

**NEW YORK CITY ECONOMIC DEVELOPMENT CORPORATION
STANDARD FORM OF AMENDMENT OF CONSULTANT CONTRACT**

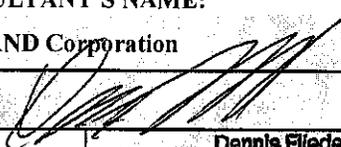
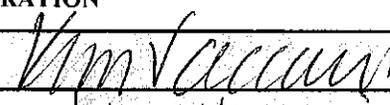
This is an amendment to the Contract entered into by New York City Economic Development Corporation (NYCEDC), a not-for-profit corporation organized pursuant to laws of the State of New York, having an office at 110 William Street, New York, New York 10038, and the Consultant:						
Consultant's Name:		The RAND Corporation				
Address:		1776 Main Street, P.O. Box 2138, Santa Monica, CA 90407-2138				
Contract No:		57830001	Contract Date:	02/01/2015	Project No: 5783	
Project Name:		Affordability Study on One- to Four-Family Flood Insurance				
Type of Services:		Consultant Services				
A copy of the Contract and copies of any and all prior amendments are attached hereto as Exhibit A.						
The Contract is hereby amended as follows:						
Amendment No:		2		Effective Date: 02/01/2016		
TYPE OF AMENDMENT						
<input checked="" type="checkbox"/>	Extension of Term	Extension Date:	01/31/2017			
<input checked="" type="checkbox"/>	Increase in Maximum Contract Price	Original Maximum Contract Price	\$ 949,753.00			
		Total Prior Increases	\$ 0.00			
		Amount of Current Increase	\$ 263,499.00			
		Revised Maximum Contract Price	\$ 1,213,252.00			
<input checked="" type="checkbox"/>	Amended and Restated Scope of Services - Exhibit B					
<input checked="" type="checkbox"/>	Other (as described below) Exhibit C: Amended and Restated Fee and Cost Schedule					
NYCEDC Executive Committee Approval Date:			12/19/13			
Capitalized terms used herein shall have the meanings set forth in the Contract, as previously amended, unless otherwise defined herein. Except as provided herein and in the pages attached hereto, if any, all terms and conditions of the Contract, as previously amended, remain unchanged and in full force and effect.						
CONSULTANT'S NAME: The RAND Corporation			NEW YORK CITY ECONOMIC DEVELOPMENT CORPORATION			
By:			By:			
Printed Name:	Dennis Fieder Director of Contract and Grant Services RAND Corporation		Printed Name:	Kim Vaccari		
Title:			Title:	CFO		
Date Signed:	5/4/16		Date Signed:			

EXHIBIT A

THE CONTRACT AND ALL PRIOR AMENDMENTS

(Incorporated by Reference)

APPENDIX B

The Exhibit B "Scope of Services" is hereby amended and restated as follows:

Amended and Restated Scope of Services

DEFINITIONS

- A. In General. All definitions set forth in the Contract to which this Appendix B (Scope of Services) is attached shall have the same meaning herein unless otherwise defined or the context otherwise requires. Except as otherwise expressly provided herein, the rules of interpretation set forth in Appendix A of the Contract shall apply to this Appendix B.
- B. Additional definitions. For purposes of this Contract, in addition to the definitions set forth in Appendix A (Definitions) the following terms shall have the following meanings:

"BW-12"	Biggert-Waters Flood Insurance Reform Act of 2012
"FEMA"	The U.S. Federal Emergency Management Agency.
"FIMA"	The Federal Insurance and Mitigation Administration that manages the National Flood Insurance Program
"FIRMs"	Flood Insurance Rate Maps
"HRO"	New York City Housing Recovery Office
"HUD"	U.S. Department of Housing and Urban Development
"NFIP"	The National Flood Insurance Program
"ORR"	NYC Mayor's Office of Recovery and Resiliency
"PACE"	Property Assessed Clean Energy. PACE is a means of financing energy efficiency upgrades or renewable energy installations for buildings.
"Tasks"	Tasks specified as part of the Services to be rendered by Consultant under this Contract.

BACKGROUND

I. Background

In July 2012, Congress passed the Biggert-Waters Flood Insurance Reform Act of 2012 (BW-12). BW-12 required changes to the National Flood Insurance Program that were intended to strengthen the financial solvency of the program by eliminating subsidies for certain classes of structures. Shortly thereafter, Hurricane Sandy struck New York City. In addition to causing damage and loss of life, Hurricane Sandy revealed New York City's vulnerability to flooding and exposed the low-penetration rate of flood insurance throughout the city.

New York City is deeply concerned about the increase in flood insurance premiums and the resulting implications for home ownership affordability and neighborhood stability. Premiums are increasing due to two factors: The first is rate changes that result from the implementation of BW-12 and the second is the expansion of the floodplain, as seen in FEMA's updated Preliminary Flood Insurance Rate Maps (FIRMs) released in December 2013. The new maps do not have an immediate impact on flood insurance requirements. However, the final FIRMs, likely to go into effect in 2016, are expected to be consistent with the Preliminary FIRMs and will expand the floodplain to nearly double the number of structures, triggering insurance purchase requirements for many New Yorkers.

In February 2013, New York City launched a study to determine flood insurance coverage, take-up rates, and average premiums in New York City prior to Sandy and to understand how rate increases due to BW-12 and the floodplain expansion will impact homeowners. The study, "Flood Insurance in New York City Following Hurricane Sandy," was completed by the RAND Corporation (see Attachment A for a Complete Summary of the Study).

Findings from the analysis indicate that the NFIP is the primary source of flood insurance for one- to four- family homes in New York City, many of which were built prior to the adoption of flood protection standards in the City's Building Code (*i.e.*, "pre-FIRM" structures). Specifically, 55 percent of one- to four-family structures in the high-risk zone of the 2007 FIRM had flood insurance. Among those homes with a federally-backed mortgage, and therefore subject to the mandatory purchase requirement, the take-up rate was 65 percent. According to RAND, the rising costs of premiums are likely to be unaffordable for many homeowners and small businesses in coastal neighborhoods. Further, increased premiums may lead to a decline in the value of homes, potentially resulting in foreclosures and relocation.

On March 21, 2014 the President signed the Homeowner Flood Insurance Affordability Act (H.R. 3370) into law. While this bill will change the number of years between now and when most New Yorkers will be required to pay full-risk rates, the bill will not change the eventual rate increases for property owners, particularly for those who will not qualify for yet-to-be-defined affordability measures such as a means-tested voucher.

Therefore, the work remains as critical as ever to ensure the long-term viability of New York City's flood-prone neighborhoods.

SERVICES

I. Summary

Rates have already begun to increase as some provisions of BW-12 have been implemented. It is, therefore, imperative that New York City move quickly to understand the impacts on residents and to develop solutions. To accomplish these goals, the City will undertake the next phase of analysis to determine, collect and/or analyze:

- a. A statistically significant sample of one- to four-family structures in the floodplain.
- b. Elevation data of structures in the floodplain for a statistically significant sample determined in (a) and needed to assess item (c) below. (Some elevation data may be available from the New York City Housing Recovery Office; additional data may need to be collected.)
- c. The economic impact of increased flood insurance rates on individual homeowners and at-risk neighborhoods.
- d. Options to encourage risk reduction (e.g. mitigation measures) and address the affordability challenges for property owners throughout the floodplain that could be adopted at the federal, state or city level.

