Submitted: November 1, 2016
Revision: November 21, 2016
Revision: April 27, 2017

HurLoss Version 8.0.a

Florida Commission on Hurricane Loss Projection Methodology

2015 Standards

Prepared for:

Florida Commission on Hurricane Loss Projection Methodology
State Board of Administration
1801 Hermitage Boulevard
Tallahassee, Florida 32308

Prepared by:

Applied Research Associates, Inc.
IntraRisk Division
8537 Six Forks Road, Suite 600
Raleigh, North Carolina 27615

Florida Commission on Hurricane Loss Projection Methodology

Model Identification

Name of Model:	HurLoss Florida Model
Model Version Identification:	8.0.a
Software Program Version Identification:	8.0.a
Interim Software Program Version Update Identification:	N/A
Software Platform Name and Identifications:	HurLoss Software Platform
Interim Data Update Designation:	N/A
Name of Modeling Organization:	Applied Research Associates, Inc.
Street Address:	8537 Six Forks Road, Suite 600
City, State, Zip Code:	Raleigh, NC, 27615
Mailing Address, if different from above:	N/A
Contact Person:	Frank Lavelle
Phone Number:	(919) 582-3350
Fax Number:	(919) 582-3401
E-mail Address:	flavelle@ara.com
Date:	November 21, 2016

November 21, 2016

Dr. Lorilee Medders
Chair, Florida Commission on Hurricane
Loss Projection Methodology
1801 Hermitage Boulevard, Suite 100
Tallahassee, FL 32308

Re: Revised ARA Model Submission under the November 1, 2015 Standards

Dear Dr. Medders:

Applied Research Associates is pleased to submit our hurricane loss projection model for review by the Florida Commission on Hurricane Loss Projection Methodology. The model has been reviewed by professionals having credentials and/or experience in the areas of meteorology, statistics, engineering, and computer science, as indicated by the signed Expert Certification Forms G-1, G-2, G-3, G-4, G-5 and G-6.

Attached to this letter are the Model Submission Checklist and a summary statement of compliance with each individual standard.

Enclosed are 7 bound copies of our submission. Electronic copies of our submission can be downloaded from an ARA ftp site. Details regarding accessing this site will be emailed to the Commission.

ARA is prepared to review proprietary data, model documentation, model validation, and any additional questions by the Professional Team during their visit.

If you have any additional questions regarding this submission, please contact me.

Sincerely,

Francis M. Lavelle, Ph.D., P.E.
Principal Engineer

FML/lw

Model Submission Checklist

1. Please indicate by checking below that the following has been included in your submission to the Florida Commission on Hurricane Loss Projection Methodology.

Yes	No	Item
X		1. Letter to the Commission
X		a. Refers to the certification forms and states that professionals having credentials and/or experience in the areas of meteorology, statistics, engineering, actuarial science, and computer science have reviewed the model for compliance with the standards
X		b. States model is ready to be reviewed by the Professional Team
X		c. Any caveats to the above statements noted with a complete explanation
X		2. Summary statement of compliance with each individual standard and the data and analyses required in the disclosures and forms
X		3. General description of any trade secret information the modeling organization intends to present to the Professional Team
X		4. Model Identification
X		5. Seven (7) Bound Copies (duplexed)
X		6. Link emailed to SBA staff containing all required documentation that can be downloaded from a single ZIP file
X		a. Submission text in PDF format
X		b. PDF file supports highlighting and hyperlinking, and is bookmarked by standard, form, and section
X		c. Data file names include abbreviated name of modeling organization, standards year, and form name (when applicable)
	X	d. Form S-6 (Hypothetical Events for Sensitivity and Uncertainty Analysis), if required, in ASCII and PDF format
X		e. Forms M-1, Annual Occurrence Rates, M-3, Radius of Maximum Winds and Radii of Standard Wind Thresholds, V-2, Mitigation Measures, Range of Changes in Damage, A-1, Zero Deductible Personal Residential Loss Costs by ZIP Code, A-2, Base Hurricane Storm Set Statewide Losses, A-3, 2004 Hurricane Season Losses, A-4, Output Ranges, A-5, Percentage Change in Output Ranges, A-7, Percentage Change in Logical Relationship to Risk, and A-8, Probable Maximum Loss for Florida, in Excel format
		7. All hyperlinks to the locations of forms are functional
X		8. Table of Contents
X		9. Materials consecutively numbered from beginning to end starting with the first page (including cover) using a single numbering system, including date and time in footnote
X		10. All tables, graphs, and other non-text items consecutively numbered using whole numbers, listed in Table of Contents, and clearly labeled with abbreviations defined
X		11. All column headings shown and repeated at the top of every subsequent page for forms and tables
X		12. Standards, disclosures, and forms in *italics*, modeling organization responses in non-italic
X		13. All graph and maps conform to guidelines in **II. Notification Requirements A.5.e.**
X		14. All units of measurement clearly identified with appropriate units used
X		15. All forms included in submission document appendix except Forms V-3, Mitigation Measures, Mean Damage Ratios and Loss Costs (Trade Secret item), and A-6, Logical Relationship to Risk (Trade Secret item)
X		16. Hard copy documentation identical to the electronic version
X		17. Signed Expert Certification Forms G-1 to G-7
X		18. All acronyms listed and defined in submission appendix

2. Explanation of "No" responses indicated above. (Attach additional pages if needed.)

Form S-6 is not required

HurLoss 8.0.a	[signature]	11/21/2016
Model Name	Modeler Signature	Date

ARA Summary Statement of Compliance

	Standard	Standard Met?
General Standards		
G-1	Scope of the Computer Model and Its Implementation	Yes
G-2	Qualifications of Modeling Organization Personnel and Consultants	Yes
G-3	Risk Location	Yes
G-4	Independence of Model Components	Yes
G-5	Editorial Compliance	Yes
Meteorological Standards		
M-1	Base Hurricane Storm Set	Yes
M-2	Hurricane Parameters and Characteristics	Yes
M-3	Hurricane Probabilities	Yes
M-4	Hurricane Windfield Structure	Yes
M-5	Landfall and Over-Land Weakening Methodologies	Yes
M-6	Logical Relationships of Hurricane Characteristics	Yes
Statistical Standards		
S-1	Modeled Results and Goodness-of-Fit	Yes
S-2	Sensitivity Analysis for Model Output	Yes
S-3	Uncertainty Analysis for Model Output	Yes
S-4	County Level Aggregation	Yes
S-5	Replication of Known Hurricane Losses	Yes
S-6	Comparison of Projected Hurricane Loss Costs	Yes
Vulnerability Standards		
V-1	Derivation of Vulnerability Functions	Yes
V-2	Derivation of Contents and Time Element Vulnerability Functions	Yes
V-3	Mitigation Measures	Yes
Actuarial Standards		
A-1	Modeling Input Data and Output Reports	Yes
A-2	Event Definition	Yes
A-3	Coverages	Yes
A-4	Modeled Loss Cost and Probable Maximum Loss Considerations	Yes
A-5	Policy Conditions	Yes
A-6	Loss Outputs and Logical Relationship to Risk	Yes
Computer Standards		
C-1	Documentation	Yes
C-2	Requirements	Yes
C-3	Model Architecture and Component Design	Yes
C-4	Implementation	Yes
C-5	Verification	Yes
C-6	Model Maintenance and Revision	Yes
C-7	Security	Yes

ARA Checklist Item 3

Item 3. General description of any trade secrets the modeling organization intends to present to the Professional Team.

The Professional Team will be shown documentation binders, validation studies and supporting information related to the model changes listed in our response to Disclosure 5 under Standard G-1. Any other materials will be dependent upon requests or suggestions from the Professional Team.

Table of Contents

List of Figures

List of Tables

General Standards

G-1 Scope of the Model and Its Implementation*

(*Significant Revision)

A. The model shall project loss costs and probable maximum loss levels for damage to insured residential property from hurricane events.

B. The modeling organization shall maintain a documented process to assure continual agreement and correct correspondence of databases, data files, and computer source code to slides, technical papers, and modeling organization documents.

C. All software and data (1) located within the model, (2) used to validate the model, (3) used to project modeled loss costs and probable maximum loss levels, and (4) used to create forms required by the Commission in the Report of Activities shall fall within the scope of the Computer/Information Standards and shall be located in centralized, model-level file areas.

A. The hurricane model developed by Applied Research Associates, Inc. (ARA) provides estimates of loss costs and probable maximum loss levels for residential property from hurricane events, excluding flood and storm surge, except as it applies to Additional Living Expenses (ALE). Losses are developed for buildings, the contents of a building, appurtenant structures, and additional living expenses. Gross losses are developed and insured losses are computed using policy information.

The model begins to estimate damage to buildings when the peak gust windspeed (in open terrain) produced by a hurricane equals or exceeds 50 mph. This 50 mph peak gust threshold corresponds to a sustained (one-minute average) windspeed (in open terrain) of about 40 mph. The methodology used in the model to predict damage and loss, given a windspeed, has been presented to the Professional Team during previous visits.

The historical data sets used in the development and validation of the model do not include loss from flood and storm surge.

B. ARA maintains a documented process to assure continual agreement and correct correspondence of databases, data files, and computer source code to slides, technical papers, and/or modeling organization documents.

C. All software and data related to the model are stored in centralized, model-level file areas including revision control systems for software, documents, and data files and file server systems for large data files.

1. ***Specify the model version identification. If the model submitted for review is implemented on more than one platform, specify each model platform. Specify which platform is the primary platform and verify how any other platforms produce the same model output results or are otherwise functionally equivalent as provided for in the "Process for Determining the Acceptability of a Computer Simulation Model" in VI. Review by the Commission, I. Review and Acceptance Criteria for Functionally Equivalent Model Platforms.***

Our current submittal is for HurLoss Florida model version 8.0.a as implemented on the HurLoss software platform version 8.0.a.

2. ***Provide a comprehensive summary of the model. This summary should include a technical description of the model including each major component of the model used to project loss costs and probable maximum loss levels for damage to insured residential property from hurricane events causing damage in Florida. Describe the theoretical basis of the model and include a description of the methodology, particularly the wind components, the vulnerability components, and the insured loss components used in the model. The description should be complete and must not reference unpublished work.***

ARA's hurricane model has been developed using wind engineering principles to enable detailed estimates of damage and loss to buildings and their contents due to wind storms. The model uses a peer reviewed (reviewed by both meteorologists and wind engineers) hurricane hazard model that enables the modeling of the entire track of a hurricane or tropical storm. The hurricane windfield model has been more extensively validated than any other published hurricane windfield model. The results of ARA's hurricane hazard model are used directly in the design windspeed map given in the American Society of Civil Engineers Standard 7-10 (ASCE 7-10), *Minimum Design Loads for Buildings and Other Structures*. Since the hurricane model simulates the entire hurricane track, whether the storm makes landfall or not, computation of loss does not require that a storm make landfall, but simply requires that the windspeed produced by the storm at any point exceed a predefined minimum value. The model has the ability to treat storms that make multiple landfalls.

ARA's physical damage model is based on load and resistance analysis of building components. The physical damage model estimates the damage to the building in terms of failure of building envelope components. Insured loss is estimated from the building damage states using empirical cost estimation techniques for building repair and replacement. Contents loss is based on an empirical model that relates contents damage to building envelope performance. The building, appurtenance, contents, and loss of use components have been validated with insurance loss data. For portfolio assessments, a fast-running loss function is developed for each building class. These functions are used to estimate losses for each coverage type and deductible in each simulated storm.

The computational procedure is straightforward Monte Carlo simulation. The model can produce losses by coverage, policy, site, zip code, county, state, and portfolio levels. The storm-by-storm and year-by-year output data can be easily post-processed to obtain average annual loss (AAL), as well as the loss distribution statistics (Probable Maximum Loss, etc.) on a per occurrence or per year basis.

Hurricane Hazard Model. The two key components of the hurricane hazard model are: (i) the hurricane windfield model (Vickery et al., 2009a) and (ii) the probabilistic models describing the occurrence rates, storm tracks, and intensities (Vickery et al., 2009b). The probabilistic portion of the hurricane hazard model is described in detail in Vickery, et al. (2000b). The key features of the storm track model are the coupling of the modeling of the central pressure with sea surface temperature, and the ability to model curved tracks that can make multiple landfalls. The entire track of a storm is modeled, from the time of storm initiation over the water, until the storm dissipates. The starting times (hour, day, and month) and locations of the storms are taken directly from the Atlantic basin hurricane database (HURDAT). Using the actual starting times and locations ensures that any climatological preference for storms to initiate in different parts of the Atlantic Basin at different times of the year is maintained.

The coupling of the central pressure modeling to sea surface temperature ensures that intense storms (such as category 5 storms) cannot occur in regions in which they physically could not exist (such as the New England area) and, as shown in Vickery, et al. (2000b), the approach reproduces the variation in the central pressure characteristics along the United States coastline. In the hurricane hazard model, the storm's intensity is modeled as a function of the sea surface temperature and wind shear until the storm makes landfall. At the time of landfall, the filling models described in Vickery (2005) are used to exponentially decay the intensity of the storm over land. Over land, following the approach outlined in Vickery, et al. (2009b), the storm size is modeled as a function of central pressure and latitude. If the storm exits land into the water, the storm intensity is again modeled as a function of sea surface temperature, allowing the storm to possibly re-intensify and make landfall again elsewhere. The validity of the modeling approach for storms near the coastal United States is shown through comparisons of the statistics historical and modeled key hurricane parameters along the North American coast. These comparisons are given in Vickery, et al. (2009b), where comparisons of occurrence rate, heading, translation speed, distance of closest approach, etc., are given. These comparisons are made using the statistics derived from historical and modeled storms that pass within 250 kilometers of a coastal milepost location. The comparisons are given for mileposts spaced 50 nautical miles apart along the entire United States Gulf and Atlantic coastlines.

Hurricane Windfield Model. The hurricane windfield model used in our simulation model is described in detail in Vickery, et al. (2009a). The vortex model uses the results of the numerical solution of the 2-D, vertically integrated equations of motion of a translating hurricane. The asymmetries in a moving storm are a function of the translation speed of the storm and the nonlinear interactions between the wind velocity vectors and the frictional effects of the surface of the earth. The numerical solutions of the equations of motion of the hurricane have been solved separately for a storm translating over the ocean and for a storm translating over land. The separate solutions were developed for the over land case and the over water case, since in the over water case, the magnitude of the surface drag coefficient is a function of the windspeed itself, whereas in the over land case the magnitude of the surface drag coefficient is windspeed independent. The outputs of the numerical model represent the integrated boundary layer averaged windspeeds, representative of a long duration average wind, taken as having an averaging time of one hour. The mean, one-hour average, integrated windspeeds are then combined with a boundary layer model to produce estimates of windspeeds for any height and averaging time.

The variation of the mean windspeed with height is modeled using a variation of the log law derived from an analysis of hurricane dropsonde data. Turbulence near the surface is modeled as described in Vickery and Skerlj (2005) and is based primarily on the ESDU (1982, 1983) models for the atmospheric boundary layer. The boundary layer model can deal with arbitrary terrain conditions (any surface roughness) changing both the properties of the mean flow field (i.e., the mean windspeed at a given height decreases with increasing surface roughness), as well as the gustiness of the wind (i.e., the gust factor increases with increasing surface roughness). The gust factor portion of the ESDU-based model has been validated through comparisons to gust factors derived from hurricane windspeed traces, as described in Vickery and Skerlj (2005).

The entire hurricane windfield model (overall flow field, boundary layer model and gust factor model) has been validated through comparisons of simulated and observed windspeeds. These windspeed comparisons have been performed through comparisons of both the peak gust windspeeds and the average windspeeds. The comparisons show the windfield model reproduces observed windspeeds well, matching both the gusts and the long period average winds. The model has been validated separately at offshore, coastal and inland stations, taking into account the effects of local terrain and anemometer height on the measured and simulated windspeeds.

Damage and Loss Model. ARA's modeling approach for damage and loss employs two separate models. A building performance model, using engineering-based load and resistance models, is used to quantify physical damage. The building physical damage model takes into account the effects of wind direction changes, progressive damage, and storm duration. Economic loss, given physical damage, is estimated using repair and reconstruction cost estimation methods. This process is therefore similar to how an insurance adjuster would estimate the claim, given observed damage to the building. Through direct simulations of thousands of storms with representative buildings, the building performance model produces outputs that are post-processed into loss functions for building, contents, and loss of use. The damage and loss modeling methodology is shown schematically in Figure 1.

The loss projection model uses these fast-running loss functions (vulnerability functions) with the hurricane model to produce insured loss. Both the physical damage model and the loss model developed by ARA have been validated through comparisons of modeled and observed damage data collected after hurricane events. Separate models have been developed to estimate the financial losses to the building, the building's contents, additional living expenses, and losses to appurtenant and exterior structures.

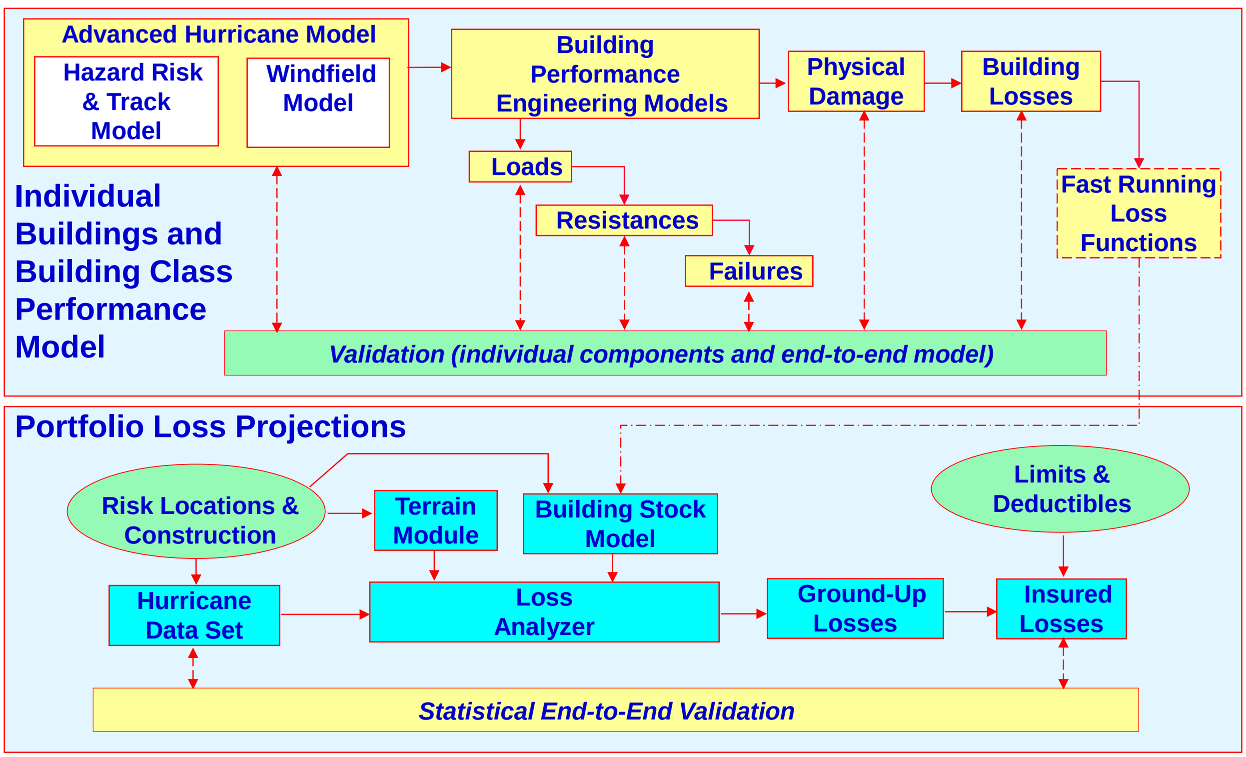


Figure 1. Overview of Hurricane Damage and Loss Modeling

Software, Hardware, and Program Structure. ARA's detailed hurricane, building performance, and loss analysis models used to develop the fast-running hurricane loss modules were developed in FORTRAN and C++. The databases supporting the models include binary data, flat text files, and Microsoft Access files. These tools are run in-house and are not currently licensed to users.

The applications run on personal computers running the Windows® operating systems with a minimum Random Access Memory (RAM) requirement of 2 GB.

Translation from Model Structure to Program Structure. ARA uses a modular design approach in converting from model structure to program structure. The analysis process is broken into distinct phases or modules: i.e., Wind, Damage, and Loss. Each of these modules is a stand-alone program. The architecture and program flow of each module are established in a structured design process through the creation of flow charts and/or “pseudo-code.” Each model element is translated into subroutines or functions on a one-to-one basis. Changes to the models are reflected by one-to-one changes in the software code. Although this approach is not a pure object-oriented design approach, it does incorporate some of the features, such as data encapsulation, that make the object-oriented approach successful.

Theoretical Basis. As indicated earlier, the hurricane hazard model is developed using the historical database of storms given in the HURDAT. ARA’s model has been peer reviewed and accepted for publication in the American Society of Civil Engineers publication, *The Journal of Structural Engineering* (Vickery et al., 2009b). The model, in its entirety, was used to develop the design windspeeds given in ASCE-7-98 for the hurricane prone coastline of the United States. ARA’s hurricane model is routinely used by two of the three major North American Boundary Layer Wind Tunnel Laboratories to determine the site-specific hurricane climate risks in terms of directionally-dependent speed frequencies for determining design wind loads for major buildings along the United States coastline, Caribbean, and Asia.

The physical damage methodology was developed using a load and resistance modeling approach. Load and resistance analysis methods are fundamental to an evaluation of building performance to extreme winds and are used extensively in the analysis and design of structural systems, including codified design. Some important theoretical and application references are given by Twisdale and Vickery (1995) in Chapter 20, “Extreme Wind Risk Assessment,” of the *Probabilistic Structural Mechanics Handbook.*

3. Provide a flowchart that illustrates interactions among major model components.

The main program analysis modules used in the multiple building model are shown in Figure 2. More detailed, proprietary flow-charts have been presented to the Professional Team.

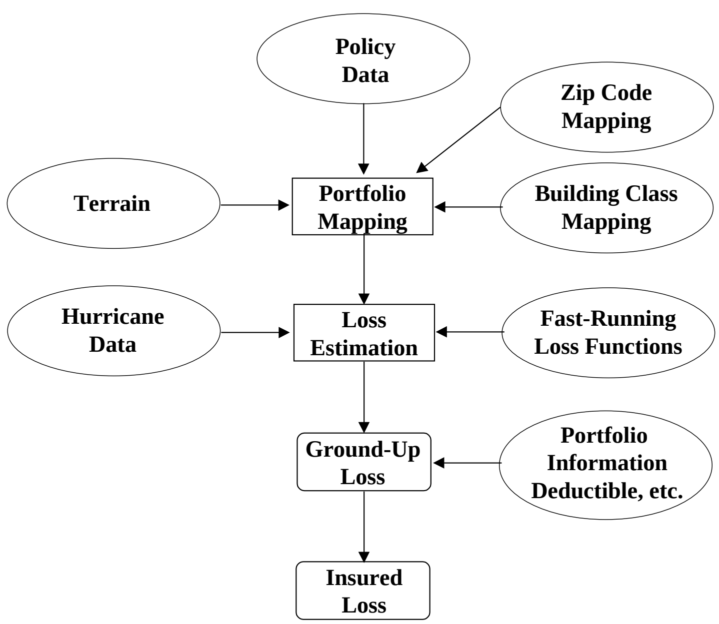


Figure 2. High Level Flowchart of Portfolio (Multiple Buildings – Multiple Sites) Computer Model

4. ***Provide a comprehensive list of complete references pertinent to the model by standard grouping using professional citation standards.***

   A complete list of references by standard grouping is provided in the *References* section.

5. ***Provide the following information related to changes in the model from the previously accepted model to the initial submission this year:***

   A. Model changes:

      1. A summary description of changes that affect the personal or commercial residential loss costs or probable maximum loss levels,

      2. A list of all other changes, and

      3. The rationale for each change.

   B. Percentage difference in average annual zero deductible statewide loss costs based on the 2012 Florida Hurricane Catastrophe Fund's aggregate personal and commercial residential exposure data found in the file named "hlpm2012c.exe" for:

      1. All changes combined, and

      2. Each individual model component change.

   C. Color-coded maps by county reflecting the percentage difference in average annual zero deductible statewide loss costs based on the 2007 Florida Hurricane Catastrophe's Fund aggregate personal and commercial residential exposure data found in the file named "hlpm2012c.exe" for each model component change.

   D. Color-coded map by county reflecting the percentage difference in average annual zero deductible statewide loss costs based on the 2012 Florida Hurricane Catastrophe Fund's aggregate personal and commercial residential exposure data found in the file named "hlpm2012c.exe" for all model components changed.

   A. For the current submission, there are four changes in the model:

   1. During our review of the model changes for this submission, ARA discovered three issues related surface roughness in our previously accepted model (HurLoss 7.0.a) that required correction. The necessary corrections were completed in an updated version of the model designated HurLoss 7.0.b, which was reviewed and accepted by the Commission on December 13, 2016. This update resulted in significant reductions in surface roughness in ZIP Codes adjacent to coastal waters and a moderate increase in surface roughness for land-locked ZIP Codes. On a statewide basis, the update from version 7.0.a to 7.0.b has a moderate upward effect on modeled loss costs based on the 2012 FHCF aggregate personal and commercial residential exposure (+4.5%).

   2. The hurricane model has been updated in version 8.0.a to include storm data from the 2014 and 2015 hurricane seasons. We also updated the sea surface temperature (SST), tropopause temperature, and wind shear data sets to include data from 2014 and 2015. We also updated the wind field model to a) improve the method for computing wind direction in the sea-land transition zone, b) add the ability to input heights at which wind speeds are computed, and c) introduce a model to vary wind direction with height. On a statewide basis, these changes produced a small downward effect on modeled losses (-0.2%).

3. The population-weighted ZIP Code centroids have been updated in version 8.0.a using June 2016 ZIP Code data and a more accurate methodology. On a statewide basis, this update has a small upward effect on modeled loss costs (+0.1%).
4. The methodology for estimating average ZIP Code surface roughness have been modified in version 8.0.a to account for the effects of bodies of water in a manner that is more closely aligned to the methodology used to estimate surface roughness at individually geocoded locations. On a statewide basis, this update has a small upward effect on modeled loss costs (+1.0%).

B. Percentage changes in average annual zero deductible statewide loss costs

The percentage change in the statewide loss costs associated with model changes 2, 3, and 4 combined is +0.8% (see Form S-5).

The percentage change in the statewide loss costs associated with the individual model changes are provided above in Part A.

C. Color coded maps showing the incremental percentage changes in the 2012 FHCF zero deductible average annual loss costs by county for each of the four changes are provided in Figure 3 through Figure 6.

D. The combined effect of changes 2, 3, and 4 is shown in Figure 7.

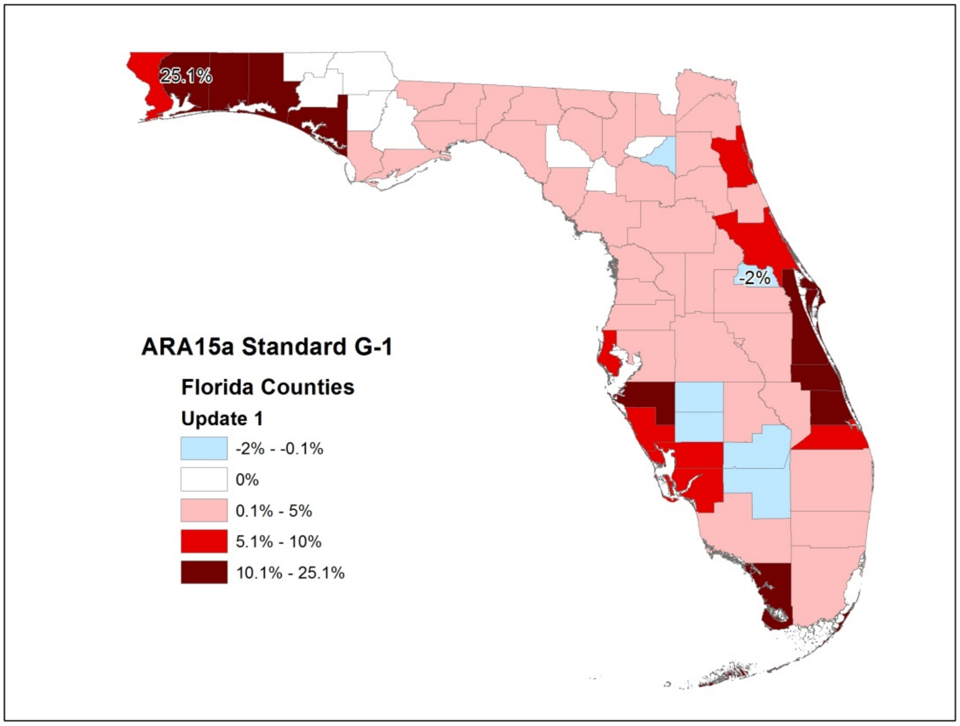


Figure 3. Percentage Change in 2012 FHCF Zero Deductible Average Annual Losses by County due to Changes in Surface Roughness from Version 7.0.a to 7.0.b

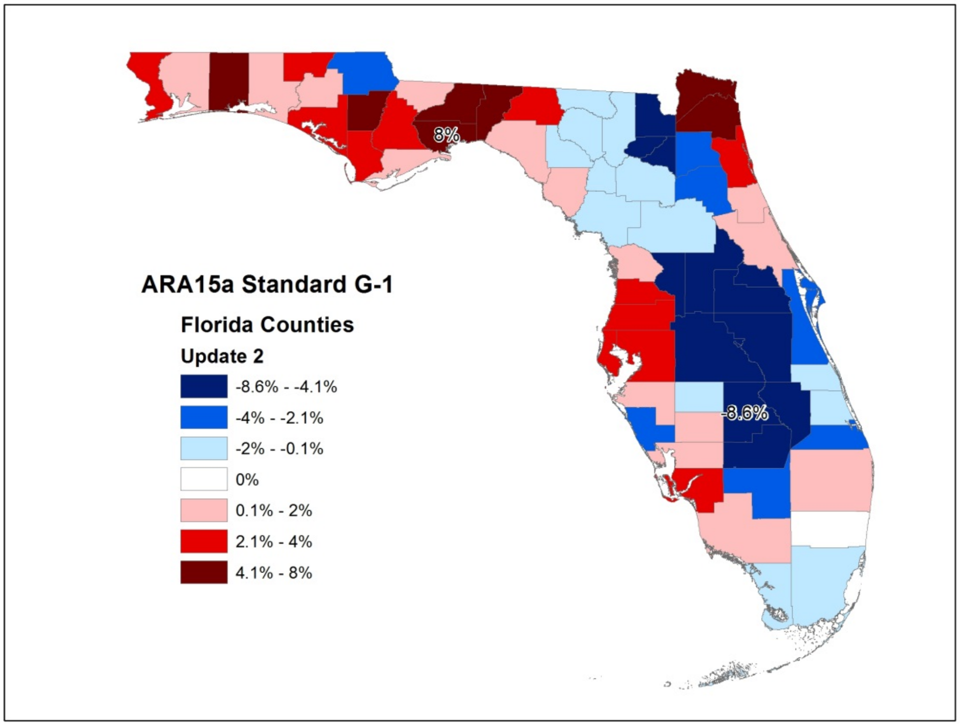


Figure 4. Percentage Change in 2012 FHCF Zero Deductible Average Annual Losses by County due to Updated Stochastic Event Set

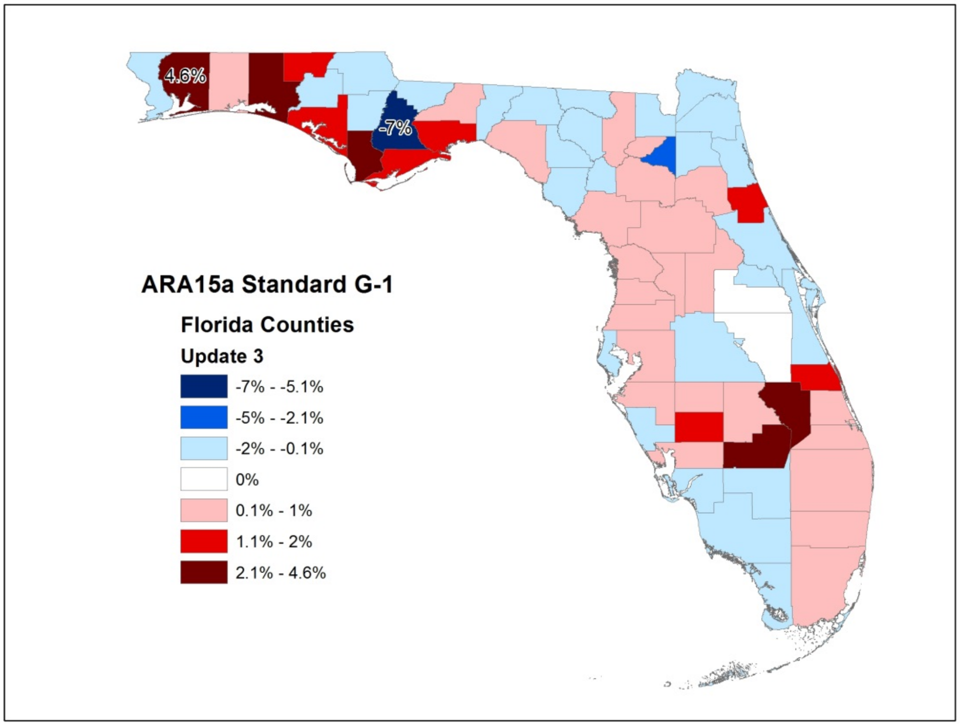


Figure 5. Percentage Change in 2012 FHCF Zero Deductible Average Annual Losses by County due to ZIP Code Centroid Update

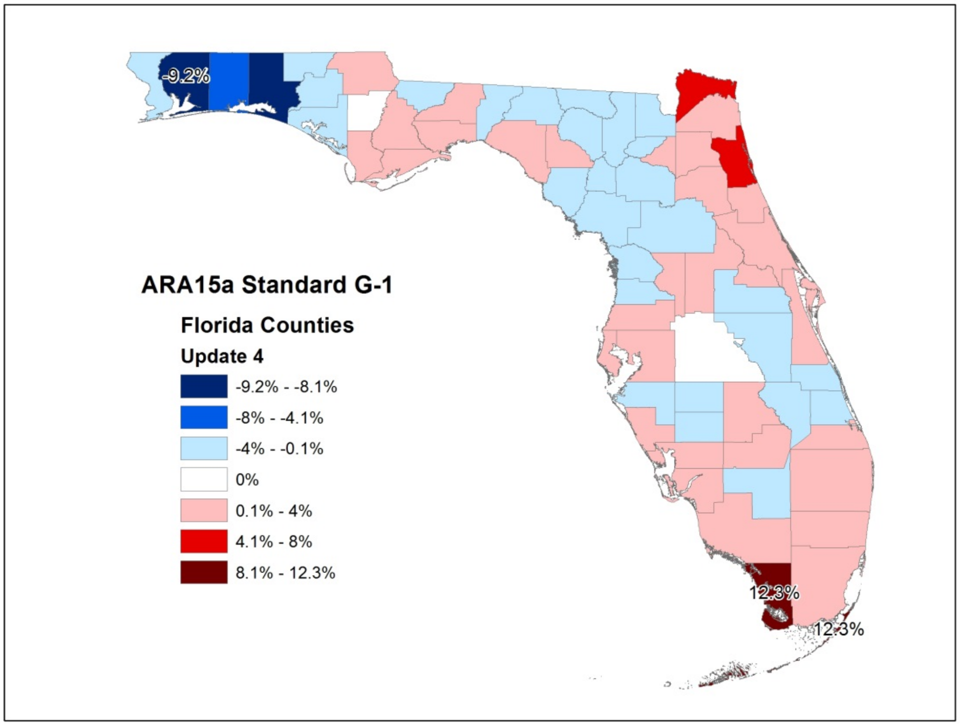


Figure 6. Percentage Change in 2012 FHCF Zero Deductible Average Annual Losses by County due to Land Use/Land Cover Update

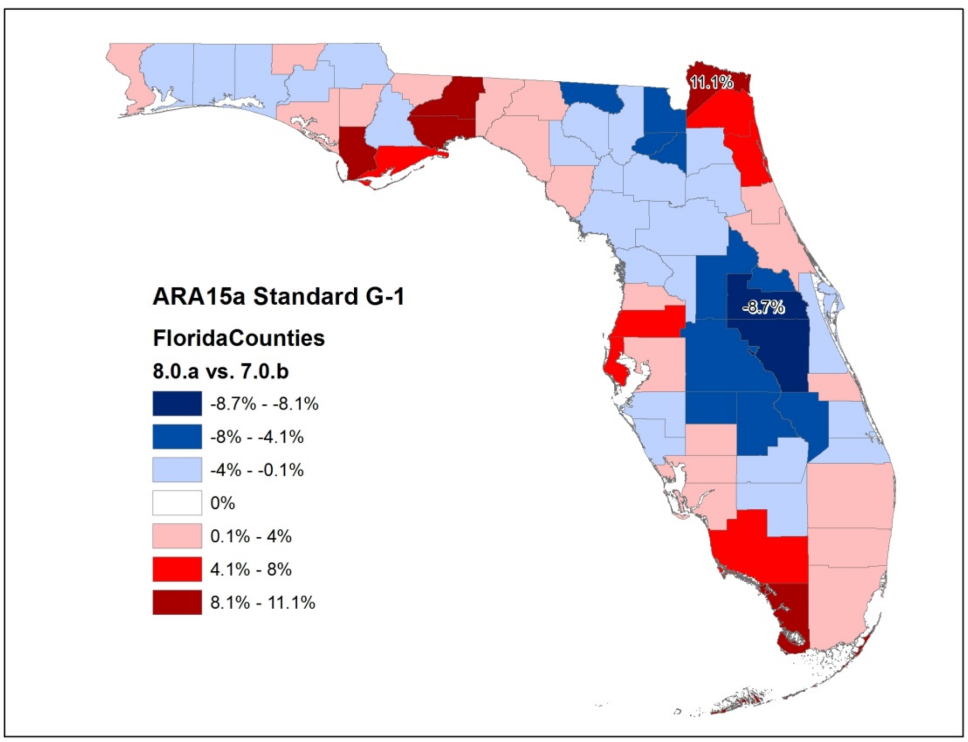


Figure 7. Percentage Change in 2012 FHCF Zero Deductible Average Annual Losses by County due to All Changes Combined

6. ***Provide a list and description of any potential interim updates to underlying data relied upon by the model. State whether the time interval for the update has a possibility of occurring during the period of time the model could be found acceptable by the Commission under the review cycle in this Report of Activities.***

   No interim updates to underlying data relied upon by the model are anticipated at this time.

G-2 Qualifications of Modeling Organization Personnel and Consultants Engaged in Development of the Model

A. Model construction, testing, and evaluation shall be performed by modeling organization personnel or consultants who possess the necessary skills, formal education, or experience to develop the relevant components for hurricane loss projection methodologies.

B. The model and model submission documentation shall be reviewed by modeling organization personnel or consultants in the following professional disciplines with requisite experience: structural/wind engineering (licensed Professional Engineer), statistics (advanced degree), actuarial science (Associate or Fellow of Casualty Actuarial Society or Society of Actuaries), meteorology (advanced degree), and computer/information science (advanced degree). These individuals shall certify Forms G-1 through G-6, Expert Certification forms, as applicable.

A. ARA's staff involved in the development of the hurricane model has extensive experience in wind engineering and hurricane loss projection. The wind engineering field includes meteorology, structural engineering, bluff body aerodynamics, probability, statistics, and risk analysis. Members of our staff are considered experts in the field of wind engineering and hurricane modeling, as demonstrated through publishing of peer reviewed papers, acting as reviewers for papers related to hurricane modeling submitted to respected professional journals, and through their active involvement in the development of wind-related codes and standards in the United States.

B. Modifications to the model have been reviewed by modeler personnel or independent experts in each of the required disciplines. All of the reviewers abide by standards of professional conduct adopted by their professions.

1. Organization Background

A. Describe the ownership structure of the modeling organization engaged in the development of the model. Describe affiliations with other companies and the nature of the relationship, if any. Indicate if the organization has changed its name and explain the circumstances.

Applied Research Associates, Inc. is an employee-owned company. ARA is not affiliated with any other company.

B. If the model is developed by an entity other than the modeling organization, describe its organizational structure and indicate how proprietary rights and control over the model and its components is exercised. If more than one entity is involved in the development of the model, describe all involved.

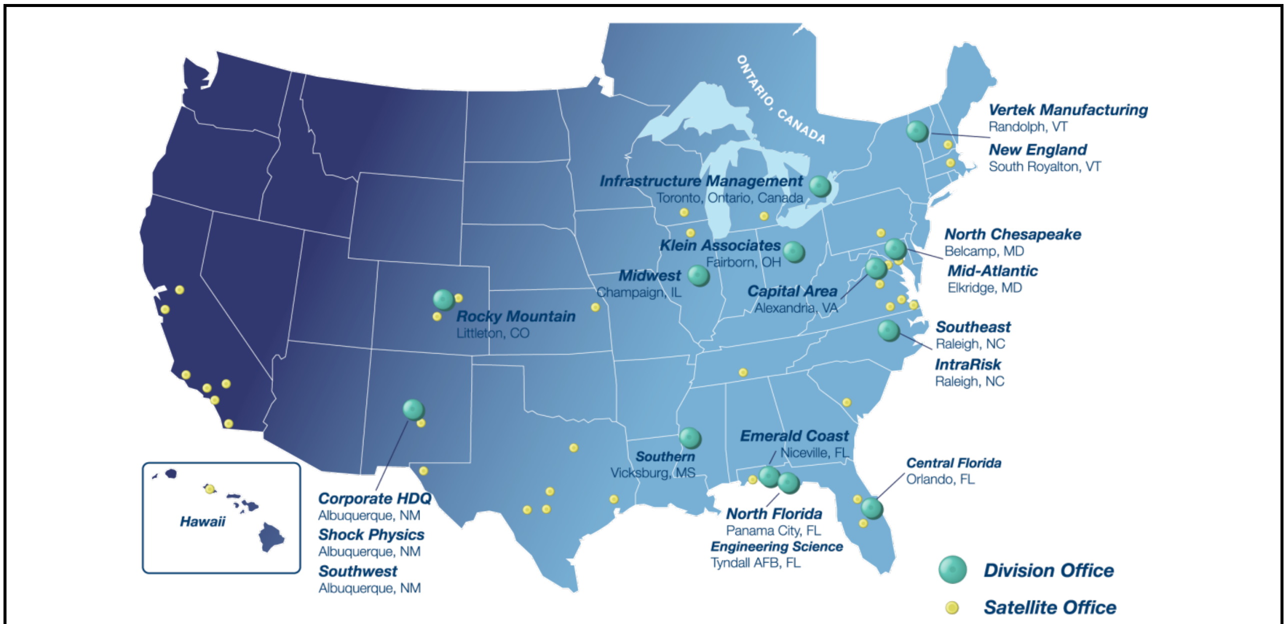
The model was developed by ARA. No other entities were involved in the model development.

C. If the model is developed by an entity other than the modeling organization, describe the funding source for the development of the model.

Not applicable.

*D. **Describe any services other than hurricane modeling provided by the modeling organization.***

ARA is a diversified engineering and applied science research, consulting, and software development firm. ARA has approximately 1,050 employees with offices throughout the United States, as shown in Figure 8. The risk analysis, wind engineering, and building performance capabilities are located in Raleigh, NC. Our building inspection and wind mitigation certification services are located in Raleigh.



ARA's Technical Capabilities	
• Probabilistic Risk and Decision Analysis	• Software Development
• Wind Engineering	• Environmental Engineering
• Structural Engineering	• Risk Management
• Engineering Reliability	• Facility/Security Engineering
• Pavements and Geotechnical Engineering	• Tests and Measurements
• Explosive Effects	

Figure 8. ARA Office Locations and Technical Specialties

*E. **Indicate if the modeling organization has ever been involved directly in litigation or challenged by a governmental authority where the credibility of one of its U.S. hurricane model versions for projection of loss costs or probable maximum loss levels was disputed. Describe the nature of each case and its conclusion.***

None.

2. Professional Credentials

*A. **Provide in a tabular format (a) the highest degree obtained (discipline and University), (b) employment or consultant status and tenure in years, and (c) relevant experience and responsibilities of individuals currently involved in the acceptability process or in any of the following aspects of the model:***

1. Meteorology
2. Statistics

3. Vulnerability
4. Actuarial Science
5. Computer/Information Science

The individuals currently involved in the primary development of the model are listed in Table 1. The requested information on experience and responsibilities is provided in the following paragraphs.

Table 1. Professional Credentials

Aspect	Individuals	Degree	Discipline	University	Status	Tenure
Meteorology	Peter J. Vickery	Ph.D.	Eng. Sci.	Western Ontario	Employee	28 years
	Lawrence A. Twisdale	Ph.D.	Civil Eng.	Illinois	Employee	34 years
	Francis M. Lavelle	Ph.D.	Civil Eng.	Rice	Employee	26 years
	Jeffrey C. Sciaudone	M.S.	Civil Eng.	Clemson	Employee	12 years
	David R. Mizzen	M.S.	Civil Eng.	Purdue	Employee	5 years
	Lauren Mudd	Ph.D.	Civil Eng.	Rensselaer	Employee	2 years
	Fangqian Liu	Ph.D.	Civil Eng.	Clemson	Employee	2 year s
Statistics	Peter J. Vickery	Ph.D.	Eng. Sci.	Western Ontario	Employee	28 years
	Marshall B. Hardy	M.S.	Statistics	Kentucky	Employee	31 years
	Francis M. Lavelle	Ph.D.	Civil Eng.	Rice	Employee	26 years
	Lawrence A. Twisdale	Ph.D.	Civil Eng.	Illinois	Employee	34 years
	Lauren Mudd	Ph.D.	Civil Eng.	Rensselaer	Employee	2 years
Vulnerability	Peter J. Vickery	Ph.D.	Eng. Sci.	Western Ontario	Employee	28 years
	Lawrence A. Twisdale	Ph.D.	Civil Eng.	Illinois	Employee	34 years
	Chris Driscoll	B.S.	Civil Eng.	South Florida	Employee	17 years
	Francis M. Lavelle	Ph.D.	Civil Eng.	Rice	Employee	26 years
	Jeffrey C. Sciaudone	M.S.	Civil Eng.	Clemson	Employee	16 years
Actuarial Science	Peter J. Vickery	Ph.D.	Eng. Sci.	Western Ontario	Employee	28 years
	Marshall B. Hardy	M.S.	Statistics	Kentucky	Employee	31 years
	Lawrence A. Twisdale	Ph.D.	Civil Eng.	Illinois	Employee	34 years
	Francis M. Lavelle	Ph.D.	Civil Eng.	Rice	Employee	26 years
	Jeffrey C. Sciaudone	M.S.	Civil Eng.	Clemson	Employee	102years
	Laura Maxwell	B.S.	Mathematics	Moravian	Consultant	N/A
Computer Science	Peter J. Vickery	Ph.D.	Eng. Sci.	Western Ontario	Employee	28 years
	Francis M. Lavelle	Ph.D.	Civil Eng.	Rice	Employee	26 years
	Chris Driscoll	B.S.	Civil Eng.	South Florida	Employee	17 years
	Jeffrey C. Sciaudone	M.S.	Civil Eng.	Clemson	Employee	12 years
	Brian Grant	M.S.	Comp. Sci.	North Carolina	Employee	16 years
	Chris Townsend	B.S.	Business	North Carolina	Employee	6 years
	Chris Gorski	B.S.	Comp. Sci.	North Carolina St.	Employee	6 years

Lawrence A. Twisdale, Jr., Ph.D., P.E., Civil Engineering, University of Illinois. Dr. Lawrence A. Twisdale, Jr., joined ARA in 1982. He is a Principal Engineer and Senior Vice President and has more than 34 years of experience directing and performing research and engineering analyses for extreme wind effects and structural response. Dr. Twisdale has 21 years' experience in the application of hurricane modeling relevant to insurance loss analysis and rate making. Dr. Twisdale has been involved in developing methodology and applications to extreme wind risk analysis and wind-borne debris hazard analysis since 1974. Dr. Twisdale has performed numerous site-specific wind analyses, including tornado, hurricane, and extratropical cyclones. Dr. Twisdale was Co-Principal Investigator with Dr. Peter Vickery on the National Science Foundation (NSF) research project "Hurricane Wind Hazards and Design Risk in the United States." This research developed a physics and meteorology-based numerical windfield model as part of a wind hazard risk assessment methodology. Dr. Twisdale was Principal Investigator on an NSF funded project to test a "Predictive Methodology for Building Cladding Performance Using a Sample of Hurricane Bertha Damage Data." He also led the efforts on the "Residential Construction Mitigation Program (RCMP)" from 1998-2000 in Southeast Florida that involved engineering mitigation analysis of over 2200 houses. He was Principal Investigator on loss mitigation studies in 2001-2002 for the State of Florida for both single-family residences and multi-family buildings. Dr. Twisdale was a Co-Principal Investigator for the Federal Emergency Management Agency's (FEMA) HAZUS Wind Loss Estimation Methodology. He was Principal Investigator on several industry-funded research projects on the "Analysis of Hurricane Windborne Debris Impact Risks for Residential Structures" that influenced the SSTD 12 and American Society of Testing and Materials (ASTM) Standards. He is a member of the Wind Engineering Research Council, IBHS Wind Committee, and the American Society of Civil Engineers (ASCE). He has served on several ASCE technical committees on wind effects, structural reliability, and dynamic structure response. Dr. Twisdale has over 70 technical papers in wind engineering, risk analysis, response of structures to extreme wind, and wind-borne debris effects. Dr. Twisdale was an invited author to prepare the chapter on "Extreme Wind Risk Assessment" in the *Probabilistic Structural Mechanics Handbook*, published in 1995.

Peter Vickery, Ph.D., P.E., Engineering Science, University of Western Ontario. Dr. Peter Vickery joined Applied Research Associates in 1988. Prior to joining ARA, Dr. Vickery completed both his Masters and Doctoral studies at the University of Western Ontario, working with Dr. Alan Davenport, an internationally recognized expert and leader of modern wind engineering technology. Dr. Vickery has over 32 years of experience in wind engineering. He has 21 years' experience in the application of hurricane modeling relevant to insurance loss analysis/rate making. Dr. Vickery has published multiple peer-reviewed journal papers related to hurricane risk as well as papers related to wind loads on buildings and other structures.

Dr. Vickery serves on the ASCE-7 wind load task committee developing wind loading provisions for use in the United States, and has served on the Board of Directors of the American Association for Wind Engineering. In 1996, Dr. Vickery received the Collingswood Prize from ASCE for the best paper published by a younger member. With Dr. Lawrence Twisdale, Dr. Vickery developed the hurricane missile models used in the wind load damage tools. The hurricane missile model results were instrumental in defining the windborne debris risk criteria as given in the SSTD-12 missile protection standard and the new ASTM wind borne debris standard. He is a Fellow of the American Society of Civil Engineers and a Licensed Engineer in the state of North Carolina.

Dr. Vickery has performed post-storm damage surveys following Hurricanes Andrew, Erin, Opal, Fran, Bertha, Bonnie, Isabel and Charley. Following Hurricane Andrew, Dr. Vickery served as an expert witness testifying to the windspeeds produced by the storm.

He was responsible for developing the wind load and damage portion of the loss model used for residential structures and played the primary role in the development of ARA's hurricane simulation model. Dr. Vickery was Co-Principal Investigator on ARA's effort to develop the HAZUS Wind Loss Estimation methodology and software and ARA's Mitigation Grant Feasibility Study for the Hawaii Hurricane Relief Fund.

Francis M. Lavelle, Ph.D., P.E., Civil Engineering, Rice University. Dr. Francis M. Lavelle joined ARA in 1990 and was the Division Manager of ARA's IntraRisk Division from 2003 to 2009. He is a Principal Engineer and Vice President with over 26 years of research, development, and project management experience in the areas of extreme loading effects, risk analysis of structures, and software development. Dr. Lavelle is currently leading ARA's software integration efforts for FEMA's HAZUS-MH Hurricane Loss Estimation Model and ARA's proprietary HurLoss insurance loss estimation model. HAZUS-MH is a joint effort between the Federal Emergency Management Agency (FEMA) and the National Institute of Building Sciences (NIBS) to produce a nationally applicable software program for estimating potential losses from earthquake, flood, and wind hazards. Dr. Lavelle has performed post-storm damage surveys following Hurricanes Isabel (2003) and Charley (2004); and he was Principal Investigator on a statewide hazard mitigation study for the Hawaii Hurricane Relief Fund. He has also performed ratemaking studies for the Florida Hurricane Catastrophe Fund and contributed to the development and testing of a Mitigation Incentives web site for the Florida Department of Community Affairs. Prior to joining ARA's IntraRisk Division, Dr. Lavelle was a Principal Investigator in ARA's Southeast Division for a number of government-sponsored research projects, including an $8.0M, 3-year contract involving both structural engineering research and software development. During the same period, he was also responsible for managing ARA's Advanced Modeling and Software Systems (AMSS) group, a group of 15 civil, mechanical, aerospace, and software engineers. Before heading the AMSS group, Dr. Lavelle was responsible for developing reliability-based design safety factors for structural response to extreme loads. His graduate research at Rice University included studies on the dynamic response of locally nonlinear structures, the seismic response of secondary systems, and retrofitting techniques for reducing earthquake-induced pounding damage in adjacent buildings. Dr. Lavelle is a member of the American Society of Civil Engineers and has been a registered professional engineer in the state of North Carolina since 1994.

Chris Driscoll, B.S., Civil Engineering, University of South Florida. Mr. Driscoll joined ARA in 1999. He has 17 years of experience in residential/commercial construction, structural engineering, and computer programming. He earned his B.S. in Civil Engineering from the University of South Florida. He has been working on residential/commercial hurricane inspection and mitigation programs for the Department of Community Affairs, FEMA, and for small municipalities. Mr. Driscoll has evaluated post-hurricane wind damage surveys for Erin (1995), Opal (1995), Georges (1998), Isabel (2003) and Charley (2004). He has performed building stock analysis using data collected from Florida Panhandle and South Florida building surveys. He is a developer of wind damage assessment computer modeling tools. Mr. Driscoll has 10 years' experience in hurricane modeling and 11 years in structural engineering.

Jeffrey C. Sciaudone, M.S., Civil Engineering, Clemson University. Mr. Sciaudone joined ARA in 2004. He has 17 years of experience in wind engineering and hurricane modeling relevant to insurance risk. He earned a Bachelors (1994) and Masters (1996) of Science in Civil Engineering from Clemson University and is a registered Professional Engineer in the state of Massachusetts. He has participated in post-hurricane damage surveys following Hurricanes Opal (1995), Isabel (2003), Charley (2004), and Katrina (2005). He has performed analyses of land-use/land cover data and remotely-sensed data for estimating aerodynamic surface roughness (z0). He currently manages the content and development of the Wind Insurance Savings Calculator website for the Florida Division of Emergency Management, which tracks discounts offered by personal lines insurers in Florida for wind mitigation-related features of homes. He performs Probable Maximum Loss and Average Annual Loss studies for insurance company clients. He has also developed a tree debris collection model for HAZUS-MH and teaches advanced level classes on the use of the HAZUS-MH hurricane model. He regularly produces Geographical Information Systems (GIS) maps to communicate natural disaster risk-related information to support ARA projects as well as using GIS and remotely-sensed data to enhance natural disaster risk analyses.

Prior to joining ARA, Mr. Sciaudone was the Director of Engineering for the Institute for Business & Home Safety (IBHS) from 1999 to 2004, where he was responsible for developing and implementing mitigation research and outreach projects on behalf of the U.S. property/casualty insurance industry for the perils of earthquake, hurricane, tornado, wildfire, flood, and hail. Projects included development of an inspection-based, code-plus residential construction program (Fortified…for safer living); redesign and continual management of a Catastrophe Loss Database; and post-disaster damage inspections following hurricanes, tornadoes, and earthquakes. Prior to joining IBHS, Mr. Sciaudone was a project engineer with Impact Forecasting L.L.C. (1996-1999), which is a division of the AON Corporation. While with Impact Forecasting, he was involved with the development of wind damage functions for an in-house hurricane loss modeling system and performing ratemaking analyses for insurance company clients.

Marshall B. Hardy, M.S., Statistics, University of Kentucky. Mr. Marshall B. Hardy joined ARA in 1983 and has 31 years' experience in applied statistical analysis and probabilistic risk assessment. He has a Master's degree in Statistics from the University of Kentucky. He has approximately 13 years' experience in support of hurricane modeling relevant to insurance loss analysis and rate making. Mr. Hardy performs multivariate statistical analysis and tests for ARA's wind engineering applications. He has aided in the design of simulations, analyzed loss distributions, and performed multivariate analyses of hurricane damage and loss data sets. He has aided in the development of loss functions. He was a key developer of ARA's TORSCR code that is now the nuclear power industry standard for Probabilistic Risk Assessments (PRA) for extreme wind and tornado-missile hazard. He has applied the TORSCR code and statistically characterized distribution parameters for ten nuclear power plant PRAs. Mr. Hardy also served as lead statistical analyst on numerous DoD, NSF, NIST, and EPA projects. This experience involved statistical modeling of uncertainty in nonlinear elasto-plastic response to wind, blast, or airplane strike, or multivariate analysis-of-variance (ANOVA) to identify dominant uncertainties in the predictive methodologies, and cluster analysis for code validation. Mr. Hardy is an expert in the SAS statistical analysis system that will be used in this work and is also an experienced FORTRAN programmer on a number of systems including the Defense Nuclear Agency (DNA) Cray computer at Los Alamos, DEC minicomputers, and PCs. The Air Force published his 1997 paper on sequential design of experiments for simulations.

Chris Townsend, B.B., Business, University of North Carolina. Mr. Chris Townsend joined ARA in 2010. He has over 19 years of experience in software development. He earned his B.B. in Business Finance with additional computer science courses from the University of North Carolina at Wilmington. He has been working on distributed and multiprocessor high performance computing for ARA. Mr. Townsend has developed many large-scale and web-based computing systems and helped pioneer the first successful software as a service platform in the agricultural industry.

