the Housing section of the Lumberton Recovery Plan recommends that abandoned properties outside the 100-year floodplain be identified where the city could construct affordable housing units by the end of 2020 using information derived from the Land Suitability Analysis (LSA) and HMDRR HomePlace document (see Technical Memo on Land Suitability Analysis and Appendix A for details). However, getting from the LSA to the reality of flood survivors living inside dozens of new affordable homes will take a significant amount of time, energy, investment, and planning on the part of the City officials/staff, their recovery partners, and of course, the survivors themselves. HMDRRI has facilitated taking many of the first steps in a long recovery process, including the creation of the following LSA which can inform future resilient housing development strategies for the city.

Linking Home Buyouts, Relocation and Greenspace Concepts

A major output of HomePlace for Lumberton, a component of the broader Relocation Strategy, is a Greenspace Concept (Figure 2) that illustrates a set of potential recovery strategies based in part on the recently adopted Lumberton Tomorrow Land Use Plan. The

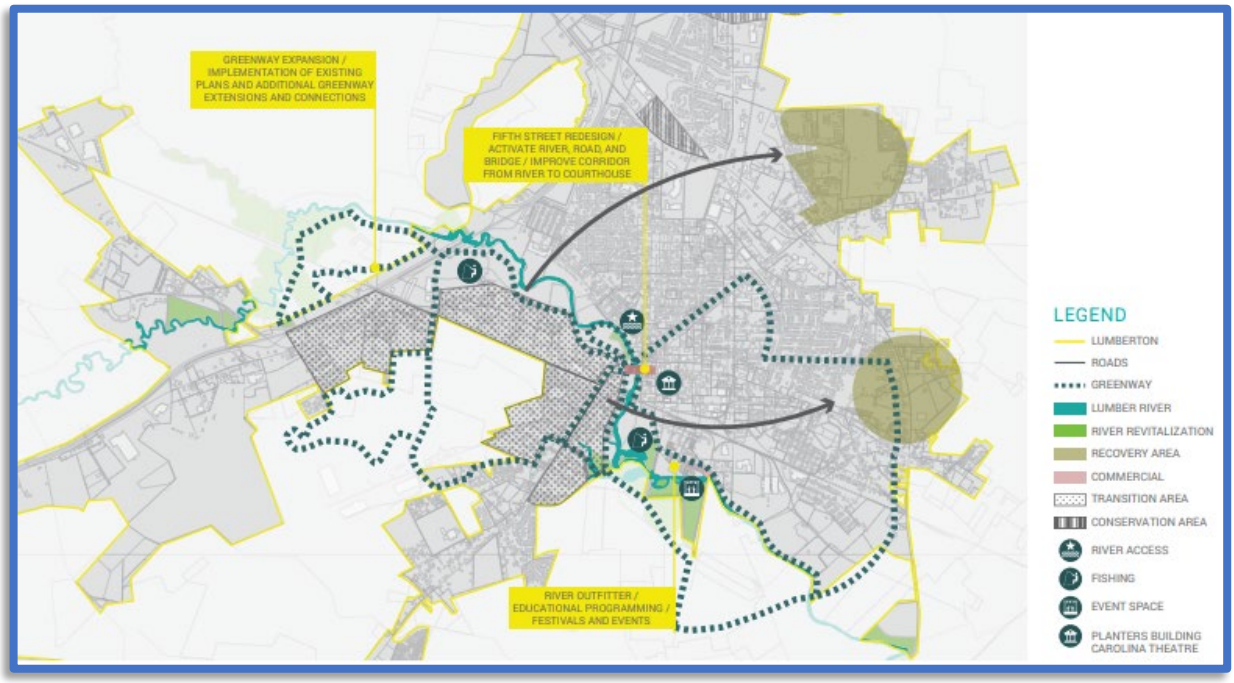


Figure 2. Lumberton Greenspace Concept.

