One-Year Post-Hurricane Matthew Field Study in Lumberton, North Carolina
Business Recovery Survey

U.S. Department of Commerce
National Institute of Standards and Technology
Generic Clearance for Community Resilience Data Collections
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For each proposed request using this generic clearance, NIST will submit the actual instrument and related documents (letters, emails to respondents, scripts, etc.), as well as proposed statistical methods to be employed to OMB along with responses to the following questions:

1. Explain who will be surveyed and why the group is appropriate to survey.

Businesses that are registered and functioning in flood vulnerable areas of Lumberton, NC is the population from which the sample will be taken in this collection. Flood vulnerable includes: areas of town that experienced inundation when the levee failed during Hurricane Matthew plus a buffer of 100 meters and areas of town included in the 100-year flood plain.

The instrument is written to access the recovery of businesses in Lumberton following Hurricane Matthew (October 2016), which were primarily affected due to flooding from the event. From a household survey conducted in December 2016, we are aware that the structural damage from Hurricane Matthew was significant in its impact to the population in terms of leading to dislocation and associated social and economic impacts. The damage to commercial structures was not insignificant and was informally observed by the team at that point in time.

The Center of Excellence (CoE) field studies team in conjunction with NIST researchers plans to conduct a quick response field study in Lumberton, North Carolina, which experienced major flooding damage due to Hurricane Matthew in early October 2016. The purpose of this field study was to explore the interconnectivity between structural damage (buildings, roads, bridges, power, water) school closures and student displacement, and housing dislocation and evacuation patterns. The information collected in this business interruption survey instrument will augment findings from December 2016. At that time business interruption was not addressed specifically in the survey tool or field work. The data from this contribute to the business interruption modeling in the IN-CORE community resilience modeling environment.

There is minimal primary data on business interruption following a large-scale natural hazard event, especially in the period of mid-term recovery (~12-18 months following the event). The instrument will be answered by owners and managers of businesses in Lumberton; some of these businesses will have been directly affected by Hurricane Matthew and related utility outages, while others were not. It is important that these businesses be surveyed within the timeframe of 12-18 months following the Hurricane event. At this point in time owners and managers will still

retain information about recovery activities immediately after the disaster in in the medium-term that can be meaningfully recorded and collected for data analysis. At each establishment one individual familiar with the recovery efforts will be surveyed — either 1) the owner or 2) the manager (in some cases the same individual will both own and manage a business). In cases where there is the potential to talk to both the owner and manager, it is preferable to speak to the individual who owns the business since this person is likely to know the most about the history of the business and the full recovery process.

2. Explain how the survey was developed including consultation with interested parties, pretesting, and responses to suggestions for improvement.

This survey instrument was developed by the NIST-funded Resilience Center of Excellence (CoE) in collaboration with NIST researchers. The main structure of the instrument follows a series of business surveys that have been conducted in Galveston, Texas and surrounding areas for over five years by researchers in the CoE. In that sense, most of questions have been thoroughly vetted in the field, as has the proposed data collection methodology.

During development, the survey instrument was reviewed by researchers interested in business interruption and recovery on both the CoE team and at NIST, specifically in the Applied Economics Office (AEO) of NIST's Engineering Laboratory (EL). This iterative collaboration created a relatively brief and thorough tool to access sources of business interruption and how recovery (short- and long-term) were sought.

During the quick response field study conducted by the CoE in December 2016, several best practices and lessons learned emerged that are applicable to this proposed business interruption survey tool. Also during that time (December 2016) some informal conversations with businesses closed following Hurricane Matthew took place. Notes from these brief interactions were reviewed during development of the tool. Furthermore, a literature review (Webb and Gilbert, 2017) of the business interruption literature was carefully reviewed during development of the survey tool.

3. Explain how the survey will be conducted, how customers will be sampled if fewer than all customers will be surveyed, expected response rate, and actions your agency plans to take to improve the response rate.