The City is requesting the following Tasks be completed by a consultant (or team of consultants).

II. Tasks and Deliverables

Task 1: Define a statistically significant sample of one- to four-family homes across the 100-year floodplain indicated on FEMA's Preliminary FIRMs for New York City.

The Consultant will define a sample mix that varies by building type, flood insurance status, location in the 100-year floodplain pre- and post-map update, and socio-economic characteristics, e.g.:

Building/construction type

- Building age (pre-FIRM or not)
- Construction type (e.g., attached row-house/masonry construction)

Flood insurance and risk information

- BFE for existing FIRMs
- BFE for Preliminary FIRMs
- Current flood insurance premiums
- Other possibly relevant characteristics (e.g. assistance received as a result of Sandy).

Financing and ownership

- Mortgage status
- Mortgage balance
- Owner-occupied or rental
- Primary residence or not

Socio-economic and demographics

- Household income
- Household size
- Owner age
- Owner ethnicity

The Consultant should work closely with ORR to align on data sources to ensure sufficient reliability and level of detail. ORR will provide the Consultant with access to detailed tax lot data that includes building and land use data from the Department of City Planning's PLUTO database; building level data from HRO on building characteristics and damage, as well as household characteristics; tax lot data from the Department of Finance on assessed values, existence of a mortgage, and tax revenues; and shapefiles of the effective FEMA FIRMs and Preliminary FIRMs.

The purpose of this task is to select an appropriate sample given analysis goals and budget constraints.

The Consultant may be asked to present its approach and interim findings to a study advisory committee including relevant city, state, federal and related stakeholders for their input and feedback.

Task 1 Work Plan

Study Sample Size

To develop an estimate of the number of one- to four-family structures needed in the study sample, the Consultant will assume a distribution of the flood insurance premiums for the one- to four-family structures in the high-risk areas of the PFIRM for New York City. This distribution is grounded in data presented in Dixon et al., 2013, and is presented in Table 1.1. It should be noted that the flood insurance premium estimates in the last two columns of Table 1 are very rough estimates and are used only to calculate a required sample size for the study.

¹ Dixon, Lloyd, Clancy, Bender, Kofner, Manheim, Zakaras, *Flood Insurance in New York City Following Hurricane Sandy*, RAND, RR-328-NYC, 2013.

Table 1. Range of Premium Costs by Water Depth for the 100-Year Storm

Difference Between BFE and Grade (feet)	Number of Structures	Percentage of Structures	Flood Insurance Premium Cost (dollars)	
			5 th percentile	95 th percentile
0 to 1	10,350	23	1,000	7,500
1 to 3	17,100	38	3,100	9,500
3 to 5	10,800	24	8,000	14,000
5 to 8	4,500	10	12,300	18,000
>8	2,250	5	15,000	25,000
Total	45,000	100	--	--

The roughly 45,000 one- to four-family structures in the high-risk zones of the PFIRM are broken down by water depth for the 100-year storm (difference between base flood elevation (BFE) and grade). Within each of these water-depth categories, a plausible distribution of flood insurance premiums for the structures in that category is assumed. The Consultant will assume that premium rates within each water-depth category follow a bell-shaped curve, with 5th and 95th percentile as indicated in the last two columns of Table 1.

The measure of affordability the Consultant will use in this sample-size analysis is the percentage of households *in each income category* for which the flood insurance premium is less than or equal to 10 percent of the household income.² Based on Census data, the distribution of household income (for owner-occupied households) in the high-risk areas of the PFIRM is assumed to be as shown in Table 2. The distribution of income in each income category is assumed to be right-skewed with mean equal to the midpoint of the income range shown in Table 2. Because household income will not be available for each structure in the sampling frame, the Consultant will assume that the distribution of income categories is approximately equal across water-depth strata in Table 1.

Table 2. Household Income Categories in the High-Risk Areas of the Preliminary Work Maps for New York City

Household Income	Percent of Households
<\$50,000	23
\$50,000 to \$75,000	15
\$75,000 to \$150,000	31
<\$150,000	31
Total	100

Source: Dixon et al., 2013

² Lower cutoffs may be appropriate for the affordability analysis, but 10 percent is an acceptable assumption for this sample-size analysis. Affordability criteria are discussed under Task 3.

Based on these assumptions, a sample size of 525 will be needed to determine the percentage of households in each income category for which the flood insurance premium will be less than or equal to 10 percent of household income with a margin of error of +/- 5 percent. For example, if the point estimate for households with income between \$50,000 and \$75,000 is 70 percent, then a sample of 525 would allow us to state with 95 percent certainty that between 65 percent and 75 percent of the households in this income category will pay 10 percent or less of household income for flood insurance.

The above analysis will be done for each income category across the high-risk areas of the PFIRM as a whole. The Consultant shall also do analysis to understand how affordability varies across neighborhoods in the PFIRM. More disaggregated analysis requires a larger sample size, and the Consultant will estimate the number of observations needed for each subarea selected for analysis. Given overall budget constraints, the Consultant proposes a sample size of 550, which will allow the Consultant to develop estimates for 5 to 10 sub-regions of the high-risk areas of the PFIRM. Note that these sub-regions together will span the entire high-risk area of the PFIRM and thus will be aggregations of the areas traditionally identified as New York City neighborhoods. However, ORR and other City agencies may guide the Consultant to assess fewer neighborhoods of concern, but with greater precision.

The 550 figure refers to the number of structures for which the Consultant will collect elevation data (discussed under Task 2). Some households will likely refuse to participate in the study, and to account for non-response, the Consultant will initially select 1,400 structures for inclusion in the study. Up to an additional 1,400 structures will be added if initial survey response rates indicate that a sufficient number of responses will not be received from the initial 1,400 selected structures.

Sample Selection

With input from ORR and other city agencies, the Consultant will divide the high-risk areas of the PFIRM into between 5 and 10 (or fewer) subareas or neighborhood groupings. The division into subareas (or neighborhood groupings) will be aided by Census data on income, ethnicity, and other factors. Using data from the City's Primary Land Use Tax Lot Output (PLUTO) database and other sources, each one- to four-family home in the high-risk areas of the PFIRM will be categorized according to subarea and water depth during the 100-year storm. A stratified sampling approach will then be used to select an initial sample of 1,000 structures, with subarea and water depth categories combining to form the strata. Within each stratum, the structures will be randomly selected.

The random sampling approach will allow estimates of the prevalence of household characteristics, including household income, household size, mortgage status, owner vs. renter occupied, primary vs. second residence, mitigation characteristics such as elevated electrical equipment and structure characteristics such as construction type.

Sample Weights

The Consultant will derive sampling weights for each sampled structure to be used in their estimation procedures. These weights will be equal to the inverse probability of a

household's selection, given its BFE and location. Weighted estimation is a common methodology in survey analyses to obtain population estimates of interest (i.e. estimates of premium affordability for NYC) from data obtained with a complex survey design.

Task 1 Deliverables

The following deliverables will be provided for Task 1:

A statistically-significant sample of structures to be used to determine the economic impact of increased insurance premiums. A chapter in the final report documenting the data and procedures used to select the sample with sufficient information to guide the replication of the analysis in their report. The chapter will also describe the rationale and procedures used to determine the 5 to 10 subareas, or neighborhoods groupings, used to select the sample.