Chris Gorski, B.S., Computer Science, North Carolina State University. Mr. Christopher Gorski joined ARA in 2011 and has over 16 years of experience in the software field. Mr. Gorski is currently a Staff Computer Scientist at Applied Research Associates and has a B.S. in Computer Science. Prior to joining ARA, much of Mr. Gorski's experience is as an independent contractor. At the UNC School of Medicine he was responsible for putting the examination system online in a system similar to the Board exams, but on the students' own computers with appropriate automatic countermeasures against student cheating. While at CrossComm Inc. Mr. Gorski was responsible for the development of several early iPhone applications for clients and supervised a junior engineer assigned to the task. Mr. Gorski has also spent several years working on database software for such diverse projects as education, retail, and remote monitoring software. His experience in his various contracts has put him at every part of the software development cycle, from design to coding to QA and release. Mr. Gorski joined the IntraRisk division of ARA in January 2011. Since coming to ARA, he has worked on both development and QA on projects including the HurLoss hurricane modeling project, the VAPO project, the IRIS wind mitigation project.

David Mizzen, M.S.C.E., Civil Engineering, Purdue University. Mr. Mizzen joined ARA in 2011. He has 6 years of wind engineering research and practical experience. He earned a Bachelor’s in Civil and Structural Engineering with Professional Internship in 2009 from the University of Western Ontario (Canada), a Master’s of Science in Civil Engineering in 2011 from Purdue University, and is an Engineer-in-Training (EIT). He has completed dozens of wind tunnel tests on high-rise structures from around the world and conducted research to determine wind loads on typical historic covered bridges. Mr. Mizzen has also performed code-based wind pressure fragilities for dozens of structures at Nuclear Power Plants across North America. He is currently involved in managing a number of projects for the National Institute of Standards and Technology (NIST) in the areas of Disaster and Failure Studies, and Community Disaster Resilience. He has developed storm surge fragility functions, and performed analyses using GIS maps to determine zip code centroids and estimated aerodynamic surface roughness using (z_0) using land-use/land-cover data.

Lauren Mudd, Ph.D., E.I.T., Civil and Environmental Engineering, Rensselaer Polytechnic Institute. Dr. Lauren Mudd joined Applied Research Associates in 2014 and has 5 years of experience in wind engineering. Prior to joining ARA, Dr. Mudd completed her Doctoral Studies at Rensselaer Polytechnic Institute. She earned both her Master of Engineering and Bachelor of Science in Civil and Environmental Engineering at the University of Louisville. Her graduate research, at Rensselaer Polytechnic Institute, consisted of a multi-hazard assessment of climate change impacts on hurricanes, using state-of-the-art stochastic hurricane simulation procedures. She has published several peer-reviewed journal papers related to hurricane risk analysis and simulation. Dr. Mudd is a registered Engineer in Training in the state of Kentucky and she is a member of the American Society of Civil Engineers, as well as the American Association of Wind Engineers.

Fangqian Liu, Ph.D., E.I.T., Civil Engineering, Clemson University. Dr. Fangqian Liu joined ARA in 2014, and has 7 years of experience in the field of wind engineering. She earned her B.S. in Civil Engineering from Beijing University of Civil Engineering and Architecture and then completed her Masters and Doctoral studies at Clemson University. During her post graduate studies, she investigated the statistical properties of historical hurricanes, from which she developed probabilistic hurricane models and a synthetic hurricane database for long-term risk assessment. She also evaluated the changes in design wind speeds and building vulnerabilities due to climate change impact. Her work in Clemson University has supported many other hurricane related researches inside Clemson University and collaborations with other institutions in the U.S.

B. Identify any new employees or consultants (since the previous submission) engaged in the development of the model or the acceptability process.

N/A.

C. Provide visual business workflow documentation connecting all personnel related to model design, testing, execution, maintenance, and decision-making.

The organization of the model and supporting personnel are shown in Figure 9. Lead individuals are shown in bold.

None of the employees identified in Table 1 was associated with the insurance industry, consumer advocacy groups, or government entities while working at ARA and contributing to the development of the model. Ms. Maxwell is a consultant to the insurance industry.

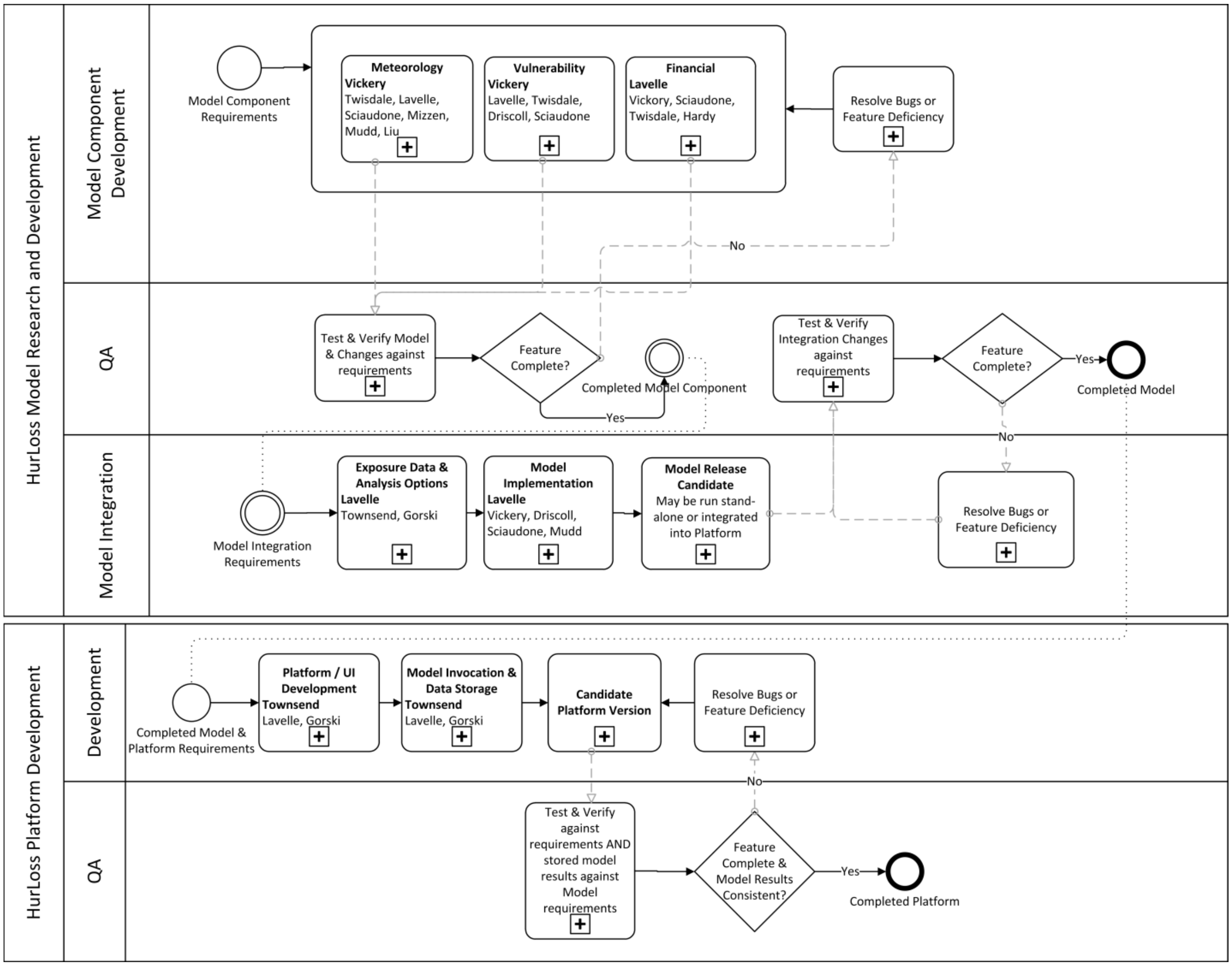


Figure 9. Model Workflow

3. Independent Peer Review

A. Provide reviewer names and dates of external independent peer reviews that have been performed on the following components as currently functioning in the model:

1. Meteorology

The windspeed (windfield) model was anonymously peer reviewed in the 1998-1999 time period prior to publication in the *Journal of Structural Engineering* by experts in the fields of wind engineering and meteorology. The current version of the model was anonymously peer reviewed in the 2007-2009 time period prior to publication in the *Journal of Applied Meteorology and Climatology* by experts in the field of hurricane meteorology. The statistical models for the Holland *B* parameter and the radius to maximum winds was anonymously peer reviewed in the 2007-2009 time period prior to publication in the *Journal of Applied*

Meteorology and Climatology by experts in the field of hurricane meteorology, and the filling model was also anonymously peer reviewed prior to the 2005 publication in the *Journal of Applied Meteorology and Climatology*.

The windspeed frequency model was anonymously reviewed at the same time the windspeed model was reviewed, also for publication in the *Journal of Structural Engineering.*

Dr. Steven Businger, a Professor of Meteorology at the University of Hawaii, performed a meteorological review in February 2005.

The meteorological components were also peer reviewed by the HAZUS Wind Committee during the period 1998-2002.

2. Statistics

The statistical aspects of the model have not been reviewed by personnel outside of ARA except through the review of publications cited above.

3. Vulnerability

The vulnerability function parameters have not been reviewed by personnel outside of ARA, except that the HAZUS Wind Committee has reviewed the methodology and procedures used to develop the vulnerability functions during the period 1998-2002.

4. Actuarial Science

The actuarial components and resulting annualized loss costs were reviewed by a consulting actuarial firm in November 2016. A copy of the consulting actuary's letter report is provided in Appendix C.

5. Computer/Information Science

The computer science aspects of the model have not been reviewed by personnel outside of ARA.

B. Provide documentation of independent peer reviews directly relevant to the modeling organization's responses to the current standards, disclosures, or forms. Identify any unresolved or outstanding issues as a result of these reviews.

The actuarial review was performed by Laura A. Maxwell, FCAS, MAAA, a consulting actuary with the firm Pinnacle Actuarial Resources, in November 2016. There are no unresolved or outstanding issues as a result of this review.

C. Describe the nature of any on-going or functional relationship the organization has with any of the persons performing the independent peer reviews.

None. The actuarial review of the model was paid for by our firm.

4. Provide a completed Form G-1, General Standards Expert Certification. Provide a link to the location of the form [insert hyperlink here].

See Form G-1.

5. Provide a completed Form G-2, Meteorological Standards Expert Certification. Provide a link to the location of the form [insert hyperlink here].

See Form G-2.

6. ***Provide a completed Form G-3, Statistical Standards Expert Certification. Provide a link to the location of the form [insert hyperlink here].***

   See Form G-3.

7. ***Provide a completed Form G-4, Vulnerability Standards Expert Certification. Provide a link to the location of the form [insert hyperlink here].***

   See Form G-4.

8. ***Provide a completed Form G-5, Actuarial Standards Expert Certification. Provide a link to the location of the form [insert hyperlink here].***

   See Form G-5.

9. ***Provide a completed Form G-6, Computer Standards Expert Certification. Provide a link to the location of the form [insert hyperlink here].***

   See Form G-6.

G-3 Insured Exposure Location

A. ***ZIP Codes used in the model shall not differ from the United States Postal Service publication date by more than 24 months at the date of submission of the model. ZIP Code information shall originate from the United States Postal Service.***

B. ***ZIP Code centroids, when used in the model, shall be based on population data.***

C. ***ZIP Code information purchased by the modeling organization shall be verified by the modeling organization for accuracy and appropriateness.***

D. ***If any hazard or any model vulnerability components are dependent on ZIP Code databases, the modeling organization shall maintain a logical process for ensuring these components are consistent with the recent ZIP Code database updates.***

E. ***Geocoding methodology shall be justified.***

A. ZIP Code centroids used in the model are updated at least every 24 months. The issue date of the current ZIP Code data set is July 2016.

B. ZIP Code centroids used in the model are population centroids.

C. Maps showing the zip code boundaries and the associated centroids will be available to the Professional Team.

D. Logical processes are in place for maintaining and updating a database of out-of-date ZIP Codes and mapping each one to a current ZIP Code.

E. The model includes a geocoding tool that estimates the latitude and longitude coordinates of a risk based on its input address and U.S. Census TIGER (Topologically Integrated Geographic Encoding and Referencing) data.

1. ***List the current ZIP Code databases used by the model and the model components to which they relate. Provide the effective (official United States Postal Service) date corresponding to the ZIP Code databases.***

The release date of the ZIP Code database used by the model is July 2016. The ZIP Code data are used by the Meteorological and Actuarial components of the model. The effective date of the current United States Postal Service ZIP Code data set is June 2016.

2. ***Describe in detail how invalid ZIP Codes are handled.***

If ZIP Codes are unidentified, we first attempt to map the zip code to one in our historical databases. If this is not successful, we use public domain information on historical ZIP Codes in an attempt to map the ZIP Code.

If a policy with an older ZIP Code is found, it is mapped to the centroid of its new ZIP Code in the most current database.

Finally, if ZIP Codes cannot be reassigned, they are removed from the analysis and reported as missing ZIP Codes.

3. Describe the data, methods, and process used in the model to convert among street addresses, geocode locations (latitude-longitude), and ZIP Codes.

Risk locations can be treated in the model using either a geocoded location or a ZIP Code. Geocoded locations can either be directly input to the model as a latitude and longitude or derived by geocoding an input street address. If a geocoded location is not provided in the input file and cannot be derived by the geocoding engine, the model will use the input ZIP Code to place the risk at a ZIP Code population centroid.

For locations that have a valid latitude and longitude provided in the input data or for which a latitude and longitude have been returned from the geocoder, the closest wind grid location and terrain grid locations are assigned based on the input or geocoded latitude and longitude. The ZIP code is then determined based on the selected wind grid location.

Geocoded latitude and longitude are computed from the input street address and the streets, address ranges, and coordinates in the US Census TIGER/Line shape files.

4. List and provide a brief description of each model ZIP Code-based database (e.g. ZIP Code centroids).

The following ZIP Code-based data sets are used in the model:

1. ZIP Code centroids are population weighted centroid coordinates for each ZIP Code polygon.
2. ZIP Code mappings for out-of-date ZIP Codes allow locations with non-current ZIP Codes to be assigned to a current ZIP Code.
3. ZIP Code surface roughnesses are assigned to locations that have not had explicit latitude-longitude coordinates input or do not have street address information that has been successfully geocoded.

5. Describe the process for updating model ZIP Code-based databases.

The ZIP Code-based data sets are updated as follows:

1. ZIP Code centroids are derived from census block centroids.
2. ZIP Code mappings for out-of-date ZIP Codes are updated by determining which current ZIP Code polygon contains the centroid of each out-of-date ZIP Code.
3. ZIP Code surface roughnesses are computed as an area-weighted average surface roughness within each ZIP.

G-4 Independence of Model Components

The meteorological, vulnerability, and actuarial components of the model shall each be theoretically sound without compensation for potential bias from the other two components.

All of the components of ARA's hurricane model, including the windspeed, climatology, damage, and loss models have been individually developed and validated.

The hurricane windfield model used in ARA's hurricane model has been validated through comparisons of modeled and observed windspeed data using information collected from over 15 landfalling storms. Details describing the ARA windfield model and the efforts taken to validate the model are given in Vickery, et al. (2009a). Example hurricane windfield validation plots are given in Figure 10 and Figure 11. In Figure 10 and Figure 11, the solid line represents model results and the individual points represent the measured data.

The damage and loss models used to produce vulnerability functions are based on first-principle approaches: engineering load and resistance analysis for physical damage estimation, and repair and reconstruction cost models for building loss estimation. These components have been independently validated. The actuarial components are theoretically sound and have also been validated separately without potential bias or compensation to the meteorology and vulnerability components.

The relationships among the meteorological, vulnerability, and actuarial components of the model are reasonable.

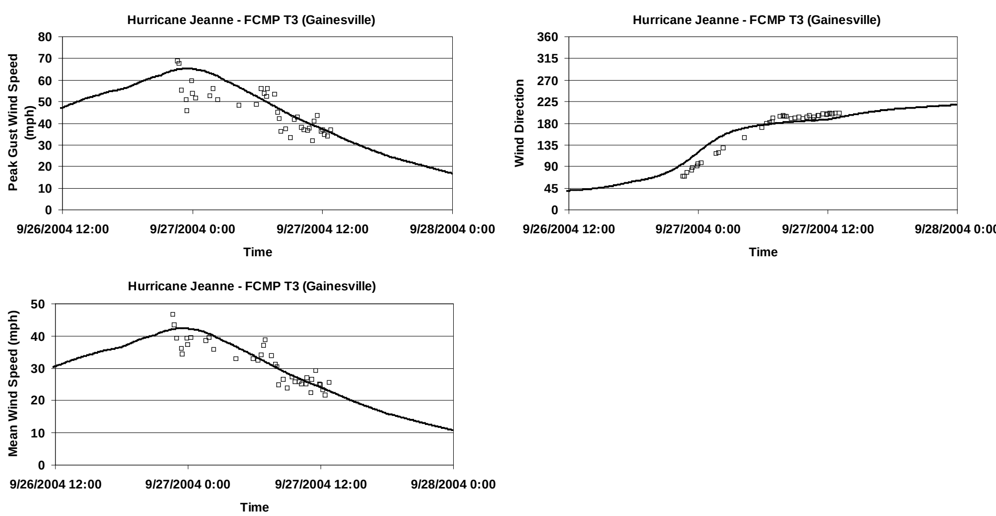


Figure 10. Comparison of Modeled and Observed Windspeeds, Wind Directions, and Pressures at Inland Locations

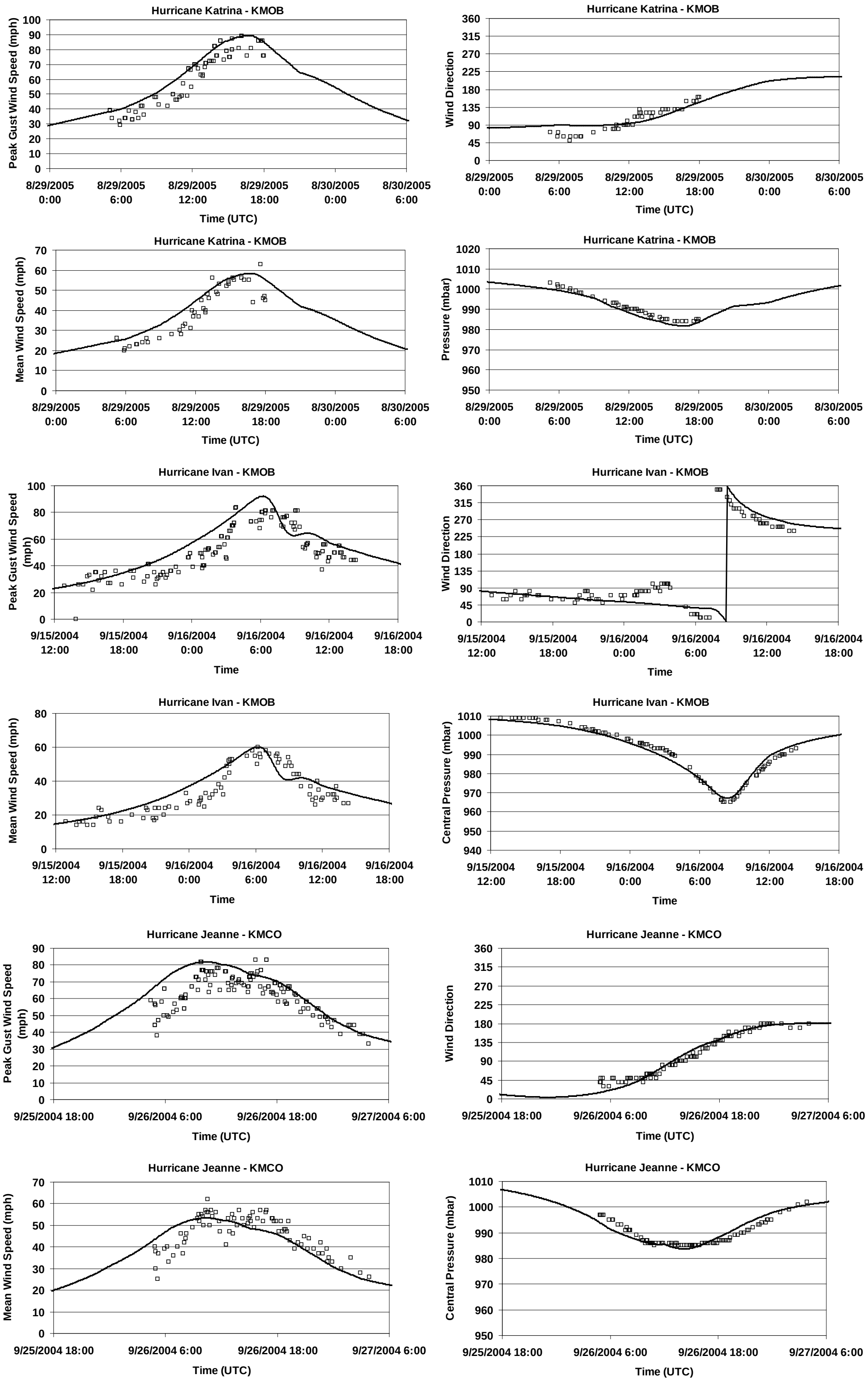


Figure 10. Comparison of Modeled and Observed Windspeeds, Wind Directions, and Pressures at Inland Locations (concluded)

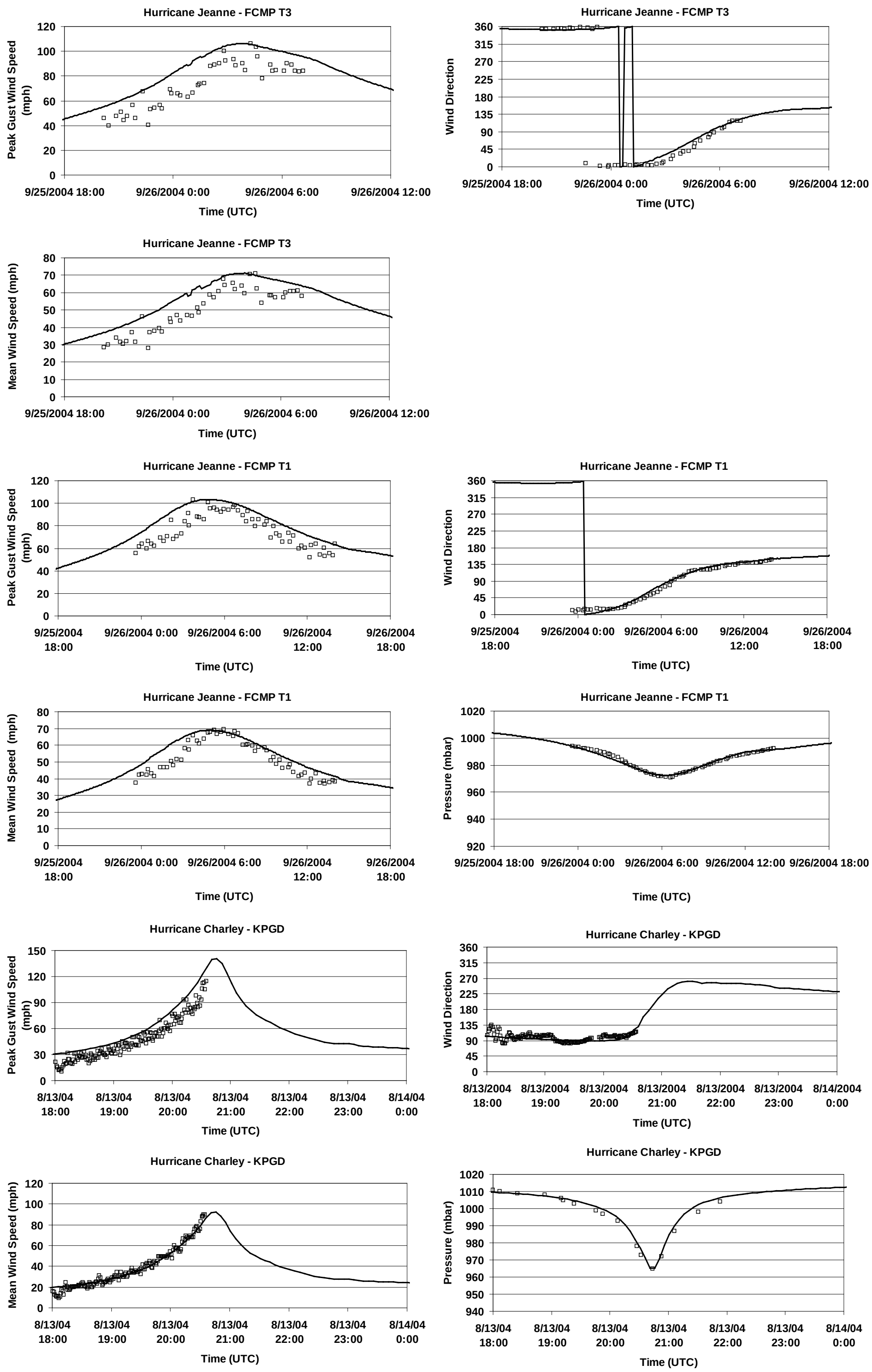


Figure 11. Comparison of Modeled and Observed Windspeeds, Wind Directions, and Pressures at Coastal and Near Coastal Locations

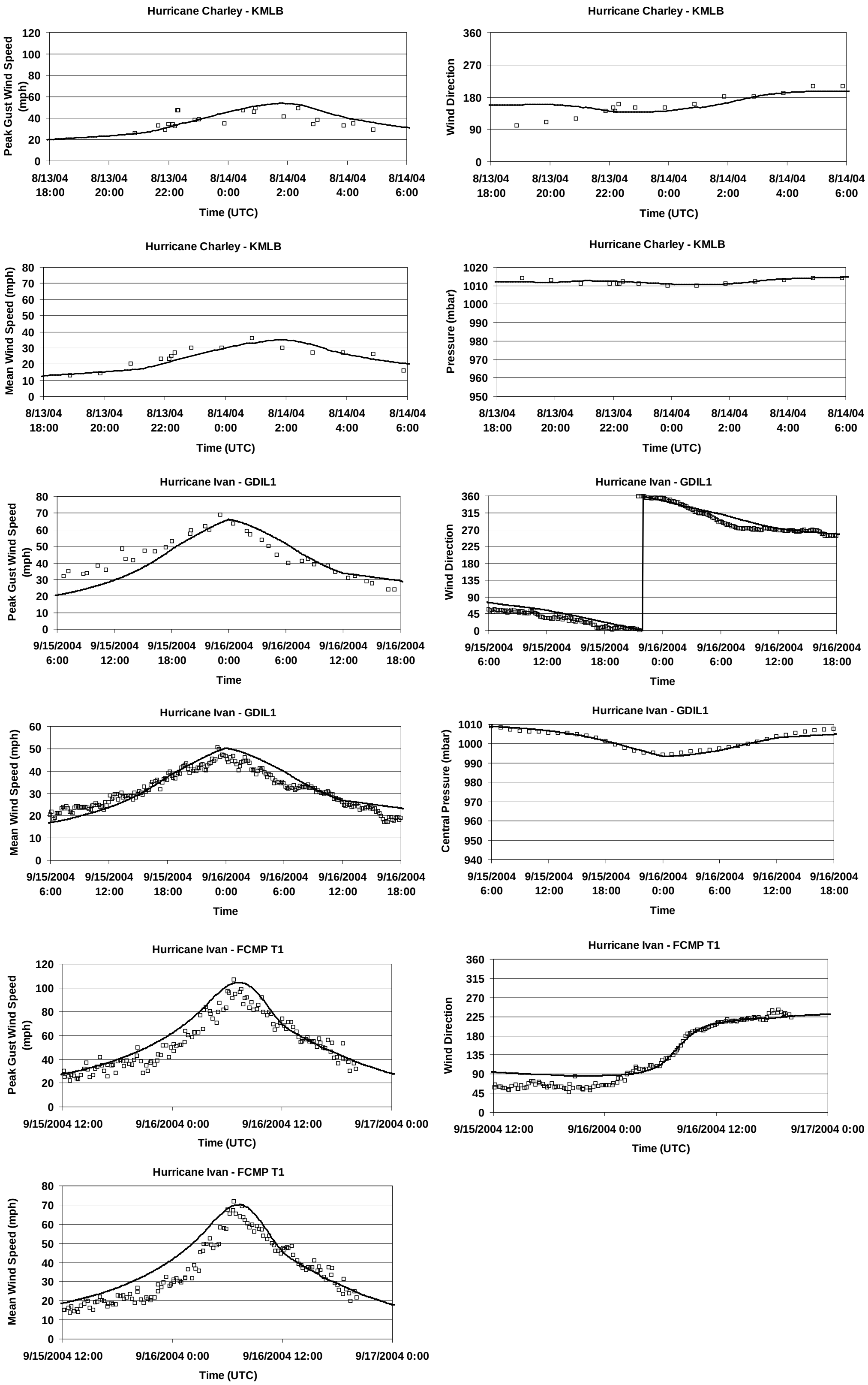


Figure 11. Comparison of Modeled and Observed Windspeeds, Wind Directions, and Pressures at Coastal and Near Coastal Locations (continued)

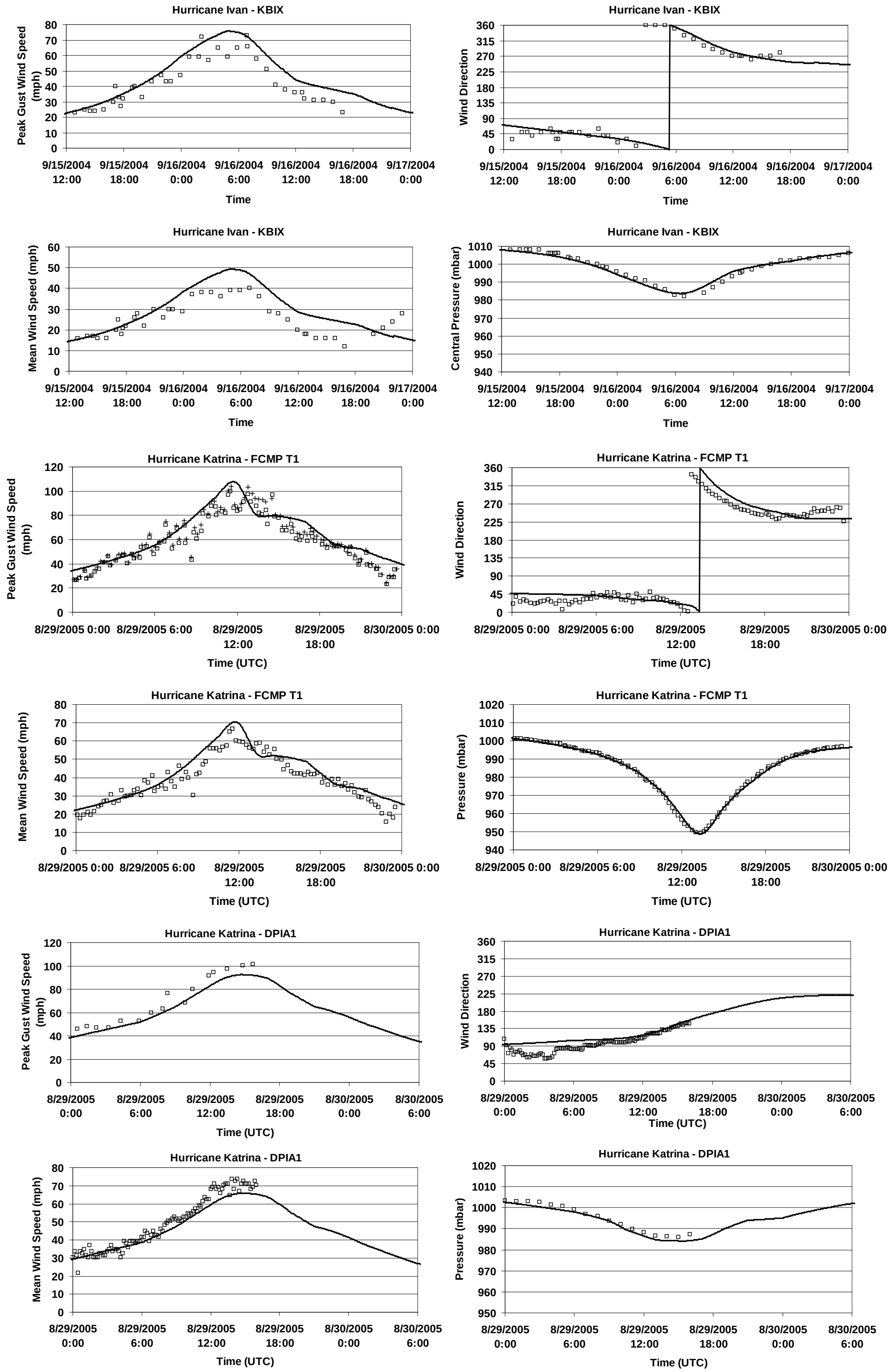


Figure 11. Comparison of Modeled and Observed Windspeeds, Wind Directions, and Pressures at Coastal and Near Coastal Locations (concluded)

G-5 Editorial Compliance

The submission and any revisions provided to the Commission throughout the review process shall be reviewed and edited by a person or persons with experience in reviewing technical documents who shall certify on Form G-7, Editorial Review Expert Certification that the submission has been personally reviewed and is editorially correct.

All documents provided to the Commission have been reviewed and edited by a person with experience in reviewing technical documents.

1. Describe the process used for document control of the submission. Describe the process used to ensure that the paper and electronic versions of specific files are identical in content.

Control of the submission document was accomplished by maintaining a single Microsoft Word document for each section of the submission. The initial version of these documents included the 2015 FHCLPM standards and the ARA responses from the 2013 submission where appropriate. After our initial submission to the Commission on November 1, 2016, all subsequent revisions will be made with the "track changes" feature turned on so that all changes could be consistently followed back to our initial submission. The track changes feature identifies all text that has been added, deleted, or changed and identifies the person making the change and the date and time it was made.

Prior to printing the paper copies, the entire document is assembled as a single PDF. The paper copies are printed from the PDF.

2. Describe the process used by the signatories on Forms G-1 through G-6, Expert Certification forms, to ensure that the information contained under each set of standards is accurate and complete.

Each signatory reviews the written portions of the submission that they are responsible for signing to ensure that the document reflects the implementation of the model.

3. Provide a completed Form G-7, Editorial Review Expert Certification. Provide a link to the location of the form [insert hyperlink here].

See Form G-7.

Meteorological Standards

M-1 Base Hurricane Storm Set*
(*Significant Revision)

A. The Base Hurricane Storm Set is the National Hurricane Center HURDAT2 as of June 9, 2015 (or later), incorporating the period 1900-2014. Annual frequencies used in both model calibration and model validation shall be based upon the Base Hurricane Storm Set. Complete additional season increments based on updates to HURDAT2 approved by the Tropical Prediction Center/National Hurricane Center are acceptable modifications to these data. Peer reviewed atmospheric science literature may be used to justify modifications to the Base Hurricane Storm Set.

B. Any trends, weighting, or partitioning shall be justified and consistent with currently accepted scientific literature and statistical techniques. Calibration and validation shall encompass the complete Base Hurricane Storm Set as well as any partitions.

A. The storm set used by ARA to define the hurricane climatology includes all storms given in the HURDAT2 database. The storm database encompasses the period 1886 through 2015 as given in the May 2016 version of HURDAT2.

B. The model does not include any weight or partitioning of the historical data.

1. Specify the Base Hurricane Storm Set, release date, and the time period used to develop and implement landfall and by-passing hurricane frequencies into the model.

The development of our hurricane model used all storms in the HURDAT2 database whether they made landfall in Florida or not, and thus our data set inherently includes all storms in the Hurricane Commission's storm set. The base hurricane storm set is HURDAT2 encompassing the period 1886-2015, released in May 2016.

2. If the modeling organization has made any modifications to the Base Hurricane Storm Set related to landfall frequency and characteristics, provide justification for such modifications.

N/A.

3. If the model incorporates short-term, long-term, or other systematic modification of the historical data leading to differences between modeled climatology and that in the Base Hurricane Storm Set, describe how this is incorporated.

N/A.

4. Provide a completed Form M-1, Annual Occurrence Rates. Provide a link to the location of the form [insert hyperlink here].

See Form M-1.

*M-2 Hurricane Parameters and Characteristics**

Methods for depicting all modeled hurricane parameters and characteristics, including but not limited to windspeed, radial distributions of wind and pressure, minimum central pressure, radius of maximum winds, landfall frequency, tracks, spatial and time variant windfields, and conversion factors, shall be based on information documented by currently accepted scientific literature.

The windspeeds associated with a modeled hurricane are estimated using ARA's peer reviewed hurricane simulation model, as described in Vickery, et al. (2009a, b). The following paragraphs summarize key elements.

Hurricane Occurrence Rate and Storm Track Modeling. The number of storms to be simulated in any one year is obtained by sampling from a negative binomial distribution. The starting position, date, time, heading, and translation speed of all tropical storms, as given in the HURDAT database, are sampled and used to initiate the simulation. Using the historical starting positions of the storms (i.e., date and location) ensures that the climatology associated with any seasonal preferences for the point of storm initiation is retained. Given the initial storm heading, speed and intensity, the simulation model estimates the new position and speed of the storm based on the changes in the translation speed and storm heading over the current six-hour period. The changes in the translation speed, c, and storm heading, θ, between times i and i+1 are obtained from,

$$\Delta \ln c = a_1 + a_2\psi + a_3\lambda + a_4 \ln c_i + a_5\theta_i + \varepsilon \qquad \textbf{Eq. 1a}$$

$$\Delta\theta = b_1 + b_2\psi + b_3\lambda + b_4 c_i + b_5\theta_i + b_6\theta_{i-1} + \varepsilon \qquad \textbf{Eq. 1b}$$

where a_1, a_2, etc., are constants, Ψ and λ are the storm latitude and longitude, respectively; c_i is the storm translation speed at time step i; θ_i is the storm heading at time step i; θ_{i-1} is the heading of the storm at time step i-1; and ε is a random error term. The coefficients a_1, a_2, etc., have been developed using 5-degree by 5-degree grids over the entire Atlantic basin. A different set of coefficients for easterly and westerly headed storms is used. As the simulated storm moves into a different 5-degree by 5-degree square, the coefficients used to define the changes in heading and speed change accordingly.

Hurricane Intensity Modeling. Hurricane intensity, as defined by central pressure difference, is modeled as a function of the relative intensity and thermodynamic and atmospheric environmental variables including sea surface temperature (SST), tropopause temperature and vertical wind shear. The relative intensity approach is based on the efficiency of a cyclone relative to a Carnot heat engine (Emanuel, 1988). The definition of the relative intensity used here is the ratio of the central pressure difference at the center of a cyclone to the maximum possible central pressure difference for the given meteorological conditions. The key parameters controlling the relative intensity are SST, tropopause temperature, T_o, and the relative humidity, taken here as a constant equal to 0.8.

For each storm in the HURDAT (Jarvinen et al., 1984) database where central pressure data are available and the storm is over water, the relative intensity is computed using the central pressure difference, SST, tropopause temperature and relative humidity (assumed constant and equal to 0.8). The SST at the storm center is determined from the HadISST dataset, which provides monthly mean SST's for the period of 1850-2015 on a 1° degree geographical grid. The T_o temperature data were obtained from the NCAR re-analysis T_o database (www.cdc.noaa.gov) which provides T_o data on a 2.5° degree geographical grid. A linear two dimensional interpolation method is used to obtain the value of T_o at the storm center.

A simple one dimensional ocean model, described in Emanuel et al. (2006) is used to simulate the effect of ocean feedback on the relative intensity calculations. The ocean feedback model calculates the mixed layer depth based on the assumed constancy of a bulk Richardson number, while the mixed layer momentum is driven by the surface stress and entrainment. The mixed layer momentum equation is integrated over a circular region of 4 times the *RMW*. The ocean mixing model returns an estimate of the mixed layer depth which is then used to compute the reduction in sea surface temperature caused by the passage of a hurricane. This reduced temperature is used in the relative intensity calculations.

The relative intensity values are subsequently used to develop regional statistical models in the form of Eq. 2, where the relative intensity at any time is modeled as a function of relative intensity at last three steps and the scaled vertical wind shear, V_s, (DeMaria and Kaplan, 1999).

$$\ln(I_{i+1}) = c_1 \ln(I_i) + c_2 \ln(I_{i-1}) + c_3 \ln(I_{i-2}) + c_4 V_s + \varepsilon \qquad \textbf{Eq. 2}$$

where c_1, c_2, etc. are constants that vary with region in the Atlantic Basin, and ε is a random error term. In the development of the dataset of historical values of *I*, the surface level wind speeds required for estimating c_1, c_2, etc., for use in the ocean mixing model were obtained using the simple windfield model described in Holland (1980), with the surface level mean wind speed equal to 80% of the gradient balance wind speed. A total of nine different regions are used to model the intensity changes of tropical cyclones in the Atlantic Basin.

In the simulation process, hurricanes that make landfall are weakened (filled) with the filling model as described in Vickery (2005), and if the center of the hurricane re-enters the water, Eq. 2 is again used to model the change in *I*. On first re-entering the water, the values of I_{i-1}, I_{i-2}, etc., used in Eq. 2 are all set to the value computed upon re-entry into the water. Ocean mixing is computed using the same simple Holland (1980) wind model used in the model development.

Estimates of wind speeds derived using the track and intensity simulation methodology model are coupled with the hurricane wind field model described in Vickery, et al. (2009a), statistical models for the Holland *B* parameter and *RMW* described in Vickery and Wadhera (2008), and a deterministic model used to decay the magnitude of *B* after a hurricane makes landfall. In the modeling of *B* and *RMW* an error term is sampled prior to the start of each simulated storm and is used throughout the simulation as a shift from the mean regression model. Using this approach, a storm that starts out larger than average remains larger than average throughout its modeled life. Similarly, a storm with a sampled value of *B* that is larger or smaller than average remains larger or smaller throughout its modeled life.

Holland B Parameter Modeling. From Vickery and Wadhera (2008), the value of *B* over open water is modeled as:

$$B = 1.76 - 1.21\sqrt{A} + \varepsilon \;; \qquad r^2 = 0.345,\ \sigma_B = 0.226 \qquad \textbf{Eq. 3}$$

where

$$A = \frac{RMW \cdot f}{\sqrt{2R_d T_s \cdot \ln\left(1 + \frac{\Delta p}{p_c \cdot e}\right)}} \qquad \textbf{Eq. 4}$$

and ε is the random error term, sampled from a normal distribution with a mean of zero and standard deviation equal to $\sigma_{B.}$

In Eq. 4, *RMW* is the radius to maximum winds (m), *f* is the Coriolis parameter, R_d is the gas constant for dry air, T_s is the sea surface temperature in degrees C, p_c is the central pressure of the tropical cyclone, Δ*p* (mb) is the difference between the p_c and the far field pressure (taken here as 1013 mb) and *e* is the base of natural logarithms. After landfall, *B* is modeled in the form:

$$B(t) = B_0 \exp(at) \qquad \textbf{Eq. 5a}$$

$$a = 0.0291 - 0.0429B_0 \text{; } a \leq -0.005 \qquad \textbf{Eq. 5b}$$

where B_0 is the value of *B* at landfall. The reduction in the magnitude of *B* after landfall was derived from comparisons of modeled and observed pressures and wind speeds at both coastal and inland stations. In the wind field modeling comparisons discussed in detail in Vickery, et al. (2009a), the magnitudes of both *B* and *RMW*, (typically decreasing and increasing after landfall, respectively) are estimated along the track of the hurricane until reasonable matches between both the modeled and observed wind speed and pressure traces is obtained. The reduction in the modeled values of *B* after landfall were found to be adequately modeled using an equation in the form of Eq. 5.

Note that Vickery and Wadhera (2008) suggest that for hurricanes approaching the Gulf of Mexico coastline that *B* decreases during the last 12 hours before landfall, and they suggest that this reduction in *B* requires further study to determine if this behavior is indicative of most hurricanes approaching the Gulf of Mexico coastline or just those in the sample. In this study, a reduction in *B* for Gulf of Mexico landfalling hurricanes was not included in the model.

RMW Modeling. In Vickery and Wadhera (2008), two models are given for the *RMW* (km), one for Gulf of Mexico hurricanes and one for all hurricanes. Here, the all storms *RMW* model is applied to Atlantic basin hurricanes and the Gulf of Mexico *RMW* model is applied to storms in the Gulf of Mexico. The models for *RMW* used in the simulation are:

$$\ln(RMW_{Atlantic}) = 3.015 - 6.291 \times 10^{-5}\Delta p^2 + 0.0337\Psi + \varepsilon_{Atlantic}\text{; } r^2 = 0.297,\ \sigma_{\ln RMW} = 0.441 \qquad \textbf{Eq. 6a}$$

$$\ln(RMW_{Gulf}) = 3.859 - 7.700 \times 10^{-5}\Delta p^2 + \varepsilon_{Gulf}\text{; } \quad r^2 = 0.290,\ \sigma_{\ln RMW} = 0.390 \qquad \textbf{Eq. 6b}$$

The two statistical models for the *RMW* (Gulf of Mexico and Atlantic Ocean) are combined to yield one *RMW* model for each simulated storm in the form:

$$RMW = a_1 RMW_{Atlantic} + (1 - a_1) RMW_{Gulf} \qquad \textbf{Eq. 7a}$$

$$a_1 = \frac{\sum \Delta p_{Atlantic}}{\sum \left[\Delta p_{Atlantic} + \Delta p_{Gulf}\right]} \qquad \textbf{Eq. 7b}$$

where Δ*p* is the central pressure difference and the summation is performed over all six hour time steps from storm origination to the current time. All simulated storm tracks containing the storm location (latitude and longitude), heading, central pressure, *RMW*, *B* and translation speed are saved and later combined with the wind field model to compute wind speeds.

1. ***Identify the hurricane parameters (e.g., central pressure, radius of maximum winds) that are used in the model.***

The primary sources of information used to develop the statistical models for describing hurricane risk in the United States are: (i) the HURDAT database, used for developing the models describing storm tracks, heading, occurrence rates and central pressure; (ii) the data given in the publication NWS-38, used for developing the models describing central pressure and radius to maximum winds; and (iii) a database of upper level aircraft measurements provided by the Hurricane Research Division for developing statistical models defining the Holland Profile parameter, *B*.

The characteristics of the hurricane that are needed to produce an estimate of windspeed at a site are as follows:

i. Central Pressure Difference (HURDAT2 1886-2015, Ho, et al., 1987)[1]

ii. Holland Pressure Profile Parameter (Aircraft Data, 1977-2001, H*Wind Data, 1998-2005)[2]

iii. Radius to Maximum Winds (HRD H*Wind Analyses, 1988-2005; Flight Level data, 1977-2001)[2]

iv. Hurricane Track (HURDAT, 1886-2007)[2]

v. Latitude and Longitude of Site (N/A)

vi. Surface Roughness at the Site (Proprietary based on NLCD 2011)

vii. Distance of the Site from the Coast (N/A).

   a. Data used for landfall validation

   b. Data set used to develop indicated model component

2. ***Describe the dependencies among variables in the windfield component and how they are represented in the model, including the mathematical dependence of modeled windfield as a function of distance and direction from the center position.***

The storm central pressure over water is modeled as a function of the mixed sea surface temperature and vertical wind shear. The storm track, which defines storm heading, translation speed, and distance to site, is a function of latitude and longitude. The radius to maximum winds is modeled as a function of central pressure and latitude, and the Holland profile parameter is modeled as a function of latitude and radius to maximum winds. The variation of windspeed as a function of distance from the center position is a function of r/R_{max}, translation speed, the Holland *B* parameter, and terrain. The effect of terrain on windspeeds is discussed in Vickery and Skerlj (2005).

3. ***Identify whether hurricane parameters are modeled as random variables, functions, or fixed values for the stochastic storm set. Provide rationale for the choice of parameter representations.***

The probability distributions for central pressure, heading, translation speed and coast crossing, or distance, are all empirical. The R_{max} is log-normal, and the error term associated with the modeling of *B* is normal. The error terms in Equations (1) and (2) are modeled using bi-normal distributions.

4. ***Describe if and how any hurricane parameters are treated differently in the historical and stochastic storm sets and provide rationale.***

The main difference between the modeling of historical and actual hurricanes is that in the modeling of the historical hurricanes we use best estimates of the key hurricane parameters (e.g. R_{max}, *B*, central pressure) and their observed variation with time rather than model values (e.g. modeled pressure, R_{max} and *B* after landfall). The default far field pressure used in the stochastic set is 1013 mbar, whereas in the modeling of actual hurricanes this may vary, depending upon the available information.

5. ***State whether the model simulates surface winds directly or requires conversion between some other reference level or layer and the surface. Describe the source(s) of conversion factors and the rationale for their use. Describe the process for converting the modeled vortex winds to surface winds including the treatment of the inherent uncertainties in the conversion factor with respect to location of the site compared to the radius of maximum winds over time. Justify the variation in the surface winds conversion factor as a function of hurricane intensity and distance from the hurricane center.***

ARA's windfield model is valid for any averaging time and height above ground. The windfield model has been validated using both peak gust windspeeds and windspeeds averaged over ten minutes. In the validation studies, all measured windspeed data were adjusted (when needed) to a height of 10 m above ground (in local terrain conditions) before windspeed comparisons were performed. The basic output of the model, for use in loss estimation, is the peak gust windspeed. The variation of the mean windspeed with height, storm intensity and distance from the center of the hurricane is treated using the hurricane boundary layer model described in Vickery, et al. (2009a).

6. ***Describe how the windspeeds generated in the windfield model are converted from sustained to gust and identify the averaging time.***

Conversions of windspeeds from hourly means to one-minute sustained and three-second gust averaging times are performed using the ESDU (1982, 1983) models for atmospheric turbulence. The ESDU models have been shown to be valid in hurricanes as discussed in Vickery and Skerlj (2005).

7. ***Describe the historical data used as the basis for the model's hurricane tracks. Discuss the appropriateness of the model stochastic hurricane tracks with reference to the historical hurricane data.***

The modeling of the hurricane tracks in our model is similar to that described in Vickery, et al. (2000b), with the addition of ocean coupling and wind shear terms. The approach models a storm track beginning with its initial development over the ocean and ending with its final dissipation over land or in the open ocean. The approach has been validated through comparisons of simulated and observed key storm statistics along the coast of the United States. The development of the storm track model used the historical data given in the HURDAT database, encompassing the period 1886 through 2015. Starting positions of model storms are updated every year to include new historical storms. Model validation includes comparisons of modeled and observed hurricane land fall statistics using United States landfall data for the period encompassing 1900 through 2015.

8. ***If the historical data are partitioned or modified, describe how the hurricane parameters are affected.***

The historical data have not been partitioned or modified.

9. ***Describe how the coastline is segmented (or partitioned) in determining the parameters for hurricane frequency used in the model. Provide the hurricane frequency distribution by intensity for each segment.***

The model does not use coastline segments or partitions for determining parameters.

10. Describe any evolution of the functional representation of hurricane parameters during an individual storm life cycle.

The evolution of a model hurricane is described in the model overview presented in our introduction to Standard M-2.

M-3 Hurricane Probabilities

A. ***Modeled probability distributions of hurricane parameters and characteristics shall be consistent with historical hurricanes in the Atlantic basin.***

B. ***Modeled hurricane landfall frequency distributions shall reflect the Base Hurricane Storm Set used for category 1 to 5 hurricanes and shall be consistent with those observed for each coastal segment of Florida and neighboring states (Alabama, Georgia, and Mississippi).***

C. ***Models shall use maximum one-minute sustained 10-meter windspeed when defining hurricane landfall intensity. This applies both to the Base Hurricane Storm Set used to develop landfall frequency distributions as a function of coastal location and to the modeled winds in each hurricane which causes damage. The associated maximum one-minute sustained 10-meter windspeed shall be within the range of windspeeds (in statute miles per hour) categorized by the Saffir-Simpson Scale.***

Saffir-Simpson Hurricane Scale:

Category	Winds (mph)	Damage
1	74 – 95	Minimal
2	96 – 110	Moderate
3	111 – 129	Extensive
4	130 – 156	Extreme
5	157 or higher	Catastrophic

A. The modeled probability distributions of hurricane strength, forward speed, radii to maximum winds and storm heading are consistent with that derived from historical storms in the Atlantic Basin. The data used to derive the statistical models include the publication NWS-38, the HURDAT data base, and annual updates to the HURDAT database available from the National Hurricane Center/Tropical Prediction Center web site. Additional information on recent storms has been obtained from the Hurricane Research Division web site as well as detailed analyses of storms as published in American Meteorological Society (AMS) Journals including, *Monthly Weather Re*view, *Weather and Forecasting*, etc.

B. The modeled hurricane probabilities reasonably reflect the Official Storm Set for each coastal segment of Florida and neighboring states as demonstrated in Form M-1.

C. The storm intensity at the time of landfall (or any other time), as defined by the Saffir-Simpson scale, can be computed using either the one-minute sustained windspeed or the central pressure. All comparisons of storm intensity presented herein are based on the maximum modeled one-minute sustained windspeed at a height of 10 meters over water at the time of landfall. In the case of modeled by-passing storms, the maximum one minute wind speed is computed at the time of closest approach to the land location in Florida having the maximum modeled peak gust wind speed.

1. Provide a complete list of the assumptions used in creating the hurricane characteristics databases.

No assumptions were made in the use or development of the above databases. With respect to hurricane intensity modeling, which is modeled as function of sea surface temperature, we have developed the model with the assumption that the outflow temperature varies with time and space as given in the NCEP/NCAR re-analysis data set.

2. Provide a brief rationale for the probability distributions used for all hurricane parameters and characteristics.

Probability distributions are used to model the error terms describing the residuals in the regression models for *B*, *RMW* and the filling models. The errors are approximately normally distributed and have been modeled using truncated normal distributions. *RMW* is modeled in log space, hence the distribution of *RMW* is lognormal. The distributions of central pressure, translation speed and heading result from the track simulation model, but the resulting distributions are approximately Weibull, log-normal and bi-normal, respectively. In the track modeling process, the error terms for the logarithm of relative intensity, change in the heading and change in logarithm of translation speed are modeled using bi-normal distributions. The modeling approach is discussed in Vickery et al. (2000b)

*M-4 Hurricane Windfield Structure**

(*Significant Revision)

A. ***Windfields generated by the model shall be consistent with observed historical storms affecting Florida.***

B. ***The land use and land cover (LULC) database shall be consistent with National Land Cover Database (NLCD) 2011 or later. Use of alternate data sets shall be justified.***

C. ***The translation of land use and land cover or other source information into a surface roughness distribution shall be consistent with current state-of-the-science and shall be implemented with appropriate geographic information system data.***

D. ***With respect to multi-story buildings, the model windfield shall account for the effects of the vertical variation of winds if not accounted for in the vulnerability functions.***

A. The windfields generated by ARA's windfield model have been shown to be consistent with historical storms through the numerous comparisons of modeled and observed hurricane windspeed traces that have been performed and published in the open literature.

B. The Land Use Land Cover (LULC) database used as the basis for estimating surface roughness values is the National Land Cover Database (NLCD) 2011, which is the most recently available version of the NLCD.

C. The conversion of the LULC classifications to surface roughness values is performed using a combination of published and proprietary conversion factors.

D. The vertical variation of winds is accounted for in the vulnerability functions. In the development of the damage functions the variation of wind speed with height was modeled using a logarithmic profile, which is discussed in Powell et al., (2003) and Vickery et al. (2009), provides a good description of the variation of wind speed with height within the hurricane boundary layer.

1. ***Provide a rotational windspeed (y-axis) versus radius (x-axis) plot of the average or default symmetric wind profile used in the model and justify the choice of this wind profile.***

Figure 12 presents a plot of the azimuthally averaged total horizontal windspeed at the surface for a model hurricane whose parameters (R_{max}, B, central pressure and translation speed) represent the average values associated with all model hurricanes making landfall along the Florida coast. The radial profile of winds associated with the windfield model has been justified through the many comparisons of modeled and observed hurricane windspeed traces.

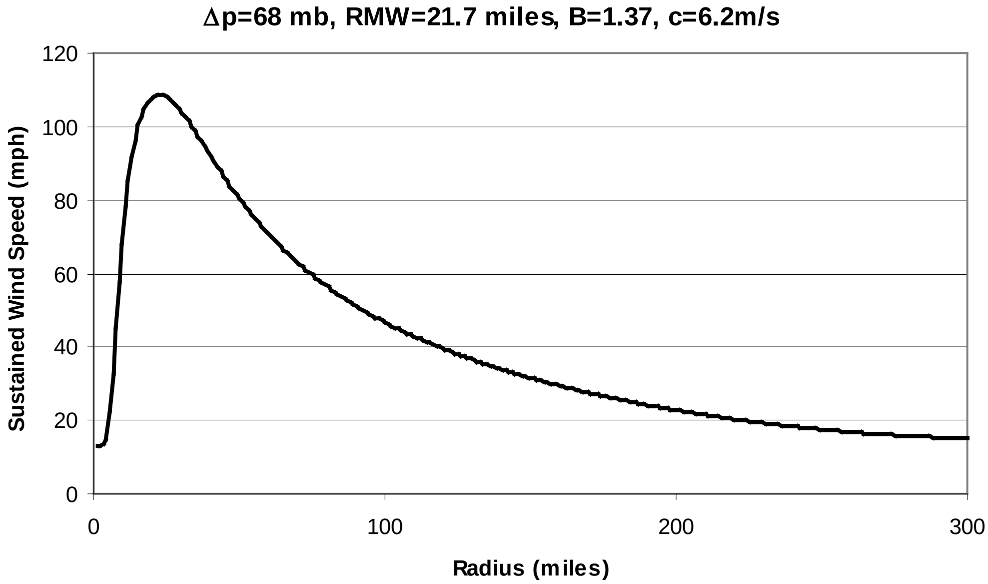


Figure 12. Radial Profile of Azimuthally Averaged Horizontal Windspeeds

2. ***If the model windfield has been modified in any way from the previous submission, provide a rotational windspeed (y-axis) versus radius (x-axis) plot of the average or default symmetric wind profile for both the new and old functions. The choice of average or default symmetric wind profile must be consistent for the new and old functions.***

   N/A.