concept includes actions such as: "enhancing the greenway system and down town Riverwalk by selectively removing vegetation and opening views from Second Street to Sixth Street, developing the Fifth Street bridge pedestrian corridor and expanding links to greenspace on north side of river" (HomePlace, 2017). The Greenspace concept shows 'recovery areas' which correspond to locations outside the floodplain and represent general areas of potential relocation or redevelopment. The LSA, however, highlights on a parcel by parcel basis the most suitable locations based on a larger set of variables and thresholds. While the City's draft Recovery plan has identified eight major issue areas, including infrastructure, public facilities, and economic development, among others, one of the greatest challenges is to encourage flood survivors who were displaced from their homes to permanently relocate to areas within the community that are desirable to live in and are located in areas that are not flood-prone. The LSA and Relocation strategy aim to help address not only some of Lumberton's long-term recovery needs but support the city's long-term resilience.

LSA Variable Description and Weighting

The selection of variables to include in the LSA began with a broad review and consideration of 36 variables of various types such as proximity to community services, transportation, environment and topography, planning, and flood risk (Appendix X). Since many variables were not applicable in Lumberton (i.e., proximity to hazardous waste sites, sea level rise vulnerability) or may not be major determinants of a site's development potential (i.e., bus stop proximity, park proximity, etc.), members of the HMDRRI team prioritized the top 8-10 variables based on past LSA experience and available knowledge about flood risk. Comparison of each member's interpretation led to strong consensus on the most important factors to focus on to conduct a preliminary LSA. Described in further detail below and in Table 1, some of the key variables included the designated 100- and 500-year flood zones, proximity to existing water and sewer infrastructure, land/building vacancy, parcel size, and zoning.

Many variables such as the municipal boundary or 100- and 500-year flood zones have thresholds defined by Boolean logic (binary in/out or yes/no) and therefore, had simple criteria for point attribution. Other factors such as parcel size and zoning contained a range of quantitative and qualitative values, and needed criteria and thresholds established. These were determined after further exploration of the variability of each factor and discussion with HMDRRI team members about what planning and development concepts were most applicable. Descriptions and justifications of each variable, its associated thresholds, and data sources are explained below and summarized in Table 1.

Table 1. Lumberton LSA Variables and Criteria Thresholds.

Category	Variable	Criteria Thresholds	Points	Max
Jurisdictional Boundaries	Municipal Limits	Out	0	1
		In	1	
	Extraterritorial Jurisdiction (ETJ)	Out	0	1
		In	1	
Proximity to Infrastructure	Water Line (0.25 mi. buffer)	Out	0	1
		In	1	
	Sewer Line (0.25 mi. buffer)	Out	0	1
		In	1	
Parcel Size*	Infill Potential	< 3,000 ft^2	0	2
		3,000 ft^2 - 20,000 ft^2	1	
		20,000 ft^2 - 100,000 ft^2	2	
	Multi-Structure Potential	100,000 ft^2 - 500,000 ft^2	1	3
		500,000 ft^2 - 1,000,000 ft^2	2	
		> 1,000,000 ft^2	3	
Building/Land Vacancy	Vacant/Abandoned Building	Occupied - FP	0	3
		Vacant - FP	2	
		Vacant - NO FP	3	
Vulnerability to Flooding	Floodway	In	0	2
		Out	2	
	100-yr Floodplain (Zone AE)	In	0	4
		Out	4	
	500-yr Floodplain	In	0	1
		Out	1	
	Hurricane Matthew Flood Extent	In	0	2
		Out	2	
Areas of Future Development	Zoning	Comm., Manuf., Cond Use Comm/Manuf.	0	2
		Agr. Mixed Use Res, Cond. Use Mixed Use Res.	1	
		Res.	2	
*Each parcel, based on its size will fall into infill potential or multi-structure potential with possible totals of 23 and 24 respectively			Total:	23/24