Task 2: Gather structure elevation data and other supplemental data, as needed, for a statistically significant sample of one- to four-family homes.

The Consultant should gather structure elevation data and other supplemental data, as needed, for a statistically significant sample of one- to four-family homes including:

- Structure elevation
- Elevation of the first floor that can be occupied
- Location of electrical/mechanicals
- Existence of a basement or cellar
- Number of floors at or above ground level
- Other information relevant for assessing risk-based premiums

Given the extent of data required the Consultant may choose to produce a full elevation certificate for each of the structures in the sample.

In addition to structure elevation and other structure characteristics needed to issue an elevation certificate, the Consultant will collect demographic information on each of the households in the sample. The Consultant will collect a short list of household characteristics so as not to add much burden to study participants.

The Consultant team will reach out to the property owners identified in Task 1 in an effort to ensure that elevation surveys are completed in a timely manner. In addition to providing the elevation data developed during this task, the Consultant team will deliver a spatial dataset that includes all socio-economic, financial, and qualitative data associated with each structure studied through this task in a relational geodatabase.

Task 2 Work Plan

Identify Property-Owner Targets/Letter Recipients

The Consultant will work with the City to compile and finalize a list of property owners and associated contact information. Up to 2,800 property owners across New York City's five boroughs will be targeted to participate in this project. It is anticipated that the Consultant will initially work with a sample of 1,400 properties with the goal of reaching

550 completes. If the response rate is not adequate for these 1,400 properties, up to an additional 1,400 properties will be targeted to participate in the study.

Develop Language for Property-Owner Letter

The Consultant will draft a property owner letter and then will solicit feedback from the City in order to produce the final version. The letter will include information about the study, why it is important to New Yorkers, and how it's being conducted. It also will include information about the incentives for participation in this study. Incentives will include:

- A \$50 gift card. The Consultant will explore the best set of gift-card options to offer potential participants, purchase the cards, and set up a system to track and distribute them.
- An Elevation Certificate for the respondents who complete the on-line survey and allow a land surveyor to visit the property and collect data on the structure.
- A one-page factsheet about flood risk for each property. This factsheet will help property owners to better understand their flood risk and will include information about flood zone type, Flood Insurance Rate Map (FIRM) terminology (e.g., base flood elevation (BFE)), structure elevation in relation to the BFE, the usefulness of an Elevation Certificate, and flood insurance premium rates. This factsheet will complement the City's Consumer Education campaign to inform New Yorkers about flood risk and flood insurance purchase requirements.

Develop and Manage Communication and Outreach with Property Owners

Coordinate Contact with Property Owners

The Consultant will work with the City to enroll the targeted property owners in the study in three different ways.

1. Mail Outreach. Initial contact will be made through a mailed letter, with a follow up letter to those who do not respond to the first letter. The Consultant Team will work with the City to ensure that the letter is written on City letterhead and mailed in accompanying envelopes. Contact information for each property owner will be supplied by the City and/or by the Build it Back program database. The Consultant will work with an external vendor, if necessary, to conduct the mail merge and mailing.
2. Phone Outreach. The Consultant will purchase phone numbers for the targeted property owners from a commercial service and attempt to enroll property owners who do not respond to the mailings by phone. Three attempts will be made to contact each property owner. The purpose of the study will be outlined and the benefits of participating, both to the individual and the community will be described. The option to complete the on-line survey over the phone will be provided. Translation services will be made available.
3. Door-to-Door Outreach. Based on the results for the mail and phone outreach, the Consultant will assess the representativeness of the existing respondents and will attempt to enroll invitees in person as a way to correct for any response bias. For example, if low-income residents are underrepresented, the Consultant will target the door-to-door outreach so as to increase representativeness of low-income residents. The Consultant will set up a program for door-to-door outreach using

community based organizations (CBOs) in the study areas. Up to 900 properties will be selected for the in-person outreach, and CBO staff will make three attempts to talk with the owner of each of these properties. CBO staff will describe the study, encourage the owners to participate, and will carry mobile devices that allow the study survey to be completed during the site visit.

Establish and Manage a Dedicated Project Email Account and Helpline

The Consultant will create and manage an email account dedicated to this project. The email address will be coordinated with the City and will be relevant to the project (e.g., info@floodaffordabilitystudyNYC.org). Management will consist primarily of responding to email inquiries. The Consultant will respond to emails sent to this designated email address within 24 hours of receipt. The Consultant will also establish and staff a telephone helpline for the project. A toll-free number will be acquired, and the Consultant will staff the helpline during business hours and some evenings when the survey is active. The Consultant will provide callers with the option to complete the on-line survey over the phone. Real translation services will be available for the callers.

Develop an On-Line Survey for Property Owners Participating in Study

Data on household demographics and finances will be collected via an on-line survey of study participants. A survey instrument will be developed and programmed that seeks information on the following:

- Household income (in ranges)
- Household size
- Ethnicity
- Age of owner
- Costs of utilities including electricity, natural gas, water and sewage, and fuel
- Monthly mortgage payment and mortgage balance
- Cost of insurance purchased on the property and whether flood insurance is purchased
- Rental income on property
- Whether the property is a primary residence, secondary residence, or not occupied by the owner.
- Structure characteristics such as year built, number of floors, and number of housing units

The survey questions will be developed by the Consultant with input from ORR. For renter-occupied units, questions on renter demographics will be asked when feasible. For those cases in which there is more than one renter-occupied unit in the structure, the demographics of only one renter household will be sought.

The Consultant will make the survey available in the primary languages spoken in the high-risk flood zones of New York City. The Consultant will use information collected by Build It Back on primary languages spoken in zip codes within the high-risk flood zones. The survey will be made available in up to five languages, including English.

Develop a Web Site for the Study

The Consultant will develop a web site for the study. The website will describe the study, provide answers to frequently asked questions, and list resources for more information. The on-line survey will also be available on the web site. The Consultant will select and register a domain name for the website. The content on the web site will be available in up to five languages.

Develop and Manage Survey Site Visit Scheduling Process

In order to maximize efficiency, the Consultant will identify date and time ranges for on-site survey visits for each targeted neighborhood in New York City. The Consultant Team will offer property owners several one-week periods, each with a variety of times, for on-site survey visits. These date and time range offerings will include evenings and weekends to accommodate property owners' schedules. Property owners will select preferred date and time slots through an online questionnaire, which will also solicit contact information. Once the final dates and times for each neighborhood have been set, property owners will then be notified via email of the final date and time for their on-site survey. The day before the scheduled site visit, the Consultant will call property owners to confirm the visit. The Consultant will provide property owners who cannot make any of the date and time ranges with the option of emailing or calling the Consultant to make alternate arrangements.

Once the on-site survey visits have been scheduled, the Consultant will use logistics software to optimize routes for the survey teams each day. This information will deliver the survey teams their work package for on-site data collection. The software will use travel times and average site-visit times (which can be modified by the Consultant Team) to determine the number of sites that can be visited by each survey team. Next, a route will be outputted for each team, along with a projected timeline to visit each site. This will be exported from the software into a GPS-friendly format that will be emailed to each team and accessible via field iPad GPS software. This entire process will take approximately 15 minutes, which is significantly less time than it takes to manually assign work and calculate routes in the field. This software is similar to routing and tracking programs used by FedEx.