3. ***If the model windfield has been modified in any way from the previous submission, describe variations between the new and old windfield functions with reference to historical storms.***

   N/A.

4. ***Describe how the vertical variation of winds is accounted for in the model where applicable. Document and justify any difference in the methodology for treating historical and stochastic storm sets***

The vertical variation of the mean wind speed used in the model is described in detail in Vickery et al. (2009a). The turbulence is modeled using the ESDU (1983) models for atmospheric turbulence. The same wind field model is used in both the stochastic storm set and for the modeling of historical storms.

5. ***Describe the relevance of the formulation of gust factor(s) used in the model.***

The validity of the ESDU gust factor model as applied to hurricane used is verified as described in Vickery and Skerlj (2005). In open terrain (z_o=0.03 m), the gust factor at a height of 10 m is about 1.52. In suburban terrain (z_o=0.3 m) the gust factor at a height of 10 m is about 1.86.

6. ***Identify all non-meteorological variables (e.g., surface roughness, topography) that affect windspeed estimation.***

Given a hurricane with fixed values of central pressure, heading, position, translation speed, radius to maximum winds, pressure profile parameter, and a site located on land, the variable that has the greatest impact on windspeed is the local ground roughness. Other variables having minor effects include distance from the coast, and distance from the center of the storm. Topographic effects are not modeled in Florida.

7. ***Provide the collection and publication dates of the land use and land cover data used in the model and justify their timeliness for Florida.***

The land use and land cover (LULC) data used to compute surface roughness lengths was collected "circa 2010" with data from satellite passes between 2009 and 2011. The full National Land Cover Database (NLCD) 2011 LULC image used to determine surface roughness in Florida was published by the Multi-Resolution Land Use Consortium (MRLC) in 2011 (Fry, et al., 2011).

8. ***Describe the methodology used to convert land use and land cover information into a spatial distribution of roughness coefficients in Florida and neighboring states.***

The LULC values are converted to roughness lengths using a combination of published and proprietary LULC-z_o mapping schemes augmented with satellite derived estimates of tree cover.

9. ***Demonstrate the consistency of the spatial distribution of model-generated winds with observed windfields for hurricanes affecting Florida. Describe and justify the appropriateness of the databases used in the windfield validations.***

Comparisons of modeled and observed windspeeds associated with landfalling storms have demonstrated the spatial distribution of the modeled windspeeds is consistent with observations. The Hurricane Jeanne comparison provided in our response to Standard M-5 presents such an example. The wind data used for model validation are obtained from The National Climatic Data Center, the National Data Buoy Center and from the Florida Coastal Monitoring Project. Only data where we can assess the local terrain roughness, ascertain the anemometer height and instrument response times are used in the validation process.

10. ***Describe how the model's windfield is consistent with the inherent differences in windfields for such diverse hurricanes as Hurricane King (1950), Hurricane Charley (2004), Hurricane Jeanne (2004), and Hurricane Wilma (2005).***

The differences in the windfields are treated through the use of different values of B, R_{max}, central pressure, and translation speed.

11. ***Describe any variations in the treatment of the model windfield for stochastic versus historical storms and justify this variation.***

The only difference between the modeling of stochastic storms and historical storms is that in modeling historical storms we use best estimates of the variation of R_{max}, B and pressure after land fall rather than model estimates.

12. ***Provide a completed Form M-2, Maps of Maximum Winds. Explain the differences between the spatial distributions of maximum winds for open terrain and actual terrain for historical storms. Provide a link to the location of the form [insert hyperlink here].***

The distribution of the actual terrain winds shows much more variation than the open terrain winds as these actual terrains include the effect of zip-code average surface roughness that can vary markedly between zip codes. Differences between the historical and modeled spatial distribution of winds is due to the small sample period for historical storms.

See Form M-2.

M-5 Landfall and Over-Land Weakening Methodologies

A. The hurricane over-land weakening rate methodology used by the model shall be consistent with historical records and with current state-of-the-science.

B. The transition of winds from over-water to over-land within the model shall be consistent with current state-of-the-science.

A. Upon making landfall, the intensity of the storm, as defined by central pressure, is reduced following the decay model described in Vickery (2005). An additional reduction in the magnitude of the pressure profile parameter is modeled using an exponential decay function. The windspeed at a height of 10 m is reduced due to the effects of friction following the methodology given in ESDU (1982, 1983). The approach has been validated through comparisons of modeled and observed marine and land based anemometers.

B. The effect of land friction dominates the change in wind speed as the wind moves from blowing over water to blowing over land. The sea-land transition used in the model is described in detail in Vickery et al. (2009b) and is treated in the ARA hurricane windfield model through the use of widely accepted wind engineering boundary layer models. The windspeeds near the ground are reduced using a modified version of the ESDU (1982, 1983) models for atmospheric turbulence. The reduction in windspeeds associated with a hurricane making landfall is produced by the ground friction, which is modeled using the ESDU (1983) boundary layer models. The approach used to model the effects of ground friction in the ARA model has been validated through comparisons of measured and modeled windspeeds from hurricanes taken offshore, at the coast, and inland from the coast.

1. Describe and justify the functional form of hurricane decay rates used by the model.

Once a simulated storm makes landfall, the central pressure difference, Δp, is decreased as the storm fills (or weakens). The filling of the storm is modeled using the approach described in Vickery (2005), where the central pressure difference at any time after landfall, $\Delta p(t)$, is given as:

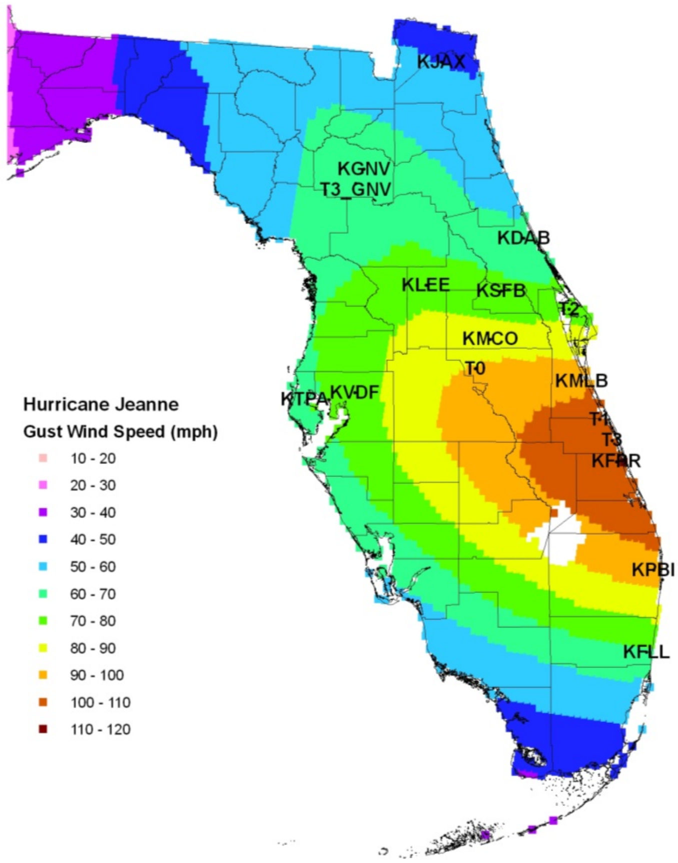
$$\Delta p(t) = \Delta p_0 \exp(-at) \qquad \textbf{Eq. 8}$$

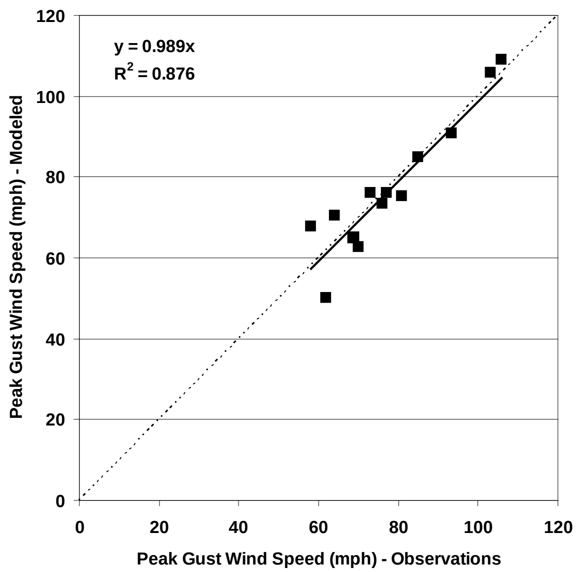
where Δp_o is the central pressure difference at the time of landfall; a is a filling parameter, which is a function of the storm intensity, translation speed and size at the time of landfall as well as the location (or region) of landfall; and t is the time in hours since the center of the storm crossed land. Using Eq. 8 to describe filling, large storms tend to fill slowly compared to small storms, weak storms fill more slowly than strong storms and slowly moving storms fill slower than fast moving storms. Four different representations of the filling parameter, a, are used – one for the Gulf of Mexico, one for the Florida Peninsula, and two for the Atlantic Coast. In performing studies for locations in Florida, only the first two filling model regions (different representations of the filling parameter, a) are applicable. In addition to the filling associated with the increase in the storm central pressure (or reduction in Δp), the windspeed at ground level is immediately decreased at the coastline because of frictional effects. This immediate decrease in windspeed is followed by a gradual decrease in windspeed at the surface associated with a change in the boundary layer characteristics of the storm in the region of the eyewall. Additional changes in the characteristics of the hurricane following landfall include a decrease in the value of the Holland profile parameter, B, modeled using an exponential decay function. An increase in the radius to maximum winds, R_{max}, is brought about because R_{max} is correlated with central pressure and/or latitude, both of which continue to change after landfall.

2. Provide a graphical representation of the modeled decay rates for Florida hurricanes over time compared to wind observations.

The decay of Florida hurricanes is dominated by the reduction in central pressure and Holland *B* parameter (which is correlated with central pressure and radius to maximum winds). The rate of decay of a hurricane is a function of storm size, translation speed, and central pressure at the time of landfall. Therefore, the decay rate varies from storm to storm. Figure 13 shows the envelope of maximum windspeeds produced by the model for Hurricane Jeanne, with comparison of modeled and observed windspeeds at both coastal and inland stations. In this representation of the windfield for Hurricane Jeanne, the storm has been decayed using the pressure filling model and exponential Holland *B* decay model used in the stochastic simulation rather than the actual pressure data. Windspeeds are given as peak gust values at a height of 10 m in open terrain.

Comparisons of decay rates with those estimated by Kaplan-DeMaria are given in Figure 14.





ASOS	Description	Peak Gust Speed (mph)	
		Observed	Modeled
KDAB	Daytona Beach ASOS	70	63
KFLL	Fort Lauderdale ASOS	58	68
KFPR	Fort Pierce ASOS		108
KGNV	Gainesville ASOS	69	65
KJAX	Jacksonville ASOS	62	50
KLEE	Leesburg ASOS	77	76
KMCO	Orlando International Airport ASOS	85	85
KMLB	Melbourne ASOS		96
KPBI	Palm Beach Airport ASOS		95
KSFB	Orlando-Sanford International Airport ASOS	76	73
KTPA	Tampa International Airport ASOS	64	71
KVDF	Tampa Vandenburg ASOS	81	75
LKWF1	Lake Worth C-MAN Station		98
T0	FCMP Tower T0	93	91
T1	FCMP Tower T1	103	106
T2	FCMP Tower T2	73	76
T3	FCMP Tower T3	106	109
T3	FCMP Tower T3 - Gainsville	69	65

Figure 13. Comparison of Modeled and Observed Windspeeds for Hurricane Jeanne. (Windspeeds are 3 Second Gust Values at a Height of 10m in Flat, Open Terrain and Storm is Decayed Using the ARA Filling Model)

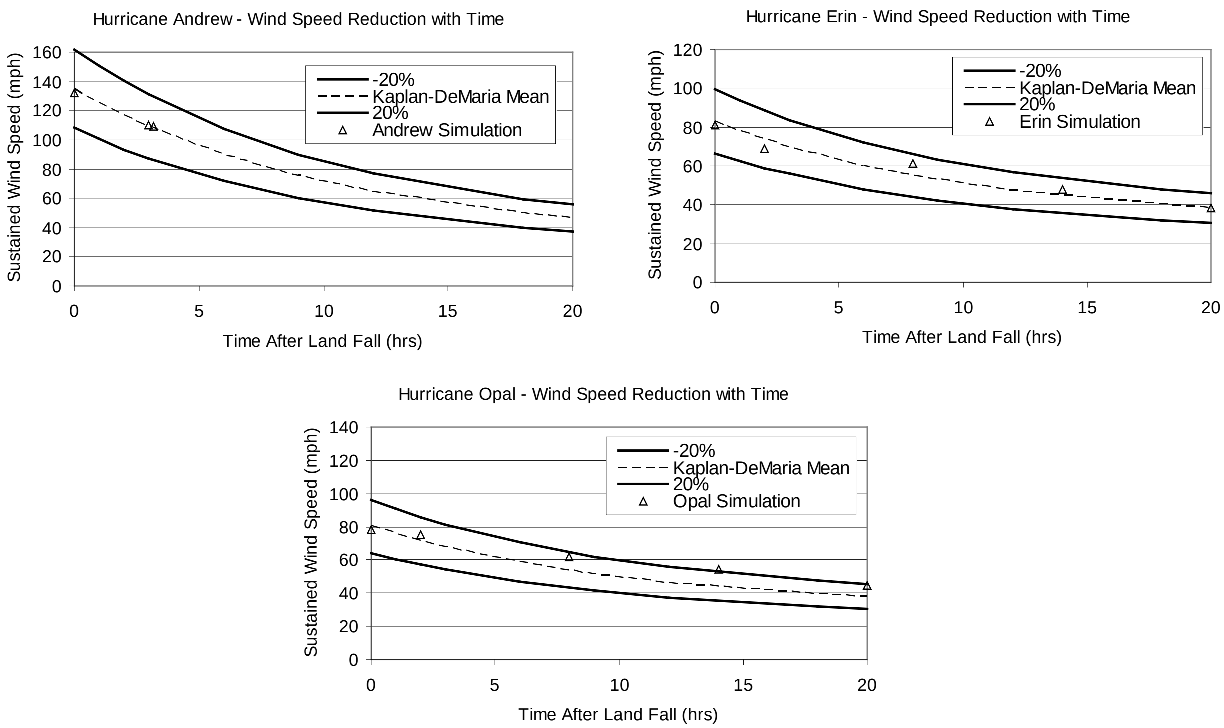


Figure 14. Example Comparisons of Modeled Decay Rates to Kaplan-DeMaria Decay Rates (Windspeeds are 1-Minute Sustained Windspeeds at a Height of 10 m in Open Terrain)

3. ***Describe the transition from over-water to over-land boundary layer simulated in the model.***

The over-water windspeeds are converted to over-land windspeeds using a modified version of the terrain transition model given in ESDU (1982). The validity of the model has been demonstrated through comparisons of modeled and observed marine and land based windspeed measurements.

4. ***Describe any changes in hurricane parameters, other than intensity, resulting from the transition from over-water to over-land.***

The parameters that change as the hurricane moves from sea to land include the surface roughness which affects the inflow angle, turbulence and change in wind speed with height. The change in surface roughness also results in an increase in the boundary layer height, which, along with the surface roughness, is a key parameter in the formulation of the model describing the variation of wind speed with height.

5. ***Describe the representation in the model of passage over non-continental U.S. land masses on hurricanes affecting Florida.***

Storms making land fall over non-continental US land masses are weakened using the filling model described in Vickery et al. (1995a).

6. ***Describe any differences in the treatment of decay rates in the model for stochastic hurricanes compared to historical hurricanes affecting Florida.***

The change in pressure following landfall for historical storms is modeled using historical data. The filling for stochastic storms is modeled using the filling model described in Vickery (2005). The changes in *B* are modeled using an exponential decay function. The change in the characteristics of the windfield associated with friction effects is the same for both historical and stochastic storms. If the radius to maximum winds of a historical storm is not known, the statistical models relating the radius to maximum winds with central pressure and latitude are used to model the radius.

M-6 Logical Relationships of Hurricane Characteristics

A. The magnitude of asymmetry shall increase as the translation speed increases, all other factors held constant.

B. The mean windspeed shall decrease with increasing surface roughness (friction), all other factors held constant.

The hurricane windfield characteristics, including the radial distribution of windspeeds, storm symmetry characteristics, and reduction in windspeed as a function of surface friction, are consistent with accepted scientific principles. The radial distribution of windspeeds has been validated through comparisons of model and observed windspeeds compared throughout the entire passage of multiple storms and at multiple anemometer sites. The effect of land friction is modeled using the ESDU terrain roughness model, and the effect of storm symmetry is treated using the approach described in Vickery et al. (2000a).

A. The magnitude of windfield asymmetry increases as the translation speed of the storm increases, all other factors held constant.

B. Surface level windspeeds decrease with increasing surface roughness, all other factors held constant.

1. Describe how the asymmetric structure of hurricanes is represented in the model.

The asymmetries are a function of the translation speed of the storm and the nonlinear interactions between the wind velocity vectors and the frictional effects associated with the interaction of the wind flow and surface friction. Examples are shown in Vickery et al. (2000a).

2. Provide a completed Form M-3, Radius of Maximum Winds and Radii of Standard Wind Thresholds. Provide a link to the location of the form [insert hyperlink here].

See Form M-3.

3. Discuss the radii values for each wind threshold in Form M-3, Radius of Maximum Winds and Radii of Standard Wind Thresholds, with reference to available hurricane observations such as those in HURDAT2. Justify the appropriateness of the databases used in the radii validations.

As evident in the hundreds of comparisons of wind modeled and historical wind speeds, the radii are generally consistent with the observations, with a small tendency for the model to underestimate winds well away from the center of the hurricane, in some cases. The data used to develop the model for the radius to maximum winds was supplied by NOAA. The resulting model has been published in the peer reviewed literature (Vickery and Wadhera, 2008). Note that radii of standard wind thresholds cannot be used as validation data as the definition of a threshold radii used by NHC differs from that produced by a hurricane wind field model.

S-1 Modeled Results and Goodness-of-Fit

A. ***The use of historical data in developing the model shall be supported by rigorous methods published in currently accepted scientific literature.***

B. ***Modeled and historical results shall reflect statistical agreement using currently accepted scientific and statistical methods for the academic disciplines appropriate for the various model components or characteristics.***

A. The use of historical data in developing the hurricane model has been demonstrated to be reasonable through publications in the scientific literature.

B. Goodness of fit tests, comparing modeled to historical data, have been performed using *t* tests, *F* tests, Chi-squared tests, and the Kolmogorov-Smirnoff test, for all historical data used to define the hurricane hazard. Example comparisons are given in Figure 15 for the distribution of storm translation speed for *all* tropical cyclones passing within 155 miles of milepost 1450 (approximately Miami). Figure 16 shows a comparison of the modeled and historical distributions of storm heading of *all* tropical cyclones passing within 155 miles of milepost 1450.

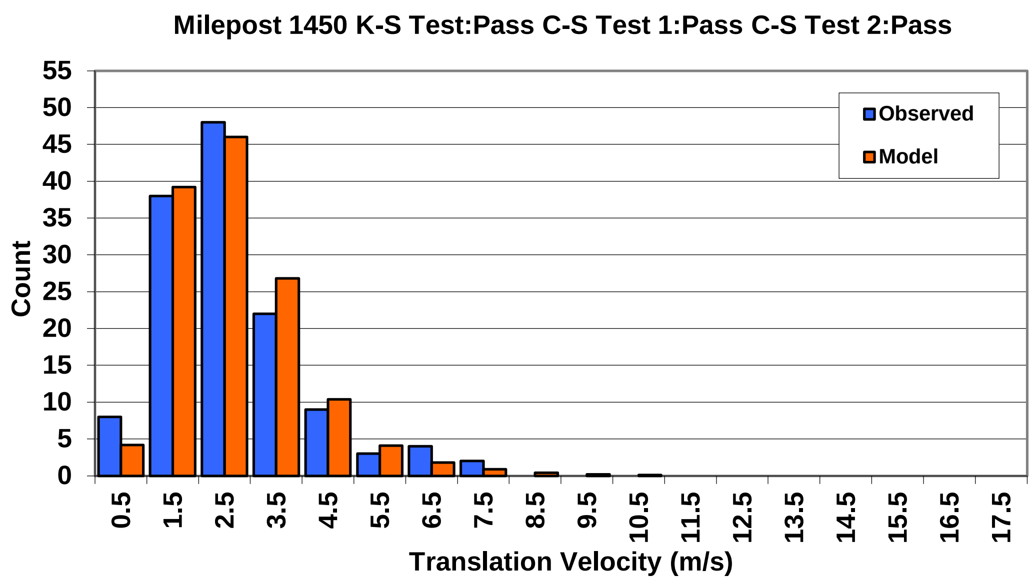


Figure 15. Comparison of Historical and Modeled Distributions of the Translation Speed of *all* Tropical Cyclones Passing Within 155 miles of Milepost 1450

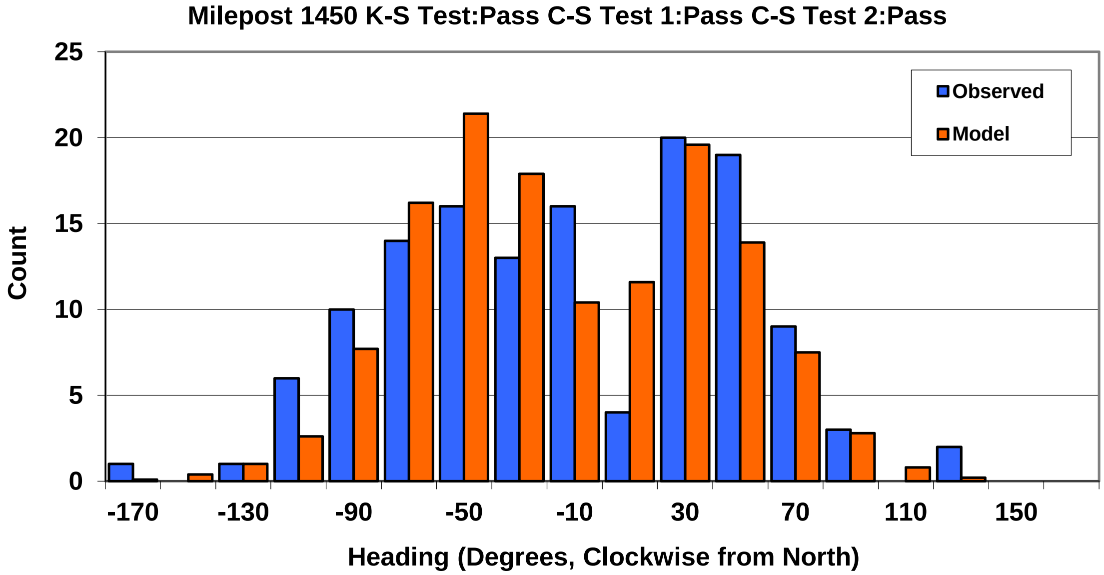


Figure 16. Comparison of Historical and Modeled Distributions of Storm Heading of *all* Tropical Cyclones Passing Within 155 miles of Milepost 1450

1. ***Provide a completed Form S-3, Distributions of Stochastic Hurricane Parameters. Identify the form of the probability distributions used for each function or variable, if applicable. Identify statistical techniques used for estimation and the specific goodness-of-fit tests applied along with the corresponding p-values. Describe whether the fitted distributions provide a reasonable agreement with the historical data. Provide a link to the form [insert hyperlink here].***

The hurricane track modeling approach used does not sample from predefined distributions of central pressure, heading, etc. The model predicts the parameters (position and central pressure) of a storm at the next time step based on its position, speed and heading at the current time step and up to two prior time steps. The resulting distributions of translation speed, heading, distance of closest approach are approximately log-normal, a mixture of two normal distributions, and either uniform or trapezoidal, respectively. The distribution of the central pressure is approximately Weibull. The radius to maximum winds is modeled using a log-normal distribution, dependent on the central pressure difference and latitude, and the Holland profile parameter is modeled as being normally distributed about the regression line with a mean dependent on latitude, radius to maximum winds, sea surface temperature, and central pressure. All distributions have been evaluated through standard statistical tests using a 5% alpha level.

Form S-3 provides comparisons of historical and modeled landfall headings, translation speeds, occurrence rates, and central pressures. p-values associated with the various statistical tests for equivalence are provided with each plot.

2. ***Describe the nature and results of the tests performed to validate the windspeeds generated.***

Windspeed validation studies have been performed using data obtained from Hurricanes Frederic (1979), Elena (1985), Hugo (1989), Bob (1991), Andrew (1992), Emily (1993), Erin and Opal (1995), Bertha and Fran (1996), Bonnie (1997), Georges (1998), Irene (1999), Charley, Frances, Ivan and Jeanne (2004), and Dennis, Katrina, Rita and Wilma (2005), and Gustav and Ike in 2008. In all cases, quantitative comparisons of modeled and observed estimates of windspeeds are only made if the measured records of windspeeds are continuous (or contain daily maxima), the height of the anemometer is known, the averaging times of both the gust and long term average is known and the terrain surrounding the anemometer is known. Comparisons for many valid records are given in Vickery, et al. (2009a).

3. ***Provide the date of loss of the insurance claims data used for validation and verification of the model.***

Insurance company data from the following hurricanes have been used to validate the model:

- Hurricane Hugo (1989)
- Hurricane Andrew (1992)
- Hurricane Erin (1995)
- Hurricane Opal (1995)
- Hurricane Bertha (1996)
- Hurricane Fran (1996)
- Hurricane Bonnie (1998)
- Hurricane Earl (1998)
- Hurricane Georges (1998)
- Hurricane Charley (2004)
- Hurricane Frances (2004)
- Hurricane Ivan (2004)
- Hurricane Jeanne (2004)
- Hurricane Wilma (2005)

4. ***Provide an assessment of uncertainty in probably maximum loss levels and loss costs for output ranges using confidence intervals or other accepted scientific characterizations of uncertainty.***

The major modeling uncertainties include hurricane, terrain, building stock, and vulnerability. An example of our analysis of hurricane modeling uncertainty is provided in Twisdale, Vickery and Hardy (1993), where it is shown that the uncertainty in windspeed as a function of return period is relatively large (CoV~10%). Using this result as an example, the mean estimated 100-year return period peak gust windspeed in the Miami region is about 145 mph, with the 95% prediction interval ranging between about 116 mph and 175 mph.

The uncertainties in the predicted windspeeds at a given location are amplified when propagated through the model to obtain predictions of loss costs. This amplification decreases with increasing uncertainty in the underlying distribution of windspeed and varies with location. In Alachua County, for example, a 1% uncertainty in the underlying distribution of windspeeds propagates through to a 7.3% uncertainty in loss costs, whereas as 10% uncertainty (expressed as a CoV) in windspeed propagates through to a 62% CoV in loss costs.

Estimates of uncertainty associated with probably maximum loss levels are given in Form A-8, Part D.

5. ***Justify any differences between the historical and modeled results using currently accepted scientific and statistical methods in the appropriate disciplines.***

There are no statistically significant differences between historical and modeled meteorological data.

6. Provide graphical comparisons of modeled and historical data and goodness-of-fit tests. Examples include hurricane frequencies, tracks, intensities, and physical damage.

The entire hurricane simulation model is validated through comparisons of statistics of storm heading, translation speed, intensity and frequencies using both historical information on landfalling hurricanes, as well as historical information on the statistics of all tropical cyclones passing within 155 miles (250 km) of milepost markers distributed along the entire US coastline (Figure 15 and Figure 16). Comparisons of the distribution of landfall frequency and intensity along various segments along the coastline of the US are given in Vickery et al. (2009b). In Vickery et al. (2009b), goodness of fit tests were presented where comparisons of the modeled and historical distributions of landfall intensity (defined by central pressure) were performed using the re-sampling technique described in James and Mason (2005). As discussed in James and Mason (2005), this re-sampling test is much more powerful than the Kolmogorov-Smirnov test. Figure 17 presents an example (for the South East Florida region) showing the historical data along with the mean modeled data along with the 5th and 95th percentile confidence interval as estimated from the re-sampling method described in James and Mason (2005). This example of landfall pressure plotted vs. return period combines the effects of both rate and intensity.

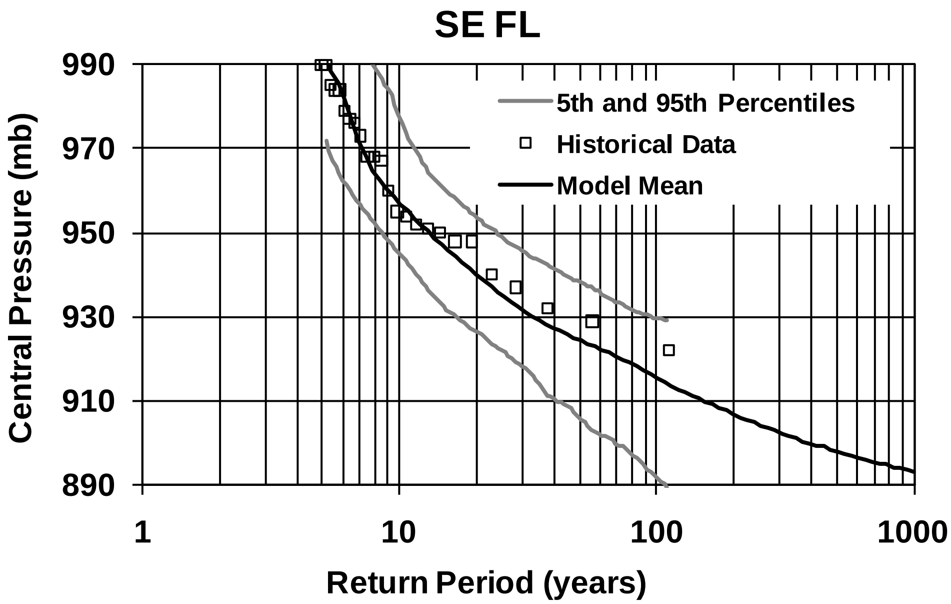


Figure 17. Comparison of Modeled and Historical Hurricane Landfall Pressures

Figure 18 and Figure 19 present comparisons of modeled and observed landfall rates and intensities for hurricanes making landfall in Florida.

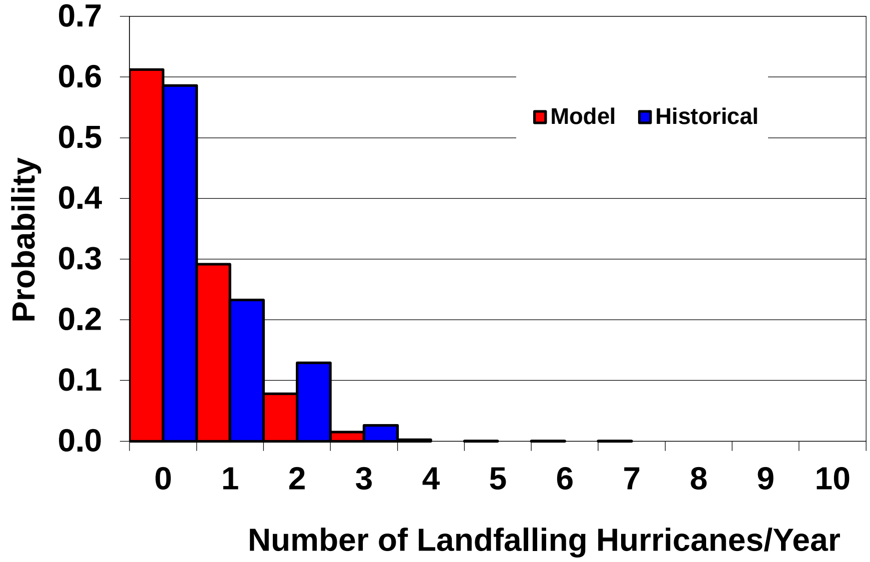


Figure 18. Comparison of Modeled and Historical Probabilities of Multiple Landfalls in a Year

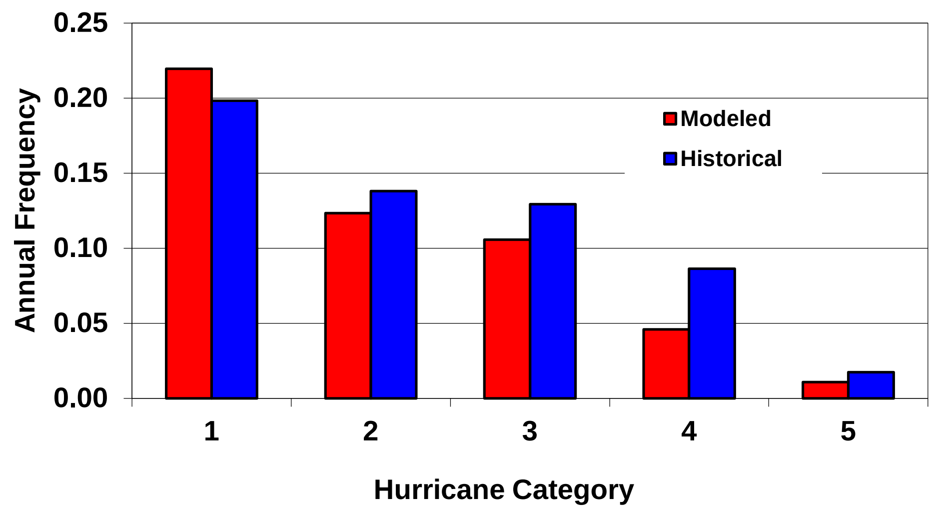


Figure 19. Comparison of Modeled and Historical Landfall Rates as a Function of Hurricane Category

7. ***Provide a completed Form S-1, Probability and Frequency of Florida Landfalling Hurricanes per Year. Provide a link to the location of the form [insert hyperlink here].***

   See Form S-1.

8. ***Provide a completed Form S-2, Examples of Loss Exceedance Estimates. Provide a link to the location of the form [insert hyperlink here].***

   See Form S-2.

S-2 Sensitivity Analysis for Model Output

A. The modeling organization shall have assessed the sensitivity of temporal and spatial outputs with respect to the simultaneous variation of input variables using currently accepted scientific and statistical methods in the appropriate disciplines and shall have taken appropriate action.

The model has been tested and sensitivities estimated for cases of simultaneous variations of input parameters. The sensitivity study results have been presented to the Professional Team.

1. Identify the most sensitive aspect of the model and the basis for making this determination.

The single most important element in loss estimation is the windspeed since the loads and, hence, physical damage to a building are proportional to the square of the windspeed. Thus, the estimation of losses is sensitive to the hurricane wind climate and the wind model. Loss results are particularly sensitive to the occurrence rate and area of the more intense hurricanes (Saffir-Simpson Category 3 or higher).

2. Identify other input variables that impact the magnitude of the output when the input variables are varied simultaneously. Describe the degree to which these sensitivities affect output results and illustrate with an example.

Given a location (i.e., the hurricane wind climate is held fixed), another key variable is surface roughness and the manner in which the boundary layer is modeled for the sea-land transition.

Loss predictions are, or course, sensitive to the building construction parameters and, hence, the vulnerability functions used. These observations of sensitivity are based on numerous detailed sensitivity analyses, theoretical considerations, as well as field observations.

Figure 20 shows an example of the distribution of the average annual loss for a house located in Alachua County associated with an assumed distribution describing the variation in the extreme windspeed distribution. The coefficient of variation associated with the input windspeed model was 1%, with this propagating to yield a 7.3% CoV associated with the prediction of the AAL. Increasing the coefficient of variation of the hurricane hazard curve to 10%, yields a CoV in the AAL of 62% and increases the mean value of the AAL by 13%. Additional examples showing the impact of the different parameters used in the model on loss cost estimates have been presented to the Professional Team during past visits.

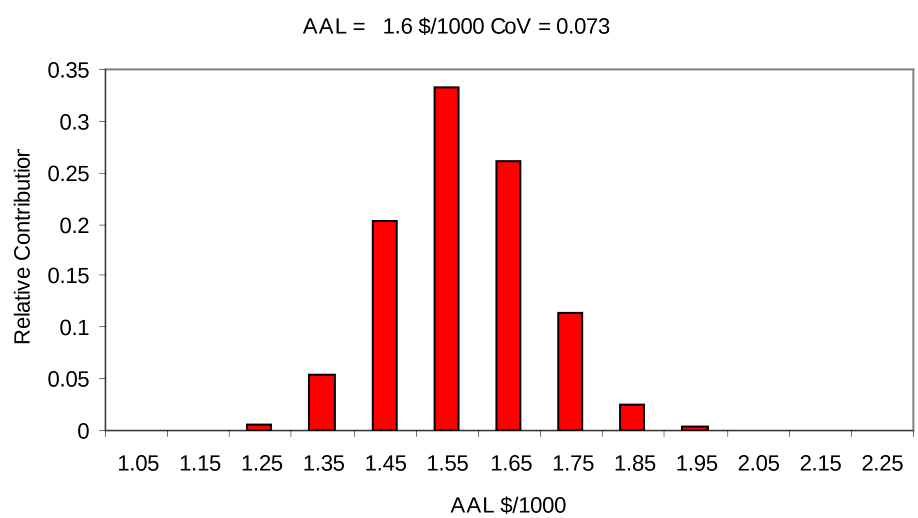


Figure 20. Distribution of AAL Associated with a 1% CoV in the Windspeed Model

3. Describe how other aspects of the model may have a significant impact on the sensitivities in output results and the basis for making this determination.

The sensitivity studies have shown that the estimation of the average annual loss is most sensitive to the estimation of windspeed (i.e. the hurricane hazard curve). In following the development of the model for estimating the hurricane windspeed hazard, this leads to the fact that the modeling of the Holland pressure profile parameter and the modeling of central pressure are other parameters that have a significant impact on the sensitivities of model outputs. An additional item that the model may be sensitive to is relative humidity, which is held constant in the development of the hurricane intensity.

A sensitivity study examining the sensitivity of the results to the number of simulated years was performed by simulating a new 100,000-year storm set with a new random seed. This study showed that the estimates of total loss costs could change by up to 8% in the low loss cost regions of Florida.

4. Describe and justify action or inaction as a result of the sensitivity analyses performed.

At the current time, no changes have been made to the model as a result of the sensitivity analysis. In light of the sensitivity in the estimation of loss costs noted in 4, we increased our stochastic storm set to include 300,000 years of simulated hurricanes.

5. Provide a completed Form S-6, Hypothetical Events for Sensitivity and Uncertainty Analysis. (Requirement for models submitted by modeling organizations which have not previously provided the Commission with this analysis. For models previously found acceptable, the Commission will determine, at the meeting to review modeling organization submissions, if an existing modeling organization will be required to provide Form S-6 (Hypothetical Events for Sensitivity and Uncertainty Analysis) prior to the Professional Team on-site review). If applicable, provide a link to the location of the form [insert hyperlink here].

Not applicable.

S-3 Uncertainty Analysis for Model Output

The modeling organization shall have performed an uncertainty analysis on the temporal and spatial outputs of the model using currently accepted scientific and statistical methods in the appropriate disciplines and shall have taken appropriate action. The analysis shall identify and quantify the extent that input variables impact the uncertainty in model output as the input variables are simultaneously varied.

Estimates of uncertainty are not a standard output of the model; however, an uncertainty analysis has been performed and has been presented to the Professional Team.

1. ***Identify the major contributors to the uncertainty in model outputs and the basis for making this determination. Provide a full discussion of the degree to which these uncertainties affect output results and illustrate with an example.***

The single most important element in loss estimation is the windspeed since the loads and, hence, physical damage to a building are proportional to the square of the windspeed. Thus, the estimation of losses is sensitive to the hurricane wind climate and the wind model. Loss results are particularly sensitive to the occurrence rate and area of the more intense hurricanes (Saffir-Simpson Category 3 or higher).

Given a location (i.e., the hurricane wind climate is held fixed), another key variable is surface roughness and the manner in which the boundary layer is modeled for the sea-land transition.

Loss predictions are, of course, sensitive to the building construction parameters and, hence, the vulnerability functions used. These observations of sensitivity are based on numerous detailed sensitivity analyses, theoretical considerations, as well as field observations. An example of the impact of a 1% uncertainty in the windspeed climate (as defined by the CoV) was presented in Figure 20, as to how this small uncertainty in windspeed propagates through to a large uncertainty in the prediction of average annual loss.

The uncertainty studies performed by ARA personnel examining the impact of reasonable estimates in the uncertainties of key input parameters were performed by propagating the uncertainties through to the prediction of losses looking at the effects one at a time and in various combinations. The result of the studies clearly showed that the uncertainties in the windspeed risk dominates the uncertainties in the losses.

Additional uncertainty studies have been performed in completing Form F under the 2002 Standards and Form S-6 under the 2009 Standards.

2. ***Describe how other aspects of the model may have a significant impact on the uncertainties in output results and the basis for making this determination.***

The uncertainty in the predicted loss costs is driven by the uncertainty in the underlying wind hazard curve, and hence, uncertainties in the modeling of central pressure, the Holland pressure profile parameter and the decay of storms as they travel inland.

3. ***Describe and justify action or inaction as a result of the uncertainty analyses performed.***

As of the current time, no changes to the model have been made as a result of the uncertainty analyses.

4. ***Form S-6, Hypothetical Events for Sensitivity and Uncertainty Analysis, if disclosed under Standard S-2, Sensitivity Analysis for Model Output, will be used in the verification of Standard S-3, Uncertainty Analysis for Model Output.***

   Not applicable.

S-4 County Level Aggregation

At the county level of aggregation, the contribution to the error in loss cost estimates attributable to the sampling process shall be negligible.

Figure 21 shows the standard errors in the total ground-up owner frame loss costs induced by the sampling process as a percentage of the county weighted average loss costs. For a 250,000-year simulation, the standard errors associated with the sampling process range from 0.8% in the counties with the most hurricane activity to 2.2% in the counties with the least hurricane activity. These errors are negligible in comparison to the uncertainties in the model.

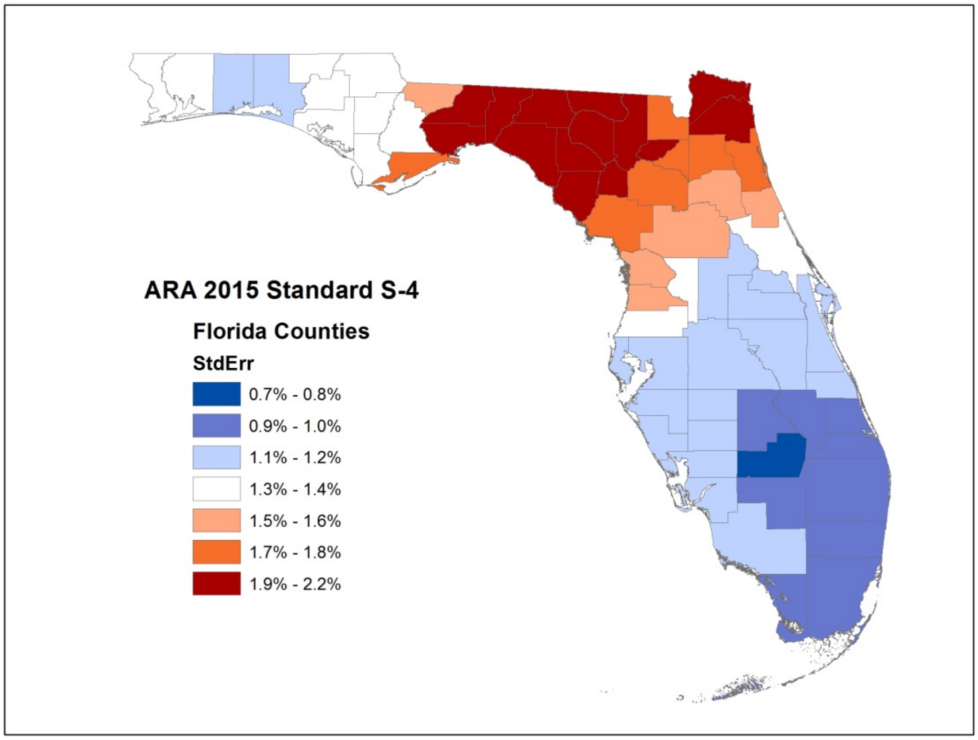


Figure 21. Standard Errors in County Weighted Average Loss Costs

1. ***Describe the sampling plan used to obtain the average annual loss costs and output ranges. For a direct Monte Carlo simulation, indicate steps taken to determine sample size. For importance sampling design, or other sampling scheme, describe the underpinnings of the design and how it achieves the required performance.***

The sampling plan used to obtain AALs and loss costs is a direct Monte Carlo simulation with a sample size 250,000 years. The sample size was selected by continuing to increase the number of simulated years and examining the standard error in the estimate of the mean loss costs. The sample set of 250,000 years produced a maximum standard error in the total owner frame ground-up loss costs of 2.2%.

S-5 Replication of Known Hurricane Losses

The model shall estimate incurred losses in an unbiased manner on a sufficient body of past hurricane events from more than one company, including the most current data available to the modeling organization. This standard applies separately to personal residential and, to the extent data are available, to commercial residential. Personal residential loss experience may be used to replicate structure-only and contents-only losses. The replications shall be produced on an objective body of loss data by county or an appropriate level of geographic detail and shall include loss data from both 2004 and 2005.

Figure 22 presents a comparison of modeled and actual total losses by storm and company for residential coverage. The comparisons indicate reasonable agreement between the observed and modeled losses (r^2 = 0.91 in linear space and r^2 = 0.92 in logarithmic space). Demand surge is not included in the modeled losses. Additional, and more detailed, comparisons of modeled and actual incurred losses are given in Form S-4.

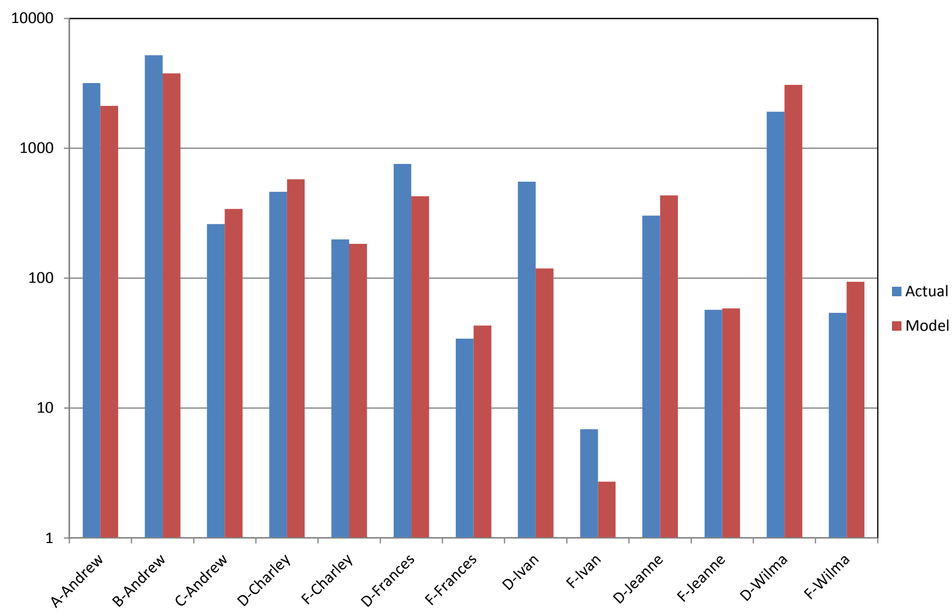
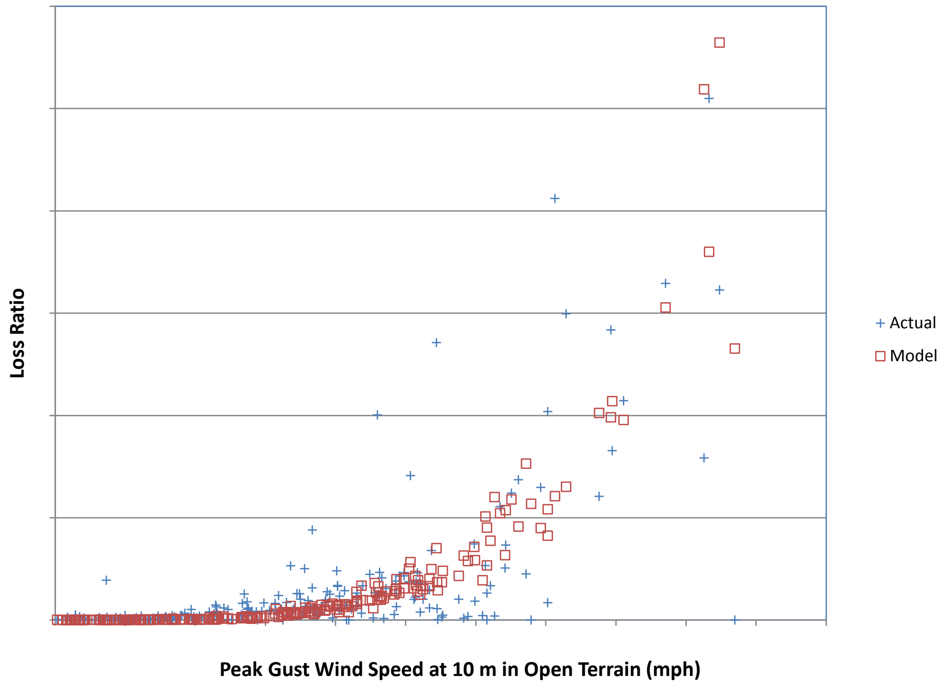


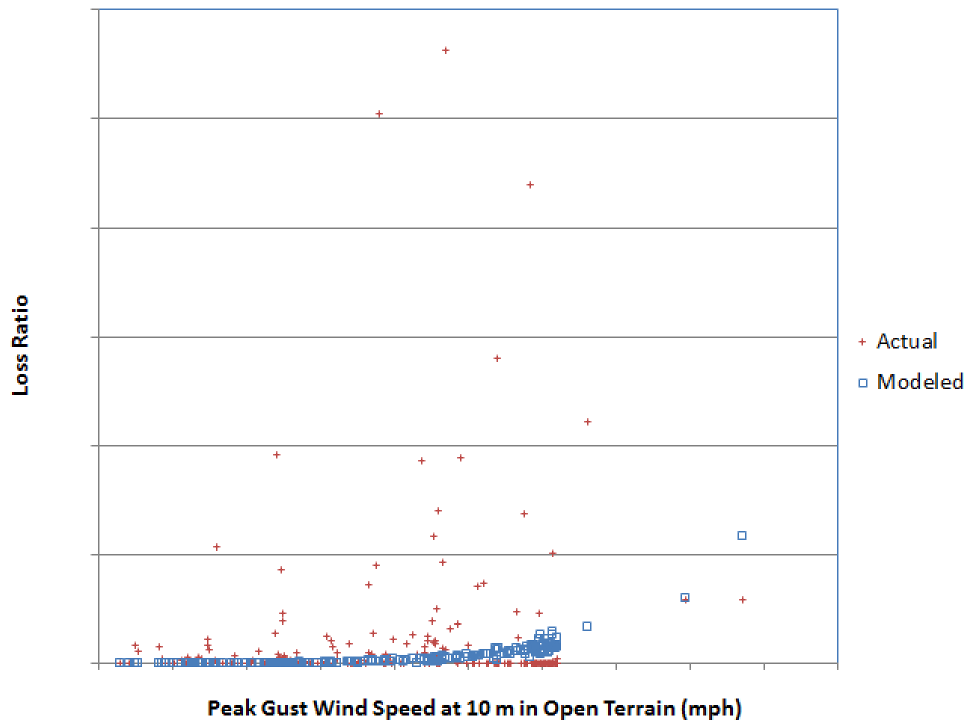
Figure 22. Comparison of Modeled and Observed Losses for Homeowner Policies

1. ***Describe the nature and results of the analyses performed to validate the loss projections generated for personal and commercial residential losses separately. Include analyses for the 2004 and 2005 hurricane season.***

Figure 22 and Figure 23 present example comparisons of simulated and observed losses from recent hurricanes



(a) Personal Residential



(b) Commercial Residential

Figure 23. Comparison of Modeled and Actual Losses as a Function of Peak Gust Windspeed in Open Terrain

2. ***Provide a completed Form S-4, Validation Comparisons. Provide a link to the location of the form [insert hyperlink here].***

See Form S-4.

S-6 Comparison of Projected Hurricane Loss Costs

The difference, due to uncertainty, between historical and modeled annual average statewide loss costs shall be reasonable, given the body of data, by established statistical expectations and norms.

The difference between historical and modeled annual average statewide loss costs is statistically reasonable, as demonstrated in Form S-5.

1. ***Describe the nature and results of the tests performed to validate the expected loss projections generated. If a set of simulated hurricanes or simulation trials was used to determine these loss projections, specify the convergence tests that were used and the results. Specify the number of hurricanes or trials that were used.***

A direct statistical validation of expected loss costs by region is not possible owing to the limited hurricane loss data at any given region, and thus indirect validation procedures are required. This validation process assumes that if the hurricane climatology, in terms of hurricane intensity, frequency, translation speed, filling and windspeed, is properly modeled, and if the prediction of loss given a hurricane is properly modeled, then the loss cost estimates should be valid. Comparisons of modeled and observed windspeeds were presented in the answer to Standard G-4. These comparisons showed that given information describing a storm, including the central pressure difference, Δp, the radius to maximum winds, R_{max}, translation speed, Holland pressure profile parameter, B, heading and location, the windfield model is able to provide good estimates of windspeed at a site.

Figure 18 shows a comparison of the historical and modeled annual rate of hurricane landfalls in Florida. In the comparisons given in Figure 18, each hurricane that makes landfall in Florida is counted as a single event for both the modeled and historical storms.

Figure 19 shows a comparison of the simulated and modeled landfall rate of hurricanes as a function of storm intensity in Florida. This comparison shows the combined effect of intensity and frequency modeling, indicating that the model is performing well in its ability to reproduce the statistics of landfall counts of storms as a function of intensity in Florida. The landfall counts given in Figure 19 represent the first landfall data for entering storms. The agreement between the annual rate historical and modeled hurricane landfalls is very good with the comparison of the landfall rate statistics passing both the Chi squared and Kolmogorov-Smirnov tests.

Figure 22 showed separate examples of total losses experienced by different companies for various events.

The ability of the model to produce reasonable estimates of loss as a function of windspeed was shown, for example, in Figure 23. As seen in this example, the model is able to reasonably reproduce the observed losses as a function of the peak windspeed in a storm.

2. ***Identify and justify differences, if any, in how the model produces loss costs for specific historical events versus loss costs for events in the stochastic hurricane set.***

Loss costs from historic storms can be produced using either the fast running loss functions developed for use in the portfolio model or with the building performance model (which takes into account storm duration, change of wind direction, etc.). The computation of loss costs from historical or stochastic storms is fundamentally the same. The losses are summed by territory, line of business, etc., and divided by the appropriate exposure and the number of years of storms.

3. ***Provide a completed Form S-5, Average Annual Zero Deductible Statewide Loss Costs – Historical versus Modeled. Provide a link to the location of the form [insert hyperlink here].***

   See Form S-5.

Vulnerability Standards

V-1 Derivation of Building Vulnerability Functions*

(*Significant Revision)

A. Development of the building vulnerability functions shall be based on at least one of the following: (1) insurance claims data, (2) laboratory or field testing, (3) rational structural analysis, and (4) post-event site investigations. Any development of the building vulnerability functions based on rational structural analysis, post-event site investigations, and laboratory or field testing shall be supported by historical data.

B. The derivation of the building vulnerability functions and their associated uncertainties shall be theoretically sound and consistent with fundamental engineering principles.

C. Residential building stock classification shall be representative of Florida construction for personal and commercial residential buildings.

D. Building height/number of stories, primary construction material, year of construction, location, building code, and other construction characteristics, as applicable, shall be used in the derivation and application of building vulnerability functions.

E. Vulnerability functions shall be separately derived for commercial residential building structures, personal residential building structures, manufactured homes, and appurtenant structures.

F. The minimum windspeed that generates damage shall be consistent with fundamental engineering principles.

G. Building vulnerability functions shall include damage as attributable to windspeed and wind pressure, water infiltration, and missile impact associated with hurricanes. Building vulnerability functions shall not include explicit damage to the building due to flood, storm surge, or wave action.

A. ARA's vulnerability functions include elements of each of the following: (1) historical data, (2) tests, (3) rational structural analysis, and (4) site inspections. The ARA personnel responsible for developing the damage and loss models have extensive experience in wind load modeling, structural analysis, post-hurricane damage surveys, and meteorology.

B. ARA's vulnerability functions have been developed for residential buildings (including mobile homes) using a theoretically sound load and resistance modeling approach, coupled with empirically-derived elements. For each structure, the model estimates physical damage to the building, which incorporates the effects of uncertainties in the component loads and resistances. This physical damage is used in turn to estimate the loss to the building and contents separately. The building damage state is used in conjunction with a restoration model to estimate the costs associated with loss of use expenses. Uncertainties in restoration costs and times are included in the model.

C. Variations in construction characteristics for personal and commercial residential properties are treated through the use of a statewide building stock model comprising four regions and four construction eras. The building stock model is based on detailed building inspection data, building code criteria, and engineering judgment. The building stock model provides distributions (e.g. percentage of hip vs. non-hip roof shapes) to weight the baseline vulnerability functions when detailed information is not available.

D. The base vulnerability functions developed for the model are for buildings with known characteristics representing a broad range of conditions present in the Florida building stock. The vulnerability functions for buildings with known construction characteristics are evaluated using a detailed, three-dimensional, time-dependent building performance model that accounts for nonlinear interactions between multiple building parameters, such as building height, roof shape, roof cover strength, and opening protection. The building performance model yields a family of cumulative distribution functions for building loss as a function of peak gust wind speed in open terrain and local terrain roughness. Each unique combination of known building characteristics represents one model building class (e.g., two stories, wood frame, hip, hurricane straps, no shutters, etc.).