There are records indicating 2,017 for-profit businesses in Lumberton in 2016; in this survey, non-profits, government agencies, and other business that do not generate profit were excluded. The sampled businesses are taken from the areas of Lumberton recorded to have been inundated with flooding after Hurricane Matthew. Additionally, businesses that fall within a 100-meter buffer around the inundation area have been induced in the sample. The FEMA 100-year floodplain was also identified and businesses have been taken from this area. For the sample. The total sample number of businesses is 350. All businesses that were inside a 100-meter buffer around the inundation area were included in the sample (n=218). From there, we drew a random

sample of businesses in the northern portion of the FEMA floodplain to reach the desired sample of 350 for-profit businesses.

The sample will be spatially and temporally ordered to make the field work as efficient, logical, and safe as possible. The primary sample units are housing units/households located in various forms of housing structures (single family, single family attached, duplexes, multi-family structures of various forms).

The survey will be administered as a paper survey and in most cases the owner (or manger) of the business will fill-in the survey by-hand. The tool is expected to take a maximum of 15 minutes to complete. The respondent will have access to the survey in some cases for up to half a day — the researcher will explain the survey and in many cases, leave it with the respondent for a period of time. This way, the respondent has time to organize completing the survey at a time during the day that is most convenient to her/his work schedule.

The response rate expected is 60-70%. It should be noted that responding to any or all the survey is considered as a survey response. All questions are optional; thus, we expect that some businesses will answer only a portion of the questions. Assuming a 100% response rate, the total burden hours would be 87.5 hours (350 businesses X 15 minutes survey time/business).

Although resources (staff, time, and funds) will be limiting factors, several actions can be taken to improve the outcomes of the field study data collection. The team will take the following actions to ensure a higher response rate:

- Training surveyors for maximum efficiency in the field,
- Concentrating surveying on weekdays and working hours,
- Making repeat visits to businesses (if they were not open at the time of the initial visit),
- Arranging scheduled follow up times for households not available for surveying during initial visit (if willing to participate),
- And, adjusting the field work plan and team composition based upon daily evaluation of results.

Additionally, in order to improve response rates, ahead of the in-person interaction in Lumberton, researchers plan to place a phone call to businesses in the sample to be surveyed to ensure that these businesses are still in the recorded location and to find out any pertinent information that may affect a visit (e.g., changes in opening hours and times when the owner or manager are present). During this call, the survey will not be introduced; the purpose is to simly check opening hours and other pertinent information about the business. This type of method has worked well with the Galveston business interruption survey work (noted above) in order to yield higher in-person response rates.

Calling ahead of the survey may allow the researchers to sort out the error in the sample ahead of going to Lumberton (e.g., businesses in the sample that were not there at the time of the flooding or have the wrong address associated with the business). In this way, the on-the-ground research time will be better spent and less time will be taken from the businesses during the in-person discussion.

Furthermore, we can include an informational sheet about the Lumberton project, specifically and the NIST CoE's community resilience work, generally. In past research by members of this research team this has been an effective approach.

4. Describe how the results of the survey will be analyzed and used to generalize the results to the entire customer population.

It is expected that the findings of this survey will inform the understanding of the CoE field studies team in conjunction with NIST researchers in terms of business interruption and best practices and circumstances for recovery.

The data will be analyzed as a case study in the specific context of Lumberton, NC and the existing social, economic, and built infrastructure elements to the community. Statistical analysis will be used to determine trends and correlations in the data, as well as relationships between factors that contributed to business disruption and/or business recovery. There are three main survey sections in the tool: 1. damage and business interruption, 2. business information (e.g., ownership or rental), and 3. recovery finance. Analyzing these types of data singularly and in conjunction is expected to extend understanding of business interruption in general and across sectors. Of particular interest to the NIST AEO researchers is enhanced understanding the effect of utilities (if and when they are restored) in business re-opening and overall recovery (in the 12-18 month period following a disaster event).

There is not a great deal of research conducted to date with primary research concerning business interruption following a large scale natural disaster and the ensuing recovery. The data from this collection will contribute to the business interruption modeling in the IN-CORE community resilience modeling environment.

The data will also be used to inform conceptual and quantitative modeling of the community as a system, including interdependencies between housing, business, and school recovery, the timing of aspects of community recovery, and the resources available versus those needed.

Furthermore, it is expected that administering the survey tool will provide useful information on best practices for field research on business interruption from a natural disaster.