Collect Structure Elevation Data

The Consultant will leverage a tested system for collecting the information required to issue ECs. The steps within this system are as follows:

1. *Gather Preliminary Data.* This includes data about the property from various sources including address, borough, block and lot, geographical location, historical topographic data near the property, FEMA information such as flood zone, flood map number, and NFIP Community, etc. The subject property is digitized in GIS and all data are entered into forms in a related MS Access database. Much of the data can be determined through GIS spatial analysis using the building footprints, effective FIRMs, and available City LiDAR data.
2. *Collect Field Data.* A trained technician will be sent to the field with a form to fill out and checklists to follow. First, elevations will be established near the site using survey grade GPS (accuracy within 0.2'). A minimum of two elevation benchmarks will be set and a barometric level will be used to verify the elevation

difference as a quality check. The technician will examine the structure to identify the features that must be identified such as building diagram, existence of garage, crawlspace, etc. The technician will use the barometric level to measure elevations at key points around and inside the structure. The elevations will be recorded in an iPad or on paper notes. The required photos will be taken around the property and at key points in the structure.

3. *Process Data Back at the Office.* The technician will return to the office and enter all necessary data into the Access database. All field work and data entry will be reviewed and checked by a NY State licensed Land Surveyor. Once the data entry is complete and approved by one of the Consultant's Land Surveyors, a complete elevation certificate will be printed with the appropriate data, dates, and signatures. The EC will be e-mailed to the property owner if necessary. If a LOMA will help the owner reduce flood insurance, the Consultant will go onto FEMA's Mapping Information Platform website, log on and enter the information for the LOMA. The Consultant will usually get the LOMA entered and approved within 15 minutes.

This system will enable the Consultant to perform about 4 ECs per day, start to finish with one field technician, and associated office support. Here are the steps the Consultant will take:

1. Receive sites approved for elevation survey from Task 1. The Consultant will be responsible for getting permission from the residents to enter their property. The Consultant will send the approved locations in GIS format. The Consultant will use this data to perform Task A described above.
2. The Consultant will set up the ESRI Collector app to have input fields for the data features. ESRI Collector is linked to ArcGIS Online (AGOL) cloud, where the data will reside as they are being collected. The Collector app can be downloaded for free on any iOS or Android device. The user will be given a login that provides access to the appropriate AGOL web map.
3. The field technician will open the app, log in, and start entering information as it is captured. The app will also show the technician what sites to go to, and provide driving directions to the next appointment. This step covers Task B described above.
4. The Consultant team will watch the data being collected from a customized dashboard back in the office to monitor live progress.
5. The Consultant team will have a detailed Geodatabase set up throughout the life of the project. The data collected in the field will be simply set up because the Collector app only allows each feature recorded to be linked to one attribute table. This is fine for the data collection, but in order to manipulate the data in the more detailed Geodatabase for data analysis, the Consultant will have to periodically pull the data from the AGOL cloud and import it into the Geodatabase. Then the data will be manipulated and related to the rest of the database schema. The Consultant will perform this pull down/import at least once per week as data are being collected.

6. The field data will also be imported into the Consultant's Access database for final review, checks, and EC generation according to the process described earlier. This covers Task C above.

The Consultant will need approximately six survey technicians, one GIS Project Manager, and one Licensed Land Surveyor working on this project in order to survey 550 properties in 4-6 months.

Collect Structure Mitigation Data

In addition to the information collected during the site visit for a normal Elevation Certificate, the Consultant will also collect information that provides insight into the feasibility and cost of flood mitigation measures. The Consultant will review available reports on mitigation measures and develop questions that will be included in the site visit. The following are examples of the types of information that might be collected:

- the number of openings below the base flood elevation of the preliminary flood insurance rate map
- the number of party walls
- basement usage
- structure construction materials
- number of housing units in the overall structure to which the subject property is connected (e.g. number of units in connected row houses).

The mitigation-related information collected during the site visits will inform the analysis of the types of mitigation measures that are feasible in New York City and bolster recommendations for this crucial aspect of the project.

Manage and Quality Check Surveyor's Data Collection Process and Data

The Consultant will ensure that data collection is done appropriately and accurately. The Consultant will accompany the field survey team during the first week of data collection and several times throughout the data collection process to ensure that elevation data acquired on-site occurs as scoped and on time.

Develop and Maintain Database Framework/Schema for Data Collection, Storage, and Analysis

The Consultant will design and develop a geospatial database to be used to store the spatial and non-spatial data needed for the project. The geodatabase design will be coordinated with the City to ensure compatibility with applicable existing City database schemas and domains. The Consultant will gather information about the City's database needs before design of the project data model begins and the Consultant will conduct a schema review with the City before the data model is finalized and populated. A geodatabase dictionary of the final project data model will be provided to the City.

Existing spatial and non-spatial data and/or data dictionaries applicable to the study will be assembled and reviewed prior to the development of the project data model. This will include the effective and preliminary FIRM Databases (SHP files); U.S. Bureau of the Census socio-economic and demographic data; building and land use data from the

Department of City Planning's PLUTO database; building level data from Housing Recovery Operations (HRO) on building characteristics and damage as well as household characteristics; and tax lot data from the Department of Finance on assessed values, existence of mortgages, and tax revenues. Additional data sources may include Build it Back database(s), mortgage data purchased from CoreLogic, NFIP flood insurance policy data, and existing Elevation Certificate data if digital. The database will support the selection of the structures to be included in the sample of one- to four-family homes, the establishment of flood insurance premiums, and the analysis of the economic impacts of premium increases and affordability options. Additionally, the existing City database schemas will be evaluated for layer properties, attributes, field properties, and domains to ensure that the geospatial database that is built for this project is informed by the existing data.

The project geospatial database will be centered on structure-specific data tied to the building footprint. The core attributes of the buildings will be those that are unchanged by any of the project analyses such as physical characteristics that may be available in existing databases and/or those that are collected on-site (e.g., year built, construction type, number of floors, number of units, elevation of lowest floor, lowest adjacent grade, etc.). Attributes of the buildings that may be variable for different study scenarios will be stored in non-spatial database tables linked to the building footprints. These tables may include sampling characteristics, on-site collection scheduling and status, FIRM scenarios (e.g., flood zone and BFE on effective, preliminary, and a projected 2020 or 2050 sea level rise scenario), flood insurance premium scenario inputs, flood insurance scenario outputs, and flood insurance affordability scenarios (e.g., higher deductibles, financing options, and mitigation options). Additional spatial layers will include parcels, neighborhoods, boroughs, and Census geographies (e.g., tract, block group, block) as necessary.

To maximize the efficiency of the on-site survey team, the Consultant will pre-process and pre-populate the geodatabase to the greatest extent possible.

Because the building characteristics needed for establishing flood insurance premiums may differ from those currently available in existing databases, the Consultant will coordinate with the City to ensure that any assumptions or crosswalks between attributes that are needed are fully vetted and validated. This will be a critical step, as flood insurance premium calculations are quite sensitive to building characteristics such as basement types and enclosure information.