In most cases, there is not enough information available in a book of business to map each property to a distinct base vulnerability function. For example, unless a 1980's era house has been inspected, its roof deck attachment type, roof-wall connection type and other key characteristics will be unknown. To address this common scenario, we use location, year of construction, building code, construction type and occupancy to estimate the probability that each unknown characteristic will have a specific value. These probabilities are quantified in our building stock models (described above in Item C) and are used to develop probability-weighted vulnerability functions for locations with one or more unknown characteristics.

E. ARA's vulnerability functions have been separately derived for commercial residential building structures, personal residential building structures, mobile homes, and appurtenant structures. However, separate information is often not available on the specific types and values of appurtenant structures covered by an insurance policy. For this common case, a probabilistic model of the types and relative values of appurtenant structure is used. These results are combined with the primary structure losses to produce an overall structural loss and then back-allocated to the primary structure and appurtenant structure coverages in proportion to their input replacement values. In cases where detailed information is available for appurtenant structures, these structures are best modeled as separate locations covered under a single policy.~~.~~

F. ARA's vulnerability functions produce damage for windspeeds above and below the hurricane threshold of 74 mph. The minimum peak gust windspeed that produces damage is about 50 mph.

G. ARA's vulnerability functions are developed using an engineering-based damage simulation methodology that explicitly models the effects of windspeed, wind direction, windborne debris impacts, and water infiltration through damaged and undamaged components of the building envelope. The vulnerability functions do not include damage due to flood, storm surge or wave action.

1. ***Describe any modifications to the building vulnerability component in the model since the previously accepted model.***

   N/A.

2. ***Provide a flow chart documenting the process by which the building vulnerability functions are derived and implemented.***

Figure 24 shows the flow chart describing the approach used to develop the damage and loss functions.

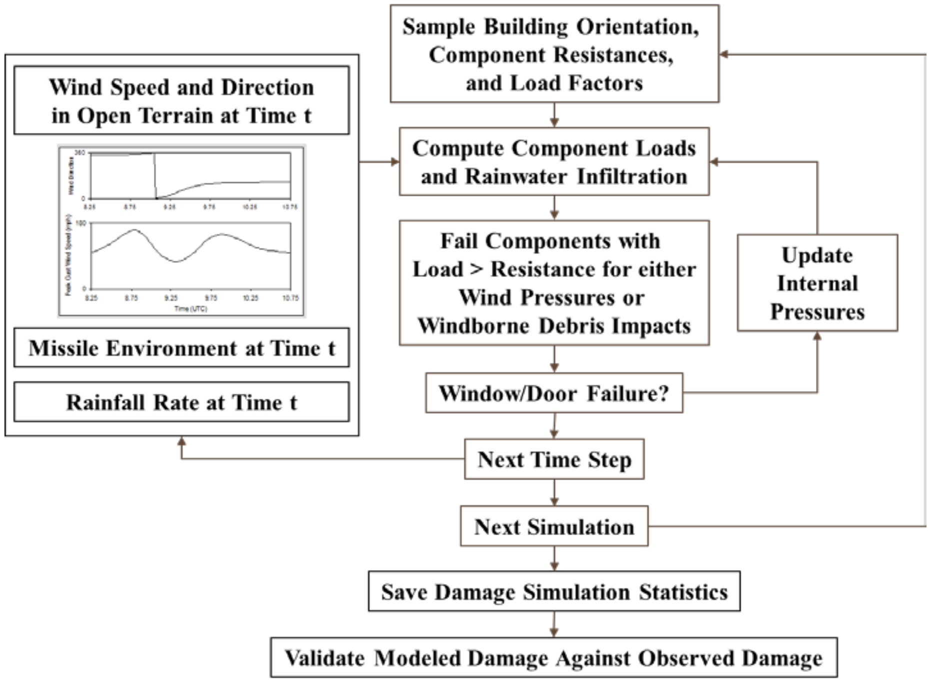


Figure 24. Flow Chart for Development of Building Vulnerability Functions

3. ***Describe the nature and extent of actual insurance claims data used to develop the building vulnerability functions. Describe in detail what is included, such as, number of policies, number of insurers, date of loss, and number of units of dollar exposure, separated into personal residential, commercial residential, and manufactured home.***

ARA has used insurance loss data from Hurricane Andrew (1992, 3 insurers), Hurricane Hugo (1989, 2 insurers), Hurricane Georges (1998, 1 insurer), Hurricane Fran (1996, 1 insurer), Hurricane Erin (1995, 1 insurer), Hurricane Bertha (1996, 1 insurer), Hurricane Bonnie (1998, 1 insurer), Hurricane Earl (1998, 1 insurer), Hurricane Opal (1995, 1 insurer), Hurricane Charley (2004, 3 insurers), Hurricane Frances (2004, 3 insurers), Hurricane Ivan, (2004, 3 insurers), Hurricane Jeanne (2004, 3 insurers), and Hurricane Wilma (2005, 3 insurers). In each case, personal lines data were available. Mobile home data were available for one storm-insurer combination. ARA has obtained and analyzed commercial residential insurance loss data from one insurer for Hurricanes Charley (2004), Frances (2004), Ivan (2004), and Wilma (2005). Due to non-disclosure agreements with the insurance companies, additional details cannot be disclosed.

4. ***Describe the assumptions, data (including insurance claims data), methods, and processes used for the development of the building vulnerability functions.***

ARA's modeling approach for damage and loss employs two separate models. A building performance model, using engineering-based load and resistance models, is used to quantify physical damage. The building physical damage model takes into account the effects of wind direction changes, progressive damage, and storm duration. Economic loss, given physical damage, is estimated using repair and reconstruction cost estimation methods. This process is therefore similar to how an insurance adjuster would estimate the claim, given observed damage to the building. Through direct simulations of thousands of storms with representative buildings, the building performance model produces outputs that are post-processed into loss functions for building, contents, and loss of use. Both the physical damage model and the loss model developed by ARA have been validated through comparisons of modeled and observed damage data collected after hurricane events. Separate models have been developed to estimate the financial losses to the building, the building's contents, additional living expenses, and losses to appurtenant and exterior structures.

Some key assumptions we have made include associating most of interior and content damage with water infiltration, and the assumptions that the claims practices, such as repair and replacement thresholds upon which the loss given damage models were developed, are still valid.

5. ***Summarize post-event site investigations, including the source, and provide a brief description of the resulting use of these data in the development or validation of building vulnerability functions.***

ARA has used information on building characteristics collected as a part of the Residential Construction Mitigation Program to determine distribution of the wind resistive characteristics of houses constructed in Florida. The details of the data collection and its use in the model are described in the March 2002 Florida Department of Community Affairs report entitled "Development of Loss Relativities for Wind Resistive Features of Residential Structures."

ARA engineers and scientists with significant experience in wind engineering, building performance, and post-storm damage surveys developed the vulnerability functions. Examples of some of the reports used directly in the development of the ARA damage and loss models include Stathopoulos (1979), Meecham (1988), FEMA (1992), Ho (1992), Crandall, et al. (1993), Cunningham (1993), Sparks, et al. (1994), Monroe (1996), Reed, et al. (1996, 1997), Uematsu and Isyumov (1998), and Twisdale, et al. (1996).

ARA engineers have performed post-storm damage surveys following Hurricanes Andrew, Erin, Opal, Bertha, Fran, Bonnie, Isabel, Charley, and Katrina. ARA engineers have also participated on FEMA Building Performance Assessment Teams (BPATs). In part because of our proven expertise in damage model development and validation, ARA was selected by a panel of wind engineering and meteorology experts to develop FEMA's HAZUS model for wind loss estimation.

6. ***Describe the categories of the different building vulnerability functions. Specifically, include descriptions of the building types and characteristics, building height, number of stories, regions within the state of Florida, year of construction, and occupancy types in which a unique building vulnerability function is used. Provide the total number of vulnerability functions available for use in the model for personal and commercial residential classifications.***

The number of categories of different vulnerability functions used in a loss projection study depends on the objective of the study. For a basic analysis, wall construction is a common way to analyze and report results since insurers have wall construction classes. On the other hand, to develop a classification for wind vulnerability, many key building variables may be evaluated. In summary, the vulnerability functions may be based on either fine-grained or coarse-grained representations of the construction parameters. Examples of the number of categories or building classes considered in loss projection studies have been reviewed with the professional team.

The basis for differentiation is the building performance model, which uses engineering analysis, empirical data, and judgment. The building categories used in the model are built up from detailed engineering load and resistance models that take into account number of stories, building shape, roof shape, roof cover, garage doors, roof-wall connection, sheathing attachment, etc. For each building, damage and loss are estimated for the building, appurtenances, contents, and loss of use. Once the losses have been generated, fast-running vulnerability (loss) functions are developed for the different coverages, etc., for each building class in each of four regions within the state of Florida. In this manner, the appropriate building vulnerability information is captured in the respective vulnerability functions used in the loss projection. The total number of standard vulnerability functions available for use in the model for personal and commercial residential classification is 19,040.

7. ***Describe the process by which local construction practices and building code adoption and enforcement are considered in the development of the building vulnerability functions.***

Variations in construction practices and building code criteria are treated through the use of a statewide building stock model comprising four regions and four construction eras. The building stock model is based on detailed building inspection data, building code criteria, and engineering judgment. The building stock model provides distributions (e.g. percentage of hip vs. non-hip roof shapes) to weight the baseline vulnerability functions when detailed information is not available. No assumptions specifically regarding building code enforcement are made in the model.

Unless they are explicitly input as separate locations, appurtenant structures and attached exterior structures such as pool enclosures and carports are modeled statistically using distributions of frequencies, replacement values, and vulnerabilities derived from field surveys conducted by ARA for the Florida Office of Insurance Regulation in 2007. The vulnerability functions used for appurtenant structures reflect the fact that these structures are permitted to be designed to lower design wind loads than the dwellings to which they are attached or adjacent.

8. ***Describe the relationship between building structure and appurtenant structure vulnerability functions and their consistency with insurance claims data.***

Given that exterior structures may be either attached or detached from the main building and that this information is rarely known on a location by location basis, our approach for modeling unknown exterior structures is to model the combined building and appurtenant structures loss assuming statistical distributions for attached and detached exterior structures as described above in our response to Disclosure 6. The combined losses are then allocated back to the building structure and appurtenant structure coverages in proportion to the replacement values provided by the user. Therefore, although the final reported results from the model for building structure and appurtenant structure appear to be perfectly correlated, they are in fact modeled independently and then back allocated to the coverages in proportion to the replacement values provided by the user.

Because insurers almost universally set the appurtenant structure coverage limit and the assumed replacement value to a fixed percentage of the building limit (e.g. 10%), it is generally not possible to validate appurtenant structure losses separately from building losses using typical claims data. A detailed analysis of attached and free-standing structure losses (Twisdale et al., 2007) provides the basis for the methodology implemented in the ARA model.

9. ***Describe the assumptions, data (including insurance claims data), methods, and processes used to develop building vulnerability functions for unknown residential construction types or for when some building characteristics are unknown.***

When some or all of the building characteristics are unknown, the vulnerability distributions are modeled as regionally- and temporally-dependent weighted combinations of the vulnerability distributions of known building types. The weights are based on a combination of building wind mitigation inspection data, building code history analysis, building permit data, real estate data, tax assessor data, and engineering judgment. The same assumptions are used for both modeled losses and actual claims data.

10. Describe how vulnerability functions are selected when input data are missing, incomplete, or conflicting.

The unknown residential vulnerability curves vary with region in Florida. The vulnerability curves are composites that reproduce the proportion of each construction type that is prevalent in a given region. The unknown residential vulnerability curves do not include mobile homes.

11. Identify the one-minute average sustained windspeed and the windspeed reference height at which the model begins to estimate damage.

The damage model is initiated when the peak gust windspeed at a height of 10 m in open terrain exceeds 50 mph. This peak gust value corresponds to a sustained windspeed (one-minute average windspeed at a height of 10 m in open terrain) of about 40 mph.

12. Describe how the duration of windspeeds at a particular location over the life of a hurricane is considered.

Duration of windspeeds is modeled in the load and resistance model via the cumulative damage algorithm illustrated previously in Figure 24. The fast-running damage functions represent the expected damage as a function of the peak gust windspeed averaged over many storms of varying durations.

13. Describe how the model addresses wind borne missile impact damage and water infiltration.

The building performance model depicted above in Figure 24 includes an explicit probabilistic model for wind borne missile impacts and an explicit model for rainfall rate and rain water infiltration through breached openings.

14. Provide a completed Form V-1, One Hypothetical Event. Provide a link to the location of the form [insert hyperlink here].

See Form V-1.

V-2 Derivation of Contents and Time Element Vulnerability Functions

A. ***Development of the contents and time element vulnerability functions shall be based on at least one of the following: (1) insurance claims data, (2) tests, (3) rational structural analysis, and (4) post-event site investigations. Any development of the contents and time element vulnerability functions based on rational structural analysis, post-event site investigations, and tests shall be supported by historical data.***

B. ***The relationship between the modeled building and contents vulnerability functions and historical building and contents losses shall be reasonable.***

C. ***Time element vulnerability function derivations shall consider the estimated time required to repair or replace the property.***

D. ***The relationship between the modeled building and time element vulnerability functions and historical building and time element losses shall be reasonable.***

E. ***Time element vulnerability functions used by the model shall include time element coverage claims associated with wind, flood, and storm surge damage to the infrastructure caused by a hurricane.***

A. ARA's vulnerability functions for contents and time element losses are derived from estimates of the physical damage to the building. The functions are based on: (1) historical data, (2) tests, (3) rational structural analysis, and (4) site inspections. The ARA personnel responsible for developing the contents damage and time element loss models have extensive experience in wind load modeling, structural analysis, post-hurricane damage surveys, and insurance claims folder analysis.

B. The relationship between modeled building and contents loss is reasonable, as demonstrated in our response to Disclosure 3.

C. Time element losses are estimated using a model that estimates the time required to rebuild a damaged building. The model does not initiate the computation for time element losses associated with direct wind-induced damage until the ground-up building loss exceeds a threshold value.

D. The relationship between modeled building and time element loss costs is reasonable, as demonstrated in our response to Disclosure 6.

E. The time element loss costs produced by the model also include a component for claims arising from indirect causes such as infrastructure damage. Time element losses associated with indirect causes can occur when there is no damage to the structure.

1. ***Describe any modification to the contents and time element vulnerability component in the model since the previously accepted model.***

   N/A.

2. ***Provide a flow chart documenting the process by which the contents vulnerability functions are derived and implemented.***

The derivation of the contents vulnerability functions follows from the building performance model illustrated above in Figure 24 and described below in Disclosure 3. After computing the physical damage state of the building produced by each simulated event, contents losses are estimated and tabulated using the process illustrated below in Figure 25.

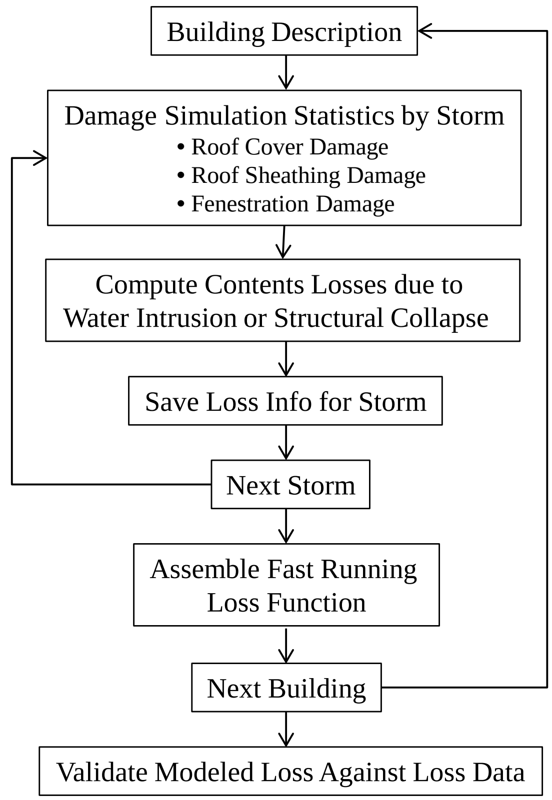


Figure 25. Flow Chart for Development of Contents Vulnerability Functions

3. Describe the assumptions, data (including insurance claims data), methods, and processes used to develop and validate the contents vulnerability functions.

The model used to estimate the vulnerability of contents is based on the physical damage and the resulting possibility of wind and water entering the building following damage. Thus, while the damage to contents is a function of the damage to the building, the model is constructed in such a way that damage to contents does not occur until sufficient physical damage to the building has occurred to allow wind and/or water to enter the building, causing damage to the contents. The contents model has been validated/calibrated separately from the building vulnerability model. Figure 26 shows a comparison of modeled and observed content loss as a function of the loss to the building. The value of the contents is assumed to be equal to the coverage limit.

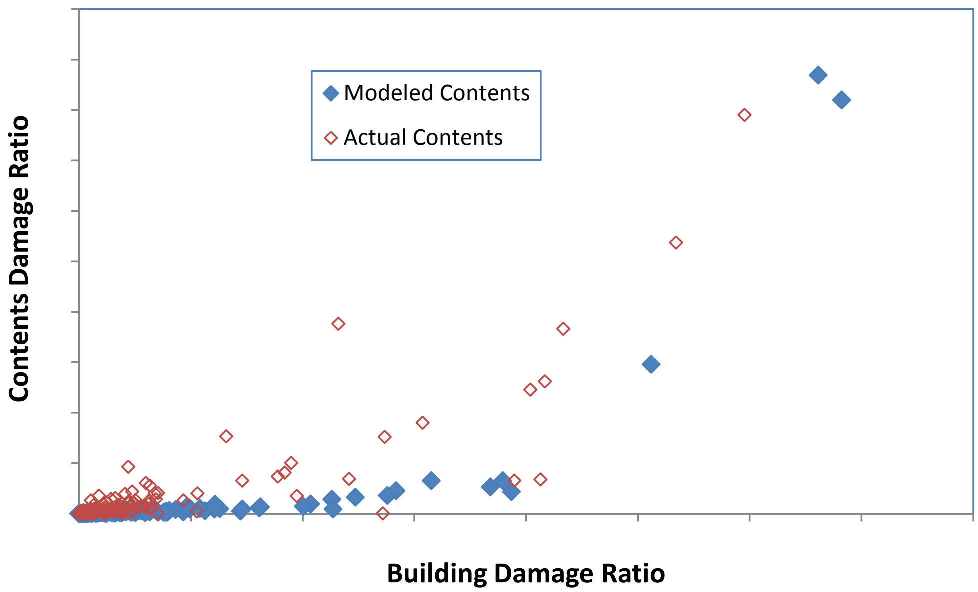


Figure 26. Comparison of Modeled and Observed Mean Content Damage vs. Mean Building Damage

4. ***Provide the total number of contents vulnerability functions. Describe whether different contents vulnerability functions are used for personal residential, commercial residential, manufactured home, unit location for condo owners and apartment renters, and building classes.***

A unique contents vulnerability function has been developed and implemented in the model for each of the 19,040 personal and commercial residential building vulnerability functions. The content damage functions are largely a function of the amount of water that enters a unit, given physical damage to the building. In the case of high-rise buildings, the damage varies with unit floor level, relative to both the ground and the roof.

5. ***Provide a flow chart documenting the process by which the time element vulnerability functions are derived and implemented.***

The derivation of the time element vulnerability functions follows from the building performance model illustrated above in Figure 24 and described above in Disclosure 4. After computing the physical damage state of the building produced by each simulated event, time element losses are estimated and tabulated using the process illustrated below in Figure 27.

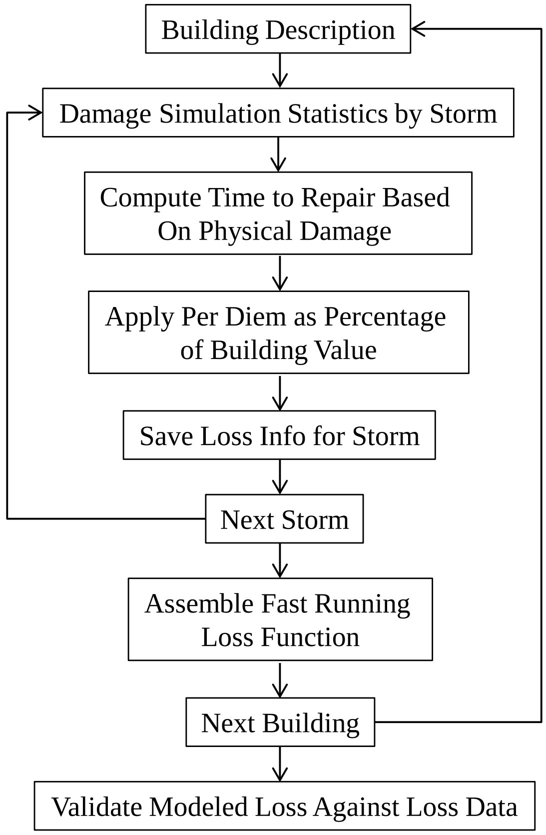


Figure 27. Flow Chart for Development of Time Element Vulnerability Functions

6. ***Describe the assumptions, data (including insurance claims data), methods, and processes used to develop and validate the time element vulnerability functions.***

A time element loss model was developed using a time restoration model that is used to estimate the time building owners are unable to use the damaged structure. The model allows for time element losses to be incurred due to indirect causes such as infrastructure damage. The model has been calibrated through comparisons of actual insurance losses.

Figure 28 shows a ZIP Code comparison of modeled and actual personal residential Additional Living Expense (ALE) losses as a function of building damage. Since the model allows for time element losses to be incurred due to infrastructure damage, there is no minimum threshold of building damage required for ALE losses.

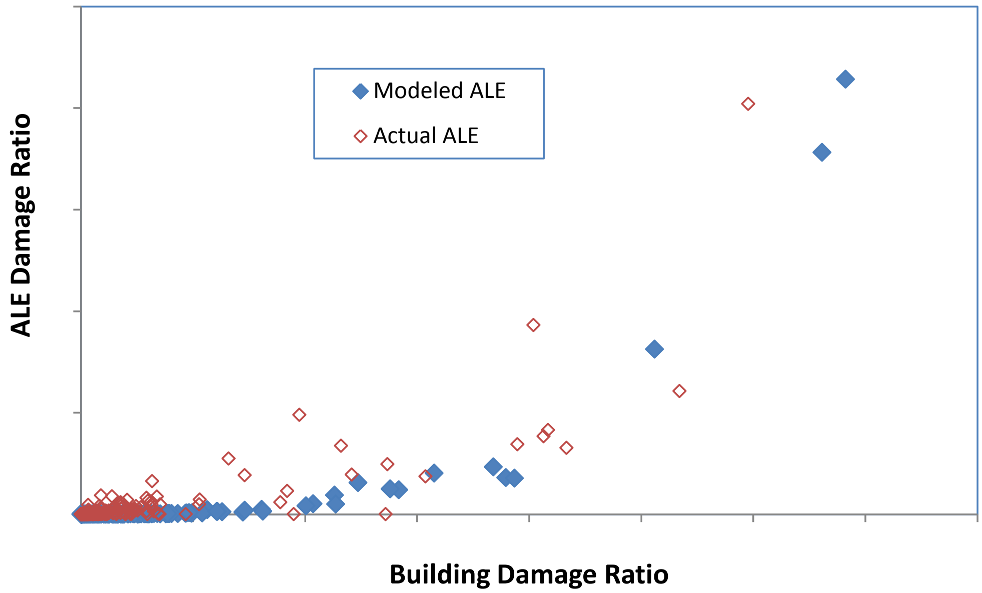


Figure 28. Comparison of Modeled and Observed Mean Time Element Losses (Additional Living Expenses) vs. Mean Building Damage

7. ***Describe how time element vulnerability functions take into consideration the damage (including damage due to storm surge, flood, and wind) to local and regional infrastructure.***

The impact of storm surge and flood damage to local and regional infrastructure is accounted for as an additional term in time element loss model to the extent that such losses were reflected in the insurance loss data used to account for un-modeled losses.

8. ***Describe the relationship between building structure and contents vulnerability functions.***

In the underlying HURDAM methodology used to develop our vulnerability functions, contents damage directly depends on the extent of building envelope damage and the resulting volume of rain water that enters the building. In the final tabulated ground-up loss distributions, contents losses are related to building loss (rather than windspeed) to preserve the strong correlation between building and contents losses.

9. ***Describe the relationship between building structure and time element vulnerability functions.***

In the underlying HURDAM methodology used to develop our vulnerability functions, the direct time element loss depends on the extent of building envelope damage, the resulting volume of rain water that enters the building, and the time require to repair or reconstruct the building. As discussed above in our response to Disclosure 8, an additional term for indirect time element losses due to causes such as infrastructure damage (to the extent such effects were included in the insurance data used to calibrate the ALE model) is then added to the direct time element loss. In the final tabulated ground-up loss distributions, time element losses are related to building loss to preserve the strong correlation between building and direct time element losses.

10. Describe the assumptions, data (including insurance claims data), methods, and processes used to develop contents and time element vulnerability functions for unknown residential construction types and for when some of the primary characteristics are unknown.

The contents and time element vulnerability functions are building stock weighted combinations of the vulnerability functions of known building types. The building stock weights vary by region within the state and construction era.

When some primary characteristics are known and some are unknown, the contents and time element vulnerability curves are developed using the same approach as the unknown case discussed above in Standard V-1, Disclosure 9, except with the weighting assigned to each known characteristics fixed at 100%.

An underlying assumption of the development, calibration and validation of the contents and time element vulnerability functions is that, unless otherwise specified, the contents limits in insurance company claims data represent the full replacement value of the building contents and the time element coverage limits are sufficient to cover a claim that would be associated with a total re-build of the structure.

V-3 Mitigation Measures

A. ***Modeling of mitigation measures to improve a building's hurricane wind resistance, the corresponding effects on vulnerability, and their associated uncertainties shall be theoretically sound and consistent with fundamental engineering principles. These measures shall include fixtures or construction techniques that enhance the performance of the building and its contents and shall consider:***

- ***Roof strength***
- ***Roof covering performance***
- ***Roof-to-wall strength***
- ***Wall-to-floor-to-foundation strength***
- ***Opening protection***
- ***Window, door, and skylight strength***

The modeling organization shall justify all mitigation measures considered by the model.

B. ***Application of mitigation measures that enhance the performance of the building and its contents shall be justified as to the impact on reducing damage whether done individually or in combination.***

A. ARA's vulnerability model was originally developed to treat the wind resistive characteristics of buildings, including fixtures or construction techniques that reduce losses. The methods used for estimating the effects of individual and multiple mitigation measures are reasonable. The effects of primary mitigation factors (e.g., opening protection, roof shape, roof deck attachment strength, roof-to-wall connection strength, roof cover strength, and secondary water resistance) on expected vulnerability and its associated uncertainty distributions are explicitly analyzed using the engineering damage simulation methodology described in our responses to Standard G-1, Disclosure 2 and Standard V-1, Disclosure 1. The effects of secondary mitigation factors (e.g., gable-end bracing and wall-to-foundation connection) on vulnerability are modeled as shifts in the entire vulnerability distribution to achieve a targeted change in mean vulnerability.

B. ARA's modeling of mitigation measures is reasonable both individually and in combination.

1. ***Describe any modifications to mitigation measures in the model since the previously accepted model.***

   N/A.

2. ***Provide a completed Form V-2, Mitigation Measures – Range of Changes in Damage. Provide a link to the location of the form [insert hyperlink here].***

   See Form V-2.

3. ***Provide a description of the mitigation measures used by the model, whether or not they are listed in Form V-2 Mitigation Measures – Range of Changes in Damage.***

Additional mitigation measures available in the model include different roof deck nailing patterns (e.g., two different nailing patterns are provided in Form V-2) and different roof-to-wall straps (e.g., double wraps are shown in Form V-2).

4. ***Describe how mitigation measures are implemented in the model. Identify any assumptions.***

Mitigation is implemented in the model by explicitly increasing the resistances of the mitigated components in the engineering models of the building and then re-computing the physical damage and economic losses. The increased losses associated with unbraced gable ends are modeled using a judgment-based modification function.

5. ***Describe how the effects of multiple mitigation measures are combined in the model and the process used to ensure that multiple mitigation measures are correctly combined.***

The interactions between multiple mitigation factors are explicitly analyzed through the engineering damage simulation methodology previously described in our responses to Standard G-1, Disclosure 2 and Standard V-1, Disclosure 1.

6. ***Describe how building and contents damage are affected by performance of mitigation measures. Identify any assumptions.***

Since mitigation features act to reduce physical damage to the building, the building losses, and consequently content and additional living expenses are reduced as well.

7. ***Describe how mitigation measures affect the uncertainty of the vulnerability. Identify any assumptions.***

Since our damage and loss models are developed using estimates of physical damage to a structure using a load and resistance model, the estimates of uncertainty associated with mitigation measures are developed the same way as for buildings without mitigation devices (e.g., we model uncertainty in the capacity of window protection, roof sheathing attachments, roof-wall connections, etc.). No additional uncertainty is added to take into account that some mitigation features (e.g., shutters) might not be installed during a hurricane.

Actuarial Standards

A-1 Modeling Input Data and Output Reports

A. ***Adjustments, edits, inclusions, or deletions to insurance company or other input data used by the modeling organization shall be based upon accepted actuarial, underwriting, and statistical procedures.***

B. ***All modifications, adjustments, assumptions, inputs and input file identification, and defaults necessary to use the model shall be actuarially sound and shall be included with the model output report. Treatment of missing values for user inputs required to run the model shall be actuarially sound and described with the model output report.***

A. The amount and quality of insurance information on historical losses varies significantly. The assumptions involved in the comparisons of historical insured hurricane losses to model estimated losses are documented as part of each study. Any adjustments are based upon accepted actuarial, underwriting, and statistical procedures. Sensitivity analyses are often used to assess how certain assumptions affect the estimated losses to ensure the reasonableness of comparisons.

B. Modifications to input data, assumptions regarding input data, and treatment of missing values in the input data are actuarially sound. Specific actions are as follows:

Modifications/Adjustments:	Out-of-date ZIP Codes are mapped to the current ZIP Code set used in the model. Records with ZIP Codes that cannot be mapped by the model must be revised by the user or omitted from the analysis. No other modifications are made to the user inputs.
Assumptions/Defaults:	Building stock models associated with construction type, year built, and occupancy are used to infer loss functions for risks with unknown or incompletely specified construction characteristics (e.g., “wood frame”). Further information is provided in V-1, Disclosure 9.
Missing Values:	Records with missing values are reported in an error log file where the user is prompted to fill in the missing values. If no values can be input, the record is removed from the analysis.

The loss costs estimates do not include any assumptions with respect to depreciation. The validation of the model with actual insurance data indicates that this approach is reasonable.

1. ***Identify insurance-to-value assumptions and describe the methods and assumptions used to determine the property value and associated losses. Provide a sample calculation for determining the property value.***

Unless separarely provided by the user, the loss model assumes that the insured limits are equal to the replacement values of the insured property and contents provided by the user. Therefore, no sample calculation for determining the property value can be provided.

2. ***Identify depreciation assumptions and describe the methods and assumptions used to reduce insured losses on account of depreciation. Provide a sample calculation for determining the amount of depreciation and the actual cash value (ACV) losses.***

The loss costs estimates do not include any assumptions with respect to depreciation. Therefore, no sample calculation for determining depreciation and ACV losses can be provided. The validation of the model with actual insurance data indicates that this approach is reasonable.

3. ***Describe the methods used to distinguish among policy form types (e.g., homeowners, dwelling property, manufactured home, tenants, condo unit owners).***

Loss costs are produced separately by the model for structure, contents, and loss of use subject to the applicable homeowner, mobile home, renters, or condo unit owner policy limits. Aside from differences in the primary coverage and coverage limits, no further distinctions are made among policy form types in the model. Mobile homes are identified through the indicated structure type.

4. ***Provide a copy of the input form(s) used by the model with the model options available for selection by the user for the Florida hurricane model under review. Describe the process followed by the user to generate the model output produced from the input form. Include the model name and version identification on the input form. All items included in the input form submitted to the Commission should be clearly labeled and defined.***

ARA uses a modified version of UNICEDE®/px data exchange format developed by AIR for data input. As an alternative, users may input data as a comma separated file and map the data to UNICEDE/px fields in the web-based user interface.

The first four lines of the input file for Notional Set 6 of Forms A-6 and A-7 are shown below. The text is wrapped for readability:

```
***1,9.0.0,20111201,X,X,X,X,FCHLPM,FML,20121015,PWH,FLORIDA,SL,USD,NS6

60,601001,X,X,X,X,X,X,X,X,X,20120101,20121231,USD,0,X,PWH,X,B,PP

63,601001,1,X,X,X,1003,12,1,0,1,29.679942,-82.603351,20120101,20121231,USD,0,1,100000,
10000,50000,20000,365,0,AIR,101,101,1,AIR,302,1980,1,1,1,0,1,PWH,C,100000,10000,50000,
20000,AA,0,0,0,0,0,0,0

64,601001,1,X,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,8,0,1,0,0,5,2,1990,0,0,0,0,1,0,0,0,0,0,0,0

…
```

The first line in the UNICEDE/px (UPX) file is the header record. The fields in the header record are as follows:

1. Record type: ***1 (required)
2. Version: 9.0.0 (HurLoss 8.0.a supports UPX versions 9.0.0 through 16.0.0)
3. Source date: YYYYMMDD
4. Source contact: optional text (30 characters)
5. Source company: optional text (60 characters)
6. Source phone: optional text (20 characters)
7. Source email: optional text (30 characters)
8. Project name: optional text (30 characters)
9. Project contact: optional text (30 characters)
10. Inforce date: optional YYYYMMDD

11. Perils covered: optional text (30 characters)
12. Data for: optional text (30 characters)
13. Policy type: SL (single location), ML (multiple location), EX (excess), FR (facultative/reinsurance)
14. Base currency: USD (U.S. dollars)
15. Comments: optional text (100 characters)

Record 60 is the policy record. The fields in the policy record are as follows:

1. Record type: 60 (required)
2. Policy ID: text (32 characters)
3. Location ID: text (60 characters)
4. Address: text (100 characters)
5. UDF1: options user defined field 1 (20 characters)
6. UDF2: options user defined field 2 (20 characters)
7. UDF3: options user defined field 3 (20 characters)
8. UDF4: options user defined field 4 (20 characters)
9. UDF5: options user defined field 5 (20 characters)
10. Insured ID Type: “X” (not used)
11. Insured ID: “X” (not used)
12. Effective start date: YYYYMMDD
13. Effective end date: YYYYMMDD
14. Currency: USD (U.S. dollars)
15. Exchange rate: “0” (not used)
16. User LOB: text (10 characters)
17. Peril Code: “PWH” (hurricane wind)
18. Policy Form: “X” (not used)
19. Status: “B” (bound)
20. Contract Type: “PP” (primary property)

Record 63 is the location record. The fields in the location record are as follows:

1. Record type: 63 (required)
2. Policy ID: text (32 characters)
3. Location ID: text (60 characters)
4. Name: text (60 characters)
5. Address: text (100 characters)
6. City: text (30 characters)
7. Area Scheme: “1003” (U.S. 5-digit ZIP Code)
8. State FIPS: up to two digits
9. County FIPS: up to three digits
10. Postal Code: up to five digits (0=unknown)
11. Country Code: 1 (U.S.)
12. Latitude
13. Longitude
14. Effective start date: YYYYMMDD

15. Effective end date: YYYYMMDD
16. Currency: USD (U.S. dollars)
17. Exchange rate: “0” (not used)
18. Risk Count: positive integer
19. Building Replacement Value: text (30 characters)
20. Appurtenant Structures Replacement Value: text (30 characters)
21. Contents Replacement Value: text (30 characters)
22. Time Element Replacement Value: text (30 characters)
23. Time Element Days Covered: number of days
24. Premium: “0” (not used)
25. Construction Type: “AIR”
26. Construction Code - Building: 100-194 (100=unknown, 101=wood frame, …)
27. Construction Code – Other Structures: 100-194 (not used)
28. Damage Modification Factor: “1” (not used)
29. Occupancy Type: “AIR”
30. Occupancy: 300-373 (300=unknown, 301=general residential, 302=single family, …)
31. Year Built: YYYY or “0” for unknown
32. Stories: positive integer or “0” for unknown
33. Guaranteed Replacement Cost Factor for Building: “1” (not used)
34. Guaranteed Replacement Cost Factor for Contents: “1” (not used)
35. Gross Area of the Building: “0” (not used)
36. Number of Peril Combinations: “1” (insurance terms are the same for all perils)
37. Peril Code: “PWH” (hurricane wind)
38. Limit Type: “C” (limit applies by coverage), “S” (limit applies to sum of coverage), or “N” (none)
39. Building Limit: text (30 characters)
40. Other Structures Limit: text (30 characters)
41. Contents Limit: text (30 characters)
42. Time Element Limit: text (30 characters)
43. Deducible Type: Use “AA” (annual amount) for Florida rate filings
44. Hurricane Deductible: text (30 characters) – if less than 1.0 treat as percent (e.g., 0.02 → 2%); otherwise, treat as dollar amount
45. All Other Perils Deductible: text (30 characters) – if less than 1.0 treat as percent (e.g., 0.02 → 2%); otherwise, treat as dollar amount
46. Deductible 3: “0” (not used for Florida rate filings)
47. Deductible 4: “0” (not used for Florida rate filings)
48. User Defined Territory: “0” (not used)
49. Sublimit Area: “0” (not used)
50. Reinsurance Count: “0” (not used)

Record 64 is the optional location detail record. The fields of the location detail record are as follows:

1. Record type: 64 (required)

2. Policy ID: text (32 characters)
3. Location ID: text (60 characters)
4. Seal of Approval: “X” (not used)
5. Floor of Interest: positive integer or “0” for unknown
6. Building Condition: “0” (not used)
7. Distance to Closest Structure: “0” (not used)
8. Tree Exposure: “0” (not used)
9. Small Debris Source within 200 feet: “0” (not used)
10. Large Debris Source within 100 feet: “0” (not used)
11. Terrain Roughness: “0” (not used)
12. Average Height of Adjacent Buildings: “0” (not used)
13. Building Orientation: “0” (not used)
14. Building Shape: “0” (not used)
15. Torsional Loads: “0” (not used)
16. Soft Story: “0” (not used)
17. Structural Irregularity: “0” (not used)
18. Special Earthquake-Resistive Systems: “0” (not used)
19. Earthquake Retrofit Measures: “0” (not used)
20. Roof Shape: 0-10 (0=unknown, 1=flat, …)
21. Roof Pitch: 0-3 (0=unknown, 1=low, 2=medium, 3=high)
22. Roof Cover: 0-11 (0=unknown, 1=asphalt shingles, …)
23. Roof Deck Material: 0-8 (0=unknown, 1=plywood, …)
24. Roof Cover Attachment: 0-4 (0=unknown, 1=screws, …)
25. Roof Deck Attachment: 0-7 (0=unknown, 1=screws/bolts, 2=nails, …)
26. Roof Anchorage: 0-7 (0=unknown, 1=hurricane ties, …)
27. Roof Built: YYYY or “0” for unknown
28. Wall Type: 0-9 (0=unknown, 1=unreinforced masonry, …)
29. Wall Siding: 0-7 (0=unknown, 1=masonry or brick veneer, …)
30. Glass Type: 0-5 (0=unknown, 1=annealed, …)
31. Glass Percent: 0-4 (0=unknown, 1=less than 5%, …)
32. Opening Protection: 0-3 (0=unknown, 1=none, 2=non-engineered, 3=engineered shutters)
33. Exterior Doors: 0-6 (0=unknown, 1=single width doors, …)
34. Building-Foundation Connection: 0-6 (0=unknown, 1=hurricane ties, …)
35. Foundation Type: 0-9 (0=unknown, 1=masonry basement, …)
36. Internal Partition Walls: 0-5 (0=unknown, 1=wood, …)
37. Attached Structures: 0, 1, 8 (0=unknown, 1=metal structures, 8=no metal structures)
38. Exterior Structures: 0, 1, 6 (0=unknown, 1=detached garage/shed, 6=no detached garage/shed)
39. Secondary Water Barrier: 0, 12, 13 (0=unknown, 12=yes, 13=no)

5. ***Disclose, in a model output report, the specific inputs required to use the model and the options of the model selected for use in a residential property insurance rate filing. Include the model name and version identification on the model output report. All items included in the model output report submitted to the Commission should be clearly labeled and defined.***

The options in the model are event set (probabilistic or historic), demand surge (on/off), and deductible type (none, occurrence, or annual). Summaries of the input exposure data and selected analysis options are provided in three model output files. Examples of these files are shown in Figure 29.

The first step in the analysis is to read in the exposure data and assign vulnerability functions to each site in the exposure data file. The log file at the top of Figure 29 reports the version number, date, and time of the analysis; the name of the input exposure file; a list of any skipped locations (none in this example); and the total number of locations retained in the model for analysis (2802 in this example).

The second major step in the analysis is to assign loss functions to each location. The first and last lines (corresponding to locations 1 and 2802) of the information file is shown in the middle of Figure 29. For each modeled location, a surface roughness (z04), wind grid identifier (igrid), and building type (iARAType1) are assigned by the model.

Upon completion of the loss calculations, a results file is produced. A sample results file is shown at the bottom of Figure 29. The results file contains the version number of the software, the selected analysis options, a summary of the number of risks and exposures by county, the annual occurrence and annual aggregate PMLs for 10 return periods, and the AALs by county and by location. The optional features of the model are discussed in Disclosure 5.

FA1_2016_ZIPS_np21_log.csv

	A	B	C	D	E
1	HurLoss Florida error log				
2	Version 8.0				
3	Run Date: 28-OCT-16				
4	Run Time: 10:38:06				
5	Input File:			FA1_2016_ZIPS.upx	
6	The following input locations were skipped:				
7	PolID	LocID	Error	Additional_Info	
8					
9	npRetain	2805			
10	nloc =	2805			

FA1_2016_ZIPS_np21_info.csv

	A	B	C	D	E	F	G	H	I	J	K
1	HurLoss Florida info file										
2	Version 8.0										
3	Run Date: 28-OCT-16										
4	Run Time: 10:38:06										
5	Input File:			FA1_2016_ZIPS.upx							
6	ip	pol	loc	dedtype	dedhur	dedaop	z0	Geo	grid	ziphl	cnty
7	1	301001	1	2	0	0	0.38	2	129599	32003	12019
8	2	301002	1	2	0	0	0.451	2	252194	32008	12121
9	3	301003	1	2	0	0	0.682	2	254265	32009	12089

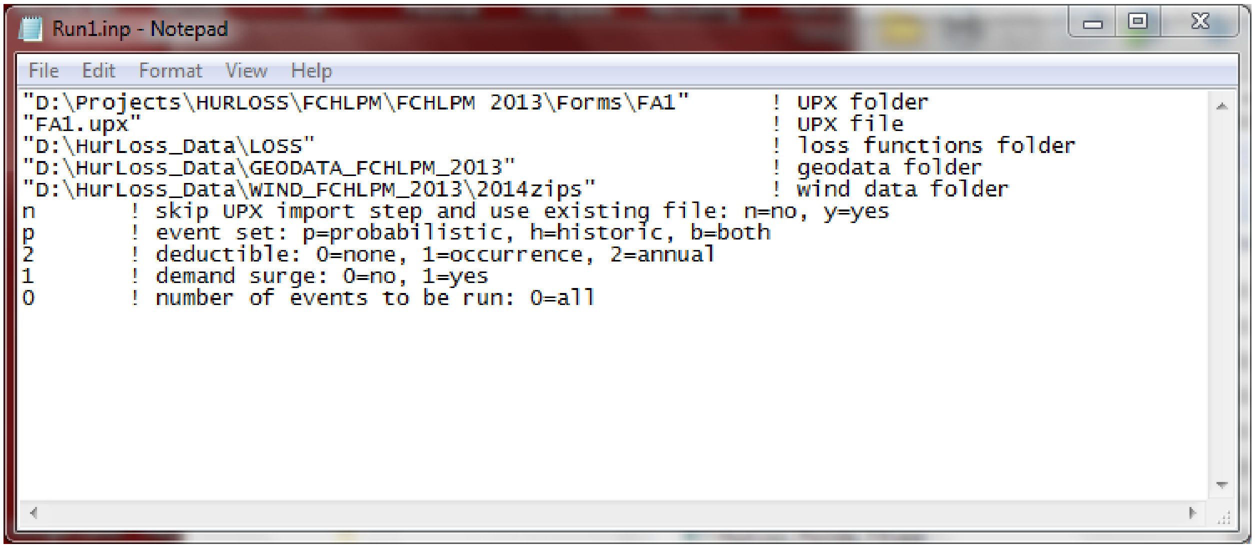
FA1_2016_ZIPS_np21_results.csv

	A	B	C	D	E	F	G	H	I	J	K	L
1	HurLoss Florida 8.0											
2	Analysis Options Selected:											
3												
4	Use existing loss function file (y/n): n											
5	Deductible type (0=ground-up; 1=occurence; 2=season):						2					
6	Run probabilistic or historic (p/h): p											
7	Include demand surge (0=no; 1=yes):				1							
8												
9	Number of Risks and TIV by County											
10	ID	County	Num	CovA	CovB	CovC	CovD	TIV				
11	80	12001	51	4250000	425000	2125000	850000	7650000				
12	...	...	...	...	...	...	...	...				
162												
163	AALs by Location											
164	RetainedF	Policy	Location	NRisk	CovA	CovB	CovC	CovD	TIV	AAL-A	AAL-B	AAI
165	1	301001	1	1	100000	10000	50000	20000	180000	82.61	8.26	
166	2	301002	1	1	100000	10000	50000	20000	180000	44.27	4.43	
167	3	301003	1	1	100000	10000	50000	20000	180000	43.7	4.37	

Figure 29. Model Output Report Files

As summarized above in our response to Disclosure 5, exposure data is input to the model using the UNICEDE/px data file format. Detailed specifications for the exposure data are available at http://www.unicede.com/UnicedePX.aspx. The policy, location, and location detail record types are used by the model to assign a vulnerability function to each valid location in the input file. The model supports versions 9.0 through 16.0 of the UNICEDE/px data standard. The input file format version number must be specified on the first line of the input file.

The process followed by the user to generate the model output is to create an input control file for the model run. The control file name is then specified by the user as parameter on the program command line. An example of an input control file is shown in Figure 30. The control file specifies the folder and name of the exposure data file, the folder containing the model vulnerability function files, the folder containing the model ZIP Code and terrain data files, and the folder containing the model wind hazard files. Four analysis options are also specified in the control file: (1) whether to use loss functions from a previous analysis (yes or no), (2) the analysis type (probabilistic or historic), (3) the deductible type (ground-up, per occurrence, or annual), and (4) demand surge (no or yes). The selected model options and the model version number are recorded in the output forms discussed above in Disclosure 4.




```
"D:\Projects\HURLOSS\FCHLPM\FCHLPM 2013\Forms\FA1"      ! UPX folder
"FA1.upx"                                               ! UPX file
"D:\HurLoss_Data\LOSS"                                  ! loss functions folder
"D:\HurLoss_Data\GEODATA_FCHLPM_2013"                   ! geodata folder
"D:\HurLoss_Data\WIND_FCHLPM_2013\2014zips"             ! wind data folder
n       ! skip UPX import step and use existing file: n=no, y=yes
p       ! event set: p=probabilistic, h=historic, b=both
2       ! deductible: 0=none, 1=occurrence, 2=annual
1       ! demand surge: 0=no, 1=yes
0       ! number of events to be run: 0=all
```

Figure 30. Input Control File for Form A-1

6. ***Describe actions performed to ensure the validity of insurer or other input data used for model inputs or validation/verification.***

Aggregate exposures by county, coverage, and line of business reported in the model output are compared to control totals provided by the insurer.

Out-of-date ZIP Codes are mapped to the current ZIP Code set used in the model. Records with ZIP Codes that cannot be mapped by the model must be revised by the user or omitted from the analysis.

The fields in each record are checked for valid ranges (known construction types, nonnegative coverage limits, valid locations, etc.). Records with invalid or missing fields are reported to the user and must be revised by the user or omitted from the analysis.

7. ***Disclose if changing the order of the model input exposure data produces different model output or results.***

The order of input does not affect the results.

8. ***Disclose if removing and adding policies from the model input file affects the output or results for the remaining policies.***

Adding or removing policies does not affect the outputs for the remaining policies.

A-2 Event Definition

Modeled loss costs and probable maximum loss levels shall reflect all insured wind related damages from storms that reach hurricane strength and produce minimum damaging windspeeds or greater on land in Florida.

A. The computation of losses begins when damage is first caused by any modeled hurricane event that affects Florida. The computation of damage and loss includes all subsequent damage produced by the event.

B. The time element loss costs produced by the model include a component for claims arising from indirect causes such as infrastructure damage. Time element losses associated with indirect causes can occur when there is no damage to the structure.

1. Describe how damage from model generated storms (landfalling and by-passing) is excluded or included in the calculation of loss costs and probable maximum loss levels for Florida.

All damages from landfalling and by-passing storms are included in the calculation of loss costs provided the event reaches hurricane strength and produces minimum damaging windspeeds or greater on land in Florida.

2. Describe how damage resulting from concurrent or preceding flood or hurricane storm surge is treated in the calculation of loss costs and probable maximum loss levels in Florida.

Damage resulting from concurrent or preceding flood or hurricane storm surge is not treated by the model, except for time element losses due to indirect causes such as infrastructure damage.

A-3 Coverages

A. ***The methods used in the calculation of building loss costs shall be actuarially sound.***

B. ***The methods used in the calculation of appurtenant structure loss costs shall be actuarially sound.***

C. ***The methods used in the calculation of contents loss costs shall be actuarially sound.***

D. ***The methods used in the calculation of time element loss costs shall be actuarially sound.***

A. The ARA model produces direct estimates of damage to buildings. The model has been validated through comparisons with actual physical damage and insured loss data, and the methods used in the development of loss costs are actuarially sound.

B. The ARA model produces direct estimates of damage to appurtenant structures. The appurtenant structures model has been validated through comparisons with actual physical damage and insured loss data. The methods used in the development of loss costs are actuarially sound.

C. The ARA model produces direct estimates of damage to contents. The model has been validated through comparisons with actual loss data. The methods used in the development of loss costs are actuarially sound.

D. The ARA time element loss model is primarily based on the distribution of times required to repair or replace the direct physical damage to the building and bring it back to its pre-storm level of functionality. The time element model also includes an additional factor for loss of use due to damage to infrastructure. The model has been calibrated using insurance loss data and is actuarially sound.

1. ***Describe the methods used in the model to calculate loss costs for building coverage associated with personal and commercial residential properties.***

The model was developed through detailed probabilistic, 3-dimensional, time-dependent engineering analysis of a broad range of personal residential, commercial residential, and non-residential building construction types and eras. Loading conditions considered in the analysis include wind pressure, windborne debris impacts, and rainfall produced by the full spectrum of tropical cyclone intensities and durations.

2. ***Describe the methods used in the model to calculate loss costs for appurtenant structure coverage associated with personal and commercial residential properties.***

In most cases, separate information is not available on the specific types and values of appurtenant structures covered by an insurance policy. For this common case, a probabilistic model of the types and relative values of appurtenant structure is used. These results are combined with the primary structure losses to produce an overall structural loss and then back-allocated to the primary structure and appurtenant structure coverages in proportion to their input replacement values. In cases where detailed information is available for appurtenant structures, these structures are best modeled as separate locations covered under a single policy.

3. ***Describe the methods used in the model to calculate loss costs for contents coverage associated with personal and commercial residential buildings.***

The model used to estimate the vulnerability of contents is based on the physical damage and the resulting possibility of wind and water entering the building following damage. Thus, while the damage to contents is a function of the damage to the building, the model is constructed in such a way that damage to contents does not occur until sufficient physical damage to the building has occurred to allow wind and/or water to enter the building, causing damage to the contents. The contents model has been validated/calibrated separately from the building vulnerability model.

4. ***Describe the methods used in the model to calculate loss costs for time element coverage associated with personal and commercial residential properties.***

The time element loss model was developed using a time restoration model that is used to estimate the time building owners are unable to use the damaged structure. The model allows for time element losses to be incurred due to indirect causes such as infrastructure damage. The model has been calibrated through comparisons of actual insurance losses.

A-4 Modeled Loss Cost and Probable Maximum Loss Considerations

A. ***Loss cost projections and probable maximum loss levels shall not include expenses, risk load, investment income, premium reserves, taxes, assessments, or profit margin.***

B. ***Loss cost projections and probable maximum loss levels shall not make a prospective provision for economic inflation.***

C. ***Loss cost projections and probable maximum loss levels shall not include any explicit provision for direct hurricane storm surge losses.***

D. ***Loss cost projections and probable maximum loss levels shall be capable of being calculated from exposures at a geocode (latitude-longitude) level of resolution.***

E. ***Demand surge shall be included in the model's calculation of loss costs and probable maximum loss levels using relevant data and actuarially sound methods and assumptions.***

A. Loss costs projections and probable maximum loss levels include only the direct costs associated with rebuilding/replacing the damaged structures, contents, appurtenant structures, and the costs associated with additional living expenses. Additional costs such as expenses, risk load, investment income, premium reserves, taxes, assessments, or profit, are not included in the loss costs projections.

B. Loss cost projections and probable maximum loss levels do not make prospective provisions for economic inflation.

C. Loss cost projections and probable maximum loss levels do not include any provisions for direct hurricane storm surge losses.

D. Loss cost projections and probable maximum loss levels can be computed for risks input at the ZIP Code or geocode levels of resolution.

E. A demand surge factor is included in the modeled losses for each simulated event. Insured losses are computed using the factored ground-up loss for each location.

F. The methods, data, and assumptions used in the demand surge model are actuarially sound.

1. Describe the method(s) used to estimate annual loss costs and probable maximum loss levels. Identify any source documents used and any relevant research results.

Using a straightforward simulation of *N* years of storms, expected annual losses are computed simply as the sum of all losses, net of policy conditions, divided by *N*. Loss costs for a given territory are computed by dividing the average annual loss by the appropriate exposure base. Probable maximum losses are determined by tabulating the annual maximum or annual aggregate losses for each simulated year, sorting the values, and selecting the appropriate value from the sorted list (e.g., the $2{,}500^{th}$ largest annual maximum loss in a 250,000-year simulation as the 100-year occurrence PML).

2. ***Identify the highest level of resolution for which loss costs and probable maximum loss levels can be provided. Identify all possible resolutions available for the reported output ranges.***

Loss costs can be produced at the coverage, policy, site, ZIP Code, county, state, and portfolio levels. The highest resolution is for a site and an individual building located at a latitude-longitude point.

The resolution for the reported output ranges in this document is ZIP Codes.

The model explicitly considers the location and terrain roughness of each area, such as beach/coastal, inland location, etc. For each simulated storm, the effects of terrain and location relative to the storm, distance from coast, and time since landfall are treated.

3. ***Describe how the model incorporates demand surge in the calculation of loss costs and probable maximum loss levels.***

A multiplicative demand surge factor is computed in the model for each simulated event. The demand surge factor is a function of the estimated industry-wide loss, and it is applied uniformly to each risk. The demand surge factor is applied to the ground-up building and time element losses at each site but not to contents losses. Additional details have been provided to the Professional Team.

4. ***Provide citations to published papers, if any, or modeling organization studies that were used to develop how the model estimates demand surge.***

The following references were used to guide the development of the demand surge model:

Andrews, M. (2006), "Demand Surge After Hurricanes Katrina & Rita," http://www.iii.org/disaster2/facts/demand_surge/.

Baker, K. (2006), "The economic and construction outlook in the Gulf States after Hurricane Katrina," http://ww.aia.org/econ_katrina_outlook , American Institute of Architects.

Davis Langdon (2005), "Impact of Katrina on the construction market," http://www.davislangdon.com (09/2005).

Engineering News-Record, ENR Cost Indexes, http://www.enr.com, A McGraw-Hill Construction Group Publication.

Grossi, P. and Kunreuther, H. (2005), Catastrophe Modeling: a New Approach to Managing Risk, Springer.

Jain, V.K., Davidson, R., and Rosowsky, D. (2005), "Modeling changes in hurricane risk over time," *Natural Hazards Review*, Vol.6, No.2, pp.88-96.

Marshall & Swift / Boeckh (MS/B), http://www.msbinfo.com .

Murray, R.A. (2005), "Hurricane Katrina: implications for the construction industry," McGraw Hill Construction.

Munich Re (2006), "The 1906 Earthquake and Hurricane Katrina," http://www.munichre.com/.

NAPCOLLC (2006), "The impact of changes to the RMS U.S. hurricane catastrophe model," http://www.napcollc.com/articles/JuneReviewRMSHurricane.pdf.

National Association of Home Builders (NAHB) (2005), "Impact of hurricane Katrina on Building Materials and Prices," http://www.nahb.org (9/2/2005).

RSMeans Company (2001), RS Means Building Construction Cost Data, Kinston, MA.

Westfall, C. (2006), "Insurers Balance Supply and Demand (Surge),"
http://www.kpmginsiders.com (03/17/2006).

5. ***Describe how economic inflation has been applied to past insurance experience to develop and validate loss costs and probable maximum loss levels.***

   Losses are computed with respect to the insured value of the building at the time of the loss.

A-5 Policy Conditions

A. ***The methods used in the development of mathematical distributions to reflect the effects of deductibles and policy limits shall be actuarially sound.***

B. ***The relationship among the modeled deductible loss costs shall be reasonable.***

C. ***Deductible loss costs shall be calculated in accordance with s. 627.701(5)(a), F.S.***

A. The model produces statistical distributions of losses that are treated mathematically to reflect deductibles and policy limits. The details of this approach and validation have been presented to the Professional Team.

B. The relationships among the modeled deductible loss costs are reasonable, as demonstrated by our results for Forms A-4 and A-6.

C. Deductible loss costs in Florida are calculated using a hurricane deductible and an all other perils deductible in accordance with s.627.70(5)(a), F.S.

1. Describe the methods used in the model to treat deductibles (both flat and percentage), policy limits, and insurance-to-value criteria when projecting loss costs and probable maximum loss levels.