Vulnerability to Flooding/Flood Risk

Source: NCEM, 2017

(Floodway, 100-Year Flood Zone; 500-Year Flood Zone; and Hurricane Matthew Flood Extent)

Perhaps the most crucial set of factors for the RS and LSA are related to flood risk and vulnerability. The 100-year floodplain (Zone AE) or base flood elevation delineates the area that is expected to be inundated by a 1% annual chance flood. The 500-year floodplain represents the area of inundation experienced by a flood with 0.2% annual chance of occurring. Hurricane Matthew's Flood extent is the flood of record for the City and generally followed boundaries in between the 100- and 500-year floodplains. The event's flood extent represents areas that officials and residents have actually seen flooding versus mapped NFIP-based floodplains which are calculated using hydrology and statistics and include a certain amount of uncertainty/inaccuracy.

Together, these flood risk variables account for both estimated flood risk that is tied to various regulations and programs as well as recent flooding events which is easier to understand from the public's perspective. These factors provide a range of possible flood elevations and while it is somewhat duplicative to include all four, it provides a more comprehensive view of a property's vulnerability to future flooding and meets a main goal of the RS to develop in safer areas.

Jurisdictional Boundaries

Source: Robeson County, 2017

(Municipal Limits; Extraterritorial Jurisdiction (ETJ)

Municipal governments in North Carolina have control and influence both within their corporate boundaries and an in areas designated as its Extraterritorial Jurisdiction, or ETJ (see Owens, 2013). For a number of reasons, it is important for the Land Suitability Analysis to extend its view to include the ETJ. In order to promote orderly development and efficient investments in infrastructure and the provision of services, the most common practice is to annex land prior to development. Where that does not happen, the ETJ helps avoid problems by applying municipal development standards, zoning, and proper layout of subdivisions for residential, commercial and industrial development. Following a disaster in which buyouts occur in the floodplain, for example, there may be insufficient land within the community to find relocation sites that are located outside flood-prone areas, thereby requiring an assessment of land within the ETJ. The Land Suitability Analysis concept, in combination with the Relocation Strategy, is well suited to this purpose. For the reasons cited above, annexation prior to development is the best practice but planning prior to annexation is fully appropriate, and this fits well with the support provided by the LSA. Post-Matthew, emphasis is placed on residential

relocations, while in the future, it may be useful for commercial and industrial business developments to apply this approach as well.

Proximity to Existing Infrastructure

Source: NC OneMap, 1997
(Water Distribution System; Sewer System)

New housing development is much more cost-effective when it's located near existing water and sewer infrastructure. These factors are key to identifying suitable areas for infill development. One limitation of these data is that it is outdated (1997). The use of a 0.25-mile buffer helps to address some of this uncertainty.

Parcel Size

Source: Robeson County, 2017
(Infill Potential; < 3,000 sq. ft.; between 3,000 and 20,000 sq. ft.; and between 20,000 and 100,000 sq. ft.)

Some lot sizes are only suitable for development of single family homes or lower densities. The thresholds were selected based on the size of existing single-family home building footprints and lots sizes within the Lumberton. The smallest existing lots in the city that have single family homes on them are at least 3,000 sq. ft. and the median parcel size found within the ETJ is about 21,000 sq. ft. Therefore, any parcel less than 3,000 sq. ft. would not be considered suitable while the other two categories already do or could support a small- to medium-size single family home and larger homes for which existing lots didn't exceed 100,000 sq. ft. Square feet was used instead of acres because some lot sizes were so small that multiple decimal places would've been required to display variability.

(***Multi-Structure Potential: between 100,000 and 500,000 sq. ft.; between 500,000 and 1,000,000 sq. ft.; and >1,000,000 sq. ft.)***

Larger lots may be suitable for development of multiple structures, including, for instance, apartment buildings. This form of development could be more attractive to developers or investment partners that seek to build a larger number of units on a given site. Thresholds were selected based on size of larger parcels within town that had multiple housing structures on them.