The data model will also be developed such that logical consistency checks of data elements can be easily written and reported. An example of a logical consistency check would be that the lowest floor elevation of a building built as slab on grade should not be below the lowest adjacent grade. Certain types of logical consistency checks will be applied to externally provided data before the data are loaded into the project data model. Others may be developed and run after the data are assembled but before analysis begins. Still other consistency checks may be needed to validate study assumptions and logic as the analysis is performed and the results are reviewed. Data collected on-site will be

synched with the project geodatabase on a weekly basis while data collection efforts are underway. This will ensure that up-to-date project information is maintained at all times.

To the extent that personally identifiable information is included in existing databases or are generated as part of this study, the Consultant team will develop a data safeguarding plan that will outline the steps necessary to protect this data from public release. The Consultant's Human Subjects Protection Committee will oversee aspects of the project involving human subjects and their information. The data safeguarding plan outlines how the data will be collected and stored and requires limited access controls. Any sensitive data will be destroyed at the conclusion of the project.

Coordinate and Manage Information Input Process for Project Database

The Consultant will maintain a complete database of all property owner information. The Consultant will ensure that all qualitative data collected during the on-site survey visits are entered into the project database on a daily basis. This information will be entered into a relational table to be linked to the spatial geodatabase so that qualitative data and elevation data are available for each structure.

Conduct a Pilot Test of the Survey Outreach Strategy

The Consultant will test the survey outreach strategy on a sample of approximately 300 properties. The response rate to for this pilot study will be monitored, the quality of the data collected analyzed, and the survey materials and outreach strategy revised as appropriate.

Task Documentation

Project documentation will include a chapter in the final report that details the procedures, analysis, and results of the data collection process. A copy of the backup data used in the analysis will be provided to the City.

Task 2 Deliverables

The following deliverables will be provided for Task 2:

- A spatial database, in ESRI Geodatabase format, including surveyed elevation data and all associated aspatial data in relational aspatial data tables necessary to determine NFIP premiums
- A chapter in the draft and final reports documenting the procedures, analysis, and data collection methods.
- Any additional information utilized or generated during the data collection process.

Task 3. Evaluate Economic Impact of Premium Increases

This purpose of this task is first to determine flood insurance premiums for the structures in the sample. Flood insurance premiums will be determined for current conditions and future conditions when the new FIRMs are implemented and NFIP prices transition to

full-risk rates. In addition, analysis will be done on the plausible scenarios for the movement to full risk rates. For example, to gauge the longer-term effects of sea-level rise on owners of one- to four-family structures, flood insurance premiums for the structures in the sample will also be projected assuming the increases in sea-level rise that are anticipated by 2020 or 2050.

This task will also evaluate the economic impacts of premium increases. The economic impact of premium increases will depend on complex interactions between geography, the housing market, flood insurance take-up, household finances, mortgage lenders, housing assistance programs, and disaster relief programs. In order to predict the ultimate impact of premium increases on households, neighborhoods, and other stakeholders in NYC and beyond, it will be essential to apply a rigorous quantitative methodology that can account for the interactions of these various complex systems. The Consultant will combine the survey data collected in Tasks 1 and 2 with additional data from NYC government and other sources to build a microsimulation model that captures the impact of flood insurance premium increases on housing affordability and household financial decisions, including flood insurance take-up and mortgage default risk. This model will estimate how the changes in flood premiums will affect the full range of outcomes for each individual household in the sample, allowing the Consultant to provide representative estimates for the entire floodplain and for household income categories specified in terms of NYC area median income (AMI).

In light of the central role that community lending institutions will play in shaping the impact of these policy changes on neighborhoods, the Consultant will supplement its quantitative analysis by conducting semi-structured interviews with the financial institutions that do the most mortgage business in the high-risk areas and thus would be most affected by heightened mortgage default risk due to flood insurance premium increases. The Consultant will incorporate insights from interviews into the design of a microsimulation model, particularly the components that analyze mortgage defaults, conversion to rental units, and foreclosures.

In order to analyze the full range of economic impacts for the 5 to 10 subareas selected for analysis, the Consultant will incorporate additional sources of neighborhood-level structure and household data into our microsimulation model. Further discussion of this task is divided into three areas; economic impact of premium increases, lender interviews and impact on neighborhoods.

Task 3a Work Plan: Premium Increases and Their Economic Impacts

Using the elevation certificates generated in Task 2, the Consultant will generate flood insurance premiums for the one- to four-family structure in the sample. The Consultant will use a sub-contractor that FEMA has certified will accurately rate every possible scenario to determine flood insurance premiums.

The Consultant's primary tasks involved in creating premium quotes/estimates to support this project will be:

1. Using the 550 elevation certificates generated in Task 2 for the study sample, the Consultant will produce a NFIP premium quote using the current effective flood map and NFIP rate schedule for each of the structures.
2. Using the BFE and flood zone for each structure under the PFIRM, the Consultant will produce a NFIP premium quote for the full-risk rate for each structure in the sample corresponding to the PFIRM based on the elevation certificate used in the previous step and the new BFE and flood zone.
3. The Consultant will add x feet (x might be 0.5, 1, 2 feet) to account for future sea level rise to the BFE of the PFIRM and recalculate the full-risk rate. This rate will capture the effects of sea-level rise.

Definition of Housing Affordability

The Consultant will use a measure of housing affordability based on the ratio of housing costs to household income. It is important that the Consultant use a comprehensive measure of housing costs that includes insurance premiums and property taxes paid by homeowners in addition to mortgage payments: the most important short-term effects of NFIP changes on owner-occupied housing costs will operate through insurance and taxes rather than mortgage payment, because changes in house prices will not directly affect mortgage servicing costs. The Consultant will measure costs for homeowners as follows:

Owner costs = mortgage payments + property taxes + utilities + insurance premiums.

Our measure of housing costs for renters is defined as

Renter costs= contract rent + utilities.

The Consultant will measure housing costs corresponding to the concepts of Selected Monthly Owner Costs (SMOC) and gross rent measured by the Census Bureau in the American Community Survey (ACS) and reported at the block group level. The SMOC data include estimates of utility costs. This comparability will make it easier for the Consultant to incorporate ACS data on housing costs into the Consultant's subarea-level of analysis. SMOC and gross rent are also used in HUD's Local Affordability Index, which will facilitate comparisons between the Consultant's findings and figures reported by HUD for locations outside the study area, including other areas of NYC. Data on mortgage payments for the structures in the sample will be sought from CoreLogic. When monthly payment is not available, it will be extrapolated from CoreLogic data on mortgage amount and mortgage term combined with the typical interest rate at the time the mortgage was issued.

For both renters and homeowners, the Consultant's measure of housing expenditure will be the share of annual income spent on housing:

$$\text{Expenditure share} = \frac{\text{housing costs}}{\text{household income}}$$

The expenditure share is a direct measure of the financial burden housing costs place on households, and the Consultant will report the effect of NFIP changes on the average expenditure share. However, it will also be important to define a binary affordability measure to summarize the extent of the affordability problem caused by NFIP changes. The Consultant will follow HUD's criteria for housing assistance in defining households with an expenditure share above 30% as cost-burdened and defining households with an expenditure share above 50% as highly cost-burdened. The 30% threshold is widely used by analysts. It is also used as an eligibility criterion for federal housing assistance programs. This concept of affordability will enhance the comparability of the Consultant's findings to other studies.