ARA has developed probability distributions of normalized ground-up loss given a building type, local terrain, and peak 3-second gust windspeed at 10 m above ground in open terrain. The distributions are modeled as piecewise linear probability density functions with the possibility of discrete probability masses at the lower and/or upper limits of each normalized loss interval. When computing the expected insured loss at a given location in a given event, the coverage limits, deductibles, coinsurance participation factor, and demand surge factor are applied to the ground-up loss distribution as it is being numerically integrated across the range of possible losses. Deductibles that are expressed as a percentage are converted to dollar equivalent and then applied.

2. Describe whether, and if so how, the model treats policy exclusions and loss settlement provisions.

The model treats policy exclusions to the extent that such exclusions are not included in the estimates of insured value. The same applies to settlement provisions (e.g., ACV vs. replacement cost).

3. Provide an example of how insurer loss (loss net of deductibles) is calculated. Discuss data or documentation used to validate the method used by the model.

Table 2 is representative of a typical one-story house.

Table 2. Example of Insurer Loss Calculation

(A)		(B)	(C)	(D)=(A)*(C)	(E)=(D)-(B)
Building Value	Policy Limit	Deductible	Damage Ratio	Zero Deductible Loss	Loss Net of Deductible
100,000	90,000	500	2%	2,000	1,712

For any given windspeed, the damage is comprised of a wide range of losses ranging between 0 and 100%. To compute the mean loss for a given windspeed, the distribution of ground-up losses derived from the building performance model is used, and the deductible is subtracted from this total loss distribution to compute the net loss. The mean loss net of deductible is then obtained by through numerical integration of the insured loss distribution. The example paid losses given above change with the characteristics of the building.

4. Describe how the model treats annual deductibles.

The model tracks the mean deductible applied to each policy in each event during a simulated year. After the hurricane deductible is exhausted (i.e., the unused portion of hurricane deductible for a given policy falls below the all other perils deductible), the model uses the all other perils deductible for that policy for the remainder of the year. When only a portion of the hurricane deductible has been expended and the remaining amount is larger than the all other perils deductible, the remaining portion of the hurricane deductible is used as the deductible for the next event in the same year. The minimum deductible used is the all other perils deductible.

A-6 Loss Outputs and Logical Relationships to Risk

A. ***The methods, data, and assumptions used in the estimation of probable maximum loss levels shall be actuarially sound.***

B. ***Loss costs shall not exhibit an illogical relation to risk, nor shall loss costs exhibit a significant change when the underlying risk does not change significantly.***

C. ***Loss costs produced by the model shall be positive and non-zero for all valid Florida ZIP Codes.***

D. ***Loss costs cannot increase as the quality of construction type, materials and workmanship increases, all other factors held constant.***

E. ***Loss costs cannot increase as the presence of fixtures or construction techniques designed for hazard mitigation increases, all other factors held constant.***

F. ***Loss costs cannot increase as the wind resistant design provisions increases, all other factors held constant.***

G. ***Loss costs cannot increase as building code enforcement increases, all other factors held constant***

H. ***Loss costs shall decrease as deductibles increase, all other factors held constant.***

I. ***The relationship of loss costs for individual coverages, (e.g., building, appurtenant structure, contents, and time element) shall be consistent with the coverages provided.***

J. ***Output ranges shall be logical for the type of risk being modeled and apparent deviations shall be justified.***

K. ***All other factors held constant, output ranges produced by the model shall in general reflect lower loss costs for:***

1. ***masonry construction versus frame construction,***
2. ***personal residential risk exposure versus manufactured home risk exposure,***
3. ***inland counties versus coastal counties, and***
4. ***northern counties versus southern counties.***

L. ***For loss cost and probable maximum loss level estimates derived from and validated with historical insured hurricane losses, the assumptions in the derivations concerning (1) construction characteristics, (2) policy provisions, (3) coinsurance, and (4) contractual provisions shall be appropriate based on the type of risk being modeled.***

A. The model produces estimates of loss as a function of annual probability of exceedance or its inverse, return period. These loss estimates are commonly referred to as probable maximum loss levels. The methodology used to estimate probable maximum loss levels is described below in our response to Disclosure 8. The methodology is actuarially sound.

B. The loss costs produced by the ARA model show no illogical relations with respect to risk, nor do loss costs exhibit a significant change when the underlying risk does not change significantly.

C. Loss costs produced by the model are positive and non-zero for all Florida ZIP Codes.

D. Loss costs decrease as "quality" of construction increases.

E. Loss costs decrease as the presence of fixtures or construction techniques designed for hazard mitigation increases.

F. Loss costs decrease as the wind resistant design provisions increase. The model does not explicitly treat "building code enforcement."

G. Loss costs do not increase as building code enforcement increases, all other factors held contstant. To the extent that building code enforcement is quantified in specific structural or building parameters, the model shows that loss costs decreases for stronger/higher quality construction, all other factors held constant.

H. Loss costs decrease with increasing deductibles, all other factors held constant.

I. The relationship of loss costs for individual coverage (A, B, C, D) is consistent with the coverage provided.

J. The output ranges provided in Form A-4 are logical. There are no deviations.

K. All other factors held constant, the output ranges are consistent with items 1-4 in this Standard.

L. Assumptions in the derivation and validation of loss cost estimates using historical insured hurricane losses are discussed in the disclosures below. These assumptions are reasonable and appropriate.

1. ***Provide a completed Form A-1, Zero Deductible Personal Loss Costs by ZIP Code. Provide a link to the location of the form [insert hyperlink here].***

   See Form A-1.

2. ***Provide a completed Form A-2, Base Hurricane Storm Set Statewide Losses. Provide a link to the location of the form [insert hyperlink here].***

   See Form A-2.

3. ***Provide a completed form A-3, 2004 Hurricane Season Losses. Provide a link to the location of the form [insert hyperlink here].***

   See Form A-3.

4. ***Provide a completed form A-4, Output Ranges. Provide a link to the location of the form [insert hyperlink here].***

   See Form A-4.

5. ***Provide a completed Form A-5, Percentage Change in Output Ranges. Provide a link to the location of the form [insert hyperlink here].***

   See Form A-5.

Form A-6 will be provided to the Commission during the closed meeting portion of meeting to review the model for acceptability.

6. ***Provide a completed Form A-7, Percentage Change in Logical Relationship to Risk. Provide a link to the location of the form [insert hyperlink here].***

   See Form A-7.

7. ***Provide a completed Form A-8, Probable Maximum Loss for Florida. Provide a link to the location of the form [insert hyperlink here].***

   See Form A-8.

8. ***Describe how the model produces probable maximum loss levels.***

The model uses a standard Monte Carlo simulation approach to estimate losses on an event by event basis. Upon completion of the simulation, the maximum event loss in each year (for annual occurrence PMLs) or the aggregate event losses in each year (for annual aggregate PMLs) are sorted in descending order. The annual probability of exceedance, *p*, associated with each simulated annual loss is simply its rank, *r*, divided by the number of simulation years, *n*. The return period is simply the inverse of the annual exceedance probability (e.g., the 100-year loss has an annual probability of exceedance of 1%).

9. ***Provide citations to published papers, if any, or modeling organization studies that were used to estimate probable maximum loss levels.***

   N/A.

10. ***Describe how the probable maximum loss levels produced by the model include the effect of personal and commercial residential insurance coverage.***

Probable maximum loss levels can be computed separately by type of business (e.g., homeowners, mobile homes, renters, condominium unit owners, or commercial residential) or for all types of business combined using the appropriate event losses and methodology described above in Disclosure 8.

11. ***Explain any difference between the values provided on Form A-8, Probable Maximum Loss for Florida, and those provided on Form S-2, Examples of Loss Exceedance Estimates.***

    N/A.

12. ***Provide an explanation for all anomalies in the loss costs that are not consistent with the requirements of this standard.***

There are no anomalies in our estimates of loss costs compared to the requirements of this standard.

The relationship between masonry and frame losses can vary by county depending on the risk locations within the county (e.g., open vs. suburban terrain and, to a much lesser extent, distance inland) and the additional risk characteristics associated with the risks (e.g., year built, opening protection, etc.). In general, losses are more sensitive to risk location and additional risk characteristics than to wall construction type.

The relationship between modeled losses and year built varies with the type of construction, the applicable building codes, the applicable design terrain exposure, and the fraction of buildings that have been re-roofed with FBC-equivalent roof coverings. As a result, there are instances, for example, in which 1998 buildings or buildings with unknown year built will sustain higher loss costs than a similar 1980 building. This behavior has also been observed in claims data.

13. Provide an explanation of the differences in output ranges between the previously accepted model and the current model.

The differences in the output between the prior year and the current year submission are due to the model updates identified under Standard G-1, Disclosure 5 and statistical variability (less than 5%) associated with the generation of a new Monte Carlo simulation event set.

The changes in average output ranges by region and policy type are summarized in Form A-5.

14. Identify the assumptions used to account for the effects of coinsurance on commercial residential loss costs.

Coinsurance is modeled as a multiplicative participation factor at the location level on the distribution of ground-up loss after it has been capped at the coverage limits and reduced by the deductible. The participation factor represents the fraction of the net risk (i.e., after applying limits and deductibles) that has been accepted by the insurer.

Computer/Information Standards

CI-1 Documentation

A. ***Model functionality and technical descriptions shall be documented formally in an archival format separate from the use of letters, slides, and unformatted text files.***

B. ***The modeling organization shall maintain a primary document repository, containing or referencing a complete set of documentation specifying the model structure, detailed software description, and functionality. Documentation shall be indicative of accepted model development and software engineering practices.***

C. ***All computer software (i.e., user interface, scientific, engineering, actuarial, data preparation, and validation) relevant to the model shall be consistently documented and dated.***

D. ***The modeling organization shall maintain (1) a table of all changes in the model from the previously accepted model to the initial submission this year and (2) a table of all substantive changes since this year's initial submission.***

E. ***Documentation shall be created separately from the source code.***

A. ARA maintains documented technical descriptions and specifications of model functionality. These archival documents are separate from and in addition to letters, presentation slides, and other unformatted text files.

B. ARA maintains a primary document binder and a complete set of document sub-binders for the components of the HurLoss suite of applications. The model documentation binders contain fully documented sections, based on accepted software engineering practices, for each computer standard.

C. The documentation for all software components is consistently documented in both content and format. Version dates are maintained for living documents and publication dates are maintained for final documents. Document templates and guidelines are maintained to keep all new documentation consistent.

D. ARA maintains a table of all changes in the model from the previously accepted submission to the current submission. We will also maintain a table of all substantive changes made after this year's initial submission, if any such changes are made.

E. The documentation has been created separately from the source code and is maintained under a revision control system.

CI-2 Requirements

The modeling organization shall maintain a complete set of requirements for each software component as well as for each database or data file accessed by a component. Requirements shall be updated whenever changes are made to the model.

Requirements are specified and documented for each of the major components of the model.

1. ***Provide a description of the documentation for interface, human factors, functionality, documentation, data, human and material resources, security, and quality assurance.***

The documentation for each component specifies the required functionality of the component, the input data required by the component, and the output data produced by the component. The documentation for each database or data file specifies the file format or database schema, the producers of the data, and the intended consumers of the data.

General requirements common to all components and the ARA policy for model revision are specified in the primary document binder.

CI-3 Model Architecture and Component Design

The modeling organization shall maintain and document (1) detailed control and data flowcharts and interface specifications for each software component, and (2) schema definitions for each database and data file, (3) flowcharts illustrating model-related flow of information and its processing by modeling organization personnel or consultants, and (4) system model representations associated with (1)-(3). Documentation shall be to the level of components that make significant contributions to the model output.

Detailed control and data flow diagrams, interface specifications, data file specifications, and model-related information flow diagrams are included in the primary document binder and the supplemental documentation binders for each of the components that make significant contributions to the model output.

CI-4 Implementation*
(*Significant Revision)

A. ***The modeling organization shall maintain a complete procedure of coding guidelines consistent with accepted software engineering practices.***

B. ***The modeling organization shall maintain a complete procedure used in creating, deriving, or procuring and verifying databases or data files accessed by components.***

C. ***All components shall be traceable, through explicit component identification in the model representations (e.g., flowcharts) down to the code level.***

D. ***The modeling organization shall maintain a table of all software components affecting loss costs and probable maximum loss levels, with the following table columns: (1) Component name, (2) Number of lines of code, minus blank and comment lines; and (3) Number of explanatory comment lines.***

E. ***Each component shall be sufficiently and consistently commented so that a software engineer unfamiliar with the code shall be able to comprehend the component logic at a reasonable level of abstraction.***

F. ***The modeling organization shall maintain the following documentation for all components or data modified by items identified in Standard G-1, Scope of the Model and Its Implementation, Disclosure 5 and Audit 5:***

1. ***A list of all equations and formulas used in documentation of the model with definitions of all terms and variables.***
2. ***A cross-referenced list of implementation source code terms and variable names corresponding to items within F.1, above.***

A. ARA has developed coding guidelines for that are consistent with accepted software engineering practices.

B. ARA has developed a set of procedures for creating, deriving, or procuring and verifying external data files or databases. Each procedure specifically addresses an individual data source.

C. Each major component of the model has been incrementally translated into a hierarchy of subcomponents, which have been implemented in source code. Documentation is provided in the relevant binders to enable users to trace the design and implementation requirements from the documentation to the source code.

D. A table of all software components affecting software loss costs with the number of lines of code, number of lines of comments, number of lines of combined code and comments, and number of blank lines is included in the Primary Documents Binder. An estimate of the breakdown between explanatory and non-explanatory comment lines is also included.

E. Components are commented at the code level at the time of development. Code-level comments include file headers, class headers, function headers, and inline comments to explain non-obvious sections of code.

F. Lists of all equations and formulas and cross-referenced lists of implementation source code terms and variable names for all components or data modified by items identified in

Standard G-1, Disclosures 5 are maintained in the appropriate component documentation binders.

1. ***Specify the hardware, operating system, other software, and all computer languages required to use the model.***

The model runs on computers running the Windows® XP, Windows 7, or Windows Server operating systems. The computer languages used to implement the model are FORTRAN, C++, C#, and T-SQL.

CI-5 Verification

A. ***General. For each component, the modeling organization shall maintain procedures for verification, such as code inspections, reviews, calculation crosschecks, and walkthroughs, sufficient to demonstrate code correctness. Verification procedures shall include tests performed by modeling organization personnel other than the original component developers.***

B. ***Component Testing***

1. ***The modeling organization shall use testing software to assist in documenting and analyzing all components.***
2. ***Unit tests shall be performed and documented for each component.***
3. ***Regression tests shall be performed and documented on incremental builds.***
4. ***Aggregation tests shall be performed and documented to ensure the correctness of all model components. Sufficient testing shall be performed to ensure that all components have been executed at least once.***

C. ***Data Testing***

1. ***The modeling organization shall use testing software to assist in documenting and analyzing all databases and data files accessed by components.***
2. ***The modeling organization shall perform and document integrity, consistency, and correctness checks on all databases and data files accessed by the components.***

A. ARA's software verification procedures include: (i) use of logical assertions and error checking throughout the code to ensure that data values are within valid ranges; (ii) reviews of completed code by engineers on the team who were not responsible for developing that code; (iii) walkthroughs of the code to ensure proper flow; (iv) inspections of internal variables to ensure proper input, output, and processing; (v) reviews of outputs to ensure proper trends; and (vi) validations against historical events, experimental data, and/or independently-computed results. Several stand-alone driver programs have been developed to test individual components of the model.

B. ARA utilizes testing software written in-house and designed specifically to test, verify, and validate the various components of the models. The testing process has been designed to ensure that all components have been executed at least once. Unit tests are performed for each component as it is written. Regression tests are performed and documented for all incremental builds of the model. Regression testing includes comparisons of annual FCHLPM submissions to the previous year with an investigation and explanation of all associated differences.

Verification and validation tests for the software components are documented through extensive comparisons of intermediate and final outputs produced by the code against historical, experimental, and/or independently-computed results. Results of these tests are documented, typically in the form of graphs or tables, in the component documentation binders.

C. ARA utilizes testing software written in-house such as bin-to-txt and bin-to-bmp utilities to verify integrity, consistency, and correctness on databases and data files. Additional data testing is performed through spot checks assisted by similar in-house utilities.

1. ***State whether any two executions of the model with no changes in input data, parameters, code, and seeds of random number generators produce the same loss costs and probable maximum loss levels.***

The model produces the same loss costs and probable maximum losses when run more than once with the same input data, analysis options, code, and random number seeds.

2. ***Provide an overview of the component testing procedures.***

New components or existing components undergoing any code revision are subject to the testing procedures in place at the time of development or update. Existing components that were developed prior to the FCHLPM standards or under previous FCHLPM standards were tested in accordance with the adopted testing procedures at the time of development. Existing components are subject to new unit-level testing when revisions occur, and all components are subject to ARA's ongoing system-level and regression testing.

ARA's current software testing procedures include unit-level testing for all newly developed or updated components, system-level testing for the model as a whole and its major sub-systems, and regression testing between versioned builds. Data files undergo specialized testing tailored to the specific dataset and designed to ensure that the data is accurate and complete.

3. ***Provide a description of verification approaches used for externally acquired data, software, and models.***

Updated versions of externally acquired geographic data sets, such as ZIP Code polygons and NLCD LULC raster layers, are visually inspected and compared to their preceding versions using GIS software.

Updates to externally acquired environmental data sets, such as historical event tracks, sea surface temperature data sets, and wind shear data sets, are inspected for changes in data formats and compared to previous versions using file comparison tools to check for any differences in sections of the data sets that existed in both the previous version of the data and the new version.

*CI-6 Model Maintenance and Revision**
(Significant Revision)

A. ***The modeling organization shall maintain a clearly written policy for model review, maintenance, and revision, including verification and validation of revised components, databases, and data files.***

B. ***A revision to any portion of the model that results in a change in any Florida residential hurricane loss cost or probable maximum loss level shall result in a new model version identification.***

C. ***The modeling organization shall use tracking software to identify and describe all errors, as well as modifications to code, data, and documentation.***

D. ***The modeling organization shall maintain a list of all model versions since the initial submission for this year. Each model description shall have a unique version identification, and a list of additions, deletions, and changes that define that version.***

A. ARA has developed and implemented a clearly written policy for model revision. In addition, procedures specific to a component are documented in the appropriate binder.

B. Any revision to the model that results in a change in any Florida residential hurricane loss cost or probably maximum loss level results in a new model version number.

C. See Disclosure C-6.1 below.

D. ARA will maintain list of all model versions since the initial submission for this year. Each model version shall have a unique version identification and a list of changes that define that version.

1. Identify procedures used to review and maintain code, data, and documentation.

ARA uses Microsoft Visual SourceSafe and Microsoft Team Foundation Server to track all changes to the software and documentation. Only authorized users are allowed to check in changes to the archive. Project check points are used to document the individual revision numbers of the source code files, header files, workspace files, data files, and documentation files in each new release of the model.

ARA uses Microsoft Team Foundation Server to document, prioritize, and assign all problems and enhancements to the software, data, and documentation.

2. Describe the rules underlying the model and code revision identification systems.

Any revision to the model that results in a change in any Florida residential hurricane loss cost or probably maximum loss level results in a new model version number. Major changes to the hazard or vulnerability models, database schema, or user interface result in a change to the leading digit of the version number. Data updates (e.g., ZIP Codes and terrain) result in a change to the second digit of the version number. Code corrections or updates made after the initial submission of the model to the FCHLPM result in a third digit being added to the version number.

CI-7 Security

The modeling organization shall have implemented and fully documented security procedures for: (1) secure access to individual computers where the software components or data can be created or modified, (2) secure operation of the model by clients, if relevant, to ensure that the correct software operation cannot be compromised, (3) anti-virus software installation for all machines where all components and data are being accessed, and (4) secure access to documentation, software, and data in the event of a catastrophe.

ARA's policy for model revision includes security procedures for accessing code, data, and documentation. These procedures are in accordance with standard industry practices. ARA corporate policy requires all company computers to run ESET NOD32 anti-virus software. Regular backups are performed for all computers on the ARA network and include offsite storage of backup tapes.

Clients will only have access to the licensable version the model, which checks imported portfolio data for reasonable input values. It is the responsibility of the client to ensure that the portfolio data are correct. Clients will not have direct access to any of the model data, such as the terrain or wind hazard databases.

1. Describe methods used to ensure the security and integrity of the code, data, and documentation.

Modifications to the code, data, and documentation can only be checked into the revision control system by authorized, in-house developers. Baseline tests are always run to ensure the model is functioning properly and reproducing known results.

References

Meteorological Standards

Alliss, R. (1992). “The Utilization of SSM/I Data in Analysis of Tropical and Extra-Tropical Cyclones,” M.S. Thesis, Dept. of MEAS, North Carolina State University, Raleigh, North Carolina.

Alliss, R., Raaman, S., and Chang, S. (1992). “Special Sensor Microwave/Imager (SSM/I) Observations of Hurricane Hugo (1989),” *Monthly Weather Review*, Volume 120, pp. 2723-2737.

Alliss, R., Sandlin, G., Chang, S., and Raaman, S. (1992). “Applications of SSM/I Data in Analysis of Hurricane Florence 1988,” *Journal of Applied Meteorology*, Volume 33, pp. 1581-1591.

American National Standards Institute, Inc. (1982), “Minimum Design Loads for Buildings and Other Structures,” ANSI A58.1, New York, NY.

American Society of Civil Engineers (1990). “ASCE-7 Minimum Design Loads for Buildings and Other Structures,” ASCE, New York, NY.

American Society of Civil Engineers (1996). “ASCE-7 Minimum Design Loads for Buildings and Other Structures,” ASCE, New York, NY.

Arya, S.P.S., (1988). *Introduction to Micrometeorology*, Academic Press, Chapter 11.

ASCE 7-10 (2010). “Minimum Design Loads for Buildings and Other Structures,” American Society of Civil Engineers, Reston, Virginia.

Ashcroft, J. (1994). “The Relationship between the Gust Ratio, Terrain Roughness, Gust Duration and the Hourly Mean Wind Speed,” *Journal of Wind Engineering and Industrial Aerodynamics*, Vol. 53, pp. 331-355.

Batts, M.E., Cordes, M.R., Russell, C.R., Shaver, J.R., and Simiu, E. (1980). “Hurricane Windspeeds in The United States,” National Bureau of Standards Report Number BSS-124, U.S. Dept. of Commerce, Washington, D.C.

Bradbury, W.M.S., Deaves, D.M., Hunt, J.C.R., Kershaw, R., Nakamura, K., Hardman, M.E. and Bearman, P.W. (1994). “The Importance of Convective Gusts,” *Meterological Applications*, Vol. 1, pp. 365-378.

Brook, R.R. (1972). “Measurements of Turbulence in a City Environment,” *Journal of Applied Meteorology*, Volume 11, pp. 443-450.

Brown, D.P., Franklin, J.L., and Landsea, C.W. (2006). “A fresh look at tropical cyclone pressure-wind relationships using recent reconnaissance-based “best track” data (1998-2005),” Preprints, 27th Conf. On Hurricanes and Tropical Meteorology, Monterey, CA, American Meterological Society, 3B.5. [Available online at http://ams.confex.com/ams/pdf/papers/107190.pdf.]

Burpee, R.W., et al. (1994). “Real-time Guidance Provided by NOAA’s Hurricane Research Division to Forecasters during Emily of 1993,” Bulletin of the American Meteorological Society, Vol. 75, No. 10, pp. 1765-1783.

Chouinard, L.E, Chang, Liu, and Cooper, C.K. (1997). “Model for Severity of Hurricanes in Gulf of Mexico,” *Journal of Waterway, Port, Costal and Ocean Engineering*, Vol. 123, No. 3, pp. 120-129.

Chow, S.H. (1971). “A Study of Windfield in the Planetary Boundary Layer of a Moving Tropical Cyclone,” MS Thesis in Meteorology, School of Engineering and Science, New York University, New York, NY.

Daneshvaran, S. and Morden, R.E. (1998). “Fast Hurricane Wind Analysis Using the Orthogonal Decomposition Method,” *Journal of Wind Engineering and Industrial Aerodynamics,* Volumes 77/78 Complete, pp. 703-714.

Darling, R.W.R. (1991). “Estimating Probabilities of Hurricane Wind Speeds Using a Large-Scale Empirical Model,” *Journal of Climate*, Volume 4, Number 10, pp. 1035-1046.

Deaves, D.M., and Harris, R.I. (1978). “A Mathematical Model of the Structure of Strong Winds,” *CIRIA Report Number 76*, London, England, Construction Industry Research and Information Association.

Deaves, D.M. (1981a). “Computation of Wind Flow Over Changes in Surface Roughness,” *Journal of Wind Engineering and Industrial Aerodynamics*, Vol. 7, pp. 65-94.

Deaves, D.M. (1981b). “Terrain-Dependence of Longitudinal R.M.S. Velocities in the Neutral Atmosphere,” *Journal of Wind Engineering and Industrial Aerodynamics*, Vol. 8, pp. 259-274.

DeMaria, M., and J. Kaplan (1999), “An updated Statistical Hurricane Intensity Prediction Scheme (SHIPS) for the Atlantic and Eastern North Pacific Basins,” Weather and Forecasting, 14, pp. 326–337.

Duchêne-Marullaz, P. (1979). “Effect of High Roughness on the Characteristics of Turbulence in Cases of Strong Winds,” *5th International Conference on Wind Engineering*, Fort Collins, Colorado, p. 15.

Durst, C.S. (1960). “Wind Speeds over Short Periods of Time,” *The Meteorological Magazine,* Vol. 89, pp. 181-186.

Emanuel, K.A. (1988). “The Maximum Intensity of Hurricanes,” *Journal of the Atmospheric Sciences*, Vol. 45, pp. 1143-1155.

Emanuel, K.A, S. Ravela, E. Vivant and C. Risi, (2006), “A statistical–deterministic approach to hurricane risk assessment,” *Bull. Amer. Meteor. Soc*., 19 299-314.

ESDU (1982). “Strong Winds in the Atmospheric Boundary Layer, Part 1: Mean Hourly Wind Speed,” Engineering Sciences Data Unit Item No. 82026, London, England.

ESDU (1983). “Strong Winds in the Atmospheric Boundary Layer, Part 2: Discrete Gust Speeds,” Engineering Sciences Data Unit Item Number 83045, London, England.

Fry, J., Xian, G., Jin, S., Dewitz, J., Homer, C., Yang, L., Barnes, C., Herold, N., and Wickham, J., 2011. Completion of the 2006 National Land Cover Database for the Conterminous United States, PE&RS, Vol. 77(9):858-864.

Garratt, J.R. (1977). “Review of Drag Coefficients Over Oceans and Continents,” *Monthly Weather Review*, Vol. 105, pp. 915-929.

Georgiou, P.N. (1985). “Design Windspeeds in Tropical Cyclone-Prone Regions,” Ph.D. Thesis, Faculty of Engineering Science, University of Western Ontario, London, Ontario, Canada.

Georgiou, P.N., Davenport, A.G., and Vickery, B.J. (1983). "Design Wind Speeds in Regions Dominated by Tropical Cyclones," *Journal of Wind Engineering and Industrial Aerodynamics,* Volume 13, Numbers 1-3, pp. 139-152.

Golden, J.H. (1984). "Meteorological Aspects of Hurricane Alicia," *ASCE Specialty Conference: Alicia, One Year Later*, Galveston, Texas, 16-17 August.

Greenway, M.E. (1979). "An Analytical Approach to Wind Velocity Gust Factors," *Journal of Industrial Aerodynamics,* Vol. 5, pp. 61-91.

Hawk, T.F and Franklin, J.L. (1999). "The NCAR GPS Dropwindsonde," *Bulletin of the American Meteorological Society,* Vol. 80, No. 3, pp. 407-420.

Hebert, P.J., Jarrell, J.D., and Mayfield, B.M. (1996). "The Deadliest, Costliest, and Most Intense United States Hurricanes of This Century (and Other Frequently Requested Hurricane Facts)," NOAA Technical Memorandum NWS-NHC-31, p. 41.

Hebert, P.J., Jarrell, J.D., and Mayfield, B.M. (1997). "The Deadliest, Costliest, and Most Intense United States Hurricanes of This Century (and Other Frequently Requested Hurricane Facts)," *NOAA Technical Memorandum* NWS-TPC-1, pp. 30.

Ho, F.P., et al. (1987). "Hurricane Climatology for the Atlantic and Gulf Coasts of the United States," NOAA Technical Report NWS38, Federal Emergency Management Agency.

Holland, G.J. (1980). "An Analytic Model of the Wind and Pressure Profiles in Hurricanes," *Monthly Weather Review,* Volume 108, Number 8, pp. 1212-1218.

Houston, S.H., Powell, M.D., and Dodge, P.P. (1997). "Surface Wind Fields in 1996 Hurricanes Bertha and Fran at Landfall," *22nd Conference on Hurricanes and Tropical Meteorology,* American Meteorological Society, Fort Collins, Colorado, 19-23 May.

Houston, S.H. and Powell M.D. (1993). "Surface Wind Fields During Hurricane Bob's (1991) Landfall in New England," *20th Conference on Hurricanes and Tropical Meteorology,* American Meteorological Society, San Antonio, Texas, 10-14 May.

Jarvinen, B.R., Neumann, C.J., and Davis, M.A.S. (1984). "A Tropical Cyclone Data Tape for the North Atlantic Basin 1886-1983: Contents, Limitations and Uses," NOAA Technical Memorandum NWS NHC 22, U.S. Department of Commerce, March.

Jensen, M. (1958). "The Model-Law for Phenomena in Natural Wind," *Ingeniøren,* Volume 2, pp. 121-128.

Jin, S., Yang, L., Danielson, P., Homer, C., Fry, J., and Zian, G. (2013). "A Comprehensive Change Detection Method for Updating the National Land Cover Database to Circa 2011," *Remote Sensing of Environment*, Vol. 132, pp. 159-175.

Kareem, A., and Stevens, J.G. (1985). "Window Glass Performance and Analysis in Hurricane Alicia," *ASCE Specialty Conference: "Hurricane Alicia: One Year Later,"* Galveston, Texas (August 1984), A. Kareem (Ed.), pp.178-186.

Karlsson, S. (1986). "The Applicability of Wind Profile Formulas to an Urban-Rural Interface Site," *Boundary Layer Meteorology,* Volume 34, pp. 333-355.

Kepert, J. (2001). "The Dynamics of Boundary Layer Jets within the Tropical Cyclone Core. Part I: Linear Theory," *Journal of Atmospheric Science,* Volume 58, pp. 2469-2484.

Krayer, W.R., and Marshall, R.D. (1992). "Gust Factors Applied to Hurricane Winds," *Bulletin of the American Meteorological Society,* Vol. 73, No. 5, pp. 613-617.

Large, W. G., and Pond, S. (1981). “Open Ocean Momentum Flux Measurements in Moderate to Strong Winds,” *Journal of Physical Oceanography*, Vol. 11, pp. 324-336.

Lettau, H.H. (1969). “Note on Aerodynamic Roughness-Parameter Estimation on the Basis of Roughens-Element Description,” *Journal of Applied Meteorology*, Volume 8, pp. 828-832.

Mark, F. (1985). “Evolution and Structure of Precipitation in Hurricane Allen (1980),” *Monthly Weather Review,* Volume 113, pp. 909-930.

Neumann, C.J. (1991). “The National Hurricane Center Risk Analysis Program (HURISK),” NOAA Technical Memorandum NWS NHC 38, National Oceanic and Atmospheric Administration, Washington, D.C.

NRC (1991). “Hurricane Elena, Gulf Coast August 29 – September 2, 1985, Natural Disasters Studies, Volume Two,” HA 286, Committee on Natural Disasters, National Research Council, Washington, DC pp. 51-58.

Powell, M.D., Vickery, P.J., and Reinhold, T. A. (2003). “Reduced Drag Coefficient for High Wind Speeds in Tropical Cyclones,” *Nature*, Vol. 422, March.

Powell, M.D., and Houston, S.H. (1998). "Surface Wind Fields of 1995 Hurricanes Erin, Opal, Luis, Marilyn, and Roxanne at Landfall," *Monthly Weather Review*, Volume 126, pp. 1259-1273.

Powell, M.D., and Houston, S.H. (1996). "Hurricane Andrew’s Landfall in South Florida – Part II: Surface Wind Fields and Potential Real-Time Applications," *Weather and Forecasting*, Volume 11, Number 3, pp. 329-349.

Powell, M.D., Houston, S.H. and Reinhold, T.A. (1996). “Hurricane Andrew’s Landfall in South Florida - Part I: Standardizing Measurements for Documentation of Surface Wind Fields,” *Weather and Forecasting*, Vol. 11, No. 3, pp. 303-328.

Powell, M.D., Dodge, P.P., and Black, L.B. (1991). "The Landfall of Hurricane Hugo in the Carolinas: Surface Wind Distribution," *Weather and Forecasting*, Volume 6, pp. 379-399.

Powell, M.D. (1987). "Changes in the Low-Level Kinematic and Thermodynamic Structure of Hurricane Alicia (1983) at Landfall," *Monthly Weather Review*, Volume 115, pp. 75-99.

Powell, M.D. (1980). “Evaluations of Diagnostic Marine Boundary-Layer Models Applied to Hurricanes,” *Monthly Weather Review,* Vol. 108, pp. 757-766.

Rodgers, E., Chang, S., and Pierce, H. (1994). “A Satellite Observational and Numerical Study of Precipitation Characteristics in Western North Atlantic Cyclones,” *Journal Applied Meteorology*, Volume 33, pp. 129-139.

Russell, L.R., and Schueller, G.F. (1974). “Probabilistic Models for Texas Gulf Coast Hurricane Occurrences,” *Journal Petroleum Technology,* pp. 279-288.

Russell, L.R. (1971). “Probability Distributions for Hurricane Effects,” *Journal of Waterways, Harbors, and Coastal Engineering Division*, Number 1, pp. 139-154.

Russell, L.R. (1968). “Probability Distributions for Texas Gulf Hurricane Effects of Engineering Interest,” Ph.D. Thesis, Stanford University, Stanford, California.

Shapiro, L.J. (1983). “The Asymmetric Boundary Layer Flow Under a Translating Hurricane,” *Journal of Atmospheric Science*, Volume 40, Number 8, pp. 1984-1998.

Shiotani, M. (1962). “The Relationship between Wind Profiles and Stabilities of the Air Layer in the Outskirts of a City,” *Journal of Meteorological Society*, *Japan*, Volume 40, pp. 315-329.

Smagorinsky, J. (1963). "General Circulation Experiments with the Primitive Equations - I. The Basic Experiment," *Monthly Weather Review*, Vol. 91, No. 3, pp. 99-164.

Smith, S.D. (1980). "Wind Stress and Heat Flux over the Ocean in Gale Force Winds," *Journal of Physical Oceanography*, Vol. 10, pp. 709-726.

Sparks, P., Baker, E.J., Belville, J., and Perry, D. C., (1991). "Hurricane Elena, Gulf Coast, August 29-September 2, 1985," *Natural Disaster Studies*, Vol. 2, National Research Council, Washington, D.C.

Sparks, P.R., Reid, G.T., Reid, W.D., Welsh, S., and Welsh, N. (1992). "Wind Conditions in Hurricane Hugo by Measurement, Inference and Experience," *Journal of Wind Engineering and Industrial Aerodynamics*, Vol. 41, pp. 55-66.

Steyn, D.G. (1982). "Turbulence in an Unstable Surface Layer over Suburban Terrain," *Boundary Layer Meteorology*, Volume 22, pp. 183-191.

Thompson, E.F., and Cardone, V.J. (1996). "Practical Modeling of Hurricane Surface Wind Fields," *Journal of Waterway, Port, Coastal, and Ocean Engineering*, Vol. 122 No. 4, pp. 195-205.

Twisdale, L.A., and Vickery, P.J. (1995). "Extreme Wind Risk Assessment," Chapter 20, *Probabilistic Structural Mechanics Handbook*, Van Nostrund Reinhold, New York.

Twisdale, L.A., Vickery, P.J., and Hardy, M.B. (1993). "Uncertainties in the Prediction of Hurricane Windspeeds," *ASCE Conference on Hurricanes of 1992*, Miami, Florida, December.

Twisdale, L.A., and Dunn, W.L. (1983). "Extreme Wind Risk Analysis of the Indian Point Nuclear Generation Station," Final Rep. 44T-2491, Addendum to Rep. 44T-2171, Research Triangle Institute, Research Triangle Park, North Carolina.

Vickery, P.J., and Twisdale, L.A. (1995a). "Wind-Field and Filling Models for Hurricane Wind-Speed Predictions," *Journal of Structural Engineering*, Volume 121, Number 11, pp. 1700-1709.

Vickery, P.J., and Twisdale, L.A. (1995b). "Prediction of Hurricane Wind Speeds in The United States," *Journal of Structural Engineering*, Volume 121, Number 11, pp. 1691-1699.

Vickery, P.J., Skerjl, P.F., Steckley, A.C., and Twisdale, L.A. (2000a). "Hurricane Wind Field Model for Use in Hurricane Simulations," *Journal of Structural Engineering*, Volume 126, Number 10, pp. 1203-1221.

Vickery, P.J., Skerlj, P.F., and Twisdale, Jr., L.A. (2000b). "Simulation of Hurricane Risk in the U.S. Using an Empirical Track Model," *Journal of Structural Engineering*, ASCE, Vol. 126, No. 10, October.

Vickery, P.J. and Skerlj, P.F. (2000). "Elimination of Exposure D Along Hurricane Coastline in ASCE 7," *Journal of Structural Engineering*, Vol. 126, No. 4, pp. 545-549.

Vickery, P.J., and Skerlj, P.F. (2005)."Hurricane Gust Factors Revisited," *Journal of Structural Engineering*, Vol. 131, No. 5, pp. 825-832.

Vickery, P.J., Wadhera, D. (2008). "Statistical Models of Holland Pressure Profile Parameter and Radius to Maximum Winds of Hurricanes from Flight Level Pressure and H*Wind Data," *Journal of Applied Meterorology and Climatology*, Vol. 47, pp. 2497-2517.

Vickery, P.J., Wadhera, D., Powell, M.D., and Chen, Y. (2009a). "A Hurricane Boundary Layer and Wind Field Model for Use in Engineering Applications," *Journal of Applied Meteorology and Climatology, 48, pp. 381-405*.

Vickery, P.J., Wadhera, D, Twisdale, L.A. and Lavelle, F.M. (2009b). "United States Hurricane Wind Speed Risk and Uncertainty," *Journal of Structural Engineering, 135 pp. 301-320*.

Vickery, P.J. (2005). "Simple Empirical Models for Estimating the Increase in the Central Pressure of Tropical Cyclones after Landfall along the Coastline of the United States," *Journal of Applied Meteorology*, December, pp. 1807-1826.

Wieringa, J. (1992). "Updating the Davenport Roughness Classification," *Journal of Wind Engineering and Industrial Aerodynamics*, Volume 41-44, pp. 357-368.

Wieringa, J. (1993). "Representative Roughness Parameters for Homogeneous Terrain," *Boundary Layer Meteorology*, Volume 63, pp. 323-363.

Willoughby, H.B. (1990). "Gradient Balance in Tropical Cyclones," *Journal of the Atmospheric Sciences*, Vol. 47, No. 2, pp. 265-274.

Yersel, M., and Goble, R. (1986). "Roughness Effects on Urban Turbulence Parameters," *Boundary Layer Meteorology*, Volume 37, pp. 271-284.

Statistical Standards

James, M.K. and Mason, L.B. (2005), "Synthetic Tropical Cyclone Database," *Journal of Waterway, Port, Coastal, and Ocean Engineering*, Vol. 131, No. 4, pp. 181-192.

Vulnerability Standards

AFPA/AWC (1996). "Wood Frame Construction Manual for One- and Two-Family Dwellings, 1995 SBC High Wind Edition," American Forest and Paper Association/American Wood Council, p.71.

AFPA/AWC (1997). "National Design Specification for Wood Construction," American Forest and Paper Association/American Wood Council, August 7.

AISC (1995). *Load Resistance Factor Design*, Manual of Steel Construction, 2nd Edition, American Institute of Steel Construction, Chicago, Illinois, Volumes I and II, pp. 6-73–6-79 and pp. 8-98–8-130.

American National Standards Institute, Inc. (1982), "Minimum Design Loads for Buildings and Other Structures," ANSI A58.1, New York, NY.

American Society of Civil Engineers (1990). "ASCE-7 Minimum Design Loads for Buildings and Other Structures," ASCE, New York, NY.

American Society of Civil Engineers (1996). "ASCE-7 Minimum Design Loads for Buildings and Other Structures," ASCE, New York, NY.

ASCE 7-10 (2010). "Minimum Design Loads for Buildings and Other Structures," American Society of Civil Engineers, Reston, Virginia.

Beason, W.L., Meyers, G.E., and James, R.W. (1984). "Hurricane Related Window Glass Damage in Houston," *ASCE Journal of the Structural Division*, Volume 110, Number 12, pp. 2843-2857, December.

Behr, R.A., and Minor, J.E. (1994). "A Survey of Glazing System Behavior in Multi-Story Buildings During Hurricane Andrew," *The Structural Design of Tall Buildings*, Volume 3, pp.143-161.

Behr, R.A., Minor, J.E., and Norville, H.S. (1993). “Structural Behavior of Architectural Laminated Glass,” *Journal of Structural Engineering*, Volume 119, Number 1.

Best, A. C., (1951), “Drop-size Distribution in Cloud and Fog,” *Quart. J. Roy. Meteor. Soc.*, 77, pp. 418-426.

Canfield, L.R., Niu, S.H., and Liu, H. (1991). “Uplift Resistance of Various Rafter-Wall Connections,” *Forest Products Journal*, Volume 41, Number 7/8, July/August.

Case, P.C. (1996). “Wind Loads on Low Buildings with 4:12 Gable Roofs,” M.S. Thesis, University of Western Ontario, London, Ontario, Canada, May.

Cherry, N.J. (1991). “Fixing Studies for MRTI Normal Weight Tiles” SBCCI Submission, Redland Technology Limited, New Technology & Product Development Centre, Horsham, West Sussex, England, December.

CMHC (1989). “Canadian Wood-Frame House Construction,” Canada Mortgage and Housing Corporation, p.48.

Conner, H.W., Gromala, D.S., and Burgess, D.W. (1997). “Roof Connections in Houses: Key to Wind Resistance,” *Journal of Structural Engineering*, Volume 113, Number 12, pp. 2459-2474, December.

Crandell, J.H., Nowak, M., Laatsch, E.M., van Overeem, A., Barbour, C.E., Dewey, R., Reigel, H., and Angleton, H. (1993). “Assessment of Damage to Single-Family Homes Caused by Hurricanes Andrew and Iniki,” Contract HC-5911, NAHB Research Center, Upper Marlboro, Maryland, for U.S. Department of Housing and Urban Development Office of Policy Development and Research, September.

Cunningham, T.P. (1993). “Roof Sheathing Fastening Schedules for Wind Uplift,” APA Report T92-28, American Plywood Association, Tacoma, Washington, March.

Davenport, A.G. (1961). “The Application of Statistical Concepts to the Wind Loading of Structures,” *Institute of Civil Engineers,* Volume 19, pp. 449-472.

Dawe, J.L., and Aridru, G.G. (1993). “Prestressed Concrete Masonry Walls Subjected to Uniform Out-of-Plane Loading,” *Canadian Journal of Civil Engineering*, Volume 20, pp.969-979.

Drysdale, R.G., and Essawy, A.S. (1988). “Out-of Plane Bending of Concrete Block Walls,” *ASCE Journal of Structural Engineering*, Volume 114, Number 1, pp. 121-133, January.

Fattal, S.G., and Cattaneo, L.E. (1977). “Evaluation of Structural Properties of Masonry in Extsting Buildings,” U.S. Department of Commerce, National Bureau of Standards, p.13.

FEMA (1992). “Building Performance: Hurricane Andrew in Florida,” Federal Emergency Management Agency, Federal Insurance Administration, FIA-22 (2/93). December 21.

Florida Building Code 2001, Second Printing, International Code Council (ICC), May, 2001.

2010 Florida Building Code, Building, First Printing, International Code Council (ICC), October 2011.

2010 Florida Building Code, Residential, First Printing, International Code Council (ICC), October 2011.

2007 Florida Building Code, Building, First Printing, International Code Council (ICC), February 2008.

2007 Florida Building Code, Residential, First Printing, International Code Council (ICC), February 2008.

2004 Florida Building Code, Building, First Printing, International Code Council (ICC), October 2004.

2004 Florida Building Code, Residential, First Printing, International Code Council (ICC), October 2004.

Forest Products Laboratory (1987). "Wood Handbook: Wood as an Engineering Material," U.S. Department of Agriculture, Washington D.C.

Grimm, C.T. (1999). "Walls May Be Half as Strong as They Say!" Southern Building, p. 19, January/February.

Gross, J.G., Dikkers, R.D. and Grogan, J.C. (1969). "Recommended Practice for Engineered Brick Masonry," Brick Industry Association, Reston, Virginia.

Ho, T.C.E. (1992). "Variability of Low Building Wind Loads," Ph.D. Thesis, Faculty of Engineering Science, University of Western Ontario, London, Ontario, Canada.

Hogan, M., and Karwoski, K. (1990). "Masonry Performance in the Coastal Zone," in Proceedings "Hurricane Hugo One Year Later," B. L. Sill and P. R. Sparks (Eds.), Charleston, South Carolina, September.

HUD (1980). *Economic Benefit-Cost and Risk Analysis of Mobile Home Safety Research: Wind Safety Analysis*, Office of Policy Development and Research, Department of Housing and Urban Development.

HUD (1994). "Final Rule - Manufactured Home Construction and Safety Standards on Wind Standards," Office of the Assistant Secretary for Housing, Department of Housing and Urban Development, *Federal Register*, Volume 59, Number 10, pp. 2456-2475.

Kareem, A., and Stevens, J.G. (1985). "Window Glass Performance and Analysis in Hurricane Alicia," *ASCE Specialty Conference: "Hurricane Alicia: One Year Later,"* Galveston, Texas (August 1984), A. Kareem (Ed.), pp.178-186.

Kind, R.J., and Wardlaw, R.L. (1984). "Behavior in Wind of Loose-Laid Roof Insulation Systems, Part I: Stone Scour and Blow-Off," *4th Canadian Workshop on Wind Engineering*, Toronto, Canada, pp. 141-149.

Leland, K.B. (1988). "The Strength of Roof Anchorage in Unreinforced Concrete Masonry," Masters Thesis, Clemson University, Clemson, South Carolina, August.

Lin, J.X., and Surry, D. (1997). "Simultaneous Time Series of Pressures on the Envelope of Two Large Low-Rise Buildings," University of Western Ontario, Boundary Layer Wind Tunnel Laboratory Report, BLWTL-SS7-1997, for Dr. E. Simiu, National Institute of Standards and Technology, March.

Macha, J., Sevier, J., and Bertin, J. (1983). "Comparison of Wind Pressures on a Mobile Home in Model and Full Scale," *Journal of Wind Engineering and Industrial Aerodynamics*, Volume 12, pp. 109-124.

Marshall, R.D., and Yokel, F.Y. (1995). "Recommended Performance-Based Criteria for the Design of Manufactured Home Foundation Systems to Resist Wind and Seismic Loads," NISTIR 5664, Building and Fire Research Laboratory, Gaithersburg, Maryland, for Department of Housing and Urban Development, Washington, D.C., August.

Marshall, R. (1977). “The Measurement of Wind Loads on a Full Scale Mobile Home,” NBSIR 77-1289, National Bureau of Standards, Washington, D.C., p. 120.

Marshall, R.D. (1993). “Wind Load Provisions of Manufactured Home Construction and Safety Standards – A Review and Recommendation for Improvement,” NISTIR 5189, Building and Fire Research Laboratory, Gaithersburg, Maryland, for Department of Housing and Urban Development, Washington, D.C., May.

Marshall, R.D. (1994). “Manufactured Homes – Probability of Failure and the Need for Better Windstorm Protection Through Improved Anchoring Systems,” NISTIR 5370, Building and Fire Research Laboratory, Gaithersburg, Maryland, for Department of Housing and Urban Development, Washington, DC, November.

McDonald, J.R., Jiang, H., and Yin, J. (1997). “Full-Scale Measurements of Wind Loads on Metal Edge Flashings and Copings,” Final Report, Institute for Disaster Research, Texas Tech University, Lubbock, Texas, for Roofing Industry Consortium, February.

McDonald, J.R., and Pennington, W.V. (1986). “Hurricane Damage to Manufactured Homes,” *Presented at American Society of Civil Engineers Structures Congress ’86*, New Orleans, Louisiana, September.

Meecham, D. (1988). “Wind Action on Hip and Gable Roofs,” M.S. Thesis, University of Western Ontario, London, Ontario, Canada, August.

MHCSS (1992). “Manufactured Home Construction and Safety Standards,” 24 CFR Chapter XX, Part 3280.

Minor, J.E. (1985). “Window Glass Performance and Hurricane Effects,” *ASCE Specialty Conference: “Hurricane Alicia: One Year Later,”* Galveston, Texas (August 1984), A. Kareem (Ed.), pp.151-167.

Minor, J.E. (1994). “Wind-Borne Debris and the Building Envelope,” *Journal of Wind Engineering and Industrial Aerodynamics*, Volume 53, pp. 207-227.

Minor, J.E., Beason, W.L., and Harris, P.L. (1978). “Designing for Wind-Borne Missiles in Urban Areas,” *ASCE Journal of the Structural Division*, Volume 104, Number ST11, pp. 1749-1760.

Minor, J.E., and Behr, R.A. (1993a). “Architectural Glazing Systems in Hurricanes: Performance, Design Criteria and Designs,” *7th U.S. National Conference on Wind Engineering*, Los Angeles, California, Volume II, pp. 453-461.

Minor, J.E., and Behr, R.A. (1993b). “Improving the Performance of Architectural Glazing in Hurricanes,” *Hurricanes of 1992*, R. A. Cook and M. Soltani (Eds.), ASCE, pp. 476-485.

Monroe, J.S. (1996). “Wind Tunnel Modeling of Low Rise Structures in a Validated Open Country Simulation,” M.S. Thesis, Clemson University, Clemson, South Carolina, August.

NCS BCS (1988). “Manufactured Home Installations,” NCS BCS A225.1/ANSI A225.1-1987, National Conference of States on Building Codes and Standards, Inc., Herndon, Virginia, p. 49.

NCS BCS (1994). “Manufactured Home Installations,” NCS BCS/ANSI A225.1-1994, National Conference of States on Building Codes and Standards, Inc., Herndon, Virginia, p. 29.

NFPA (1973). “Standard for Mobile Homes,” NFPA Number 501B-1973/ANSI A119.1, p. 33.

Parris, S. (1996). “Design of Wind Uplift Capacities and Retro-Fitted Adhesives,” 490 and 491 Project Presentation, Clemson University, Clemson, South Carolina, August.

Reed, T.D., Rosowsky, D.V., and Schiff, S.D. (1996). "Roof Rafter to Top-Plate Connection in Coastal Residential Construction," *International Wood Engineering Conference*, pp. 4-458–4-465

Reed, T.D., Rosowsky, D.V., and Schiff, S.D. (1997). "Uplift Capacity of Light-Frame Rafter to Top Plate Connections," *Journal of Architectural Engineering,* pp. 157-163, December.

Rosowsky, D.V., and Reinhold, T.A. (1999). "Rate-of-Load and Duration-of-Load Effects for Wood Fasteners," *ASCE Journal of Structural Engineering*, Volume 125, Number 7, pp.719-724, July.

Roy, R. (1983). "Wind Tunnel Measurements of Total Loads on a Mobile Home," *Journal of Wind Engineering and Industrial Aerodynamics,* Volume 13, pp. 327-338.

SAA (1989). *Loading Code, Part 2 – Wind Forces,* AS1170 Part 2, Standards Association of Australia, Sydney.

SBCCI (1991). "Standard Building Code: Appendix H, Manufactured Home Tie Down Standards," Southern Building Code Congress International, Inc., Birmingham, Alabama, pp. 601-606.

Simiu, E., and Scanlan, R.H. (1996). *Wind Effects on Structures: Fundamental and Applications to Design*, 3rd Edition, John Wiley & Sons, New York.

SJI (1998). "Structural Design of Steel Joist Roofs to Resist Uplift Loads," *Technical Digest No. 6,* Steel Joist Institute, Myrtle Beach, South Carolina.

SJI (1994). "Catalogue of Standard Specifications, Load Tables, and Weight Tables for Steel Joists and Joist Girders," Steel Joist Institute, Myrtle Beach, South Carolina.

Smith, T.L. (1999). "Records of Survey on Building Damages Caused by Hurricane Andrew," Personal Communications, TL Smith Consulting.

Sparks, P.R., Schiff, S.D., and Reinhold, T.A. (1994). "Wind Damage to Envelopes of Houses and Consequent Insurance Losses," *Journal of Wind Engineering and Industrial Aerodynamics,* Volume 53, pp. 145-155.

Stathopoulos, T. (1979). "Turbulent Wind Action on Low Rise Buildings," Ph.D. Thesis, University of Western Ontario, London, Ontario, Canada, February.

Tryggvason, B.V., Surry, D., and Davenport, A.G. (1976). "Predicting Wind-Induced Response in Hurricane Zones," *Journal of Structural Division,* Volume 102, Number 12, pp. 2333-2350.

Twisdale, L.A., Sciaudone, J.C., Vickery, P.J., Chen, J., and Wadhera, D. (2007). "Evaluation and Report on the Insurability of Attached and Free Standing Structures," Final Report 17819, Applied Research Associates, Inc., Raleigh, N.C., April.

Twisdale, L.A., Vickery, P.J., and Lin, J.X. (2004a). "Analysis of Hurricane Windborne Debris Impact Risk for Residential Structures: Part I," in preparation for submission to the *ASCE Journal of Structural Engineering*.

Twisdale, L.A., Vickery, P.J., and Lin, J.X. (2004b). "Analysis of Hurricane Windborne Debris Impact Risk for Residential Structures: Part II," in preparation for submission to the *ASCE Journal of Structural Engineering*.

Twisdale, L.A., Vickery, P.J., and Steckley, A.C. (1996). "Analysis of Hurricane Windborne Debris Impact Risk for Residential Structures," Applied Research Associates, Raleigh, North Carolina, March.

Twisdale, L.A (1996). “Risk Assessment Techniques: Evaluating Mitigation Options and Cost Effectiveness,” *Workshop on Recovery Through Coastal Windstorm Mitigation*, Gainesville, Florida, November 14-15.

Uematsu, Y., and Isyumov, N. (1998). “Peak Gust Pressures Acting on the Roof and Wall Edges of a Low-Rise Building,” *Journal of Wind Engineering and Industrial Aerodynamics,* Volumes 77 and 78, pp. 217-231.

Vasquez, J.L. (1994). “Development of a Windspeed-Damage Correlation Model for Manufactured Housing Subjected to Extreme Winds,” M.S. Thesis, Louisiana State University and Agricultural and Mechanical College, December.

Vickery, P.J., Lin, J.X., and Twisdale, L.A. (1998) “Analysis of Hurricane Windborne Debris Impact Risk for Residential Structures: Part II,” Final Rep. 5609, Rev. 1, Applied Research Associates, Inc., Raleigh, North Carolina, April.

Vickery, P.J., Lin, J.X., and Twisdale, L.A. (2003). “Analysis of Hurricane Pressure Cycling Following Missile Impact for Residential Structures,” *Journal of Wind Engineering and Industrial Aerodynamics,* Vol. 91.

Young, M.A., and Vickery, B.J. (1994). “A Study of Roof Uplift Forces on Three Schools of Windsor Roman Catholic Separate School Board,” Final Report BLWT-SS29-1994, The Boundary Layer Wind Tunnel Laboratory, The University of Western Ontario, Ontario, Canada.

Zaitz, M.D. (1994). “Roof Sheathing Racking Effect on Fastener Withdrawal Capacities,” M.S. Thesis, Clemson University, Clemson, South Carolina, pp.4-5, August.

Zollo, R.F. (1993). “Hurricane Andrew: August 24, 1992, Structural Performance of Buildings in Dade County, Florida,” Technical Report No. CEN 93-1, University of Miami, Miami, Florida, March.

Actuarial Standards

Andrews, M. (2006), “Demand Surge After Hurricanes Katrina & Rita,” http://www.iii.org/disaster2/facts/demand_surge/

Baker, K. (2006), “The economic and construction outlook in the Gulf States after Hurricane Katrina,” http://ww.aia.org/econ_katrina_outlook , American Institute of Architects

Bhinderwala, S. (1995). “Insurance Loss Analysis of Single Family Dwellings Damaged in Hurricane Andrew,” M.S. Thesis, Clemson University, Clemson, South Carolina.

Boissonnade, A., and Dong, W-M (1993). “Hurricane Loss Estimation and Forecasting: Applications to Risk Management,” *7th US National Conference on Wind Engineering*, Los Angeles, California, pp. 115-124.

Clark, K.M. (1987). “A Formal Approach to Catastrophe Risk Assessment and Management,” *November 9-11, 1986,* Volume LXXIII, Number 140, pp. 69-91.

Davis Langdon (2005), “Impact of Katrina on the construction market,” http://www.davislangdon.com (09/2005).

Engineering News-Record, ENR Cost Indexes, http://www.enr.com, A McGraw-Hill Construction Group Publication.

Friedman, D.G. (1987). “US Hurricanes & Windstorms,” DYP Insurance & Reinsurance Group Ltd.

Grossi, P. and Kunreuther, H. (2005), Catastrophe Modeling: a New Approach to Managing Risk, Springer.

Hebert, P.J., Jarrell, J.D., and Mayfield, B.M. (1996). “The Deadliest, Costliest, and Most Intense United States Hurricanes of This Century (and Other Frequently Requested Hurricane Facts),” NOAA Technical Memorandum NWS-NHC-31, p. 41.

Hebert, P.J., Jarrell, J.D., and Mayfield, B.M. (1997). “The Deadliest, Costliest, and Most Intense United States Hurricanes of This Century (and Other Frequently Requested Hurricane Facts),” *NOAA Technical Memorandum* NWS-TPC-1, pp. 30.