Building/Land Vacancy

Source: NC OneMap and NCEM, 2017
(Structure on Parcel: 'Yes' or 'No'; Building Footprint Present: FP or NO FP)

Two sources of data were used to create a proxy to determine which lots were vacant and with no building because they would be the easiest to develop, whereas if there is a building footprint (FP), it may or may not have to be demolished. NC OneMap standardized parcel data

includes a field describing the parcel either as having a structure 'Y' or not having one 'N'. A proxy was created because it was observed that some properties listed as "N", not having a structure appeared to have building footprints on them when overlaid in GIS. The latest building footprint data was obtained through North Carolina Emergency Management so that three categories could be created with the goal of identifying properties listed as having no structure that also do not have a building footprint on them. The following categories listed from lowest to highest relative suitability include: YesStruct - FP; NoStruc - FP; and NoStruc - NO FP.

Areas of Future Development

Source: City of Lumberton, 2017
(*Zoning: Commercial, Manufacturing, Residential, CUP Residential, CUP Manufacturing*)

Zoning reflects the community's intent for use of that property based on a number of factors. It may be more difficult to develop replacement housing on properties that have been zoned for something different from residential, such as Manufacturing whereas a property already zoned for residential, will not require a rezoning, variance, or other procedural action. Lumberton's zoning ordinance contains over two dozen factors which were consolidated into 5 categories for simplicity (Table 3). Zones of greatest interest for the RS and LSA include Residential and Conditional Use Permit Residential both of which would require little to no extra administrative burden. Developing housing in zones such as Manufacturing or Commercial would go against prior planning goals and require rezoning.

Table 3. Lumberton Zoning Codes.

Zoning Code	Description
B1-B7	Commercial
M1-M3	Manufacturing
A, R3, R6, R7, R11, R15, R20	Residential
CUP A, CUP R6	Conditional Use Permit Residential
CUP B2- CUP B4:	Conditional Use Permit Manufacturing

The twelve variables represent the factors that determine a parcel's composite suitability for housing development or redevelopment. The factors and thresholds inform the results of the LSA which can guide decisions that meet the goals of the HMDRRI RS to reduce flood risk, retain flood survivors within their communities, and minimize construction costs.

The LSA's goals, initial methods, variables and thresholds selected, relative weights, and results were shared and discussed with the Lumberton Technical Advisory Committee (TAC). The TAC was receptive to the LSA concept and acknowledged the value of LSA. While this analysis was done for siting potential recovery redevelopment, the results are also useful to address the lack of affordable housing in general. Additionally, a similar method could be used by the city for many other planning objectives such as siting future park/greenspace or other public facilities. Further description of these possibilities is provided in the Technical Memo for the LSA.