Affordability measures used by HUD and others seem to ignore tax-deductibility, but this issue is important for the Consultant's analysis for at least two reasons. First, mortgage payments and property taxes are deductible from federal income taxes, while insurance premiums are not. The impact of a given premium increase on a household's after-tax purchasing power therefore depends on which tax bracket the household is in, which is in turn a function of income. Second, insurance premiums are tax-deductible for landlords as a business expense. Impacts on household budgets and conversions of owner-occupied units to rental units may therefore be sensitive to income tax rates. The Consultant will assess how to include these considerations in the Consultant's microsimulation model.

Impacts on Owner-Occupied Housing: Property Values, Tax Revenues, Flood Insurance

Take-Up

For homeowners, flood insurance premium increases will affect affordability and other outcomes through several distinct channels simultaneously. In order to determine the affordability impact of flood insurance premium increases, the Consultant will have to model the impact of premium increases on property values, property taxes, and flood insurance take-up. Besides being important in their own right, estimates of these outcomes will allow us to quantify impacts on city tax revenues and city and federal exposure due to unmet disaster needs arising from lack of insurance.

The most direct impact on housing costs for homeowners is simply the increased cost of flood insurance. Previous research suggests that annual premium increases of \$5,000 to \$10,000 may be widespread. These increases are potentially large relative to mortgage, property taxes and other components of housing costs: for NYC as a whole, median owner costs (defined comparably to the measure of costs) were \$21,420 per year over 2008-2012.

Property Values

In addition to the direct effect of higher premiums on household budgets, economic theory predicts that future changes in flood premiums will be capitalized into house prices. Theory and some evidence suggest that house prices will fall by the net present

value of all future flood premiums. In this "full capitalization" scenario, a house facing an immediate \$5,000 annual premium increase with a 5% interest rate would see its value reduced by \$100,000 as soon as buyers became aware of the change in premiums. The Consultant's base case will assume full capitalization of flood premium increases under the current NYC average mortgage interest rate, so the Consultant will model the change in house prices as

$$\text{Future house price} = \text{Current house price} - \alpha \frac{\Delta \text{flood premium}}{\text{interest rate}}$$

Where *future house price* refers to the house price after the PFIRM is adopted and flood insurance prices move to full-risk rates. Current house price refers to house price given the current flood insurance rate map and NFIP pricing practices.

Under full capitalization, $\alpha = 1$. While some studies find evidence for full capitalization, house price impacts higher or lower than those implied by full capitalization are also consistent with economic theory under different circumstances. Price impacts may be larger than full capitalization ($\alpha > 1$) if perceptions of uninsured flood risk increase at the same time as flood premiums. However, price impacts may be less than full capitalization ($\alpha < 1$) if buyers do not intend to purchase flood insurance. The Consultant will perform sensitivity analyses that vary the capitalization rate over a range of values suggested by the empirical literature.

The Consultant's analysis will estimate the impact of moving to full-risk rates as well as the impact of various plausible transition paths to full-risk rates.

Property Taxes

Changes in house prices will affect property taxes, which has implications both for housing affordability and for NYC finances. In general, reduced market values due to capitalization of flood premium increases will tend to reduce assessed values. In most cases, reduced market values should lead to reduced property taxes, offsetting some of the burden of premium increases. However, the relationship between changes in market value and changes in assessed value depends on a property's history of market value increases because NYC limits year-to-year increases in the assessed value. The Consultant will therefore use tax lot data on both market and assessed values to calculate year-by-year property tax changes, and the Consultant will carefully review NYC Finance Department rules to ensure that our microsimulation model captures the provisions of the property tax.

Flood Insurance Take-Up

The impact of flood insurance premium increases on housing affordability will depend on flood insurance take-up. The Mandatory Purchase Requirement (MPR) requires all homeowners in the FEMA regulatory floodplain with a federally-backed or insured mortgage to carry flood insurance, but this mandate is not perfectly enforced. Recipients

of FEMA assistance and Community Development Block Grant monies are also required to purchase flood insurance. Two groups of homeowners that are not subject to the MPR include: (1) those who have paid off their mortgage, and (2) those who have mortgages from state-regulated or private lenders. Previous research reported a take-up rate of 55 percent for the NYC floodplain overall, and 65 percent among properties with mortgages.

The Consultant will draw on estimates from past studies to model homeowners' flood insurance take-up decisions. The results of the take-up model will affect homeowner costs as well as unmet disaster needs that may lead to city, state, and federal spending after future flooding. To predict unmet disaster needs, the Consultant will request data on flood damage during Sandy from NYC's Build it Back program. This data will allow the Consultant to predict flood damage as a function of structure elevation, allowing us to simulate how flood insurance take-up would affect the magnitude of uninsured damages under selected flood scenarios. Build it Back damage assessment data will also be evaluated to suggest possible "partial" mitigation options if patterns emerge to show certain pre-storm housing characteristics resulted in less damage than others.

Mortgage Default and Foreclosure Risk

Foreclosure rates in NYC are high relative to other areas in the Northeast and have trended upward in recent years despite the nationwide economic recovery, and so an emphasis on default and foreclosure risk in this research is well-motivated. Declines in house prices and problems with affordability can increase the risk of mortgage default and foreclosures. In theory, negative equity is a necessary but not sufficient condition for mortgage default and foreclosure. (A homeowner with positive equity who is unable to meet his mortgage obligations would do better financially by selling the house and paying off the mortgage than by defaulting.) Even homeowners who have negative equity at a point in time may not default, however. Besides any direct costs to the homeowner (such as stigma or poor credit), the homeowner gives up the opportunity to profit off future house price increases. A recent study using data from Massachusetts reports a default rate of only 7 percent among homeowners with negative equity. However, that study found that homeowners with more negative equity positions posed much greater default risks. The applicability of these findings to New York City will be evaluated.

The "double trigger" theory of mortgage default holds that defaults occur when a homeowner with negative equity experiences another adverse life event (e.g., divorce, illness, job loss) that degrades his/her ability to afford his mortgage obligations. Under the double trigger theory, flood insurance premium increases are particularly worrisome because they are likely to reduce housing equity and substantially increase ownership costs at the same time. The Consultant will therefore need to understand the housing equity positions of homeowners in the flood plain prior to NFIP changes in order to assess how flood premium increases affect default risk. Combining the Consultant's estimated affordability impacts with information on which households would experience negative equity as a result of flood premium capitalization will enable the Consultant to

identify the households at highest risk of default and foreclosure as a result of NFIP changes.

The Consultant will have to calculate housing equity for the households in its sample in order to predict default and foreclosure risk. Using tax lot data on market values and mortgage data from CoreLogic, the Consultant will define housing equity for the structures in its sample as the difference between the market value and the outstanding balance on the mortgage:

$$\text{Equity} = \text{Value} - \text{Mortgage Balance.}$$

After calculating current housing equity, the Consultant will predict future housing equity by subtracting the capitalized cost of increased flood premiums from the current house price. As an intermediate output, the Consultant will calculate the fraction of homeowners who move from positive to negative equity as a result of NFIP changes.