Jain, V.K., Davidson, R., and Rosowsky, D. (2005), “Modeling changes in hurricane risk over time,” Natural Hazards Review, Vol.6, No.2, pp.88-96.

Marshall & Swift / Boeckh (MS/B), http://www.msbinfo.com

Murray, R.A. (2005), “Hurricane Katrina: implications for the construction industry,” McGraw Hill Construction.

Munich Re (2006), “The 1906 Earthquake and Hurricane Katrina,” http://www.munichre.com/ .

NAPCOLLC (2006), “The impact of changes to the RMS U.S. hurricane catastrophe model,” http://www.napcollc.com/articles/JuneReviewRMSHurricane.pdf

National Association of Home Builders (NAHB) (2005), “Impact of hurricane Katrina on Building Materials and Prices,” http://www.nahb.org (9/2/2005)

RSMeans Company (2001), RS Means Building Construction Cost Data, Kinston, MA.

Westfall, C. (2006), “Insurers Balance Supply and Demand (Surge),” http://www.kpmginsiders.com (03/17/2006).

Appendix A - Forms

Form G-1: General Standards Expert Certification

I hereby certify that I have reviewed the current submission of HurLoss Version 8.0.a
(Name of Model)

for compliance with the 2015 Standards adopted by the Florida Commission on Hurricane Loss Projection Methodology and hereby certify that:

1) The model meets the General Standards (G1 – G5);
2) The disclosures and forms related to the General Standards section are editorially and technically accurate, reliable, unbiased, and complete;
3) My review was completed in accordance with the professional standards and code of ethical conduct for my profession;
4) My review involved ensuring the consistency of the content in all sections of the submission; and
5) In expressing my opinion I have not been influenced by any other party in order to bias or prejudice my opinion.

Francis M. Lavelle
Name

Ph.D., P.E., (Engineering)
Professional Credentials (area of expertise)

Francis M. Lavelle
Signature (original submission)

10/31/2016
Date

Francis M. Lavelle
Signature (revision to submission)

11/18/2016

Francis M. Lavelle
Signature (response to deficiencies, if any)

1/4/2017
Date

Francis M. Lavelle
Signature (final submission)

4/27/2017
Date

An updated signature and form is required following any modification of the model and any revision of the original submission. If a signatory differs from the original signatory, provide the printed name and professional credentials for any new signatories. Additional signature lines shall be added as necessary with the following format:

Signature (revision to submission)

Date

NOTE: A facsimile or any properly reproduced signature will be acceptable to meet this requirement.

Form G-2: Meteorological Standards Expert Certification

I hereby certify that I have reviewed the current submission of HurLoss Version 8.0.a
(Name of Model)

for compliance with the 2015 Standards adopted by the Florida Commission on Hurricane Loss Projection Methodology and hereby certify that:

1) The model meets the Meteorological Standards (M1 – M6);
2) The disclosures and forms related to the Meteorological Standards section are editorially and technically accurate, reliable, unbiased, and complete;
3) My review was completed in accordance with the professional standards and code of ethical conduct for my profession; and
4) In expressing my opinion I have not been influenced by any other party in order to bias or prejudice my opinion.

Peter J. Vickery	Ph.D., P.E., (Engineering Sciences)
Name	Professional Credentials (area of expertise)
	10/31/2016
Signature (original submission)	Date
	11/18/2016
Signature (revision to submission)	Date
	1/4/2017
Signature (response to deficiencies, if any)	Date
	04/27/2017
Signature (final submission)	Date

An updated signature and form is required following any modification of the model and any revision of the original submission. If a signatory differs from the original signatory, provide the printed name and professional credentials for any new signatories. Additional signature lines shall be added as necessary with the following format:

Signature (revision to submission)	Date

NOTE: A facsimile or any properly reproduced signature will be acceptable to meet this requirement.

Form G-3: Statistical Standards Expert Certification

I hereby certify that I have reviewed the current submission of HurLoss (Name of Model) Version 8.0.a

for compliance with the 2015 Standards adopted by the Florida Commission on Hurricane Loss Projection Methodology and hereby certify that:

1. The model meets the Statistical Standards (S1 – S6);
2. The disclosures and forms related to the Statistical Standards section are editorially and technically accurate, reliable, unbiased, and complete;
3. My review was completed in accordance with the professional standards and code of ethical conduct for my profession; and
4. In expressing my opinion I have not been influenced by any other party in order to bias or prejudice my opinion.

Marshall B. Hardy	M.S. (Statistics)
Name	Professional Credentials (area of expertise)
	10/31/2016
Signature (original submission)	Date
	11/18/2016
Signature (revision to submission)	Date
	1/4/2017
Signature (response to deficiencies)	Date
	4/27/2017
Signature (final submission)	Date

An updated signature and form is required following any modification of the model and any revision of the original submission. If a signatory differs from the original signatory, provide the printed name and professional credentials for any new signatories. Additional signature lines shall be added as necessary with the following format:

Signature (revision to submission)	Date

NOTE: A facsimile or any properly reproduced signature will be acceptable to meet this requirement.

Form G-4: Vulnerability Standards Expert Certification

I hereby certify that I have reviewed the current submission of HurLoss Version 8.0.a
(Name of Model)

for compliance with the 2015 Standards adopted by the Florida Commission on Hurricane Loss Projection Methodology and hereby certify that:

1) The model meets the Vulnerability Standards (V1 – V3);
2) The disclosures and forms related to the Vulnerability Standards section are editorially and technically accurate, reliable, unbiased, and complete;
3) My review was completed in accordance with the professional standards and code of ethical conduct for my profession; and
4) In expressing my opinion I have not been influenced by any other party in order to bias or prejudice my opinion.

Peter J. Vickery	Ph.D., P.E., (Engineering Sciences)
Name	Professional Credentials (area of expertise)
	10/31/2016
Signature (original submission)	Date
	11/18/2016
Signature (revisions to submission)	Date
	1/4/2017
Signature (revisions to submission, if any)	Date
	4/27/2017
Signature (final submission)	Date

An updated signature and form is required following any modification of the model and any revision of the original submission. If a signatory differs from the original signatory, provide the printed name and professional credentials for any new signatories. Additional signature lines shall be added as necessary with the following format:

Signature (revision to submission)	Date

NOTE: A facsimile or any properly reproduced signature will be acceptable to meet this requirement.

Form G-5: Actuarial Standards Expert Certification

I hereby certify that I have reviewed the current submission of HurLoss (Name of Model) Version 8.0.a

for compliance with the 2015 Standards adopted by the Florida Commission on Hurricane Loss Projection Methodology and hereby certify that:

1) The model meets the Actuarial Standards (A1 – A6);
2) The disclosures and forms related to the Actuarial Standards section are editorially and technically accurate, reliable, unbiased, and complete;
3) My review was completed in accordance with the Actuarial Standards or Practice and Code of Conduct; and
4) In expressing my opinion I have not been influenced by any other party in order to bias or prejudice my opinion.

Laura A. Maxwell	FCAS, MAAA (Actuarial)
Name	Professional Credentials (area of expertise)
[signature]	11/10/2016
Signature (original submission)	Date
[signature]	12/27/2016
Signature (revisions to submission)	Date
[signature]	1/10/2017
Signature (response to deficiencies)	Date
Laura A. Maxwell [signature]	4/26/2017
Signature (final submission)	Date

An updated signature and form is required following any modification of the model and any revision of the original submission. If a signatory differs from the original signatory, provide the printed name and professional credentials for any new signatories. Additional signature lines shall be added as necessary with the following format:

Signature (revision to submission)	Date

NOTE: A facsimile or any properly reproduced signature will be acceptable to meet this requirement.

Form G-6: Computer Standards Expert Certification

I hereby certify that I have reviewed the current submission of HurLoss (Name of Model) Version 8.0.a

for compliance with the 2015 Standards adopted by the Florida Commission on Hurricane Loss Projection Methodology and hereby certify that:

1) The model meets the Computer Standards (C1 – C7);
2) The disclosures and forms related to the Computer Standards section are editorially and technically accurate, reliable, unbiased, and complete;
3) My review was completed in accordance with the professional standards and code of ethical conduct for my profession; and
4) In expressing my opinion I have not been influenced by any other party in order to bias or prejudice my opinion.

Francis M. Lavelle
Name

Ph.D., P.E., (Engineering)
Professional Credentials (area of expertise)

Francis M. Lavelle
Signature (original submission)

10/31/2016
Date

Francis M. Lavelle
Signature (revision to submission)

11/18/2016

Francis M. Lavelle
Signature (response to deficiencies, if any)

1/4/2017
Date

Francis M. Lavelle
Signature (final submission)

4/27/2017
Date

An updated signature and form is required following any modification of the model and any revision of the original submission. If a signatory differs from the original signatory, provide the printed name and professional credentials for any new signatories. Additional signature lines shall be added as necessary with the following format:

Signature (revision to submission)

Date

NOTE: A facsimile or any properly reproduced signature will be acceptable to meet this requirement.

Form G-7: Editorial Certification

I hereby certify that I have reviewed the current submission of HurLoss Version 8.0.a
(Name of Model)

for compliance with the "Process for Determining the Acceptability of a Computer Simulation Model" adopted by the Florida Commission on Hurricane Loss Projection Methodology in its *Report of Activities as of November 1, 2015,* and hereby certify that:

1) The model submission is in compliance with the Commission's Notification Requirements and General Standard G-5 (Editorial Compliance);
2) The disclosures and forms related to each standards section are editorially accurate and contain complete information and any changes that have been made to the submission during the review process have been reviewed for completeness, grammatical correctness, and typographical errors;
3) There are no incomplete responses, inaccurate citations, charts or graphs, or extraneous text or references;
4) The current version of the model submission has been reviewed for grammatical correctness, typographical errors, completeness, the exclusion of extraneous data/ information and is otherwise acceptable for publication; and
5) In expressing my/our opinion I/we have not been influenced by any other party in order to bias or prejudice my/our opinion.

Lisa West	B.S. (Technical Editing)
Name	Professional Credentials (area of expertise)
Lisa West	10/31/2016
Signature (original submission)	Date
Lisa West	11/18/2016
Signature (revision to submission)	
Lisa West	1/4/2017
Signature (response to deficiencies, if any)	Date
Lisa West	4/27/2017
Signature (final submission)	Date

An updated signature and form is required following any modification of the model and any revision of the original submission. If a signatory differs from the original signatory, provide the printed name and professional credentials for any new signatories. Additional signature lines shall be added as necessary with the following format:

Signature (revision to submission)	Date

NOTE: A facsimile or any properly reproduced signature will be acceptable to meet this requirement.

Form M-1: Annual Occurrence Rates

A. ***Provide a table of annual occurrence rates for landfall from the data set defined by marine exposure that the model generates by hurricane category (defined by maximum windspeed at landfall in the Saffir-Simpson scale) for the entire state of Florida and additional regions as defined in Figure 31. List the annual occurrence rate per hurricane category. Annual occurrence rates shall be rounded to two decimal places. The historical frequencies below have been derived from the Base Hurricane Storm Set. If modeling organization Base Hurricane Storm Set differs from that defined in Standard M-1 (for example, using a different historical period), the historical rates in the table shall be edited to reflect this difference (see below).***

B. ***Describe model variations from the historical frequencies.***

C. ***Provide vertical bar graphs depicting distributions of hurricane frequencies by category by region of Florida (Figure 31), for the neighboring states of Alabama/Mississippi and Georgia, and for by-passing hurricanes. For the neighboring states, statistics based on the closest coastal segment to the state boundaries used in the model are adequate.***

D. ***If the data are partitioned or modified, provide the historical annual occurrence rates for the applicable partition (and its complement) or modification as well as the modeled annual occurrence rates in additional copies of Form M-1, Annual Occurrence Rates.***

E. ***List all hurricanes added, removed, or modified from the previously accepted model version of the Base Hurricane Storm Set.***

F. ***Provide this form in Excel format. The file name shall include the abbreviated name of the modeling organization, the standards year, and the form name. Also include Form M-1, Annual Occurrence Rates, in a submission appendix.***

Note: Except where specified, Number of Hurricanes does not include By-Passing Hurricanes. Each time a hurricane goes from water to land (once per region) it is counted as a landfall in that region. However, each hurricane is counted only once in the Entire State totals. Hurricanes recorded for neighboring states need not have reported damaging winds in Florida.

Form M-1, Annual Occurrence Rates, Form A-2, Base Hurricane Storm Set Statewide Losses, and Form S-1, Probability and Frequency of Florida Landfalling Hurricanes per Year, are based on the 115-year period 1900-2014 (consistent with Standard M-1, Base Hurricane Storm Set). It is intended that the storm set underlying Forms M-1, Annual Occurrence Rates, A-2, Base Hurricane Storm Set Statewide Losses, and S-1, Probability and Frequency of Florida Landfalling Hurricanes per Year, will be the same.

As specified in Standard M-1, Base Hurricane Storm Set, the modeling organization may exclude hurricanes that caused zero modeled damage, or include additional complete hurricane seasons, or may modify data for historical storms based on evidence in the peer-reviewed scientific literature. This may result in the modeling organization including additional landfalls in Florida and neighboring states to those listed in Form A-2, Base Hurricane Storm Set Statewide Losses, for Florida or counted in Form M-1, Annual Occurrence Rates, in the case of neighboring states. In this situation, the historical numbers

in Form M-1, Annual Occurrence Rates, should be updated to agree with the modeling organization Base Hurricane Storm Set.

Any additional Florida hurricanes should be included in Form A-2, Base Hurricane Storm Set Statewide Losses, as instructed there, and the historical landfall counts in Form S-1, Probability and Frequency of Florida Landfalling Hurricanes per Year, should be updated.

In some circumstances, the modeling organization windfield reconstruction of a historical storm may indicate that it is a by-passing hurricane (the modeling organization windfield results in damaging winds somewhere in the state). In this situation, the historical numbers in Form M-1, Annual Occurrence Rates, should be updated to agree with the modeling organization Base Hurricane Storm Set, but no changes are required for Form A-2, Base Hurricane Storm Set Statewide Losses, or Form S-1, Probability and Frequency of Florida Landfalling Hurricanes per Year.

A. Annual occurrence rates generated by the model are provided in Form M-1.

B. Modeled probabilities of landfalling hurricanes by region are consistent with the limited observed (or historical) data. Figure 32 presents comparisons of modeled and observed landfall counts of hurricanes as a function of Saffir-Simpson category, as defined by windspeed. The agreement between the modeled and historical rates of landfalling storms as a function of intensity and region is reasonable, with the differences between historical and modeled results falling well within the range of uncertainty associated with the limited number of historical observations of landfalling hurricanes. The intensities of historical storms and the landfall region have been obtained directly from the data given in the Form M-1.

C. See Figure 32.

D. The data are not partitioned or modified.

E. The hurricanes that have been updated to reflect changes in the May 2016 and earlier version of HURDAT2 are listed below.

HurLoss 7.0.a	**HurLoss 8.0**	
1944 NOTNAMED 13	1903 NOTNAMED 03	1933 NOTNAMED 08
1945 NOTNAMED 01	1920 NOTNAMED 02	1933 NOTNAMED 11
1945 NOTNAMED 09	1920 NOTNAMED 03	1933 NOTNAMED 12
1946 NOTNAMED 06	1921 NOTNAMED 01	1934 NOTNAMED 01
1947 NOTNAMED 04	1921 NOTNAMED 06	1934 NOTNAMED 03
1947 NOTNAMED 09	1923 NOTNAMED 06	1935 NOTNAMED 03
1948 NOTNAMED 08	1924 NOTNAMED 05	1936 NOTNAMED 05
1948 NOTNAMED 09	1924 NOTNAMED 10	1939 NOTNAMED 02
1949 NOTNAMED 02	1926 NOTNAMED 01	1940 NOTNAMED 02
1950 EASY	1928 NOTNAMED 04	1941 NOTNAMED 02
1950 KING	1929 NOTNAMED 01	1950 BAKER
1953 HAZEL	1929 NOTNAMED 02	1953 FLORENCE
	1932 NOTNAMED 02	1969 CAMILLE
	1932 NOTNAMED 03	1998 GEORGES
	1933 NOTNAMED 05	1999 IRENE

F. See Form M-1.

Table 3. Annual Occurrence Rates

	Entire State				Region A - NW Florida			
	Historical		Modeled		Historical		Modeled	
Category	Number	Rate	Number	Rate	Number	Rate	Number	Rate
1	23	0.20	25	0.22	14	0.12	11	0.10
2	16	0.14	14	0.12	5	0.04	5	0.04
3	15	0.13	12	0.11	6	0.05	3	0.02
4	10	0.09	5	0.05	0	0.00	1	0.01
5	2	0.02	1	0.01	0	0.00	0	0.00

	Region B - SW Florida				Region C - SE Florida			
	Historical		Modeled		Historical		Modeled	
Category	Number	Rate	Number	Rate	Number	Rate	Number	Rate
1	7	0.06	6	0.05	6	0.05	8	0.07
2	4	0.03	4	0.03	6	0.05	6	0.05
3	5	0.04	4	0.04	6	0.05	5	0.04
4	4	0.03	2	0.02	6	0.05	3	0.02
5	1	0.01	1	0.01	1	0.01	1	0.01

	Region D - NE Florida				Florida By-Passing Hurricanes			
	Historical		Modeled		Historical		Modeled	
Category	Number	Rate	Number	Rate	Number	Rate	Number	Rate
1	1	0.01	3	0.02	4	0.05	4	0.03
2	2	0.02	1	0.01	4	0.06	2	0.01
3	0	0.00	0	0.00	4	0.05	1	0.01
4	0	0.00	0	0.00	1	0	1	0.01
5	0	0.00	0	0.00	0	0	0	0.00

	Region E - Georgia				Region F - Alabama/Mississippi			
	Historical		Modeled		Historical		Modeled	
Category	Number	Rate	Number	Rate	Number	Rate	Number	Rate
1	1	0.01	2	0.02	6	0.05	6	0.05
2	1	0.01	1	0.01	3	0.03	3	0.03
3	0	0.00	0	0.00	5	0.04	3	0.02
4	0	0.00	0	0.00	1	0.01	1	0.01
5	0	0.00	0	0.00	1	0.01	0	0.00

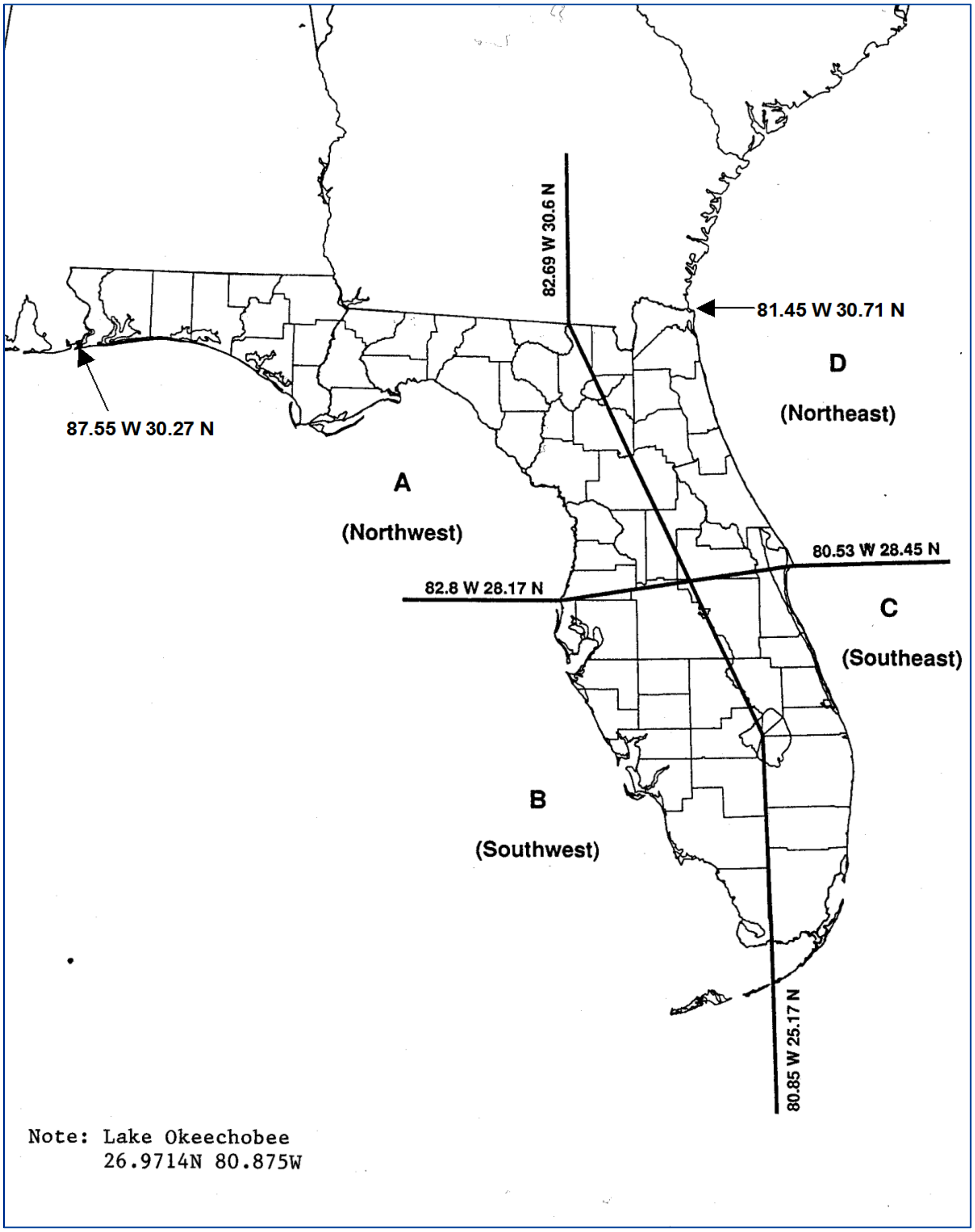


Figure 31. State of Florida and Neighboring States By Region

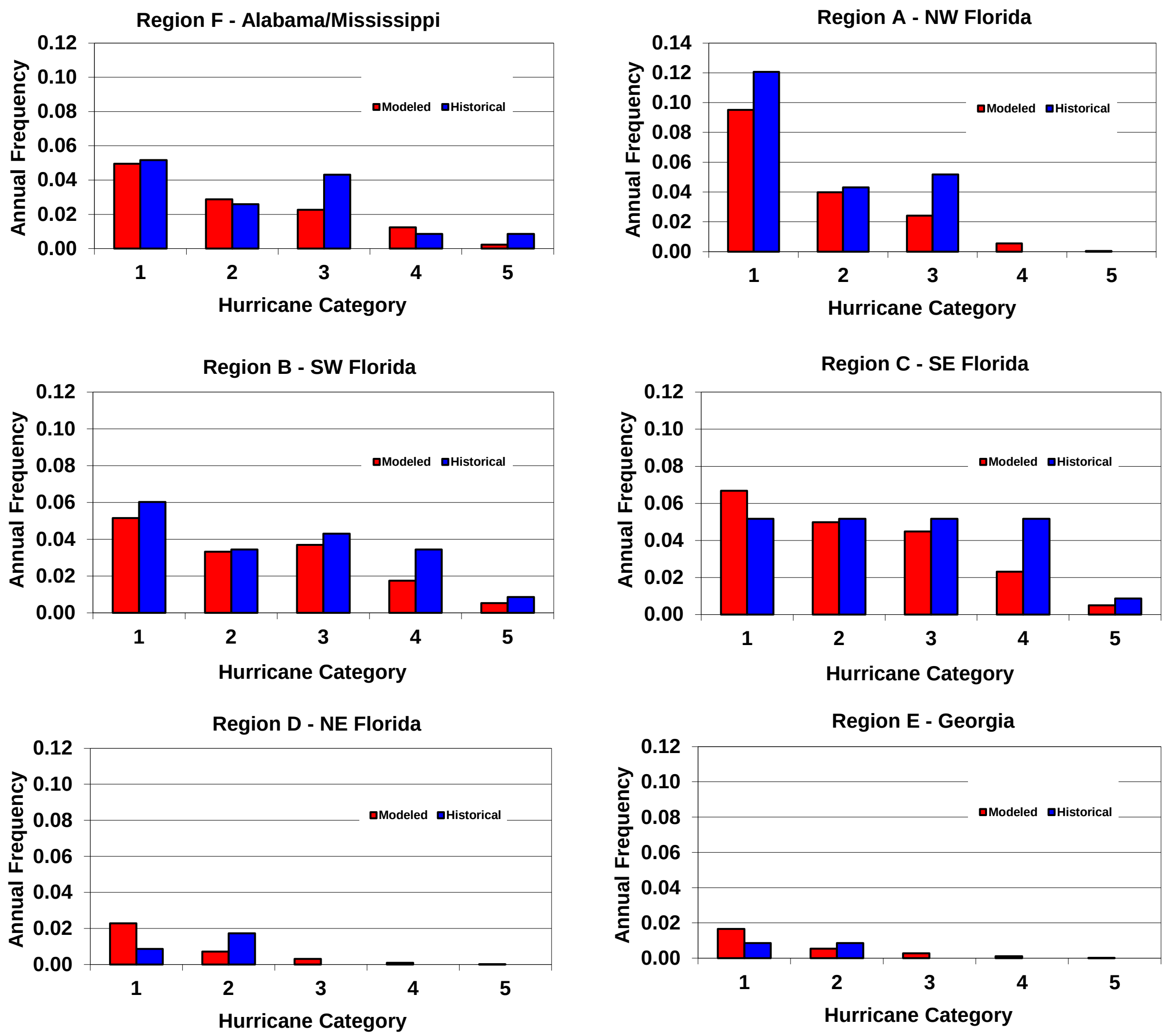


Figure 32. Comparison of Modeled and Observed Landfalling Counts of Hurricanes by Category (defined by windspeed) and Region

Form M-2: Maps of Maximum Winds

A. ***Provide color contour plots on maps with ZIP Code boundaries of the maximum winds for the modeled version of the Base Hurricane Storm Set for land use set for open terrain and for land use set for actual terrain. Plot the position and values of the maximum windspeeds on each contour map.***

B. ***Provide color contour plots on maps witn ZIP Code boundaries of the maximum winds for a 100-year and a 250-year return period from the stochastic storm set for land use set for open terrain and for land use set for actual terrain. Plot the position and values of te maximum windspeeds on each contour map.***

Actual terrain is the roughness distribution used in the standard version of the model as defined by the modeling organization. Open terrain uses the same roughness length of 0.03 meters at all land points.

Maximum winds in these maps are defined as the maximum one-minute sustained winds over the terrain as modeled and recorded at each location.

The same color scheme and increments shall be used for all maps.

Use the following eight isotach values and interval color coding:

(1)	***Minimum damaging***	***Blue***
(2)	***50 mph***	***Medium Blue***
(3)	***65 mph***	***Light Blue***
(4)	***80 mph***	***White***
(5)	***95 mph***	***Light Red***
(6)	***110 mph***	***Medium Red***
(7)	***125 mph***	***Red***
(8)	***140 mph***	***Magenta***

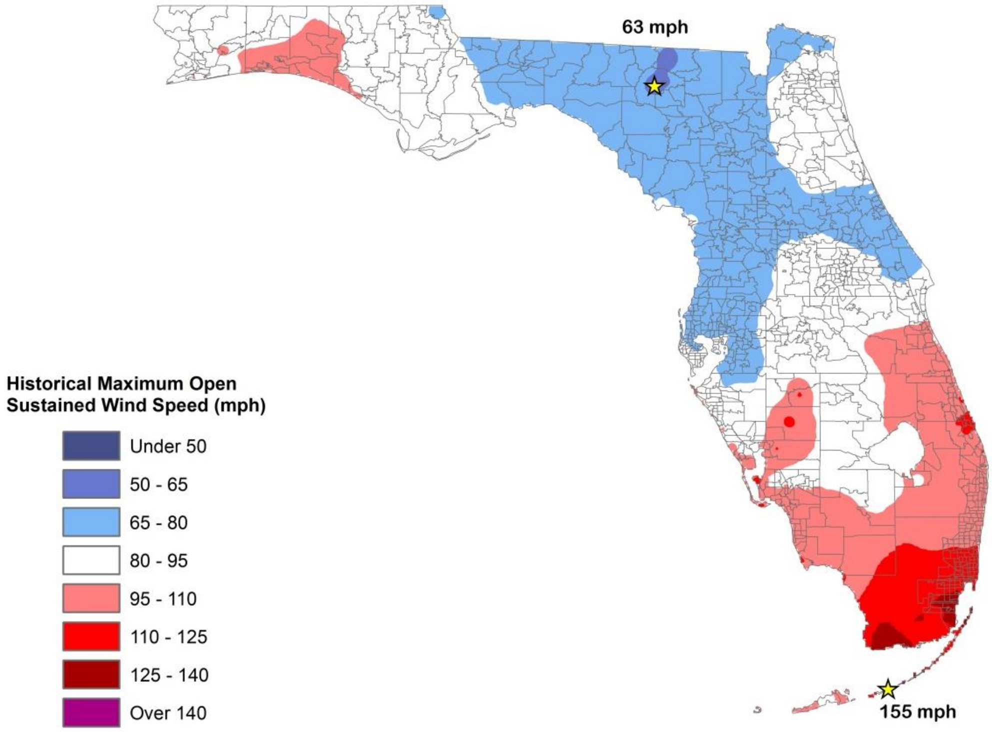
Contouring in addition to these isotach values may be included.

C. ***Include Form M-2, Maps of Maximum Winds, in a submission appendix.***

A. Figure 33 shows the maximum windspeeds (one-minute sustained at a height of 10 m in both open and local terrains, at the ZIP-Code centroid) for the historical storm set. If central pressure data is given in HURDAT, the central pressure as a function of time after landfall uses the HURDAT data. If central pressure data is not given in HURDAT, the central pressure after landfall is modeled using the filling models given in Vickery (2005), whereas the central pressure at or before landfall is estimated using the windspeed given in HURDAT. If available, the radius to maximum winds is modeled using information obtained from NWS-38 or the Hurricane Research Division of NOAA. If no radius to maximum wind data is available, then R_{max} is modeled using the mean of the regression models used in the stochastic storm modeling. Windspeeds data are given for both and open terrain conditions (upper map) and local (actual) terrain (lower map)

B. Figure 34 and Figure 35 present the maximum sustained windspeeds for return periods of 100- and 250 years from the stochastic storm set. The upper map in each figure presents results for open terrain conditions and the lower map presents results for actual terrain conditions.

C. The maximum windspeeds plotted in Figure 33 (modeled historical windspeeds) are 132 mph in open terrain and 106 mph in actual terrain. The maximum 100-year return period windspeeds plotted in Figure 34 are 120 mph in open terrain and 92 mph in actual terrain. The maximum 250-year return period windspeeds plotted in Figure 35 are 136 mph in open terrain and 102 mph in actual terrain.



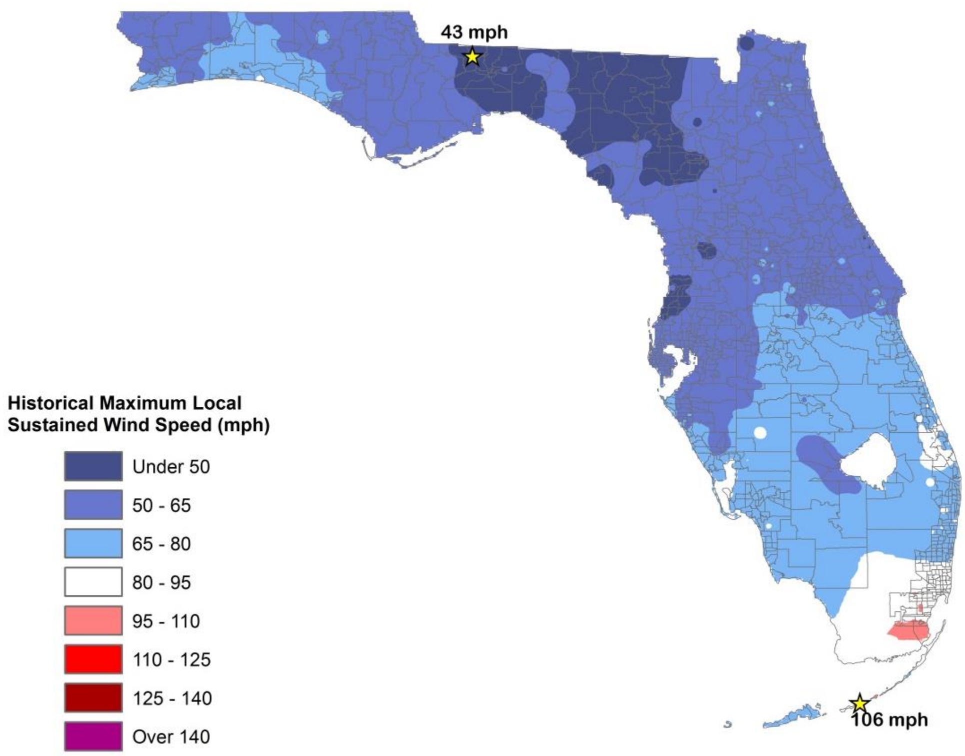


Figure 33. Maximum One-Minute Sustained Windspeed at a Height of 10 m in Open Terrain (upper map) and Local Terrain (lower map) Derived from the Historical Storm Set

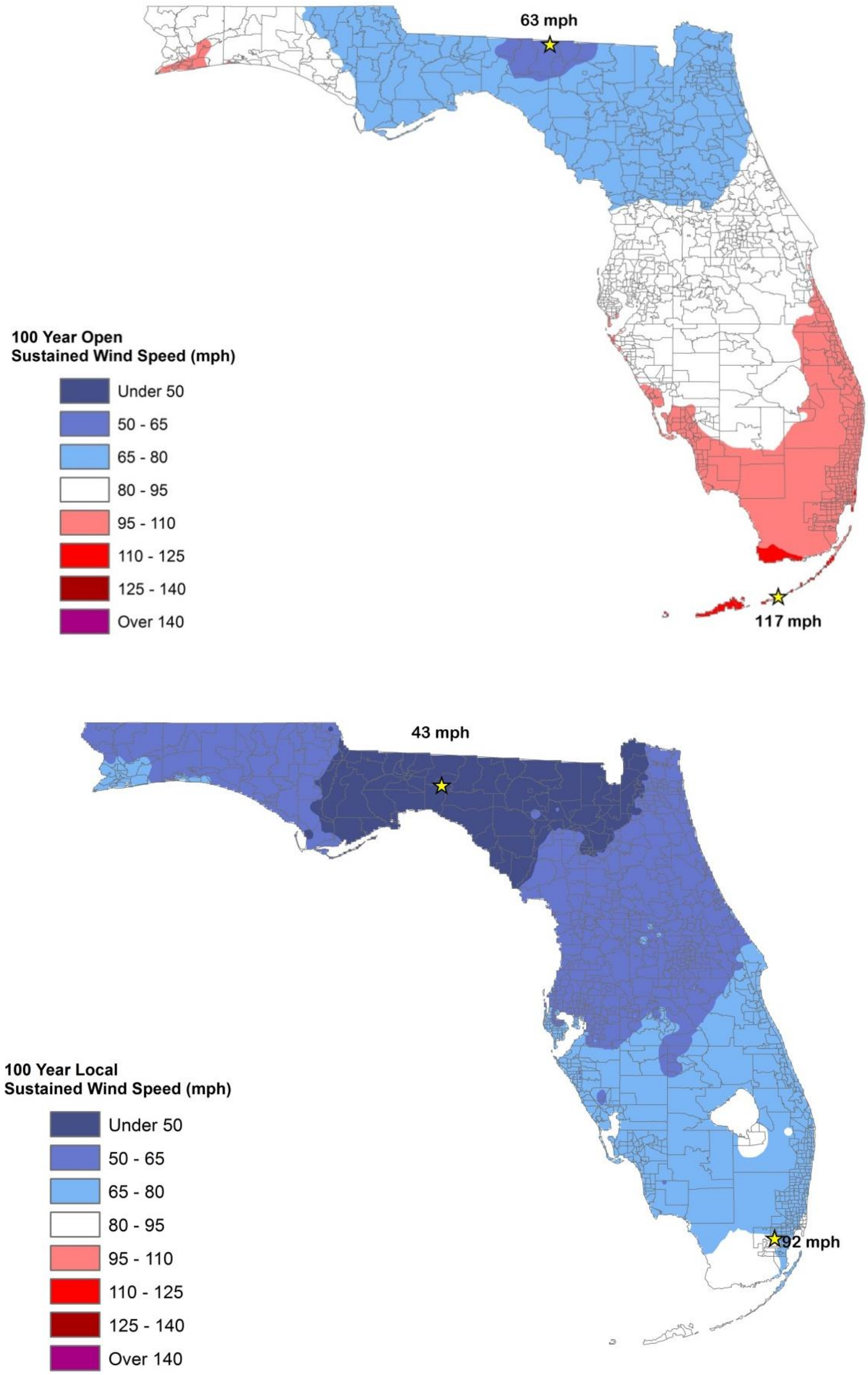


Figure 34. 100-Year Return Period Sustained Windspeeds at a Height of 10 m Above Ground in Open Terrain (upper plot) and Local Terrain (lower plot)

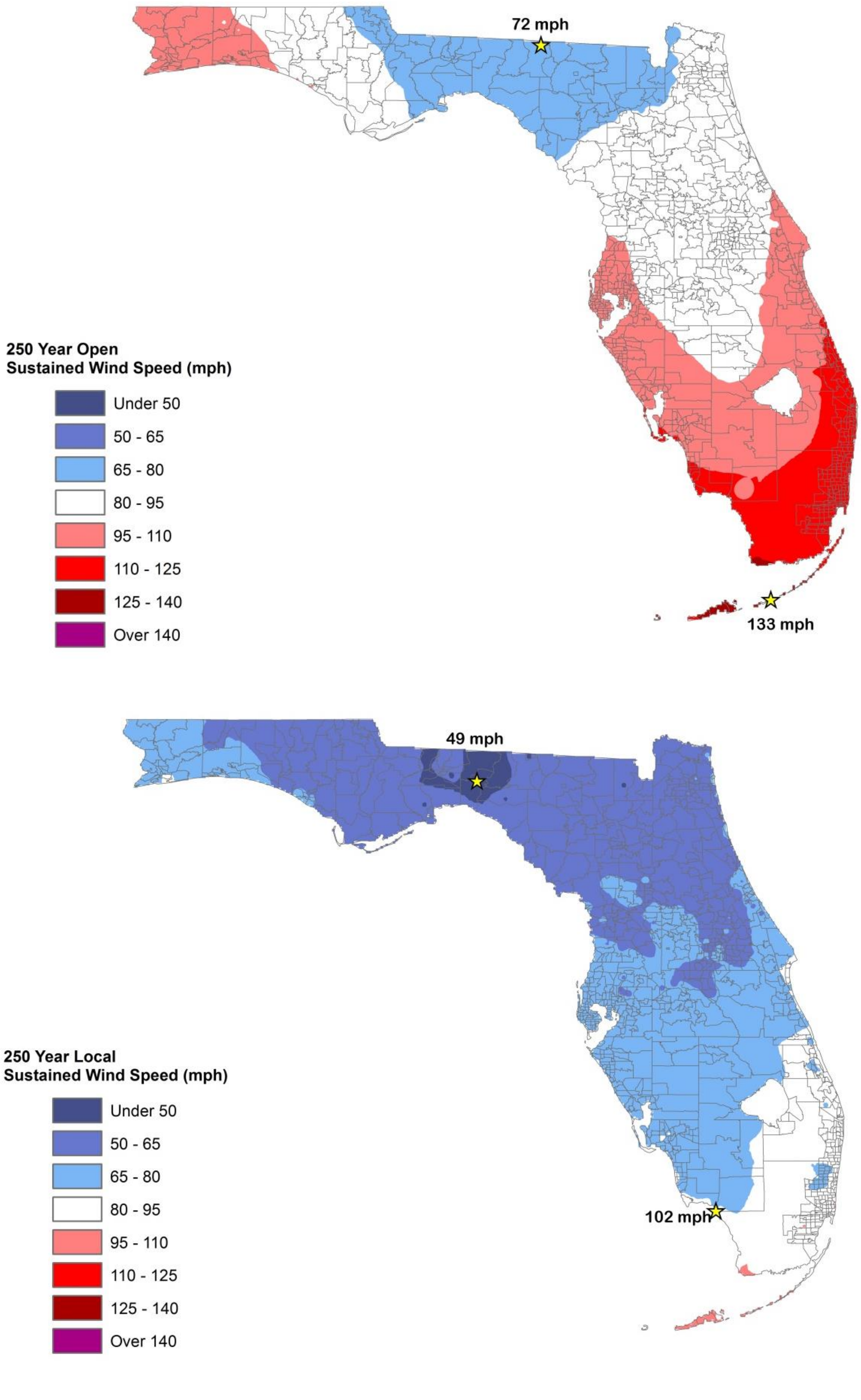


Figure 35. 250-Year Return Period Sustained Windspeeds at a Height of 10 m Above Ground in Open Terrain (upper plot) and Local Terrain (lower plot)

Form M-3: Radius of Maximum Winds and Radii of Standard Wind Thresholds

A. ***For the central pressures in the table below, provide the first quartile (1Q), median (2Q), and third quartile (3Q) values for (1) the radius of maximum winds (Rmax) used by the model to create the stochastic storm set, and the first quartile (1Q), median (2Q), and third quartile (3Q) values for the outer radii of (2) Category 3 winds (>110 mph), (3) Category 1 winds (>73 mph), and (4) gale force winds (>40 mph).***

B. ***Describe the procedure used to complete this form.***

C. ***Identify the other variables that influence Rmax.***

D. ***Sepcify any truncations applied to Rmax distrubutions in the model, and if and how these truncations vary with other variables.***

E. ***Provide a box plot and histogram of Central Pressure (x-axis) versus Rmax (y-axis) to demonstrate relative populations and continuity of sampled hurricanes in the stochastic storm set.***

F. ***Provide this form in Excel using the format given in the file named "2015FormM3.xlsx." The file name shall include the abbreviated name of the modeling organization, the standards year, and the form name. Also include Form M-3, Radius of Maximum Winds and Radii of Standard Wind Thresholds, in a submission appendix.***

Central Pressure (mb)	Rmax (mi)			Outer Radii (>110 mph) (mi)			Outer Radii (>73 mph) (mi)			Outer Radii (>40 mph) (mi)		
	1Q	2Q	3Q	1Q	2Q	3Q	1Q	2Q	3Q	1Q	2Q	3Q
990	17.1	22.2	28.7				15.4	23.1	31.5	73.5	97.0	130.5
980	19.3	24.7	30.8				25.6	32.5	40.8	86.3	110.8	141.0
970	20.0	27.4	35.3				34.1	44.7	54.6	102.2	132.9	169.3
960	19.4	25.6	33.8				41.8	52.5	65.0	110.6	142.8	182.3
950	17.1	23.3	30.6			20.7	44.2	56.5	70.7	110.0	144.2	185.6
940	16.0	21.2	27.8		21.2	30.0	45.6	58.7	72.9	107.4	141.4	178.3
930	14.5	19.4	24.8	15.8	24.0	31.2	46.6	58.2	72.8	105.1	134.4	179.5
920	12.9	16.1	20.8	20.8	26.4	31.7	44.3	55.0	68.1	96.0	124.6	159.2
910	10.1	12.3	15.3	21.1	25.1	30.0	38.1	47.5	57.1	81.8	104.7	132.3
900	9.1	10.2	11.6	20.5	23.1	26.1	35.9	40.7	47.7	74.4	87.9	106.2

A. The ranges provided are the results of simulations performed using the statistical models for R_{max} and the Holland pressure profile parameter described earlier. For each central pressure value given in the table (far field pressure = 1013 mbar in all cases), 1000 examples of Florida landfalling storms were extracted from the stochastic storm set. Using the values of B, R_{max}, central pressures, and translation speed associated with each of the 1000 example hurricanes, we compute the range (distance from the storm center) to the indicated windspeed. The central pressures associated with the 100 hurricanes are centered on the indicated value, within a range of 5 mb. The range to the indicated windspeed was obtained by computing the maximum windspeed over the full azimuth range of 360 degrees in 10-degree increments. The radii were increased at increments of 0.05 R_{max} until the maximum computed windspeed reduced below the target windspeed. From each of the 1000 simulations we provide minimum and maximum values resulting from the 1000 simulations.

B. The radius to maximum winds is a function of central pressure and latitude. The functional form of the relationship between R_{max} and both latitude and central pressures is described in M-2.

C. A graphical representation of 5,000 landfalling storm examples is given in Figure 36. Black boxes represent data points more than 1.5 but less than 3 times the inter quartile range higher than the third quartile. Red boxes represent data points more than 3 times the inter quartile range higher than the third quartile. Figure 37 presents histograms showing the relative frequency of pressures and radius to maximum winds for Florida landfalling hurricanes, computed using the model results from a 300,000 year simulation.

D. An electronic copy of Form M-3 is given in the file ARA15FormM3.xls. Form M-3 presents radii data from 100 randomly chosen landfalling storms in each of 10 central pressure bins.

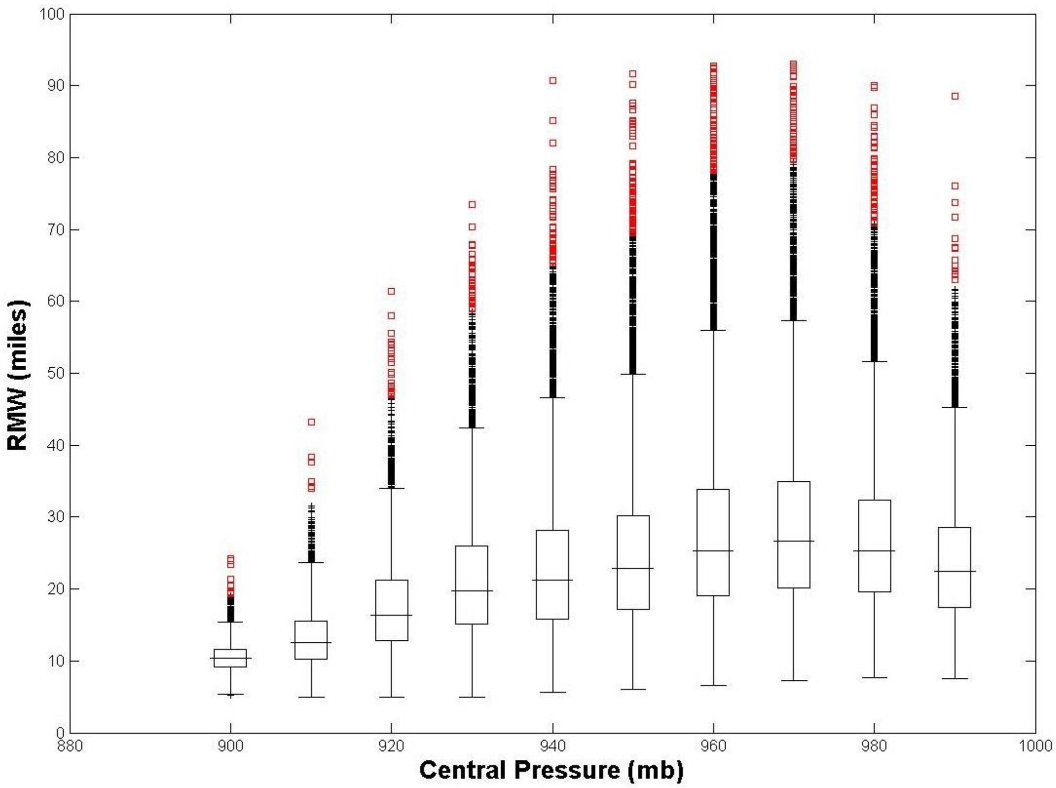


Figure 36. Simulated Distribution of R_{max} vs. Central Pressure Derived from 5,000 Florida Landfalling Model Hurricanes

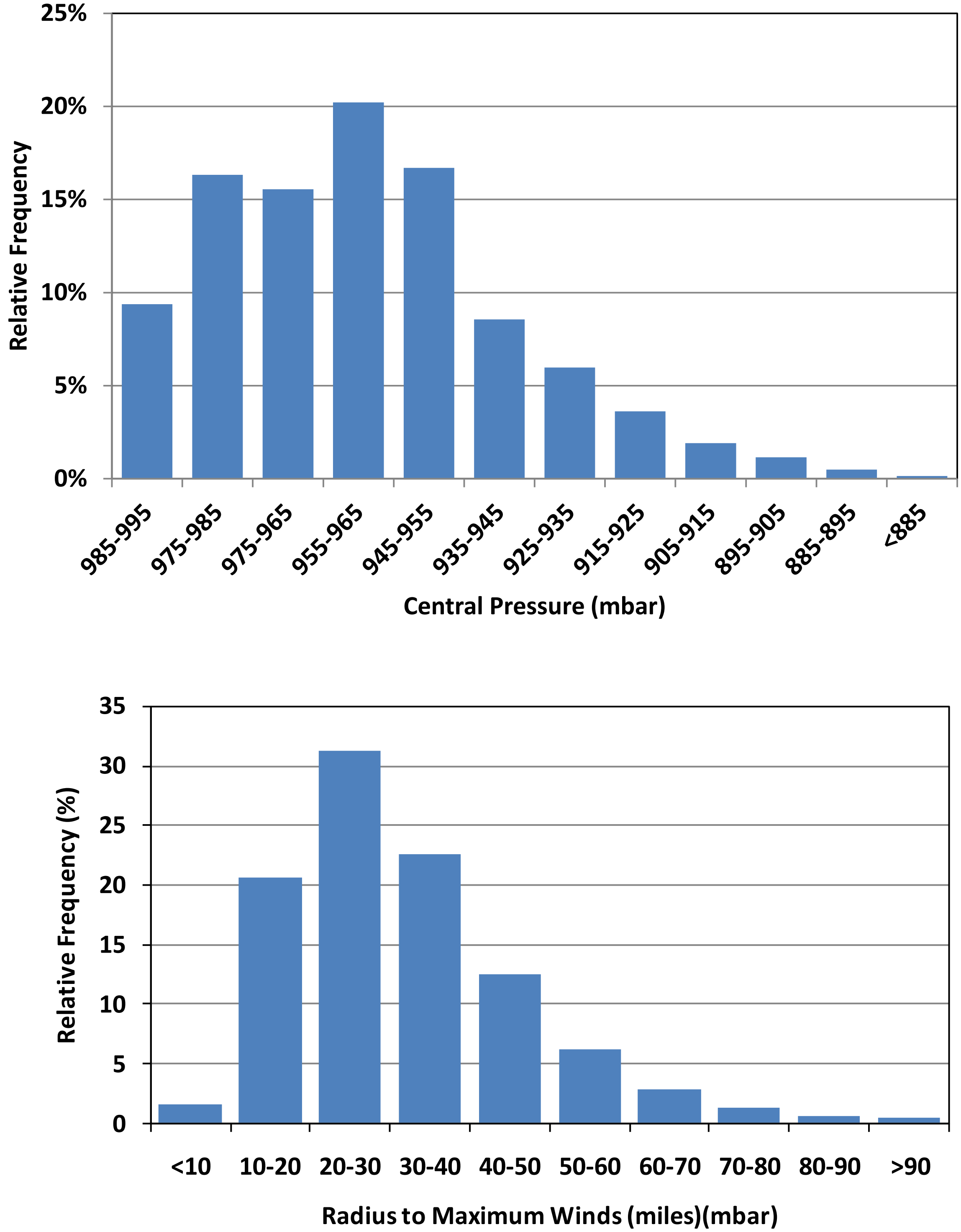


Figure 37. Histograms of Central Pressure (upper plot) and Radius to Maximum Winds (lower plot) for all Model Hurricanes Making Landfall in Florida

Form S-1: Probability and Frequency of Florida Landfalling Hurricanes per Year

Complete the table below showing the probability and modeled frequency of landfalling Florida hurricanes per year. Modeled probability shall be rounded to four decimal places. The historical probabilities and frequencies below have been derived from the Base Hurricane Storm Set for the 115 year period 1900-2014 (as given in Form A-2, Base Hurricane Storm Set Statewide Losses). Exclusion of hurricanes that caused zero modeled Florida damage or additional Florida landfalls included in the modeling organization Base Hurricane Storm Set as identified in their response to Standard M-1, Base Hurricane Storm Set, should be used to adjust the historical probabilities and frequencies provided here.

If the data are partitioned or modified, provide the historical probabilities and frequencies for the applicable partition (and its complement) or modification as well as the modeled probabilities and frequencies in additional copies of Form S-1, Probability and Frequency of Florida Hurricanes per Year).

Include Form S-1, Probability and Frequency of Florida Landfalling Hurricanes per Year, in a submission appendix.

Model Results
Probability of Florida Landfalling Hurricanes per Year

Number of Hurricanes per Year	Historical Probabilities	Modeled Probabilities	Historical Frequencies	Modeled Frequencies
0	0.5913	0.6123	68	71
1	0.2609	0.2916	30	34
2	0.1217	0.0782	14	9
3	0.0261	0.0150	3	2
4	0.0000	0.0025	0	0
5	0.0000	0.0004	0	0
6	0.0000	0.0000	0	0
7	0.0000	0.0000	0	0
8	0.0000	0.0000	0	0
9	0.0000	0.0000	0	0
10 or more	0.0000	0.0000	0	0

Form S-2: Examples of a Loss Exceedance Estimates

Provide estimates of the aggregate personal and commercial insured losses for various probability levels using the notional risk data set specified in Form A-1, Zero Deductible Personal Residential Loss Costs by ZIP Code, and using the 2012 Florida Hurricane Catastrophe Fund aggregate personal and commercial residential zero deductible exposure data provided in the file named "hlpm2012c.exe." Provide the total average annual loss for the loss exceedance distribution. If the modeling methodology does not allow the model to produce a viable answer, please state so and why.

Include Form S-2, Examples of Loss Exceedance Estimates, in a submission appendix.

Part A

Return Period (years)	Probability of Exceedance	Estimated Loss Notional Risk Data Set	Estimated Personal and Commercial Residential Loss FHCF Data Set
Top Event	N/A	62,525,866	294,214,342,927
10,000	0.01%	42,052,633	202,125,940,399
5,000	0.02%	37,138,075	180,873,818,336
2,000	0.05%	32,476,357	157,657,792,735
1,000	0.10%	28,774,137	136,806,256,682
500	0.20%	25,136,907	117,622,546,232
250	0.40%	21,435,004	98,459,051,566
100	1.00%	16,488,985	74,420,431,335
50	2.00%	12,641,130	56,113,369,606
20	5.00%	7,328,955	31,519,149,389
10	10.00%	3,876,083	16,461,316,955
5	20.00%	1,355,803	5,167,490,657

Part B

Mean (Total Average Annual Loss)	1,417,820	5,999,943,553
Median	38,846	133,083,866
Standard Deviation	3,611,318	16,144,577,758
Interquartile Range	886,535	3,031,815,807
Sample Size	250,000 years	250,000 years

Form S-3: Distributions of Stochastic Hurricane Parameters

Provide the probability distribution functional form used for each stochastic hurricane parameter in the model. Provide a summary of the justification for each functional form selected for each general classification.

Include Form S-3, Distributions of Stochastic Hurricane Parameters, in a submission appendix.

Stochastic Hurricane Parameter (Function or Variable)	Functional Form of Distribution	Data Source	Year Range Used	Justification for Functional Form
Occurrence Rate[2]	Polya	HURDAT	1886-2015	Fits to historical data
Relative Intensity [1]	Regression model with residuals fit to bi-normal distributions	HURDAT, Blake et al. (2007 with NHC Updates	1886-2007	Fits to historical data
Translation Speed[1]	Regression model with residuals fit to bi-normal distributions	HURDAT	1886-2007	Fits to historical data
Radius to Maximum Winds [1]	Normally distributed residual errors in log space	Flight Level Data, H*Wind Analyses	1977-2001 1988-2005	Best fit to data
Heading[1]	Regression model with residuals fit to bi-normal distributions	HURDAT	1886-2007	Fits to historical data
Holland B[1]	Normally distributed errors in linear space	Flight Level Data	1977-2001 1988-2005	Best fit to data

[1] Dates of data used to develop hurricane track and intensity model.
[2] Dates of data used to initiate storms in the current model.

Figure 38 presents a comparison of the distribution of the historical and modeled basin-wide occurrence rate and the p-values for various statistical tests.

Figure 39 presents coastal segments used to compare modeled and historical hurricane parameters.

Figure 40 through Figure 44 presents comparisons of modeled and historical translation speeds, headings, occurrence rates, and central pressures along the coastal segments given in Figure 39. P-values associated with various statistical tests for equivalence are presented in the figures.

Figure 45 through Figure 49 presents the same information given in Figure 40 through Figure 44, except the comparisons are given for the four Florida landfall regions rather than the coastal segments.

Figure 50 presents comparisons of the key hurricane parameters on a statewide basis.

Figure 51 presents comparisons of modeled and historical values of B and RMW at landfall along the coast of Florida and adjacent states.