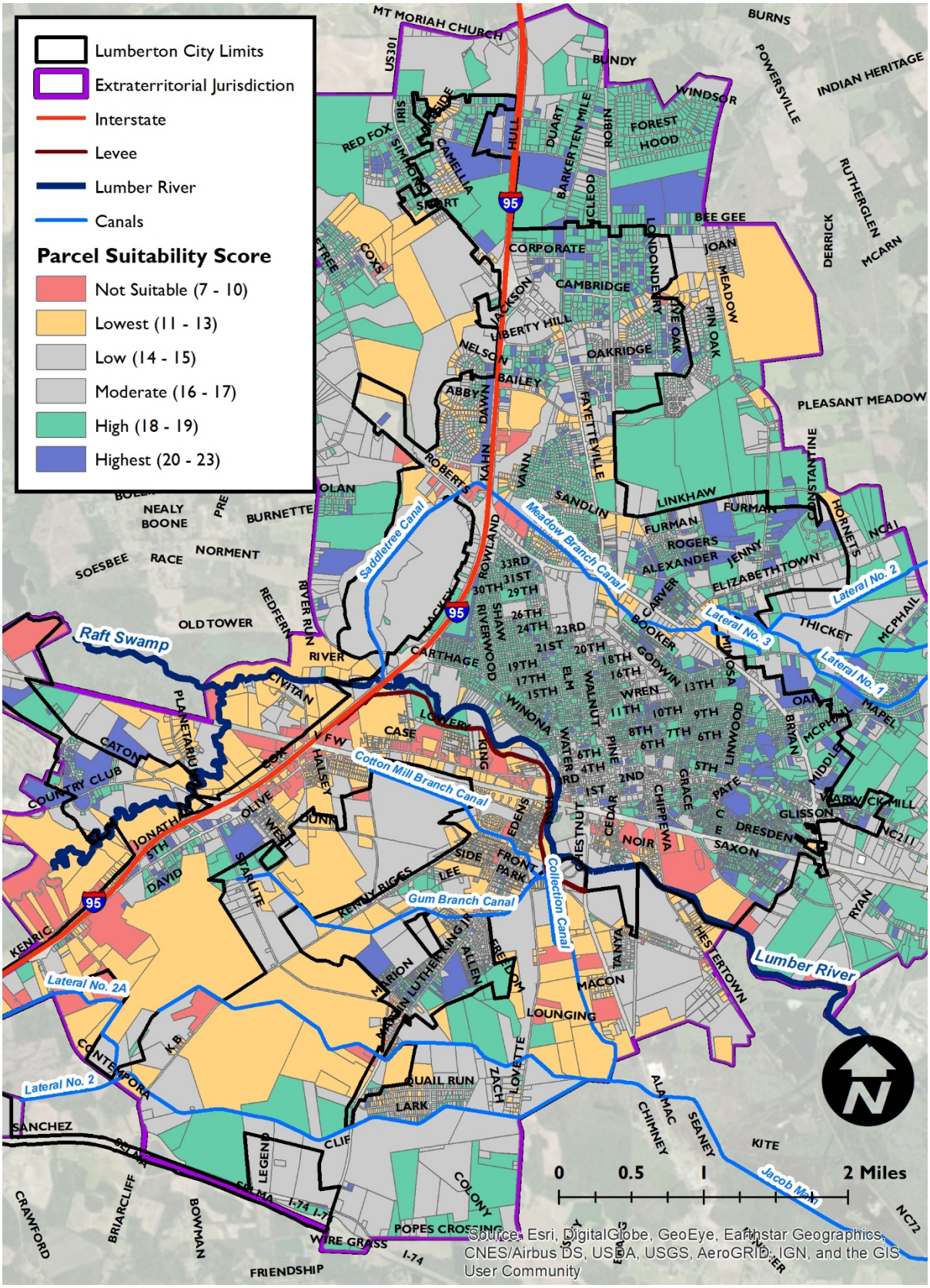
LSA Results and Interpretation

The results of the LSA reveal significant spatial variation in the total suitability score within the Town's ETJ. For instance, there are areas in close proximity to one another, but with major differences in suitability, most likely a result of the irregular shape of the floodplain boundary and its relative weight and influence on the scoring. Of the thousands of parcels analyzed that intersected the ETJ, there are hundreds of parcels that received a 'high' suitability score and hundreds more that received a 'highest' score. Figure 3 illustrates areas in turquoise and blue that are of highest suitability found north and east of downtown. The many smaller scattered individual lots are on generally higher ground and if vacant, could serve as opportunities for infill development. Other slightly larger highly suitable parcels found in the Linwood Ave - Roberts Ave - 5th St area could be assessed as possible multi-structure or multifamily housing candidates. Additional infill may be possible on vacant properties in North Lumberton in the Bailey Rd – Oakridge Rd – Live Oak Ln – Bee Gee Rd area seen in Figure 4.