In order to quantify the increase in default risk, the Consultant will specify a model of the default decision. In addition to a homeowner's equity position, important determinants of default include homeowner borrowing costs and expectations of future house prices. Although expectations of future house prices are difficult to measure, the nature of the flood premium increases makes it credible to model the effect of NFIP changes as a permanent decrease in the level of housing value that does not affect any perceived trends in housing value.

Ideally, the Consultant will use historical data on house prices, homeowner characteristics, mortgage rates, defaults and foreclosures in NYC neighborhoods to model the probability of default as a function of these determinants. If such data are not readily available, however, the Consultant will model default risk using parameters estimated in other contexts from the literature.

The Consultant's model will produce individual-level predictions of the change in default risk for the households in its sample. In order to estimate bank exposure and federal exposure due to foreclosure, the Consultant will combine its estimated default and foreclosure probabilities with information on the probability that mortgages are federally insured.

Impacts on Renters

For renters, there may be no direct short-run impact from increases in the flood insurance premiums paid by the landlord. In the longer run, however, renters may experience indirect impacts from NFIP-induced changes in the equilibrium between the rental and owner-occupied markets. The effects of these changes on rental affordability are unclear, however, because several offsetting effects will take place. On the one hand, NFIP changes could make homeownership unaffordable to current neighborhood residents and less attractive to potential homebuyers, which would increase demand for rental housing.

On the other hand, the supply of rental housing could either increase or decrease, and net supply increases would have the potential to undo any rental shortages or rent increases due to NFIP changes. Reductions in the attractiveness of homeownership may lead to one- to four-family structures being converted to rental units, increasing rental unit supply. However, flood premiums may decrease the profitability of new development in the flood plain, potentially slowing the growth of new housing units. Finally, all these effects will be modified by NYC's rent control policies.

Policy Interactions: Income Taxes, Housing Assistance, and Mortgage Relief

Interactions between NFIP changes and other pre-existing public policies are likely to be important to fully understanding the impacts on households and neighborhoods. In particular, federal tax policy and other housing policies will lead to different affordability and default risk impacts on differently situated households. The Consultant will confer with HUD and the City to identify other important housing assistance policies and build these into its microsimulation model. Besides providing the most accurate possible picture of affordability and neighborhood impacts in the current policy environment, building housing assistance policies into the model will enable analysis of new policy options as requested in Task 4.

Task 3b Work Plan: Lender Interviews

The Consultant will conduct semi-structured interviews with lenders about perceptions of NFIP changes and their impact on current and future foreclosure risk and the neighborhoods or types of mortgage holders most at risk from such changes. During these interviews the Consultant may also probe some of the policy options such as mitigation financing and the triggers necessary for mortgage modifications. The Consultant will develop the list of interview participants and develop the interview protocol and facilitate the interviews, building on the questions such as:

- Where are mortgage amounts highest relative to current market values and incomes?
- Where are banks experiencing defaults?
- How are banks responding?
- Are banks initiating foreclosures?
- What is happening to foreclosed properties? Are they being resold to new owner-occupants or becoming rental properties?

The Consultant anticipates conducting 7-12 interviews with banks and other lending institutions.

Task 3c Work Plan: Neighborhood Impacts

Neighborhood-specific analysis will be critical to understanding the real impact of NFIP changes on NYC. The most important influences on the impact of the changes (geography/topography, housing stock characteristics, household demographics and

economic status) are likely to be unevenly distributed across neighborhoods but highly correlated within neighborhoods. Even if impacts on the average SFHA household are modest, some neighborhoods could be destabilized.

Unfortunately, collection of data on a sample large enough to deliver neighborhood-specific impacts for all affected neighborhoods would be prohibitively expensive because NYC has so much built coastline. A visual comparison between the PFIRM and a map of NYC community districts suggests that at least 20 (and perhaps over 30) of the city's 59 community districts contain land in the high-risk areas of the PFIRM. The Consultant, based on input from the City, will break out its findings on the economic implications of NFIP premium increases for the 5 to 10 (or fewer) subareas used in the analysis.

The Consultant will also explore whether to extrapolate its findings to community districts or other neighborhood groupings. The Consultant will combine its microsimulation model with secondary data sources to explore whether to estimate neighborhood-specific impacts. Specifically, the Consultant will use geocodes and structure characteristics from NYC planning department's PLUTO database, property values from the NYC Department of Finance, mortgage data from CoreLogic along with demographic and income data at the census block group from the ACS 5-year estimates program. While the Consultant will not deduce the flood insurance premium increase for a given structure without performing a site visit, the Consultant will model the empirical relationship between structure characteristics observed in the PLUTO data and flood premium increases for the structures the Consultant surveyed in Tasks 1 and 2. The Consultant will use this model to predict premiums for all the one- to four-family structures in the floodplain. The Consultant will assess whether to use the projections to report findings at a more disaggregated level than the 5 to 10 subareas used in the data collection process.

Task 3 Deliverables

The following deliverables will be provided for Task 3:

A chapter in the draft and final reports documenting the magnitude of the affordability challenge for one- to four-family homes due to flood insurance premium increases across New York City's 100-year floodplain.

The report will include analysis of how premium changes will impact:

- (i) property value
- (ii) take-up rates for flood insurance
- (iii) risk of foreclosure, and
- (iv) change in tax revenue for property at the household level and city level.

Additional analysis to estimate the percent of homes in affected areas that would be at substantially heightened risk of default will also be presented.

Task 4. Analyze Mitigation Financing Tools and Affordability Measures

Building on the findings from Task 3 about affordability challenges, the Consultant team will identify and evaluate a range of policy options that could help property owners reduce risks and make insurance premiums more affordable. The Consultant will consider a range of options, including but not limited to (i) mitigation financing, (ii) means-tested vouchers, (iii) increased deductibles, (iv) “partial” credit mitigation approaches and (v) financial solutions for reduced property values (where not restored through mitigation). The analysis will proceed by addressing the following topics:

- Define and evaluate potential mechanisms to deliver financial assistance to those in need
- Anticipate take-up rates among New York City residents for each option; size the potential costs of the programs; and evaluate impact for different scenarios
- Assess the feasibility of implementation and develop the work plan for implementing the two to three most feasible solutions

Additionally, for specific subareas of the high-risk areas where risk reduction is found to be particularly challenging, the Consultant team will identify strategies for reducing the scale of economic and social disruption.

Task 4 Work Plan

Defining and Evaluating Potential Mechanisms

The Consultant will evaluate a number of potential mechanisms for mitigating risk and reducing the financial impact of increased flood insurance premiums (summarized in Table 3). The Consultant team will review relevant similar programs and conduct interviews with organizations implementing them (including HUD, New York Green Bank, New York’s Property Assessed Clean Energy (PACE) program, the City, FEMA and various banks). The interviews will cover topics such as means-testing/eligibility criteria for their existing programs, program take-up rates, administration costs, and methods employed to reach out to households.