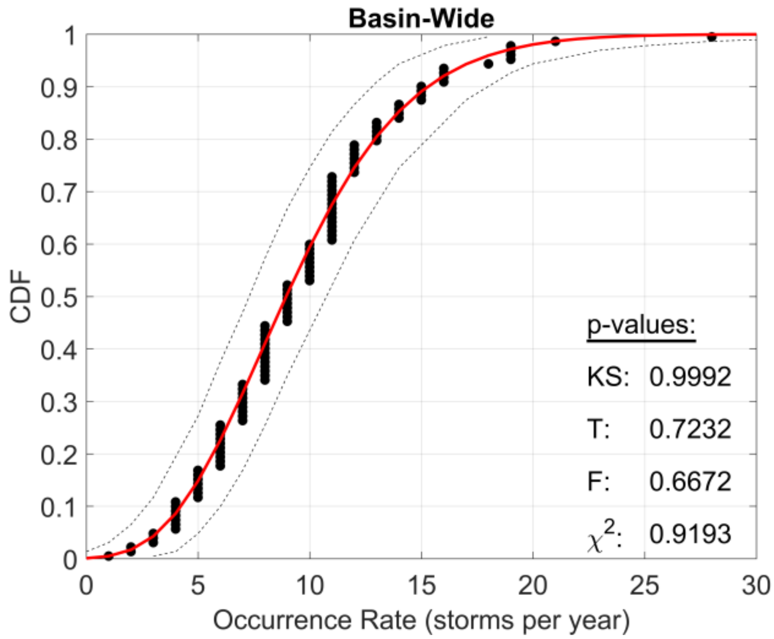


Figure 38. Modeled and Historical Basin Wide Storm Frequencies

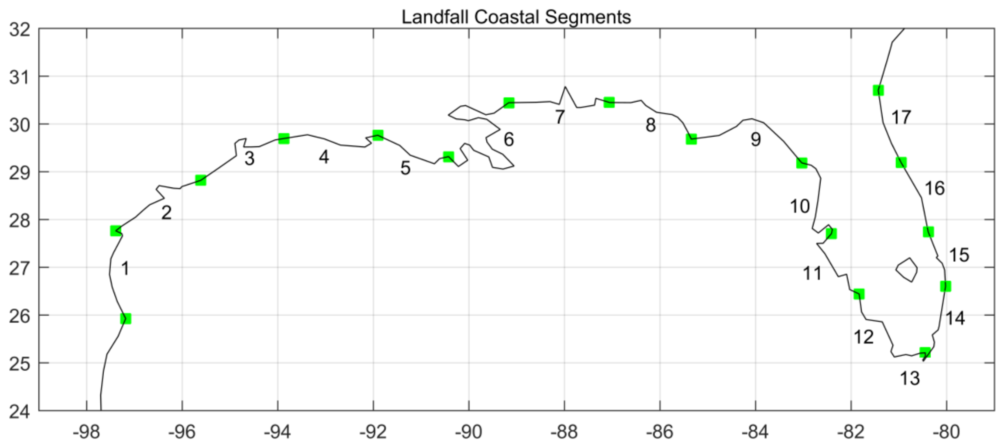


Figure 39. Locations of Coastal Segments Used to Compare Modeled and Historical Properties of Hurricanes at Landfall

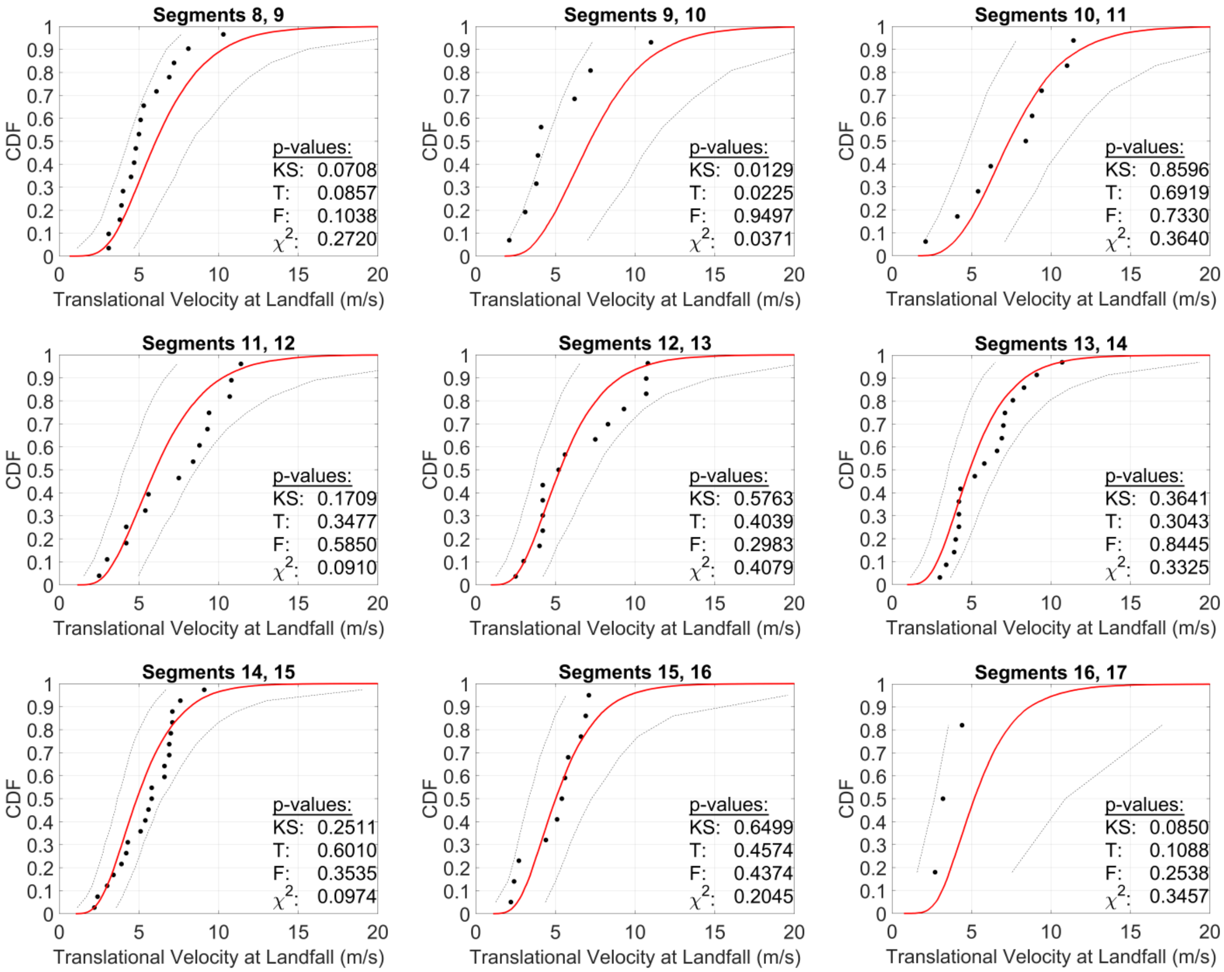


Figure 40. Comparisons of Modeled and Observed Translation Speed at Landfall for Segments Along the Florida Coast Line

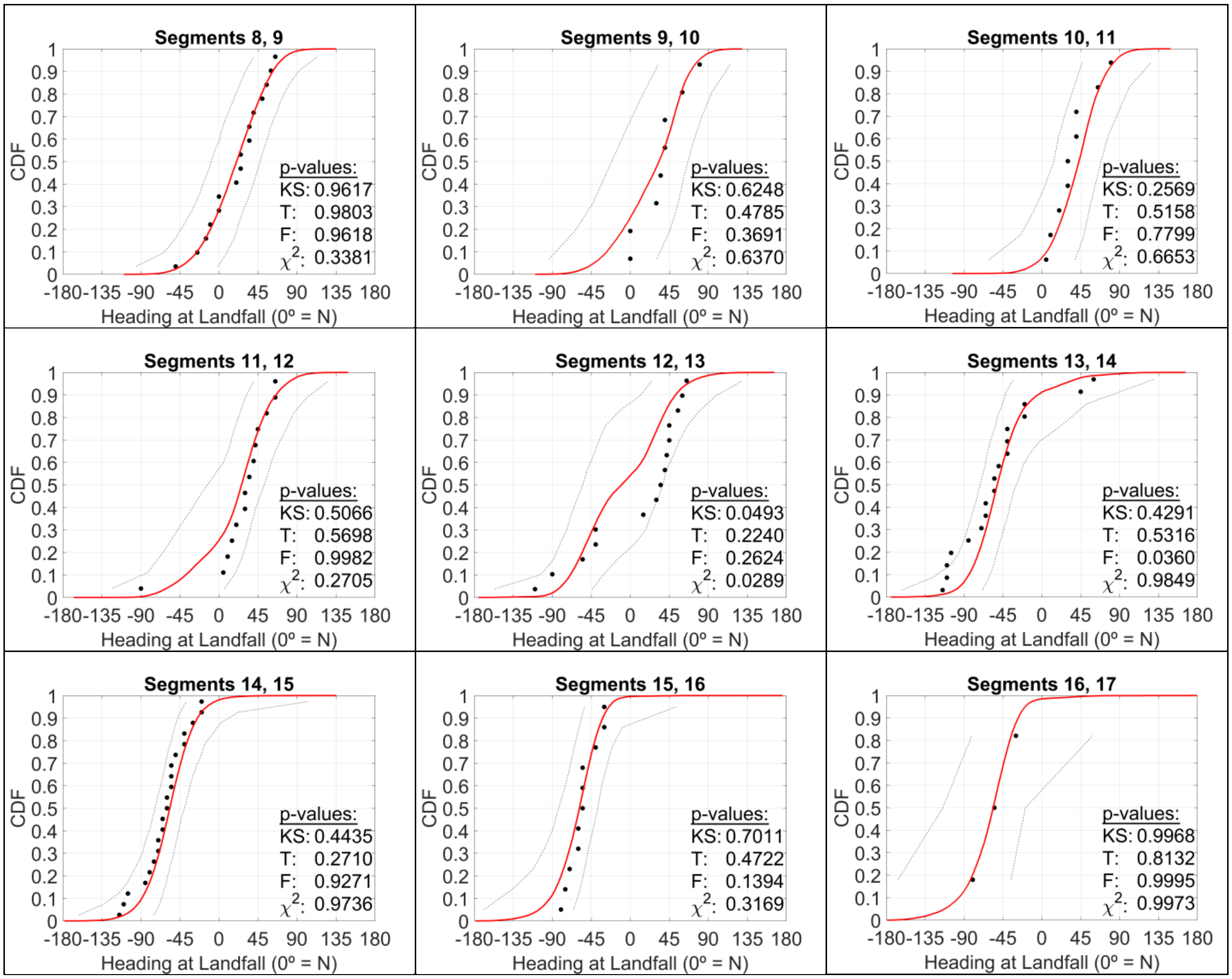


Figure 41. Comparisons of Modeled and Observed Storm Headings at Landfall for Segments Along the Florida Coast Line

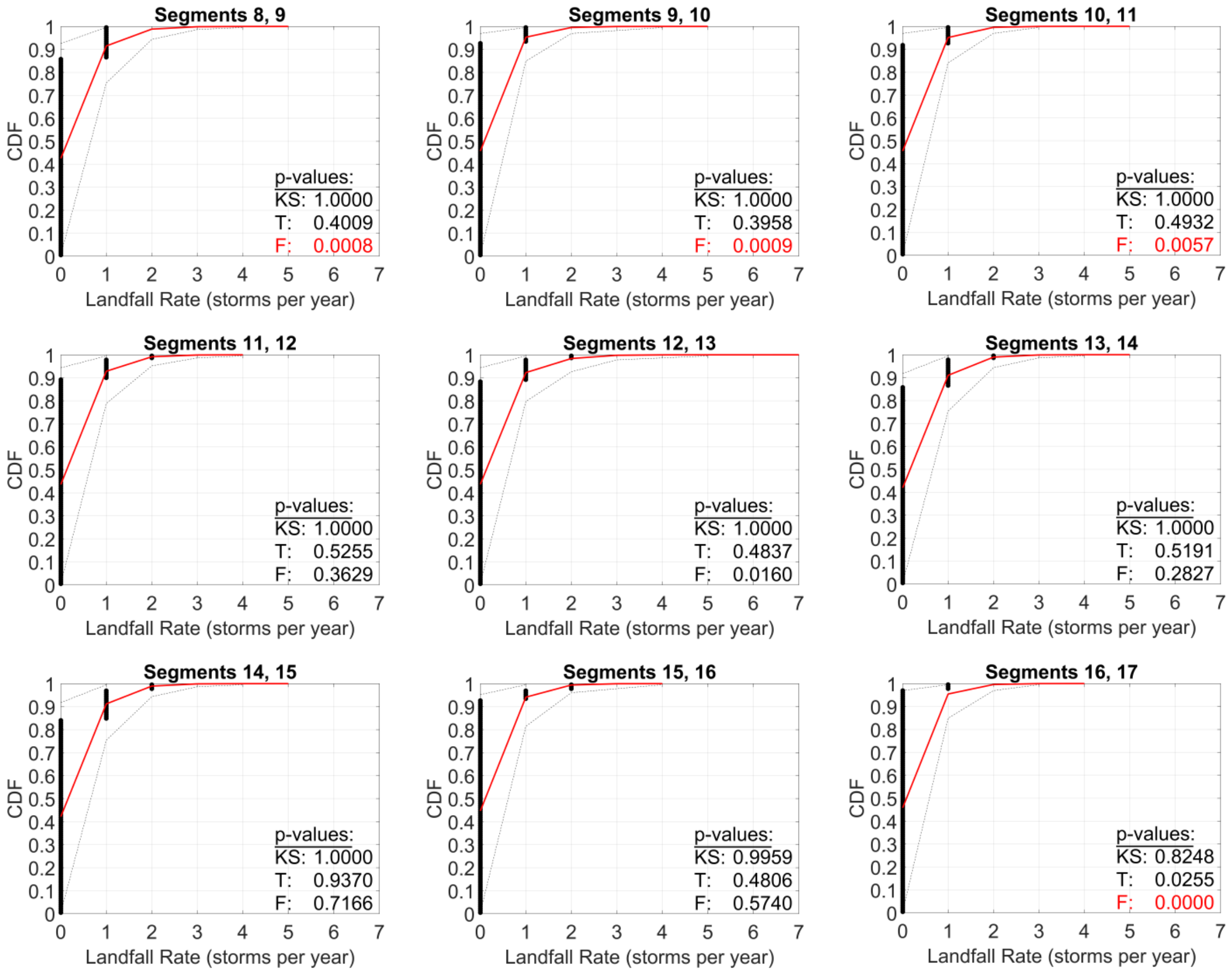


Figure 42. Comparisons of Modeled and Observed Storm Headings at Landfall for Segments Along the Florida Coast Line

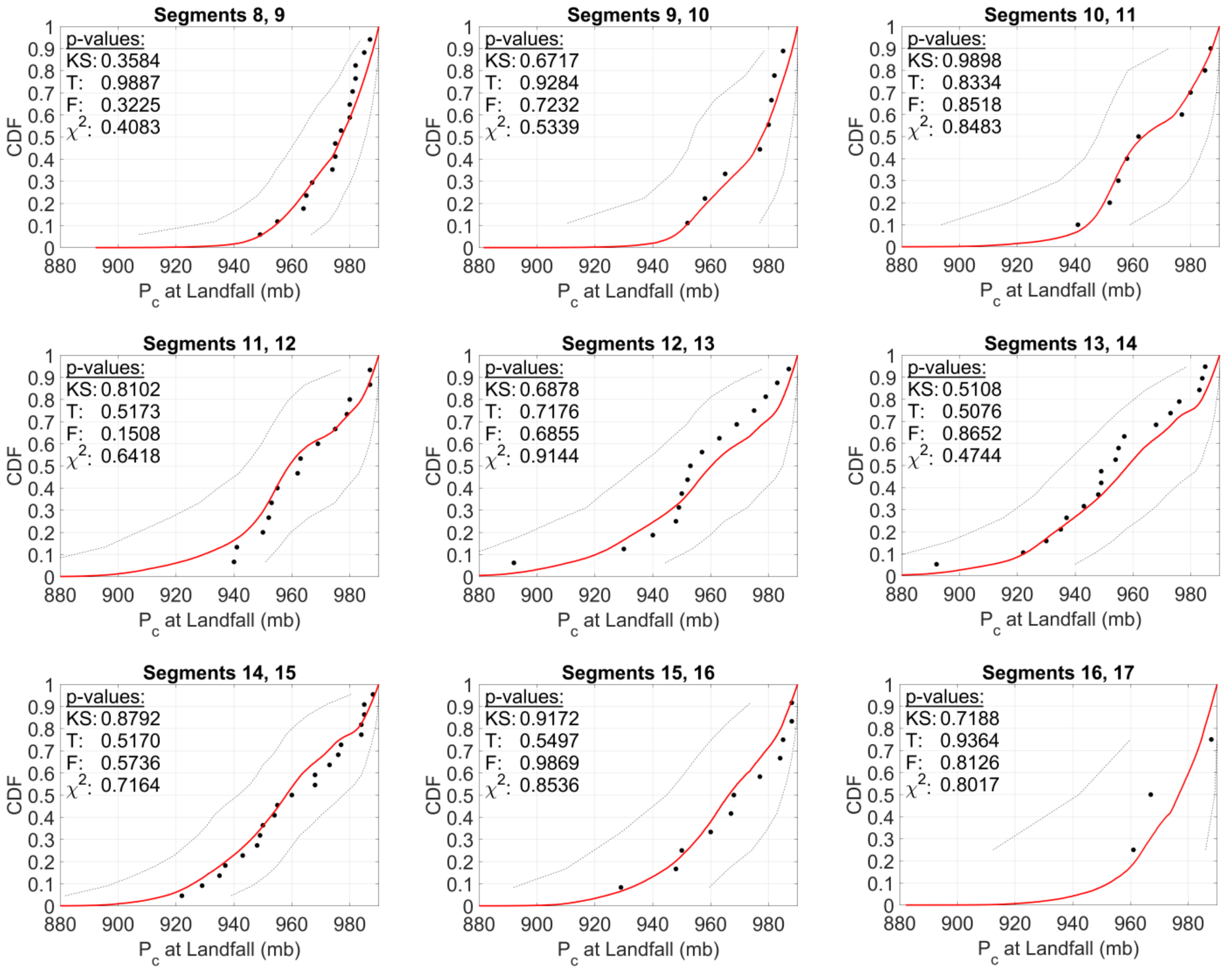


Figure 43. Comparisons of Modeled and Observed Landfall Central Pressures for Segments along the Florida Coast Line

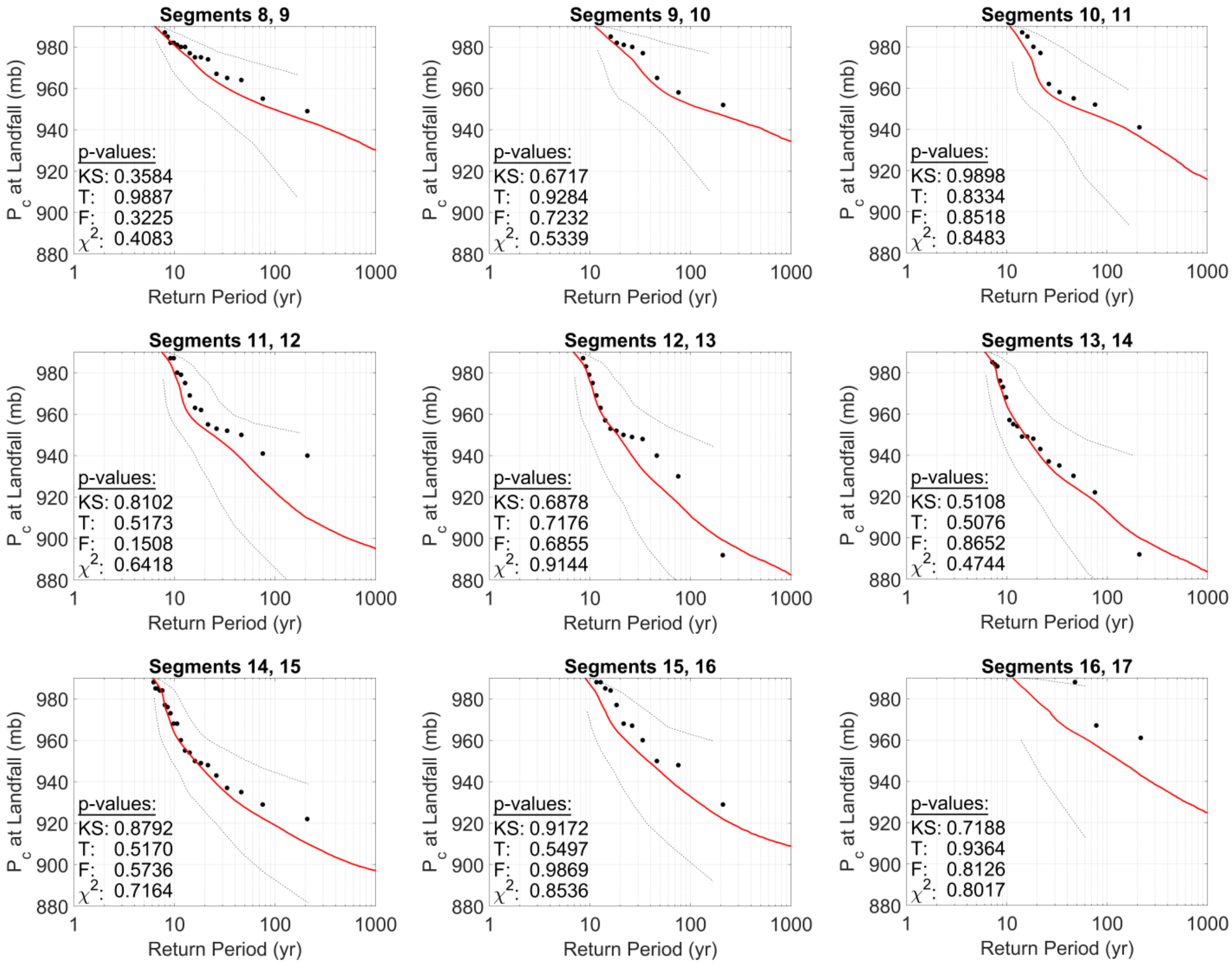


Figure 44. Comparisons of Modeled and Observed Landfall Central Pressures for Segments along the Florida Coast Line Plotted as a function of Return Period

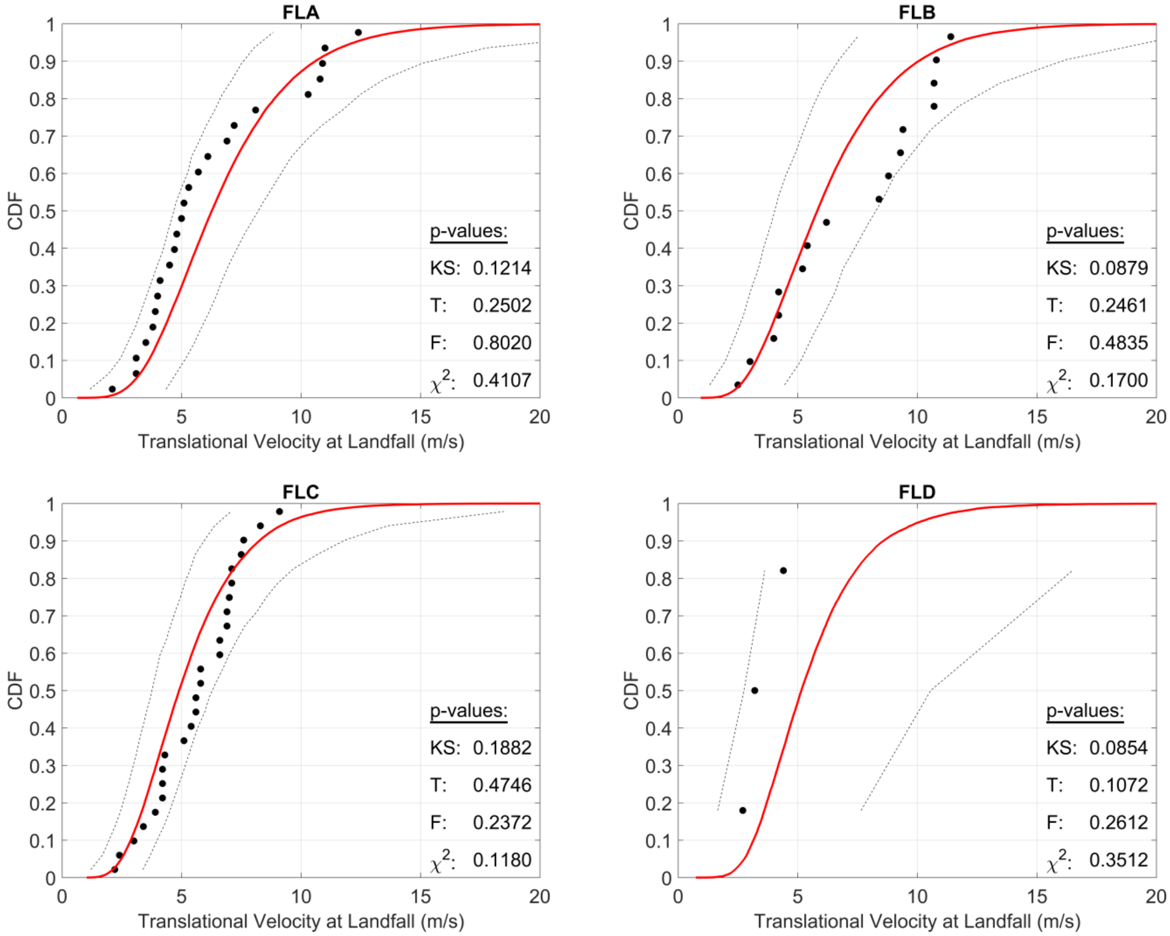


Figure 45. Comparisons of Modeled and Observed Translation Speed at Landfall Along the Coasts of the Four Florida Regions

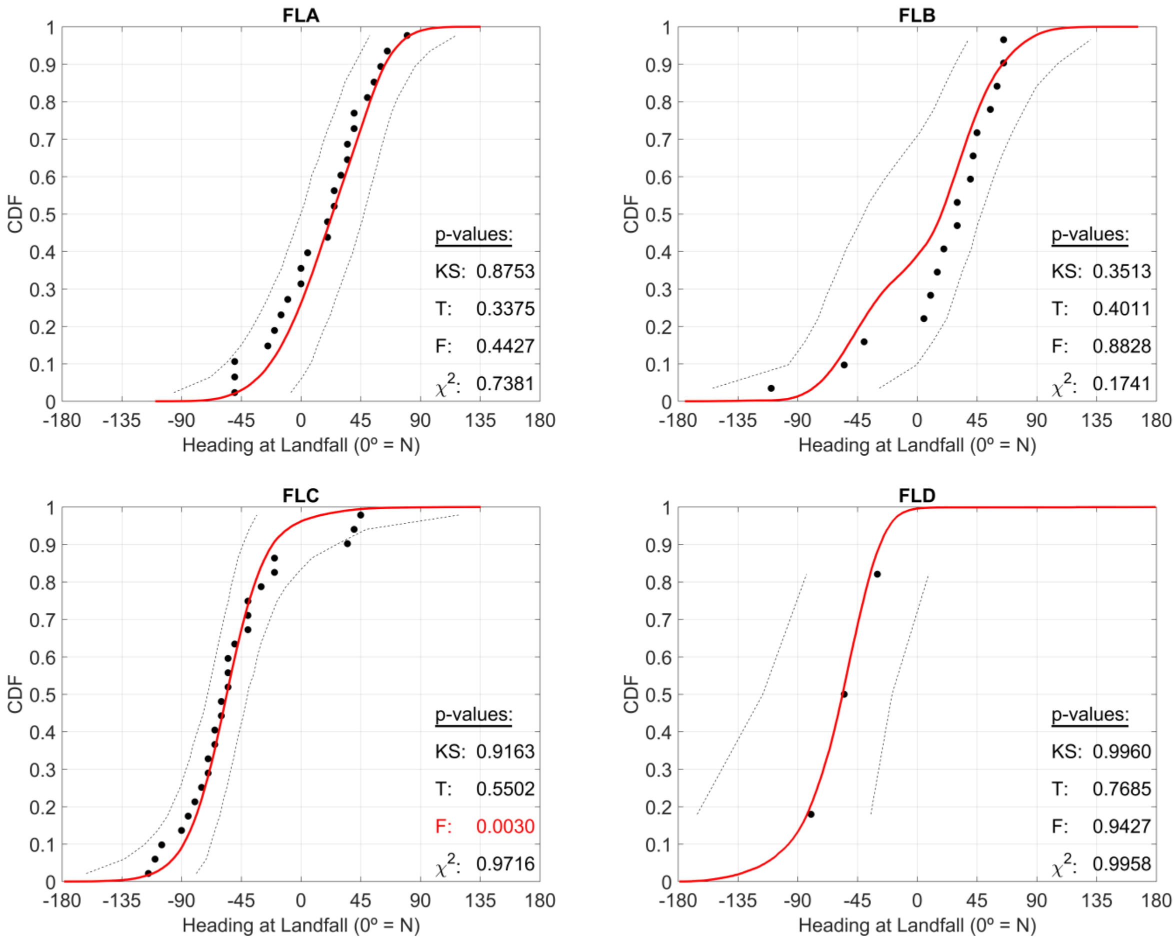


Figure 46. Comparisons of Modeled and Observed Storm Heading at Landfall Along the Coasts of the Four Florida Regions

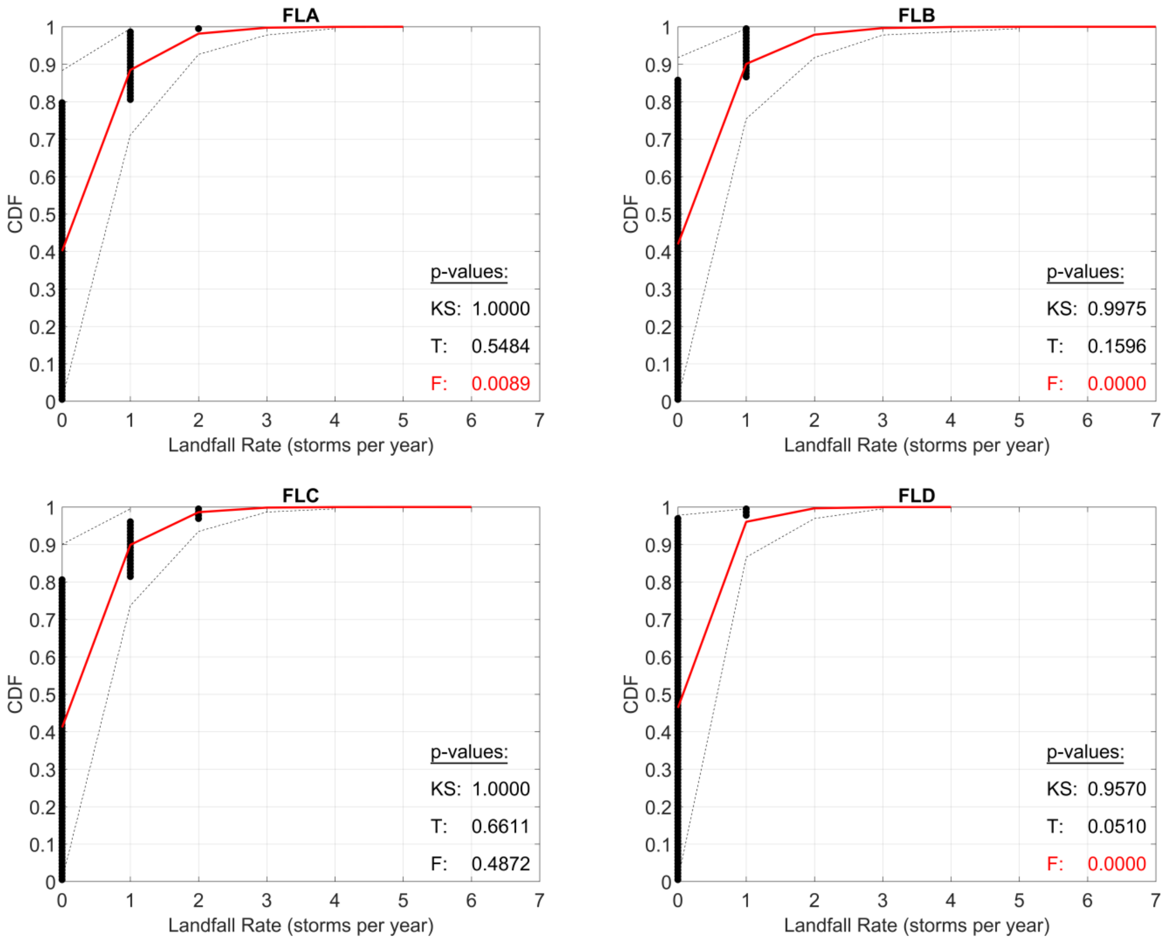


Figure 47. Comparisons of Modeled and Observed Landfall Rates Along the Coasts of the Four Florida Regions

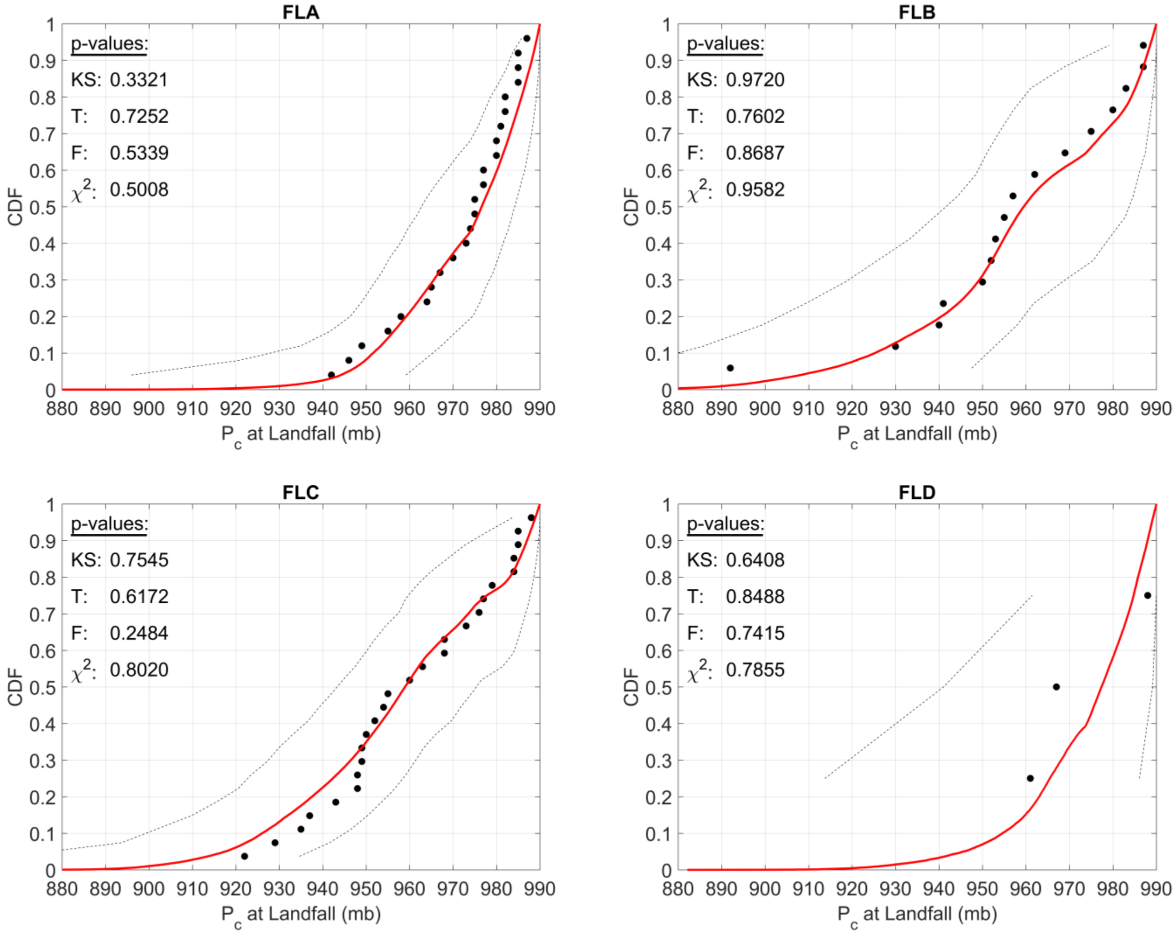


Figure 48. Comparisons of Modeled and Observed Distributions of Landfall Central Pressure Along the Coasts of the Four Florida Regions

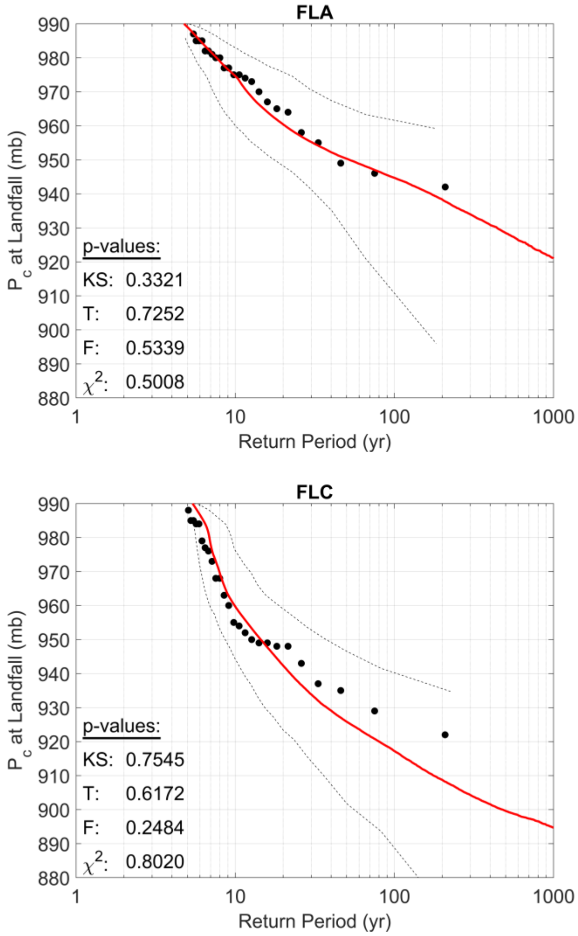


Figure 49. Comparisons of Modeled and Observed Distributions of Landfall Central Pressure Plotted as a Function of Return Period Along the Coasts of the Four Florida Regions

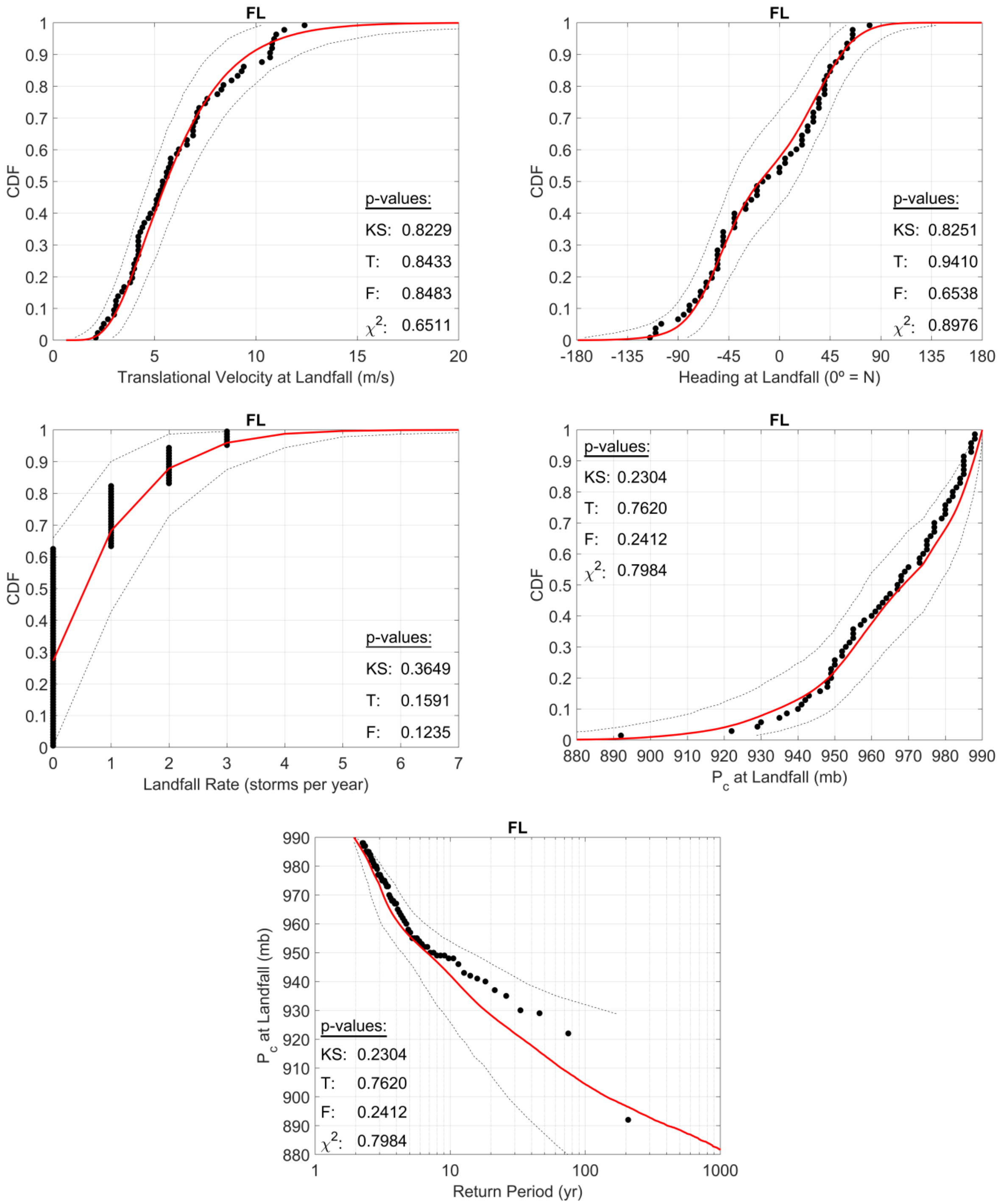


Figure 50. Comparisons of Modeled and Observed Distributions of Translation Speed, Heading, Landfall Rates, and Central Pressure Plotted vs. Return Period for the Entire Florida Coastline

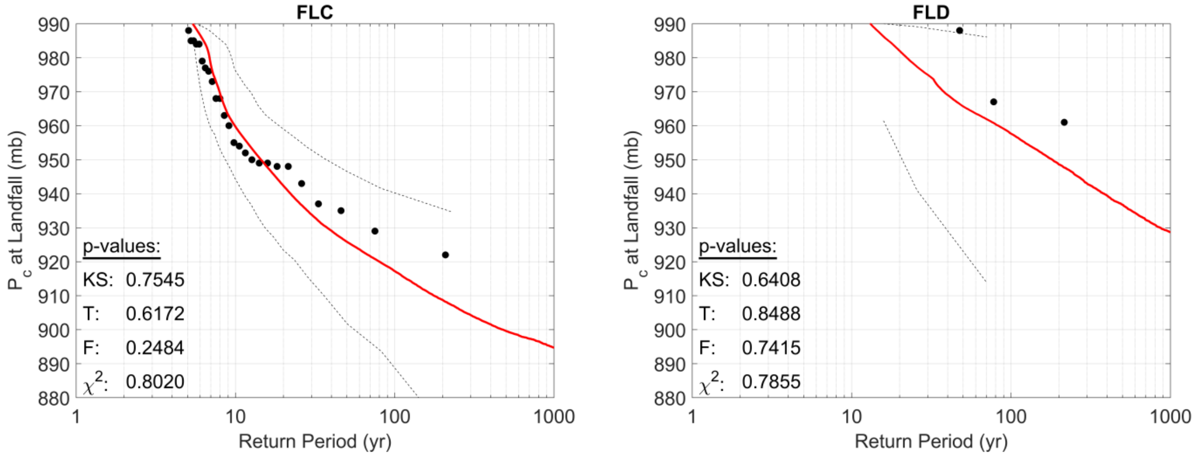


Figure 51. Comparisons of Modeled and Historical Values of B (left) and RMW (right) Along the Coast of Florida and Adjoining States

Form S-4: Validation Comparisons

A. Provide five validation comparisons of actual personal residential exposures and loss to modeled exposures and loss. Provide these comparisons by line of insurance, construction type, policy coverage, county or other level of similar detail in addition to total losses. Include loss as a percent of total exposure. Total exposure represents the total amount of insured values (all coverages combined) in the area affected by the hurricane. This would include exposures for policies that did not have a loss. If this is not available, use exposures for only those policies that had a loss. Specify which was used. Also, specify the name of the hurricane event compared.

B. Provide a validation comparison of actual commercial residential exposures and loss to modeled exposures and loss. Use and provide a definition of the model's relevant commercial residential classifications.

C. Provide scatter plot(s) of modeled versus historical losses for each of the required validation comparisons. (Plot the historical losses on the x-axis and the modeled losses on the y-axis.)

Rather than using a specific published hurricane windfield directly, the winds underlying the modeled loss cost calculations must be produced by the model being evaluated and should be the same hurricane parameters as used in completing Form A-2, Base Hurricane Storm Set Statewide Losses.

Example Formats for Personal Residential:

Hurricane = ____________________

Exposure = Total exposure or loss only (please specify) _____________________

Construction	Company Actual Loss / Exposure	Modeled Loss / Exposure	Difference
Wood Frame			
Masonry			
Other (specify)			
Total			

Hurricane = ____________________

Exposure = Total exposure or loss only (please specify) _____________________

Coverage	Company Actual Loss / Exposure	Modeled Loss / Exposure	Difference
A			
B			
C			
D			
Total			

Example Format for Commercial Residential:

Hurricane = ____________________

Exposure = Total exposure or loss only (please specify) _____________________

Construction	Company Actual Loss / Exposure	Modeled Loss / Exposure	Difference
Total			

Five validation personal residential comparisons and two commercial residential comparisons are provided on the following pages. In each case, the exposure includes all ZIP Codes with a loss. Scatter plots of the results are shown in Figure 52. The modeled losses in the validation cases do not include demand surge.

A. Personal Residential Comparisons

Comparison Number 1 - Hurricane Charley			
Total Loss by County			
County	Company Actual Loss/Exposure	Modeled Loss/Exposure	Difference
Charlotte	0.1057	0.0697	-0.0360
Orange	0.0104	0.0086	-0.0018
Osceola	0.0132	0.0179	0.0047
Lee	0.0068	0.0091	0.0024
Polk	0.0043	0.0078	0.0035

Comparison Number 2 - Hurricane Andrew			
Total Loss by Construction Classs			
Coverage	Company Actual Loss/Exposure	Modeled Loss/Exposure	Difference
Frame	0.3121	0.1584	-0.1538
Masonry	0.2029	0.1349	-0.0680

Comparison Number 3 - Hurricane Andrew			
Total Loss by Coverage			
Coverage	Company Actual Loss/Exposure	Modeled Loss/Exposure	Difference
A - Andrew Coverage A+B	0.2190	0.1895	-0.0295
A - Andrew Coverage C	0.1962	0.0448	-0.1514
A - Andrew Coverage D	0.1270	0.0605	-0.0665

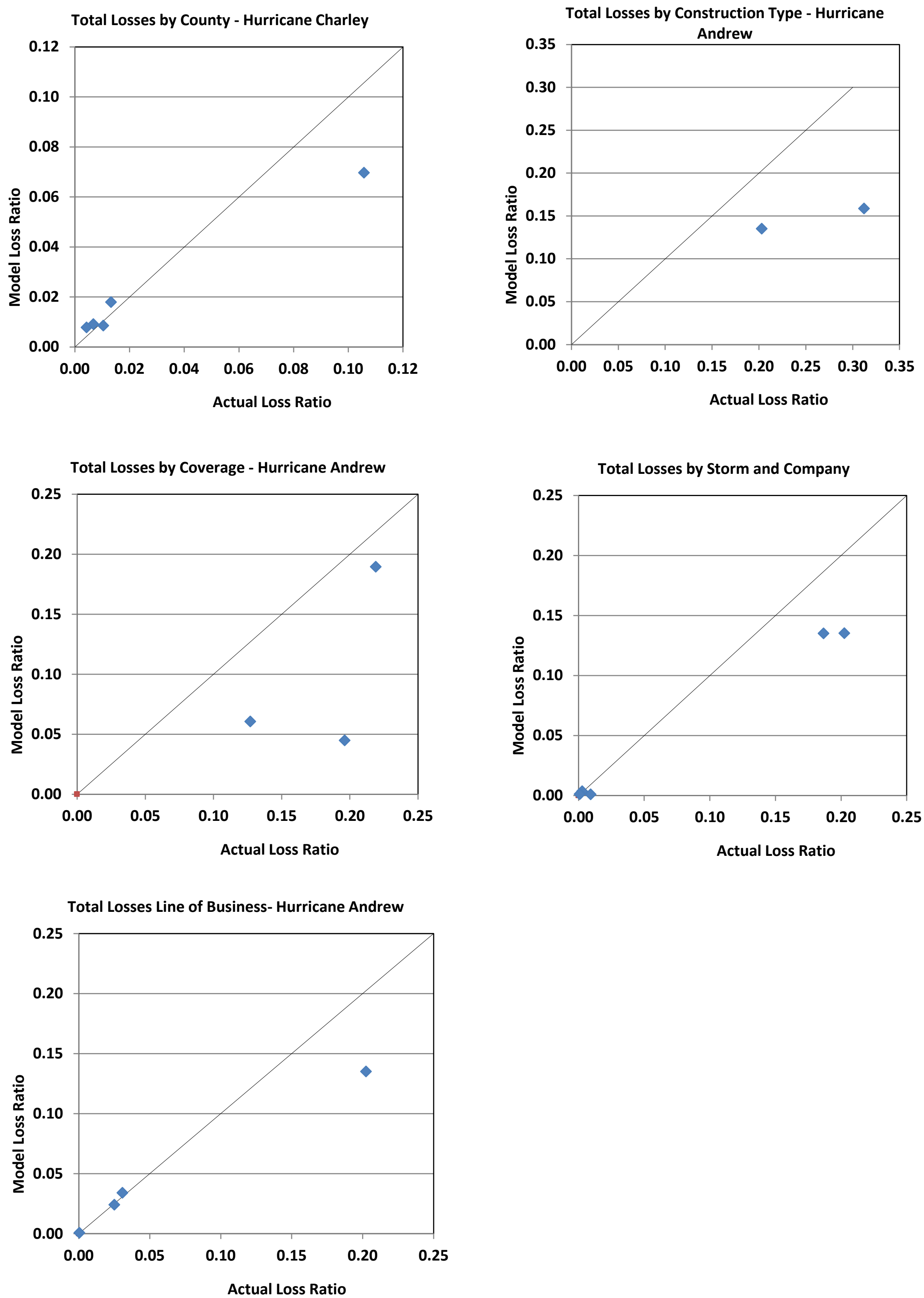
Comparison Numer 4 - Hurricanes			
Total Loss by Coverage			
Company - Storm	Company Actual Loss/Exposure	Modeled Loss/Exposure	Difference
A-Andrew	0.2024	0.1350	-0.0675
B-Andrew	0.1866	0.1349	-0.0518
D-Charley	0.0027	0.0034	0.0007
F-Jeanne	0.0013	0.0013	0.0000
F-Frances	0.0008	0.0010	0.0002
D-Wilma	0.0092	0.0007	-0.0084

Comparison Number 5 - Hurricanes Andrew and Bonnie			
Total Losses by Line of Business			
Company - Storm - LoB	Company Actual Loss/Exposure	Modeled Loss/Exposure	Difference
A-Andrew Homeowner	0.2024	0.1350	-0.0675
A-Andrew Renter	0.0308	0.0340	0.0032
A-Andrew Condominum	0.0251	0.0240	-0.0010
A-Bonnie Mobile Home	0.0004	0.0007	0.0003

B. Commercial Residential Comparisons

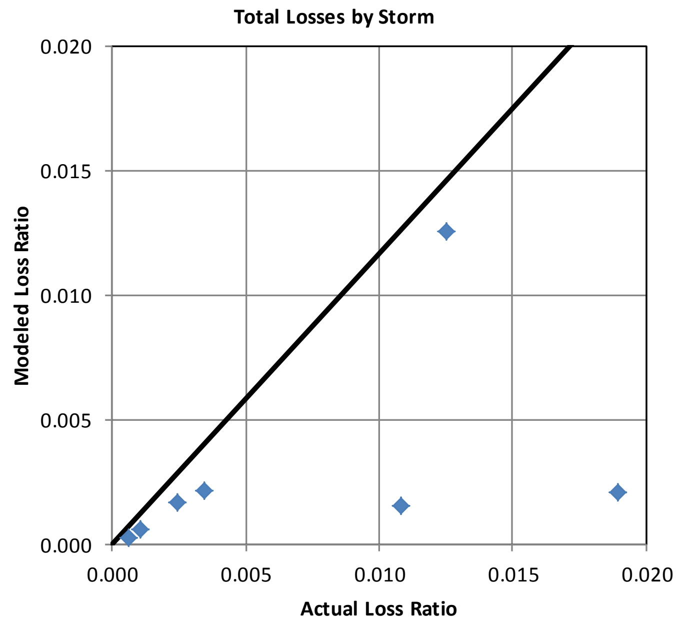
Comparison Number 6 - Hurricanes			
Total Loss by Storm			
Storm	Company Actual Loss/Exposure	Modeled Loss/Exposure	Difference
Charley	0.0034	0.0021	-0.0013
Frances	0.0108	0.0015	-0.0093
Ivan	0.0190	0.0021	-0.0168
Jeanne	0.0025	0.0017	-0.0008
Dennis	0.0011	0.0006	-0.0005
Katrina	0.0006	0.0003	-0.0004
Wilma	0.0125	0.0126	0.0000

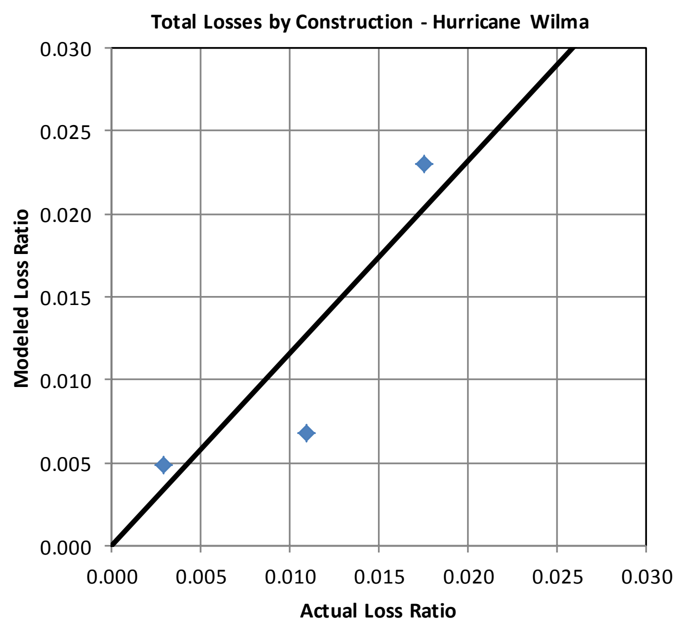
Comparison Number 7 - Hurricane Wilma			
Total Loss by Construction Classs			
Construction	Company Actual Loss/Exposure	Modeled Loss/Exposure	Difference
Frame	0.0029	0.0048	0.0019
Masonry	0.0175	0.0230	0.0055
Engineered	0.0109	0.0068	-0.0041



(Part A: Personal Residential)

Figure 52. Validation Comparisons





(Part B: Commercial Residential)

Figure 52. Validation Comparisons (continued)

Form S-5: Average Annual Zero Deductible Statewide Loss Costs – Historical versus Modeled

A. Provide the average annual zero deductible statewide personal and commercial residential loss costs produced using the list of hurricanes in the Base Hurricane Storm Set as defined in Standard M-1, Base Hurricane Storm Set based on the 2012 Florida Hurricane Catastrophe Fund's aggregate personal and commercial residential exposure data found in the file named "hlpm2012c.exe."

B. Provide a comparison with the statewide personal and commercial residential loss costs produced by the model on an average industry basis.

Average Annual Zero Deductible Statewide Personal and Commercial Residential Loss Costs

Time Period	(Part A) Historical Hurricanes	(Part B) Produced by Model
Current Submission (8.0.a)	$4.78B	$6.00B
Previously Accepted Model* (7.0.b) (2013 Standards)	$5.22B	$5.95B
Percent Change Current Submission/ Previously Accepted Model*	-8.4%	+0.8%

NA if no previously accepted model.

C. Provide the 95% confidence interval on the differences between the mean of the historical and modeled personal and commercial residential loss.

The 95% confidence interval on the difference between the mean of the historical loss and the mean of the modeled loss is -$3.66B to +$1.23B.

D. If the data are partitioned or modified, provide the average annual zero deductible statewide personal and commercial residential loss costs for the applicable partition (and its complement) or modification as well as the modeled average annual zero deductible statewide personal and commercial residential loss costs in additional copies of Form S-5, Average Annual Zero Deductible Loss Costs – Historical versus Modeled.

Not applicable.

E. Include For S-5, Average Annual Zero Deductible Statewide Loss Costs – Historical versus Modeled, in a submission appendix.

Form V-1: One Hypothetical Event

A. ***Windspeeds for 96 ZIP Codes and sample personal and commercial residential exposure data are provided in the file named "FormV1Input15.xlsx." The windspeeds and ZIP Codes represent a hypothetical hurricane track. Model the sample personal and commercial residential exposure data provided in the file against these windspeeds at the specified ZIP Codes and provide the damage ratios summarized by windspeed (mph) and construction type.***

The windspeeds provided are one-minute sustained 10-meter windspeeds. The sample personal and commercial residential exposure data provided consists of four structures (one of each construction type – wood frame, masonry, manufactured home, and concrete) individually placed at the population centroid of each of the ZIP Codes provided. Each ZIP Code is subjected to a specific windspeed. For completing Part A, Estimated Damage for each individual windspeed range is the sum of ground up loss to all structures in the ZIP Codes subjected to that individual windspeed range, excluding demand surge and storm surge. Subject Exposure is all exposures in the ZIP Codes subjected to that individual windspeed range. For completing Part B, Estimated Damage is the sum of the ground up loss to all structures of a specific type (wood frame, masonry, manufactured home, or concrete) in all of the windspeed ranges, excluding demand surge and storm surge. Subject Exposure is all exposures of that specific type in all of the ZIP Codes.

One reference structure for each of the construction types shall be placed at the population centroid of the ZIP Codes. Do not include contents, appurtenant structures, or time element coverages.