Suitable areas north and east of downtown can be compared to the lower scoring, low-lying area south and west of downtown (Figure 5), across the Lumber River and located behind the levee. While the LSA identified some areas of higher suitability in south Lumberton off of Martin Luther King Jr. Drive in the McCollum St - Marion Rd - Crandlemire Rd area near Lumberton Junior High School, these areas are reliant on the levee for flood protection. Other potentially suitable parcels were identified in west Lumberton, south of I-95, but they are in close proximity to the regional airport, a potentially negative factor not included in the LSA.

Lumberton can use these findings to dive deeper into potential suitable properties for infill or larger housing development and consider additional factors not included in this analysis such as property ownership, land value/acquisition cost, proximity to airports, schools, grocery stores and other commercial activity centers.

Figure 3. City-Wide Land Suitability Analysis for Lumberton.



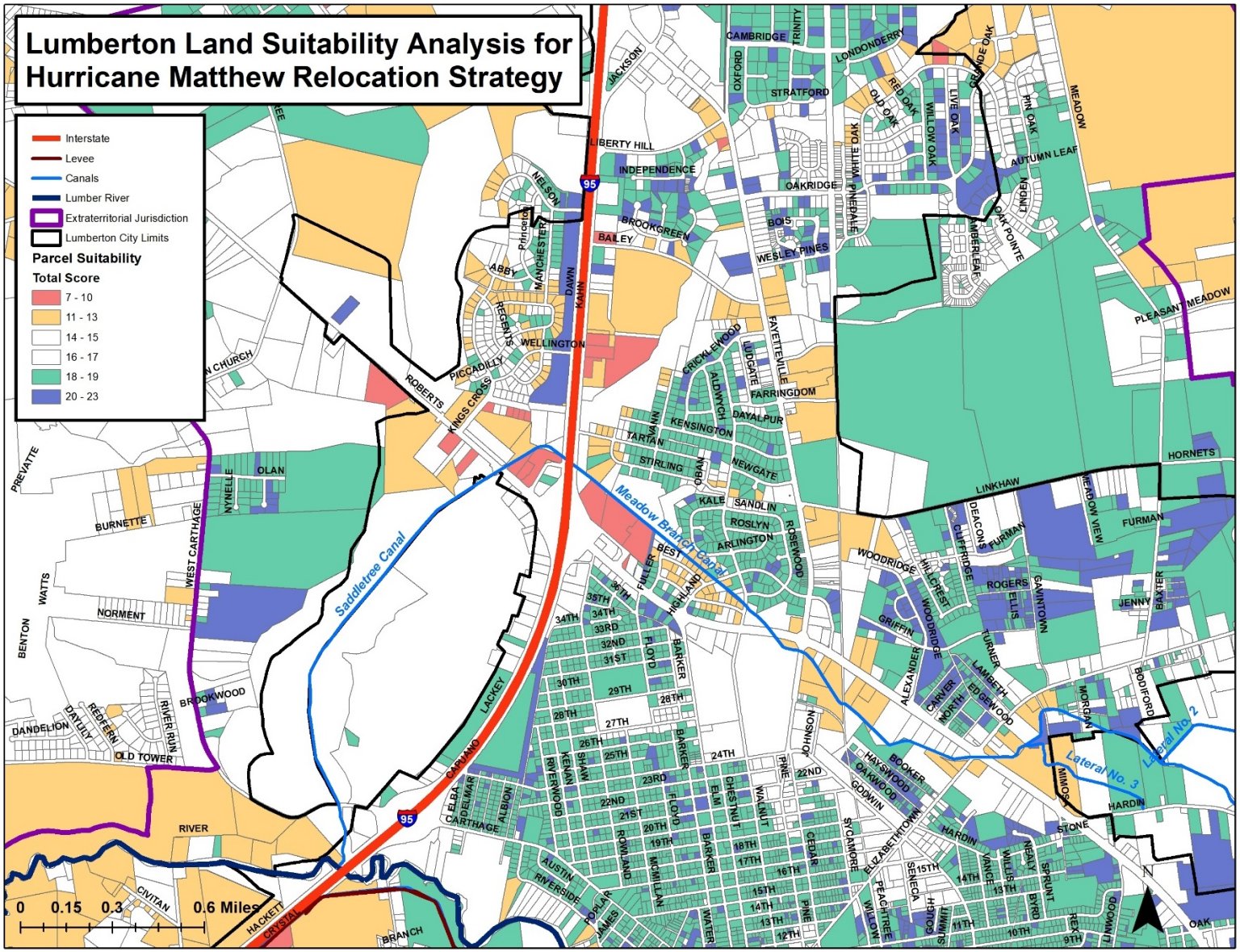


Figure 4. Highest and Lowest Suitability in North Lumberton.