Table 3: Potential Mechanisms To Be Used as a Starting Point for Task 4 Research

Type	Examples
Mitigation financing	HUD’s Section 203(k) program for the rehabilitation and repair of single family home; or New York Green Bank, a new division of New York State Energy Research and Development Authority; or Loans coupled with New York’s Property Assessed Clean Energy (PACE) program provided through Energize NY
Means-tested voucher	Delivery of vouchers through FEMA or HUD
Increased deductibles	City and/or FEMA to cover the first layer of loss
Financial solutions for reduced property values	Mortgage workouts with banks

Additionally, the Consultant will conduct interviews/brainstorming sessions with others such as academics and community resilience experts to identify new ideas or new processes that should be considered. The interviews will form the basis of the Consultant

team's analysis of options for addressing affordability challenges as well as for exploration of the advantages and disadvantages of each option.

The alignment of the options with the goal of encouraging risk reduction will be assessed as part of this work. For example, a major concern about the means-tested voucher program is that it would distort the price signal that motivates property owners to invest in risk-mitigation measures. To address this concern, proposals have been made to couple a means-tested voucher program with a mitigation loan program, thereby inducing structural improvements that make sense for the property. The Consultant will draw on this literature and on the survey findings that provide insight into the cost and feasibility of different mitigation measures. Examples of such mitigation measures include elevating utilities, elevating the structure, filling in the basement, and dry-floodproofing the structure.

The Consultant will also work on defining mortgage workout options.

Anticipate Uptake, Size the Potential Costs of the Programs, and Evaluate Impacts of Different Scenarios

In order to anticipate take-up rates among New York City residents for each option and to project the potential costs of the programs, the Consultant team will combine data and information from a number of sources:

- Data collected from Tasks 2 and 3 will be used regarding structure elevation, the demographics of the population living in the floodplain, and the affordability challenges of those residents. The Consultant will estimate the number of households who will be eligible for the programs given different eligibility criteria.
- The elevation and structural data of the homes surveyed in Task 2 will provide rough estimates of the number of structures that are candidates for mitigation measures, thus informing the potential funds required for the mitigation financing programs.
- In the household surveys administered as part of Task 2, participants will be asked to respond to scenarios about their level of interest in several policy options. This will provide some information on potential take-up rates for the various options.
- Relevant data will be collected from organizations that have run similar programs in order to develop estimates of potential administrative costs.

Because many factors influence the actual take-up of any of the policy options, estimating precise take-up rates will be difficult. Therefore, the Consultant team will conduct sensitivity analysis to look at the program costs at different levels of take-up. The time horizon of the programs will have significant implications on costs. In defining these options, the Consultant team will also consider the interactions between the potential policy and the phase-in of BW-12 and HFIAA.

Clearly, take-up rates, program costs, and program impact are inter-related. The Consultant team will evaluate the potential costs and impacts of the different programs in various dimensions including:

- the impact of mitigation financing options on the household's exposure to flood risk
- The availability of "partial" mitigation opportunities and insurance affordability
- the impact of means-tested vouchers on take-up, insurance affordability, and the prevention of mortgage foreclosures
- the impact of flood insurance policies with higher deductibles on household exposure to flood losses and flood insurance take-up.

Analysis will be conducted to examine the distribution impacts of the programs, identifying segments of the population that may benefit most from the program and the implications on the affordability challenge. Where possible, analysis will also be conducted to examine the potential program costs to individuals, homeowners, the City, and the Federal Government.

Assess the Feasibility of the Implementation and Develop Work Plans

The Consultant team will develop an evaluation framework that identifies a set of dimensions to be considered for each option. This will allow comparison across options in those dimensions. The Consultant will specify dimensions in which the City would want to evaluate desirability and feasibility of the options. The desirability of a particular option will depend upon the objectives the City is trying to achieve, which will likely be multi-dimensional. For example, the City may be very interested in properly incentivizing property owners to mitigate flood risk regardless of their income level. Therefore the City may want to provide or promote mitigation tools or mitigation financing options. The City may need a very different set of options to enable low to moderate income property owners to afford their flood insurance premiums. There may also be a policy option better suited to targeting at-risk neighborhoods. For all the elements of this task the Consultant team will work with the City to better understand their goals and constraints and to better understand current thinking from FEMA about implementation of specific provisions in BW-12 and HFIAA. The Consultant team will also consult other community organizations and FEMA and other relevant federal agencies to further explore the options and potential work plans for the most promising options. Selection of the most promising options will be done with feedback from the City.

At this point, it is not clear the tools or policy options examined would lend themselves to such a framework. If a full evaluation framework is not tenable, the Consultant will use another appropriately suited policy analysis tool.

Task 4 Deliverables

A chapter in the draft and final reports will include the following:

- Identification of the programs and policies that can facilitate mitigation financing and address the affordability challenge of rising flood insurance rates.
- Estimation of expected take-up rates among New York City residents for each program.

- A rough calculation of the potential costs of the programs (where possible for individual, household, City and Federal Government), program revenue, as well as the feasibility of implementation.
- A work plan for implementing the two to three most feasible programs.

III. Timeline

The proposed project timeline is presented below (see Gantt chart in Figure 1). Below Figure 1, is a summary of associated deliverables.

A draft final report will be delivered 21 months after project start. The draft final will address comments by the City on interim drafts. The draft final report will then be submitted to the Consultant's peer review process, revised as appropriate, professionally edited and formatted, and then publicly released. The Consultant anticipates public release no later than 24 months after project start. If the City has pressing demand for earlier results the Consultant will work to accommodate these needs.

A summary of deliverables by task:

- Task 1: A statistically significant sample of structures to be used to determine the economic impact of increased insurance premiums
- Task 2: Elevation and other data necessary to determine NFIP premiums for a statistically significant sample of one- to four-family homes in the floodplain.
- Task 3: A clear picture of the size of the affordability challenge for one- to four-family homes due to flood insurance premium increases across New York City's 100-year floodplain, including analysis of how premium changes will impact (i) household income, (ii) property value, (iii) take-up rates for flood insurance, (iv) risk of foreclosure, and (v) change in tax revenue for property at the household level and city level. Analysis will produce an estimate of the percent of homes in affected areas that would be subject to substantially heightened risks of default
- Task 4: A report that defines and evaluates solutions to facilitate mitigation financing, and to address the affordability challenge. The report will also address the potential costs of the programs and the feasibility of implementation. Specifically for each solution, we will develop (i) an expected take-up rate among New York City residents, (ii) an expected cost of implementation (where applicable for individual, home, City and Federal Government), and (iii) anticipated stream of revenue or recoup costs (where applicable, for individual, household, City and Federal Government). The report will also deliver a work plan for implementing the 2-3 most feasible solutions.

EXHIBIT 1 TO APPENDIX C

Exhibit 1 to the Appendix C “Fee and Cost Schedule” is hereby amended and restated as follows:

Amended and Restated Fee and Cost Schedule

The maximum payment for each portion of the Services shall be the respective amounts set forth in the following table:

Tasks	Amount per Task
Task 1: Define a statistically significant sample of one- to four-family homes across the 100-year floodplain indicated on FEMA’s Preliminary FIRMs for New York City.	\$ 60,946
Task 2: Gather structure elevation data and other supplemental data, as needed, for a statistically significant sample of one- to four-family homes.	\$ 676,990
Task 3: Determine the economic impact of premium increases for the statistically significant sample determined in Task 1 using the elevation data collected in Task 2 for one- to four-family homes.	\$ 232,162
Task 4: Analyze mitigation financing tools and affordability measure	\$ 243,154
Maximum Contract Price (Tasks 1 – 4)	\$ 1,213,252