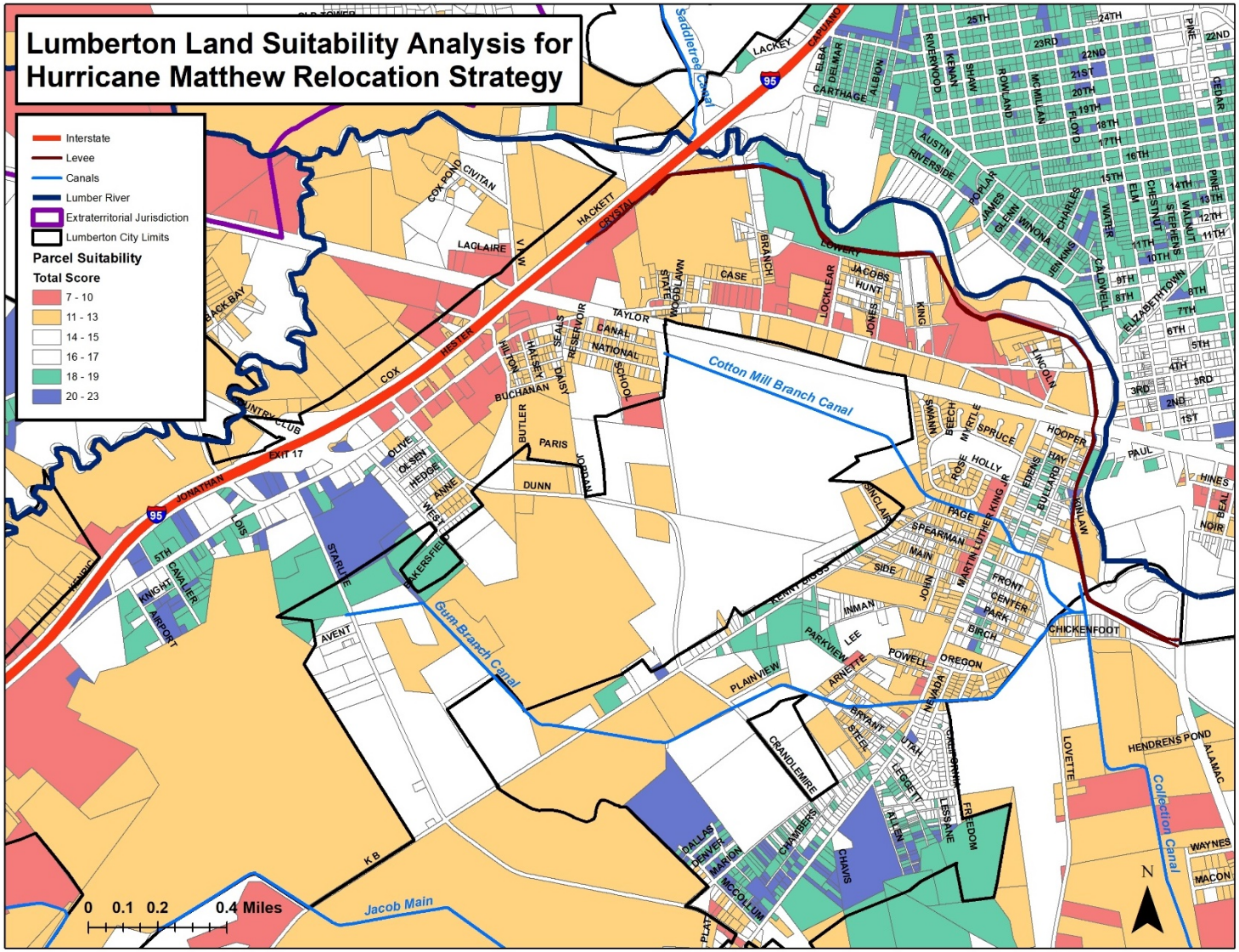


Figure 5. Highest and Lowest Suitability *in South and West Lumberton.*

Conclusions and Next Steps

As a first step in utilizing the LSA results, officials in Lumberton can further investigate and explore characteristics of the most suitable parcels. There are at least 100 individual parcels within Lumberton's city limits that are considered to have the 'highest' composite suitability, may be vacant and/or acquirable and could support multiple types of housing. Located primarily just east and north of downtown, dozens of small-medium size vacant lots exist in areas of reduced flood risk that could support infill development of single family homes. A few larger parcels meet the same criteria and could support a cluster of single family homes or denser multi-family apartment buildings that could help to alleviate the lack of affordable housing in the area. One example already being considered is the Linklaw Farm, which is comprised of about 500 acres and is considered highly suitable for development based on the LSA.

Moving forward, the City of Lumberton may consider revising and expanding upon the LSA method for a variety of purposes. Suggested considerations for more general improvements to the process are listed in the concluding remarks of the Technical Memo on Land Suitability Analysis. Other potential steps for getting the most out of the LSA include:

- Exclude other non-suitable areas such as cemeteries, past and expected future buyout properties, land with poor soil conditions, or others as identified to narrow the scope of suitable properties.
- Share LSA method and results with housing stakeholder groups (local/state housing finance agencies, religious groups, non-profits, and private foundations) to aid in discussing programs and funding mechanisms that support other housing recovery goals.
- Consider pairing the existing or revised results of the LSA with design-oriented public engagement activities during all relevant community plan development or update processes (i.e., Comprehensive Land Use Plan, Bicycle and Pedestrian Plan, Hazard Mitigation Plan, etc.)

Implications for Future Planning and Use of LSAs

Along with the devastation seen after Hurricane Matthew, the record-breaking 2017 hurricane season in the U.S. is a stark reminder of the great challenges we face in preparing for, responding to, and recovering from major natural hazard events. For many communities like Lumberton, the rain came down harder, the wind blew faster, and the water levels rose higher than had ever been seen before. Along with recovery from these events, current and future generations are trying to understand how to plan and invest more effectively knowing that in an era of climate change, these risks are only expected to increase. Major events like hurricanes Matthew, Harvey, Irma, Maria, and now Florence have produced a set of extremely difficult circumstances for the thousands of people affected. They have also brought people together in amazing ways. The human spirit often shines during response and recovery as everyday heroes emerge and local officials call for the need to 'build back better'. However, the physical and emotional trauma that transpires in the aftermath of an event often reveal the disproportionate impact felt by communities of modest wealth and communities of color who were struggling prior to the event. Opportunities to invest in alleviating these impacts are limited and at the federal government level, lean towards a reactive instead of proactive approach. Pre-event planning offers another opportunity to create positive change with and for those with the greatest levels of vulnerability.

Every year, more accurate data is collected, analyzed, and visualized through new tools that increase awareness and understanding of our country's natural hazard risks. Some tools are also getting better at linking together community goals and addressing multiple issues at once. HMDRRI's approach to the LSA is an example of how a tool can be flexible, yet powerful in its ability to inform a relocation strategy. Supported by the indigenous knowledge of a community, planning approaches like this can be used to guide a more resilient and equitable recovery in the future.

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