Reference Frame Structure	**Reference Masonry Structure**
• One story • Unbraced gable end roof • ASTM D3161 Class F (110 mph) or • ASTM D7158 Class G (120 mph) shingles • ½" plywood deck • 6d nails, deck to roof members • Toe nail truss to wall anchor • Wood framed exterior walls • 5/8" diameter anchors at 48" centers for wall/floor/foundation connections • No shutters • Standard glass windows • No door covers • No skylight covers • Constructed in 1995	• One story • Unbraced gable end roof • ASTM D3161 Class F (110 mph) or • ASTM D7158 Class G (120 mph) shingles • ½" plywood deck • 6d nails, deck to roof members • Weak truss to wall connection • Masonry exterior walls • No vertical wall reinforcing • No shutters • Standard glass windows • No door covers • No skylight covers • Constructed in 1995
Reference Manufactured Home Structure	Reference Concrete Structure
• Tie downs • Single unit • Manufactured in 1980	• Twenty story • Eight apartment units per story • No shutters • Standard glass windows • Constructed in 1980

B. ***Confirm that the structures used in completing the form are identical to those in the above table for the reference structures. If additional assumptions are necessary to***

complete this form (for example, regarding structural characteristics, duration or surface roughness), provide the reasons why the assumptions were necessary as well as a detailed description of how they were included.

The structures used in completing Form V-1 are identical to those in the above table. Windspeeds are assumed to be representative of sustained winds at a height of 10 m in open terrain. No additional assumptions were required. Demand surge is not included in the estimated damages.

C. Provide a plot of the Form V-1, One Hypothetical Event, Part A data.

Figure 53.

D. Include Form V-1, One Hypothetical Event, in a submission appendix.

Part A

Windspeed (mph)	Estimated Damage/Subject Exposure
41 – 50	0.06%
51 – 60	0.14%
61 – 70	0.89%
71 – 80	1.95%
81 – 90	4.93%
91 – 100	11.93%
101 – 110	18.33%
111 – 120	42.31%
121 – 130	58.09%
131 – 140	69.63%
141 – 150	83.12%
151 – 160	88.36%
161 – 170	91.16%

Part B

Construction Type	Estimated Damage/Subject Exposure
Wood Frame	31.01%
Masonry	31.01%
Mobile Home	38.83%
Concrete	19.81%

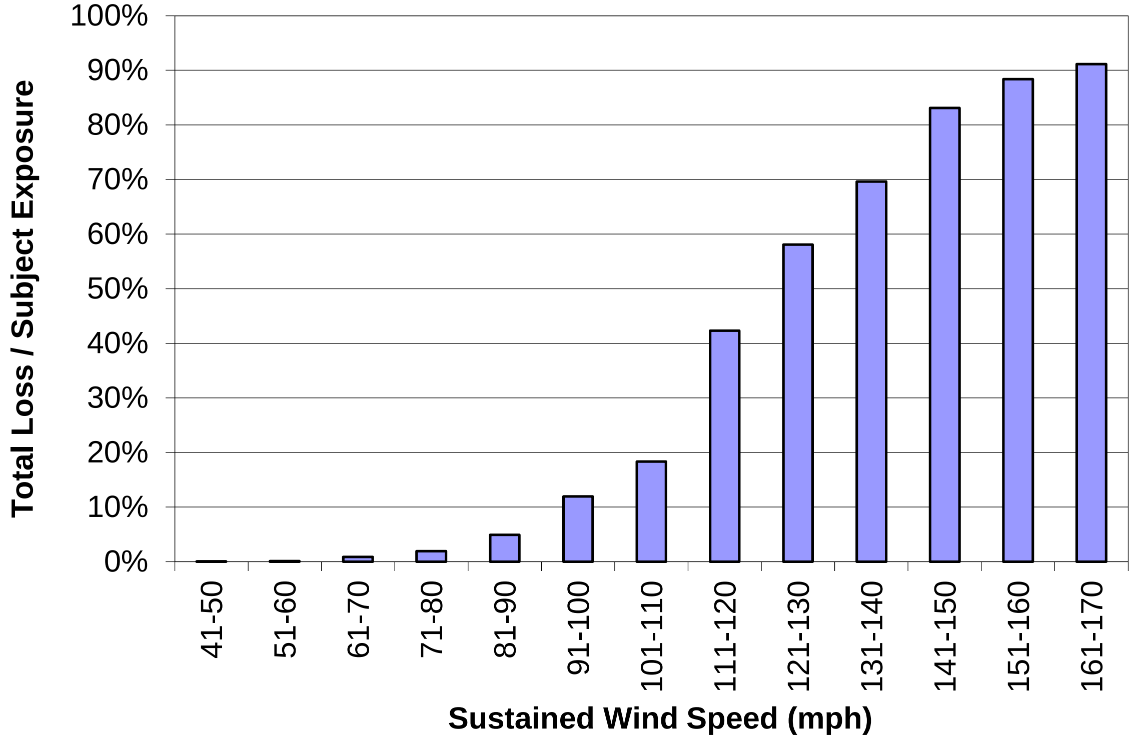


Figure 53. Losses vs. Windspeed for Form V-1, Part A

Form V-2: Mitigation Measures – Range of Changes in Damage

A. Provide the change in the zero deductible personal residential reference building damage rate (not loss cost) for each individual mitigation measure listed in Form V-2, Mitigation Measures, Range of Changes in Damage, as well as for the combination of the four mitigation measures provided for the Mitigated Frame Building and the Mitigated Masonry Building below.

B. If additional assumptions are necessary to complete this form (for example, regarding duration or surface roughness), provide the rationale for the assumptions as well as a detailed description of how they are included.

C. Provide this form in Excel format without truncation. The file name shall include the abbreviated name of the modeling organization, the standards year, and the form name. Also include Form V-2, Mitigation Measures, Range of Changes in Damage, in a submission appendix.

Reference Frame Building	Reference Masonry Building
• One story • Unbraced gable end roof • ASTM D3161 Class F (110 mph) or • ASTM D7158 Class G (120 mph) shingles • ½" plywood deck • 6d nails, deck to roof members • Toe nail truss to wall anchor • Wood framed exterior walls • 5/8" diameter anchors at 48" centers for wall/floor/foundation connections • No shutters • Standard glass windows • No door covers • No skylight covers • Constructed in 1995	• One story • Unbraced gable end roof • ASTM D3161 Class F (110 mph) or • ASTM D7158 Class G (120 mph) shingles • ½" plywood deck • 6d nails, deck to roof members • Weak truss to wall connection • Masonry exterior walls • No vertical wall reinforcing • No shutters • Standard glass windows • No door covers • No skylight covers • Constructed in 1995
Mitigated Frame Building	**Mitigated Masonry Building**
• ASTM D7158 Class H (150 mph) shingles • 8d nails, deck to roof members • Truss straps at roof • Plywood Shutters	• ASTM D7158 Class H (150 mph) shingles • 8d nails, deck to roof members • Truss straps at roof • Plywood Shutters

Reference and mitigated buildings are fully insured building structures with a zero deductible building only policy.

Place the reference building at the population centroid for ZIP Code 33921.

Windspeeds used in the form are one-minute sustained 10 meter windspeeds.

A. The changes in expected ground-up building damage rates for mitigated frame and masonry structures are provided in Form V-2. Winds specified are assumed to be one-minute winds in open terrain.

B. The surface roughness assumed is the ZIP Code average surface roughness used by the model for the specified ZIP Code.

C. Form V-2 is provided in the file named ARA15FormV2.xlsx.

Individual Mitigation Measures			PERCENTAGE CHANGES IN DAMAGE ((REFERENCE DAMAGE RATE - MITIGATED DAMAGE RATE) / REFERENCE DAMAGE RATE) * 100									
			FRAME STRUCTURE					MASONRY STRUCTURE				
			WINDSPEED (MPH)					WINDSPEED (MPH)				
			60	**85**	**110**	**135**	**160**	**60**	**85**	**110**	**135**	**160**
	REFERENCE BUILDING		--	--	--	--	--	--	--	--	--	--
ROOF CONFIGURATION												
	BRACED GABLE ENDS		0%	2%	2%	0%	0%	0%	3%	2%	0%	0%
	HIP ROOF		6%	26%	55%	23%	3%	7%	29%	57%	17%	0%
ROOF COVERING												
	METAL		0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
	ASTM D7158 CLASS H SHINGLES		0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
	MEMBRANE		0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
	NAILING OF DECK	*8d*	0%	15%	9%	3%	0%	0%	17%	11%	2%	0%
ROOF-WALL STRENGTH												
	CLIPS		0%	1%	26%	5%	0%	0%	0%	27%	3%	0%
	STRAPS		0%	1%	31%	9%	0%	0%	0%	32%	5%	0%
WALL- FLOOR STRENGTH												
	TIES OR CLIPS		0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
	STRAPS		0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
WALL-FOUNDATION STRENGTH												
	LARGER ANCHORS OR CLOSER SPACING		0%	0%	0%	0%	0%	-----	-----	-----	-----	-----
	STRAPS		0%	0%	0%	0%	0%	-----	-----	-----	-----	-----
	VERTICAL REINFORCING		-----	-----	-----	-----	-----	0%	0%	0%	0%	0%
OPENING PROTECTION												
	WINDOW SHUTTERS	*STR. WOOD PANELS*	0%	10%	33%	19%	4%	0%	11%	34%	16%	2%
		METAL	0%	10%	33%	19%	4%	0%	11%	34%	16%	2%
		ENGINEERED	0%	14%	46%	26%	6%	0%	15%	47%	23%	1%
	DOOR AND SKYLIGHT COVERS		0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
WINDOW, DOOR, SKYLIGHT STRENGTH	*WINDOWS*	*IMPACT GLASS*	0%	14%	46%	26%	6%	0%	15%	47%	23%	1%
	ENTRY DOORS	*MEETS WIND-BORNE DEBRIS REQUIREMENTS*	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
	GARAGE DOORS	*MEETS WIND-BORNE DEBRIS REQUIREMENTS*	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
	SLIDING GLASS DOORS	*MEETS WIND-BORNE DEBRIS*	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
	SKYLIGHT	IMPACT RATED	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
MITIGATION MEASURES IN COMBINATION			PERCENTAGE CHANGES IN DAMAGE ((REFERENCE DAMAGE RATE - MITIGATED DAMAGE RATE) / REFERENCE DAMAGE RATE) * 100									
			FRAME STRUCTURE					MASONRY STRUCTURE				
			WINDSPEED (MPH)					WINDSPEED (MPH)				
			60	**85**	**110**	**135**	**160**	**60**	**85**	**110**	**135**	**160**
BUILDING	*MITIGATED BUILDING*		0%	23%	63%	62%	33%	0%	25%	65%	60%	26%

Form A-1: Zero Deductible Personal Residential Loss Costs by ZIP Code

A. Provide three maps, color-coded by ZIP Code (with a minimum of six value ranges), displaying zero deductible personal residential loss costs per $1,000 of exposure for frame, masonry, and manufactured home.

B. Create exposure sets for these exhibits by modeling all of the buildings from Notional Set 3 described in the file "Notional Input15.xlsx" geocoded to each ZIP Code centroid in the state, as provided in the model. Provide the predominant County name and the Federal Information Processing Standards (FIPS) Code associated with each ZIP Code centroid. Refer to the Notional Policy Specification below for additional modeling information. Explain any assumptions, deviations, and differences from the prescribed exposure information.

C. Provide, in the format given in the file names "2015FormA1.xlsx," the underlying loss cost data rounded to 3 decimal places used for A. above in both Excel and PDF format. The file name shall include the abbreviated name of the modeling organization, the standards year, and the form name.

Notional Policy Specifications

Policy Type	Assumptions
Owners	**Coverage A = Building** • Replacement Cost included subject to Coverage A limit • Ordinance or Law not included **Coverage B = Appurtenant Structures** • Replacement Cost included subject to Coverage B limit • Ordinance or Law not included **Coverage C = Contents** • Replacement Cost included subject to Coverage C limit **Coverage D = Time Element** • Time Element = 12 months • Per Diem = $150.00/day per policy, if used Loss costs per $1,000 shall be related to the Coverage A limit.
Manufactured Home	**Coverage A = Building** • Replacement Cost included subject to Coverage A limit **Coverage B = Appurtenant Structures** • Replacement Cost included subject to Coverage B limit **Coverage C = Contents** • Replacement Cost included subject to Coverage C limit **Coverage D = Time Element** • Time Element = 12 months • Per Diem = $150.00/day per policy, if used Loss costs per $1,000 shall be related to the Coverage A limit.

A. The required maps are shown in Figure 54 through Figure 56.

B. The loss costs plotted are the total average annual losses summed across the four coverages per $1,000 of Coverage A. The risks are modeled using ZIP Code level location information.

C. The underlying loss cost data, rounded to three decimal places, are provided in ARA15aFormA1_revised_2016-11-14.xlsx.

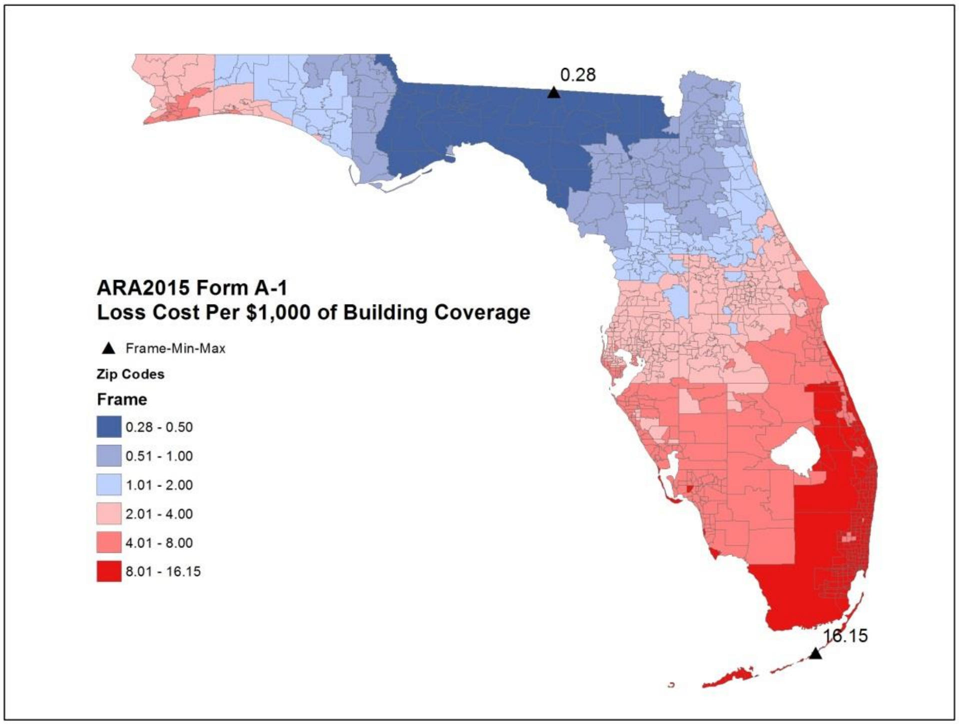


Figure 54. Ground-Up Loss Cost Wood Frame Houses

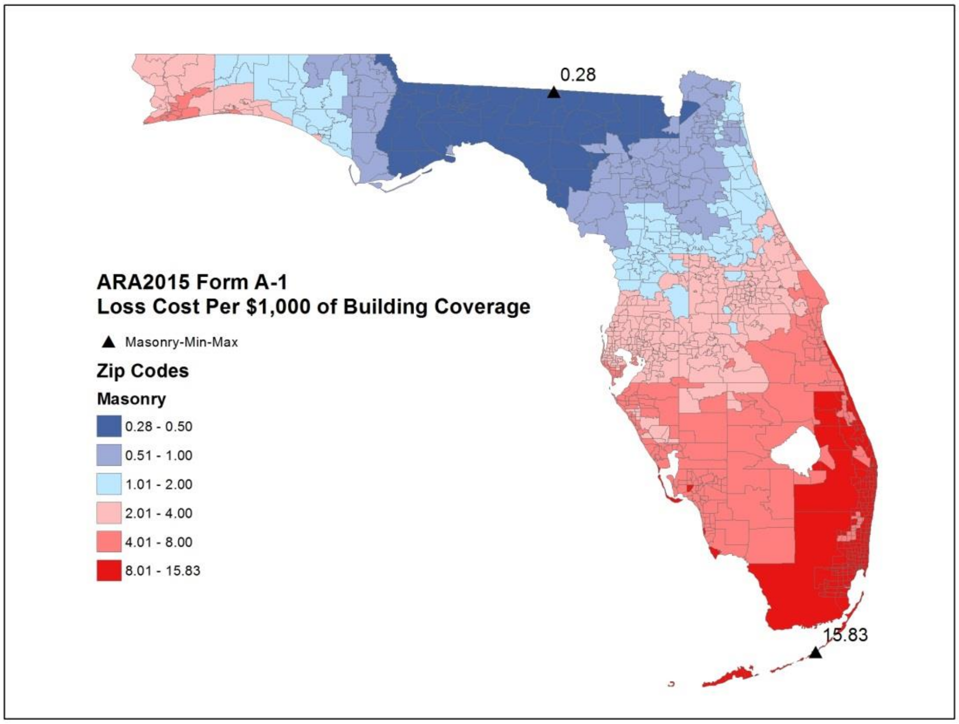


Figure 55. Ground-Up Loss Cost for Masonry Wall Houses

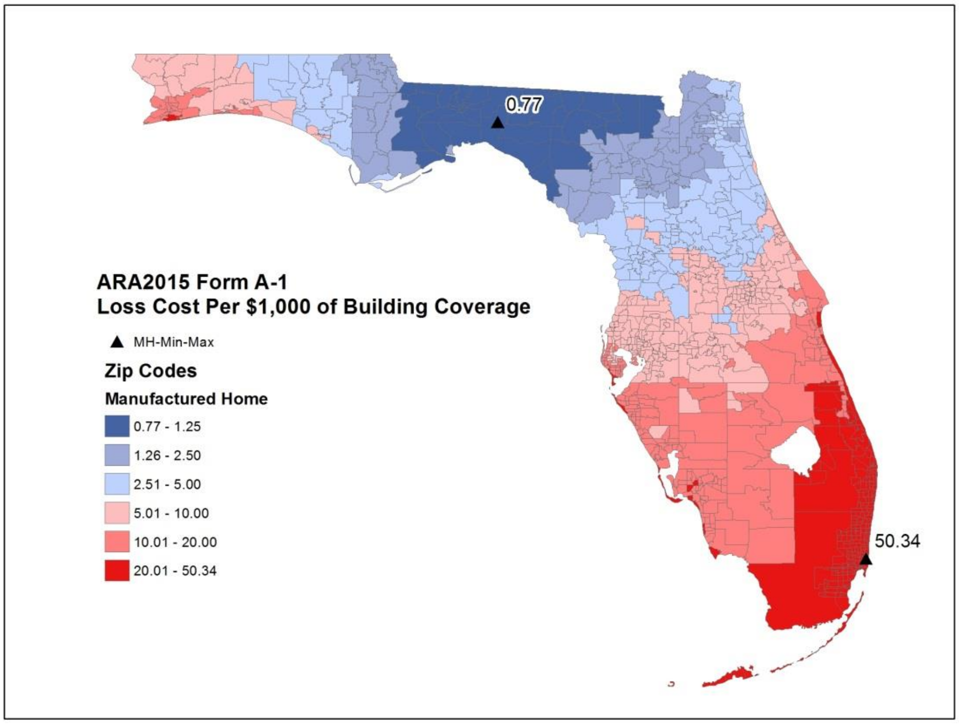


Figure 56. Ground-Up Loss Cost for Manufactured Home

Form A-2: Base Hurricane Storm Set Statewide Loss Costs

A. ***Provide the total insured loss and the dollar contribution to the average annual loss assuming zero deductible policies for individual historical hurricanes using the Florida Hurricane Catastrophe Fund's aggregate personal and commercial residential exposure data found in the file named "hlpm2012c.exe." The list of hurricanes in this form should include all Florida and by-passing hurricanes in the modeling organization Base Hurricane Storm Set, as defined in Standard M-1, Base Hurricane Storm Set.***

B. ***The table below contains the minimum number of hurricanes from HURDAT2 to be included in the Base Hurricane Storm Set, based on the 115-year period 1900-2014. Each hurricane has been assigned an ID number. As defined in Standard M-1, Base Hurricane Storm Set, the Base Hurricane Storm Set for the modeling organization may exclude hurricanes that had zero modeled impact, or it may include additional hurricanes where there is clear justification for the changes. For hurricanes in the table below resulting in zero loss, the table entry should be left blank. Additional hurricanes included in the model's Base Hurricane Storm Set shall be added to the table below in order of year and assigned an intermediate ID number as the hurricane falls within the bounding ID numbers.***

C. ***Provide this form in Excel format. The file name shall include the abbreviated name of the modeling organization, the standards year, and the form name. Also include Form A-2, Base Hurricane Storm Set Statewide Losses, in a submission appendix.***

Note: Total dollar contributions should agree with the total average annual zero deductible statewide loss costs provided in Form S-5 (Average Annual Zero Deductible Statewide Loss Costs – Historical versus Modeled), Part A and Part B for current year.

ID	Landfall/ Closest Approach Date	Year	Name	Personal and Commercial Residential Insured Losses ($)	Dollar Contribution
1	9/6/1900	1900	NoName01-1900	4,286,341	36,951
5	8/15/1901	1901	NoName04-1901	103,564,522	892,798
10	9/11/1903	1903	NoName03-1903	5,936,649,508	51,178,013
15	10/17/1904	1904	NoName04-1904	676,579,396	5,832,581
20	6/17/1906	1906	NoName02-1906	1,183,025,862	10,198,499
25	9/27/1906	1906	NoName06-1906	258,513,392	2,228,564
30	10/18/1906	1906	NoName08-1906	17,699,569,812	152,582,498
35	10/11/1909	1909	NoName11-1909	1,025,658,587	8,841,884
40	10/18/1910	1910	NoName05-1910	9,615,392,374	82,891,314
45	8/11/1911	1911	NoName02-1911	196,512,698	1,694,075
50	9/14/1912	1912	NoName04-1912	97,771,165	842,855
55	8/1/1915	1915	NoName01-1915	126,914,317	1,094,089
60	9/4/1915	1915	NoName04-1915	83,195,414	717,202
65	7/5/1916	1916	NoName02-1916	385,304,826	3,321,593
70	10/18/1916	1916	NoName14-1916	1,432,117,346	12,345,839
75	9/29/1917	1917	NoName04-1917	4,857,185,201	41,872,286
80	9/10/1919	1919	NoName02-1919	465,732,657	4,014,937
85	10/25/1921	1921	TampaBay06-1921	7,854,894,972	67,714,612
90	9/15/1924	1924	NoName05-1924	35,060,721	302,248

ID	Landfall/ Closest Approach Date	Year	Name	Personal and Commercial Residential Insured Losses ($)	Dollar Contribution
95	10/21/1924	1924	NoName10-1924	525,001,390	4,525,874
100	7/28/1926	1926	NoName01-1926	534,802,326	4,610,365
105	9/18/1926	1926	GreatMiami07-1926	93,368,624,377	804,901,934
110	10/21/1926	1926	NoName10-1926	990,967,723	8,542,825
115	8/8/1928	1928	NoName01-1928	5,827,481,206	50,236,907
120	9/17/1928	1928	LakeOkeechobee04-1928	70,417,652,197	607,048,726
125	9/28/1929	1929	NoName02-1929	6,495,169,013	55,992,836
130	9/1/1932	1932	NoName03-1932	422,902,902	3,645,715
135	7/30/1933	1933	NoName05-1933	3,099,884,716	26,723,144
136	9/1/1933	1933	NoName08-1933	4,019,381	34,650
140	9/4/1933	1933	NoName11-1933	12,003,404,858	103,477,628
141	7/23/1934	1934	NoName03-1934	72,876,037	628,242
145	9/3/1935	1935	LaborDay03-1935	22,828,706,010	196,799,190
150	11/4/1935	1935	NoName07-1935	642,172,639	5,535,971
155	7/31/1936	1936	NoName05-1936	1,195,304,692	10,304,351
160	8/11/1939	1939	NoName02-1939	863,158,702	7,441,023
165	10/6/1941	1941	NoName05-1941	26,103,897,185	225,033,596
170	10/19/1944	1944	NoName13-1944	13,916,444,373	119,969,348
175	6/24/1945	1945	NoName01-1945	2,085,655,118	17,979,786
180	9/15/1945	1945	NoName09-1945	14,062,907,958	121,231,965
185	10/8/1946	1946	NoName06-1946	2,746,500,897	23,676,732
190	9/17/1947	1947	NoName04-1947	51,099,122,993	440,509,681
195	10/12/1947	1947	NoName09-1947	1,520,254,211	13,105,640
200	9/22/1948	1948	NoName08-1948	6,252,379,397	53,899,822
205	10/5/1948	1948	NoName09-1948	2,294,682,074	19,781,742
210	8/26/1949	1949	NoName02-1949	26,149,304,969	225,425,043
215	8/31/1950	1950	Baker-1950	130,390,946	1,124,060
220	9/5/1950	1950	Easy-1950	724,672,520	6,247,177
225	10/18/1950	1950	King-1950	10,526,390,967	90,744,750
230	9/26/1953	1953	Florence-1953	147,826,398	1,274,366
235	10/9/1953	1953	Hazel-1953	640,988,485	5,525,763
240	9/25/1956	1956	Flossy-1956	159,804,629	1,377,626
245	9/10/1960	1960	Donna-1960	18,088,457,834	155,934,981
250	8/27/1964	1964	Cleo-1964	6,297,930,124	54,292,501
255	9/10/1964	1964	Dora-1964	5,693,364,438	49,080,728
256	10/3/1964	1964	Hilda-1964	1,425,000	12,284
260	10/14/1964	1964	Isbell-1964	9,711,553,528	83,720,289
265	9/8/1965	1965	Betsy-1965	4,631,153,849	39,923,740
270	6/9/1966	1966	Alma-1966	2,034,620,183	17,539,829
275	10/4/1966	1966	Inez-1966	297,994,948	2,568,922
280	10/19/1968	1968	Gladys-1968	816,236,689	7,036,523
285	6/19/1972	1972	Agnes-1972	24,561,896	211,740
290	9/23/1975	1975	Eloise-1975	733,083,992	6,319,690
295	9/4/1979	1979	David-1979	5,562,289,321	47,950,770
300	9/13/1979	1979	Frederic-1979	188,699,266	1,626,718
305	9/2/1985	1985	Elena-1985	55,528,075	478,690
306	10/31/1985	1985	Juan-1985	48,418,709	417,403

ID	Landfall/ Closest Approach Date	Year	Name	Personal and Commercial Residential Insured Losses ($)	Dollar Contribution
310	11/21/1985	1985	Kate-1985	274,847,067	2,369,371
315	10/12/1987	1987	Floyd-1987	12,793,361	110,288
320	8/24/1992	1992	Andrew-1992	22,933,134,355	197,699,434
325	8/3/1995	1995	Erin-1995	1,261,529,084	10,875,251
330	10/4/1995	1995	Opal-1995	466,747,506	4,023,685
335	7/19/1997	1997	Danny-1997	67,595,195	582,717
340	9/3/1998	1998	Earl-1998	59,138,739	509,817
345	9/25/1998	1998	Georges-1998	313,919,523	2,706,203
346	9/14/1999	1999	Floyd-1999	36,437,085	314,113
350	10/15/1999	1999	Irene-1999	306,551,554	2,642,686
355	8/13/2004	2004	Charley-2004	8,250,743,150	71,127,096
360	9/5/2004	2004	Frances-2004	7,699,468,936	66,374,732
365	9/16/2004	2004	Ivan-2004	1,234,136,429	10,639,107
370	9/26/2004	2004	Jeanne-2004	8,422,193,688	72,605,118
375	7/10/2005	2005	Dennis-2005	583,491,011	5,030,095
380	8/25/2005	2005	Katrina-2005	1,038,216,453	8,950,142
381	9/9/2005	2005	Ophelia-2005	143,679,481	1,238,616
382	9/21/2005	2005	Rita-2005	8,788,221	75,761
385	10/24/2005	2005	Wilma-2005	18,171,108,499	156,647,487
			Total	**555,361,117,589**	**4,787,595,841**

Form A-3: 2004 Hurricane Season Losses

A. Provide the percentage of residential zero deductible losses, rounded to four decimal places, and the monetary contribution from Hurricane Charley (2004), Hurricane Frances (2004), Hurricane Ivan (2004), and Hurricane Jeanne (2004) for each affected ZIP Code, individually and in total. Include all ZIP Codes where losses are equal to or greater than $500,000.

F. Use the 2012 Florida Hurricane Catastrophe Fund's aggregate personal and commercial residential exposure data found in the file named "hlpm2012c.exe."

G. Rather than using directly a specified published windfield, the winds underlying the loss cost calculations must be produced by the model being evaluated and should be the same hurricane parameters as used in completing Form A-2, Base Hurricane Storm Set Statewide Losses.

B. Provide maps color-coded by ZIP Code depicting the percentage of total residential losses from each hurricane, Hurricane Charley (2004), Hurricane Frances (2004), Hurricane Ivan (2004), and Hurricane Jeanne (2004) and for the cumulative losses using the following interval coding:

Red	***Over 5%***
Light Red	***2% to 5%***
Pink	***1% to 2%***
Light Pink	***0.5% to 1%***
Light Blue	***0.2% to 0.5%***
Medium Blue	***0.1% to 0.2%***
Blue	***Below 0.1%***

Plot the relevant storm track on each map.

C. Provide this form in Excel format. The file name should include the abbreviated name of the modeling organization, the standards year, and the form name. Also include Form A-3, 2004 Hurricane Season Losses, in a submission appendix.

The monetary contributions from each 2004 hurricane to each affected ZIP Code with modeled losses of at least $500,000 are given below for the 2012 FHCF exposure data. The data are also provided in the file named ARA15aFormA3_revised_2016-11-14.xlsx.

ZIP	Hurricane Charley		Hurricane Frances		Hurricane Ivan		Hurricane Jeanne		Total	
	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)
32003	-	0.0000%	2,570,435	0.0334%	-	0.0000%	1,989,212	0.0236%	4,559,647	0.0178%
32008	-	0.0000%	547,264	0.0071%	-	0.0000%	208,616	0.0025%	755,879	0.0030%
32009	-	0.0000%	124,447	0.0016%	-	0.0000%	106,912	0.0013%	231,359	0.0009%
32011	-	0.0000%	422,867	0.0055%	-	0.0000%	348,977	0.0041%	771,844	0.0030%
32013	-	0.0000%	2,539	0.0000%	-	0.0000%	1,151	0.0000%	3,690	0.0000%
32024	-	0.0000%	1,774,996	0.0231%	-	0.0000%	1,083,281	0.0129%	2,858,277	0.0112%
32025	-	0.0000%	1,246,607	0.0162%	-	0.0000%	953,690	0.0113%	2,200,297	0.0086%
32033	-	0.0000%	403,034	0.0052%	-	0.0000%	235,022	0.0028%	638,057	0.0025%
32034	-	0.0000%	2,033,308	0.0264%	-	0.0000%	-	0.0000%	2,033,308	0.0079%
32038	-	0.0000%	1,091,232	0.0142%	-	0.0000%	437,579	0.0052%	1,528,811	0.0060%
32040	-	0.0000%	280,642	0.0036%	-	0.0000%	234,101	0.0028%	514,743	0.0020%
32043	-	0.0000%	1,795,532	0.0233%	-	0.0000%	1,339,689	0.0159%	3,135,221	0.0122%
32044	-	0.0000%	128,991	0.0017%	-	0.0000%	86,127	0.0010%	215,117	0.0008%
32046	-	0.0000%	225,808	0.0029%	-	0.0000%	197,325	0.0023%	423,133	0.0017%
32052	-	0.0000%	186,221	0.0024%	-	0.0000%	185,952	0.0022%	372,172	0.0015%
32053	-	0.0000%	110,578	0.0014%	-	0.0000%	90,492	0.0011%	201,070	0.0008%
32054	-	0.0000%	649,162	0.0084%	-	0.0000%	435,081	0.0052%	1,084,243	0.0042%
32055	-	0.0000%	868,293	0.0113%	-	0.0000%	741,365	0.0088%	1,609,657	0.0063%
32058	-	0.0000%	148,106	0.0019%	-	0.0000%	110,225	0.0013%	258,331	0.0010%
32059	-	0.0000%	100,494	0.0013%	-	0.0000%	63,123	0.0007%	163,618	0.0006%
32060	-	0.0000%	1,070,886	0.0139%	-	0.0000%	603,342	0.0072%	1,674,228	0.0065%
32061	-	0.0000%	19,903	0.0003%	-	0.0000%	13,331	0.0002%	33,234	0.0001%
32062	-	0.0000%	201,404	0.0026%	-	0.0000%	86,675	0.0010%	288,079	0.0011%
32063	-	0.0000%	568,802	0.0074%	-	0.0000%	475,408	0.0056%	1,044,210	0.0041%
32064	-	0.0000%	230,364	0.0030%	-	0.0000%	176,320	0.0021%	406,684	0.0016%
32065	-	0.0000%	2,044,431	0.0266%	-	0.0000%	1,681,676	0.0200%	3,726,107	0.0146%
32066	-	0.0000%	318,033	0.0041%	-	0.0000%	134,117	0.0016%	452,150	0.0018%
32068	-	0.0000%	3,091,348	0.0402%	-	0.0000%	2,438,933	0.0290%	5,530,281	0.0216%
32071	-	0.0000%	379,208	0.0049%	-	0.0000%	125,573	0.0015%	504,781	0.0020%
32073	-	0.0000%	2,468,004	0.0321%	-	0.0000%	1,967,338	0.0234%	4,435,342	0.0173%
32080	-	0.0000%	3,391,144	0.0440%	-	0.0000%	1,740,282	0.0207%	5,131,426	0.0200%
32081	-	0.0000%	488,533	0.0063%	-	0.0000%	388,161	0.0046%	876,694	0.0034%

ZIP	Hurricane Charley		Hurricane Frances		Hurricane Ivan		Hurricane Jeanne		Total	
	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)
32082	-	0.0000%	4,298,971	0.0558%	-	0.0000%	3,233,157	0.0384%	7,532,128	0.0294%
32083	-	0.0000%	38,854	0.0005%	-	0.0000%	27,465	0.0003%	66,319	0.0003%
32084	-	0.0000%	1,813,955	0.0236%	-	0.0000%	1,222,913	0.0145%	3,036,867	0.0119%
32086	-	0.0000%	2,128,154	0.0276%	-	0.0000%	1,333,704	0.0158%	3,461,858	0.0135%
32087	-	0.0000%	101,971	0.0013%	-	0.0000%	85,928	0.0010%	187,898	0.0007%
32091	-	0.0000%	883,301	0.0115%	-	0.0000%	631,386	0.0075%	1,514,687	0.0059%
32092	-	0.0000%	2,603,120	0.0338%	-	0.0000%	1,985,627	0.0236%	4,588,746	0.0179%
32094	-	0.0000%	185,606	0.0024%	-	0.0000%	122,103	0.0014%	307,710	0.0012%
32095	-	0.0000%	668,107	0.0087%	-	0.0000%	504,469	0.0060%	1,172,576	0.0046%
32096	-	0.0000%	96,212	0.0012%	-	0.0000%	97,260	0.0012%	193,472	0.0008%
32097	-	0.0000%	537,458	0.0070%	-	0.0000%	-	0.0000%	537,458	0.0021%
32102	-	0.0000%	612,640	0.0080%	-	0.0000%	218,933	0.0026%	831,573	0.0032%
32110	-	0.0000%	526,366	0.0068%	-	0.0000%	209,385	0.0025%	735,751	0.0029%
32112	-	0.0000%	850,149	0.0110%	-	0.0000%	351,291	0.0042%	1,201,440	0.0047%
32113	-	0.0000%	1,020,053	0.0132%	-	0.0000%	510,829	0.0061%	1,530,882	0.0060%
32114	4,101,519	0.0497%	1,940,262	0.0252%	-	0.0000%	738,061	0.0088%	6,779,843	0.0265%
32117	3,459,160	0.0419%	2,303,170	0.0299%	-	0.0000%	857,028	0.0102%	6,619,358	0.0259%
32118	13,960,989	0.1692%	4,489,192	0.0583%	-	0.0000%	1,453,054	0.0173%	19,903,235	0.0777%
32119	10,560,313	0.1280%	3,374,700	0.0438%	-	0.0000%	1,293,818	0.0154%	15,228,831	0.0595%
32124	548,668	0.0066%	693,930	0.0090%	-	0.0000%	340,393	0.0040%	1,582,991	0.0062%
32127	38,790,036	0.4701%	6,649,721	0.0864%	-	0.0000%	2,756,442	0.0327%	48,196,199	0.1882%
32128	14,943,732	0.1811%	4,645,261	0.0603%	-	0.0000%	2,150,698	0.0255%	21,739,692	0.0849%
32129	10,863,532	0.1317%	3,119,686	0.0405%	-	0.0000%	1,235,440	0.0147%	15,218,658	0.0594%
32130	156,519	0.0019%	901,874	0.0117%	-	0.0000%	347,083	0.0041%	1,405,475	0.0055%
32131	-	0.0000%	407,049	0.0053%	-	0.0000%	211,340	0.0025%	618,389	0.0024%
32132	9,537,111	0.1156%	1,393,556	0.0181%	-	0.0000%	805,054	0.0096%	11,735,720	0.0458%
32134	-	0.0000%	1,168,611	0.0152%	-	0.0000%	557,738	0.0066%	1,726,350	0.0067%
32136	602,868	0.0073%	1,402,070	0.0182%	-	0.0000%	611,189	0.0073%	2,616,127	0.0102%
32137	-	0.0000%	6,186,882	0.0804%	-	0.0000%	3,579,698	0.0425%	9,766,579	0.0381%
32139	-	0.0000%	245,615	0.0032%	-	0.0000%	80,788	0.0010%	326,404	0.0013%
32140	-	0.0000%	126,621	0.0016%	-	0.0000%	80,003	0.0009%	206,624	0.0008%
32141	17,095,509	0.2072%	3,253,217	0.0423%	-	0.0000%	2,049,434	0.0243%	22,398,160	0.0875%

ZIP	Hurricane Charley		Hurricane Frances		Hurricane Ivan		Hurricane Jeanne		Total	
	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)
32145	-	0.0000%	223,646	0.0029%	-	0.0000%	112,642	0.0013%	336,288	0.0013%
32148	-	0.0000%	943,576	0.0123%	-	0.0000%	467,734	0.0056%	1,411,309	0.0055%
32159	-	0.0000%	17,120,118	0.2224%	-	0.0000%	11,306,662	0.1342%	28,426,780	0.1110%
32162	-	0.0000%	25,447,955	0.3305%	-	0.0000%	18,918,418	0.2246%	44,366,374	0.1733%
32163	-	0.0000%	801,110	0.0104%	-	0.0000%	650,699	0.0077%	1,451,809	0.0057%
32164	-	0.0000%	4,992,321	0.0648%	-	0.0000%	2,826,784	0.0336%	7,819,106	0.0305%
32168	32,861,937	0.3983%	4,686,972	0.0609%	-	0.0000%	2,442,802	0.0290%	39,991,712	0.1562%
32169	48,611,062	0.5892%	6,419,771	0.0834%	-	0.0000%	3,263,957	0.0388%	58,294,790	0.2277%
32174	7,501,361	0.0909%	9,059,100	0.1177%	-	0.0000%	3,826,703	0.0454%	20,387,164	0.0796%
32176	8,192,697	0.0993%	5,993,864	0.0778%	-	0.0000%	1,681,453	0.0200%	15,868,014	0.0620%
32177	-	0.0000%	1,945,716	0.0253%	-	0.0000%	1,073,168	0.0127%	3,018,884	0.0118%
32179	-	0.0000%	1,673,923	0.0217%	-	0.0000%	866,292	0.0103%	2,540,215	0.0099%
32180	-	0.0000%	470,298	0.0061%	-	0.0000%	181,278	0.0022%	651,576	0.0025%
32181	-	0.0000%	275,529	0.0036%	-	0.0000%	115,966	0.0014%	391,496	0.0015%
32187	-	0.0000%	183,840	0.0024%	-	0.0000%	87,357	0.0010%	271,198	0.0011%
32189	-	0.0000%	496,656	0.0065%	-	0.0000%	200,939	0.0024%	697,595	0.0027%
32190	-	0.0000%	107,906	0.0014%	-	0.0000%	42,050	0.0005%	149,956	0.0006%
32195	-	0.0000%	1,126,993	0.0146%	-	0.0000%	716,390	0.0085%	1,843,384	0.0072%
32202	-	0.0000%	36,926	0.0005%	-	0.0000%	31,505	0.0004%	68,432	0.0003%
32204	-	0.0000%	261,715	0.0034%	-	0.0000%	207,844	0.0025%	469,559	0.0018%
32205	-	0.0000%	1,408,730	0.0183%	-	0.0000%	1,162,509	0.0138%	2,571,239	0.0100%
32206	-	0.0000%	386,243	0.0050%	-	0.0000%	313,728	0.0037%	699,971	0.0027%
32207	-	0.0000%	1,572,021	0.0204%	-	0.0000%	1,270,209	0.0151%	2,842,231	0.0111%
32208	-	0.0000%	867,602	0.0113%	-	0.0000%	705,645	0.0084%	1,573,248	0.0061%
32209	-	0.0000%	640,083	0.0083%	-	0.0000%	521,549	0.0062%	1,161,632	0.0045%
32210	-	0.0000%	2,745,122	0.0357%	-	0.0000%	2,202,705	0.0262%	4,947,827	0.0193%
32211	-	0.0000%	870,073	0.0113%	-	0.0000%	689,514	0.0082%	1,559,587	0.0061%
32212	-	0.0000%	1,327	0.0000%	-	0.0000%	636	0.0000%	1,963	0.0000%
32216	-	0.0000%	1,318,788	0.0171%	-	0.0000%	1,042,341	0.0124%	2,361,129	0.0092%
32217	-	0.0000%	1,045,568	0.0136%	-	0.0000%	823,375	0.0098%	1,868,943	0.0073%
32218	-	0.0000%	1,984,321	0.0258%	-	0.0000%	1,702,052	0.0202%	3,686,373	0.0144%
32219	-	0.0000%	424,813	0.0055%	-	0.0000%	360,268	0.0043%	785,080	0.0031%

ZIP	Hurricane Charley		Hurricane Frances		Hurricane Ivan		Hurricane Jeanne		Total	
	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)
32220	-	0.0000%	534,040	0.0069%	-	0.0000%	448,849	0.0053%	982,889	0.0038%
32221	-	0.0000%	1,405,213	0.0183%	-	0.0000%	1,165,922	0.0138%	2,571,135	0.0100%
32222	-	0.0000%	496,292	0.0064%	-	0.0000%	416,585	0.0049%	912,877	0.0036%
32223	-	0.0000%	2,004,441	0.0260%	-	0.0000%	1,566,937	0.0186%	3,571,377	0.0139%
32224	-	0.0000%	1,975,616	0.0257%	-	0.0000%	1,561,855	0.0185%	3,537,471	0.0138%
32225	-	0.0000%	2,690,145	0.0349%	-	0.0000%	2,128,167	0.0253%	4,818,312	0.0188%
32226	-	0.0000%	812,780	0.0106%	-	0.0000%	632,609	0.0075%	1,445,389	0.0056%
32227	-	0.0000%	1,638	0.0000%	-	0.0000%	1,018	0.0000%	2,656	0.0000%
32233	-	0.0000%	977,313	0.0127%	-	0.0000%	757,804	0.0090%	1,735,116	0.0068%
32234	-	0.0000%	259,192	0.0034%	-	0.0000%	209,766	0.0025%	468,958	0.0018%
32244	-	0.0000%	2,439,415	0.0317%	-	0.0000%	2,016,920	0.0239%	4,456,336	0.0174%
32246	-	0.0000%	1,689,651	0.0219%	-	0.0000%	1,337,443	0.0159%	3,027,094	0.0118%
32250	-	0.0000%	1,422,237	0.0185%	-	0.0000%	1,101,908	0.0131%	2,524,145	0.0099%
32254	-	0.0000%	266,260	0.0035%	-	0.0000%	220,044	0.0026%	486,304	0.0019%
32256	-	0.0000%	1,964,912	0.0255%	-	0.0000%	1,577,789	0.0187%	3,542,701	0.0138%
32257	-	0.0000%	1,914,819	0.0249%	-	0.0000%	1,536,076	0.0182%	3,450,896	0.0135%
32258	-	0.0000%	1,927,674	0.0250%	-	0.0000%	1,575,313	0.0187%	3,502,986	0.0137%
32259	-	0.0000%	3,640,945	0.0473%	-	0.0000%	2,937,305	0.0349%	6,578,250	0.0257%
32266	-	0.0000%	458,543	0.0060%	-	0.0000%	360,748	0.0043%	819,291	0.0032%
32277	-	0.0000%	1,187,125	0.0154%	-	0.0000%	805,594	0.0096%	1,992,718	0.0078%
32301	-	0.0000%	802,390	0.0104%	-	0.0000%	-	0.0000%	802,390	0.0031%
32303	-	0.0000%	1,816,395	0.0236%	-	0.0000%	-	0.0000%	1,816,395	0.0071%
32304	-	0.0000%	437,787	0.0057%	-	0.0000%	-	0.0000%	437,787	0.0017%
32305	-	0.0000%	406,071	0.0053%	-	0.0000%	-	0.0000%	406,071	0.0016%
32308	-	0.0000%	1,247,502	0.0162%	-	0.0000%	-	0.0000%	1,247,502	0.0049%
32309	-	0.0000%	2,114,994	0.0275%	-	0.0000%	-	0.0000%	2,114,994	0.0083%
32310	-	0.0000%	317,959	0.0041%	-	0.0000%	-	0.0000%	317,959	0.0012%
32311	-	0.0000%	1,018,382	0.0132%	-	0.0000%	-	0.0000%	1,018,382	0.0040%
32312	-	0.0000%	2,750,168	0.0357%	-	0.0000%	-	0.0000%	2,750,168	0.0107%
32317	-	0.0000%	903,230	0.0117%	-	0.0000%	-	0.0000%	903,230	0.0035%
32320	-	0.0000%	94,114	0.0012%	98,025	0.0079%	-	0.0000%	192,140	0.0008%
32321	-	0.0000%	71,093	0.0009%	63,892	0.0052%	-	0.0000%	134,985	0.0005%

ZIP	Hurricane Charley		Hurricane Frances		Hurricane Ivan		Hurricane Jeanne		Total	
	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)
32322	-	0.0000%	121,314	0.0016%	-	0.0000%	-	0.0000%	121,314	0.0005%
32324	-	0.0000%	65,168	0.0008%	-	0.0000%	-	0.0000%	65,168	0.0003%
32327	-	0.0000%	941,144	0.0122%	-	0.0000%	-	0.0000%	941,144	0.0037%
32328	-	0.0000%	314,252	0.0041%	266,754	0.0216%	-	0.0000%	581,006	0.0023%
32331	-	0.0000%	117,746	0.0015%	-	0.0000%	67,239	0.0008%	184,985	0.0007%
32332	-	0.0000%	11,437	0.0001%	-	0.0000%	-	0.0000%	11,437	0.0000%
32333	-	0.0000%	482,623	0.0063%	-	0.0000%	-	0.0000%	482,623	0.0019%
32334	-	0.0000%	29,905	0.0004%	-	0.0000%	-	0.0000%	29,905	0.0001%
32336	-	0.0000%	43,367	0.0006%	-	0.0000%	-	0.0000%	43,367	0.0002%
32340	-	0.0000%	366,542	0.0048%	-	0.0000%	249,069	0.0030%	615,611	0.0024%
32344	-	0.0000%	508,574	0.0066%	-	0.0000%	-	0.0000%	508,574	0.0020%
32346	-	0.0000%	173,099	0.0022%	-	0.0000%	-	0.0000%	173,099	0.0007%
32347	-	0.0000%	370,065	0.0048%	-	0.0000%	132,679	0.0016%	502,744	0.0020%
32348	-	0.0000%	372,374	0.0048%	-	0.0000%	-	0.0000%	372,374	0.0015%
32350	-	0.0000%	52,357	0.0007%	-	0.0000%	39,889	0.0005%	92,246	0.0004%
32351	-	0.0000%	350,197	0.0045%	-	0.0000%	-	0.0000%	350,197	0.0014%
32352	-	0.0000%	112,581	0.0015%	-	0.0000%	-	0.0000%	112,581	0.0004%
32356	-	0.0000%	6,564	0.0001%	-	0.0000%	1,958	0.0000%	8,522	0.0000%
32358	-	0.0000%	92,066	0.0012%	-	0.0000%	-	0.0000%	92,066	0.0004%
32359	-	0.0000%	213,427	0.0028%	-	0.0000%	63,167	0.0008%	276,595	0.0011%
32401	-	0.0000%	-	0.0000%	927,838	0.0752%	-	0.0000%	927,838	0.0036%
32403	-	0.0000%	-	0.0000%	57,378	0.0046%	-	0.0000%	57,378	0.0002%
32404	-	0.0000%	-	0.0000%	1,549,179	0.1255%	-	0.0000%	1,549,179	0.0060%
32405	-	0.0000%	-	0.0000%	1,435,510	0.1163%	-	0.0000%	1,435,510	0.0056%
32407	-	0.0000%	-	0.0000%	759,258	0.0615%	-	0.0000%	759,258	0.0030%
32408	-	0.0000%	-	0.0000%	1,842,613	0.1493%	-	0.0000%	1,842,613	0.0072%
32409	-	0.0000%	-	0.0000%	381,754	0.0309%	-	0.0000%	381,754	0.0015%
32413	-	0.0000%	-	0.0000%	2,744,167	0.2224%	-	0.0000%	2,744,167	0.0107%
32420	-	0.0000%	-	0.0000%	76,986	0.0062%	-	0.0000%	76,986	0.0003%
32421	-	0.0000%	-	0.0000%	69,640	0.0056%	-	0.0000%	69,640	0.0003%
32423	-	0.0000%	-	0.0000%	22,928	0.0019%	-	0.0000%	22,928	0.0001%
32424	-	0.0000%	-	0.0000%	111,015	0.0090%	-	0.0000%	111,015	0.0004%

ZIP	Hurricane Charley		Hurricane Frances		Hurricane Ivan		Hurricane Jeanne		Total	
	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)
32425	-	0.0000%	-	0.0000%	359,316	0.0291%	-	0.0000%	359,316	0.0014%
32426	-	0.0000%	-	0.0000%	18,363	0.0015%	-	0.0000%	18,363	0.0001%
32427	-	0.0000%	-	0.0000%	31,389	0.0025%	-	0.0000%	31,389	0.0001%
32428	-	0.0000%	-	0.0000%	534,426	0.0433%	-	0.0000%	534,426	0.0021%
32430	-	0.0000%	-	0.0000%	22,042	0.0018%	-	0.0000%	22,042	0.0001%
32431	-	0.0000%	-	0.0000%	97,890	0.0079%	-	0.0000%	97,890	0.0004%
32433	-	0.0000%	-	0.0000%	1,118,335	0.0906%	-	0.0000%	1,118,335	0.0044%
32435	-	0.0000%	-	0.0000%	447,393	0.0363%	-	0.0000%	447,393	0.0017%
32437	-	0.0000%	-	0.0000%	12,013	0.0010%	-	0.0000%	12,013	0.0000%
32438	-	0.0000%	-	0.0000%	44,843	0.0036%	-	0.0000%	44,843	0.0002%
32439	-	0.0000%	-	0.0000%	885,726	0.0718%	-	0.0000%	885,726	0.0035%
32440	-	0.0000%	-	0.0000%	146,347	0.0119%	-	0.0000%	146,347	0.0006%
32442	-	0.0000%	-	0.0000%	57,062	0.0046%	-	0.0000%	57,062	0.0002%
32443	-	0.0000%	-	0.0000%	50,373	0.0041%	-	0.0000%	50,373	0.0002%
32444	-	0.0000%	-	0.0000%	1,288,748	0.1044%	-	0.0000%	1,288,748	0.0050%
32445	-	0.0000%	-	0.0000%	22,981	0.0019%	-	0.0000%	22,981	0.0001%
32446	-	0.0000%	-	0.0000%	306,682	0.0248%	-	0.0000%	306,682	0.0012%
32448	-	0.0000%	-	0.0000%	153,204	0.0124%	-	0.0000%	153,204	0.0006%
32449	-	0.0000%	-	0.0000%	8,030	0.0007%	-	0.0000%	8,030	0.0000%
32455	-	0.0000%	-	0.0000%	153,493	0.0124%	-	0.0000%	153,493	0.0006%
32456	-	0.0000%	-	0.0000%	522,982	0.0424%	-	0.0000%	522,982	0.0020%
32459	-	0.0000%	-	0.0000%	6,661,023	0.5397%	-	0.0000%	6,661,023	0.0260%
32460	-	0.0000%	62,255	0.0008%	-	0.0000%	-	0.0000%	62,255	0.0002%
32462	-	0.0000%	-	0.0000%	99,399	0.0081%	-	0.0000%	99,399	0.0004%
32464	-	0.0000%	-	0.0000%	136,385	0.0111%	-	0.0000%	136,385	0.0005%
32465	-	0.0000%	-	0.0000%	111,584	0.0090%	-	0.0000%	111,584	0.0004%
32466	-	0.0000%	-	0.0000%	162,626	0.0132%	-	0.0000%	162,626	0.0006%
32501	-	0.0000%	-	0.0000%	25,223,569	2.0438%	-	0.0000%	25,223,569	0.0985%
32502	-	0.0000%	-	0.0000%	8,292,993	0.6720%	-	0.0000%	8,292,993	0.0324%
32503	-	0.0000%	-	0.0000%	82,126,928	6.6546%	-	0.0000%	82,126,928	0.3207%
32504	-	0.0000%	-	0.0000%	65,349,959	5.2952%	-	0.0000%	65,349,959	0.2552%
32505	-	0.0000%	-	0.0000%	42,193,936	3.4189%	-	0.0000%	42,193,936	0.1648%

ZIP	Hurricane Charley		Hurricane Frances		Hurricane Ivan		Hurricane Jeanne		Total	
	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)
32506	-	0.0000%	-	0.0000%	80,066,602	6.4877%	-	0.0000%	80,066,602	0.3127%
32507	-	0.0000%	-	0.0000%	163,192,060	13.2232%	-	0.0000%	163,192,060	0.6373%
32508	-	0.0000%	-	0.0000%	324,511	0.0263%	-	0.0000%	324,511	0.0013%
32509	-	0.0000%	-	0.0000%	38	0.0000%	-	0.0000%	38	0.0000%
32511	-	0.0000%	-	0.0000%	47,894	0.0039%	-	0.0000%	47,894	0.0002%
32514	-	0.0000%	-	0.0000%	83,401,388	6.7579%	-	0.0000%	83,401,388	0.3257%
32526	-	0.0000%	-	0.0000%	87,336,552	7.0767%	-	0.0000%	87,336,552	0.3411%
32531	-	0.0000%	-	0.0000%	2,049,397	0.1661%	-	0.0000%	2,049,397	0.0080%
32533	-	0.0000%	-	0.0000%	66,293,819	5.3717%	-	0.0000%	66,293,819	0.2589%
32534	-	0.0000%	-	0.0000%	27,575,761	2.2344%	-	0.0000%	27,575,761	0.1077%
32535	-	0.0000%	-	0.0000%	4,313,440	0.3495%	-	0.0000%	4,313,440	0.0168%
32536	-	0.0000%	-	0.0000%	6,791,366	0.5503%	-	0.0000%	6,791,366	0.0265%
32539	-	0.0000%	-	0.0000%	6,255,414	0.5069%	-	0.0000%	6,255,414	0.0244%
32541	-	0.0000%	-	0.0000%	16,391,886	1.3282%	-	0.0000%	16,391,886	0.0640%
32542	-	0.0000%	-	0.0000%	18,107	0.0015%	-	0.0000%	18,107	0.0001%
32544	-	0.0000%	-	0.0000%	14,073	0.0011%	-	0.0000%	14,073	0.0001%
32547	-	0.0000%	-	0.0000%	16,264,516	1.3179%	-	0.0000%	16,264,516	0.0635%
32548	-	0.0000%	-	0.0000%	20,003,882	1.6209%	-	0.0000%	20,003,882	0.0781%
32550	-	0.0000%	-	0.0000%	7,388,785	0.5987%	-	0.0000%	7,388,785	0.0289%
32561	-	0.0000%	-	0.0000%	92,586,689	7.5021%	-	0.0000%	92,586,689	0.3616%
32563	-	0.0000%	-	0.0000%	69,233,179	5.6098%	-	0.0000%	69,233,179	0.2704%
32564	-	0.0000%	-	0.0000%	916,626	0.0743%	-	0.0000%	916,626	0.0036%
32565	-	0.0000%	-	0.0000%	6,701,517	0.5430%	-	0.0000%	6,701,517	0.0262%
32566	-	0.0000%	-	0.0000%	48,794,179	3.9537%	-	0.0000%	48,794,179	0.1906%
32567	-	0.0000%	-	0.0000%	538,981	0.0437%	-	0.0000%	538,981	0.0021%
32568	-	0.0000%	-	0.0000%	4,108,783	0.3329%	-	0.0000%	4,108,783	0.0160%
32569	-	0.0000%	-	0.0000%	13,467,287	1.0912%	-	0.0000%	13,467,287	0.0526%
32570	-	0.0000%	-	0.0000%	33,575,203	2.7205%	-	0.0000%	33,575,203	0.1311%
32571	-	0.0000%	-	0.0000%	55,210,707	4.4736%	-	0.0000%	55,210,707	0.2156%
32577	-	0.0000%	-	0.0000%	10,278,998	0.8329%	-	0.0000%	10,278,998	0.0401%
32578	-	0.0000%	-	0.0000%	11,823,684	0.9581%	-	0.0000%	11,823,684	0.0462%
32579	-	0.0000%	-	0.0000%	8,236,793	0.6674%	-	0.0000%	8,236,793	0.0322%

ZIP	Hurricane Charley		Hurricane Frances		Hurricane Ivan		Hurricane Jeanne		Total	
	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)
32580	-	0.0000%	-	0.0000%	1,591,398	0.1289%	-	0.0000%	1,591,398	0.0062%
32583	-	0.0000%	-	0.0000%	42,295,937	3.4272%	-	0.0000%	42,295,937	0.1652%
32601	-	0.0000%	1,314,723	0.0171%	-	0.0000%	762,708	0.0091%	2,077,431	0.0081%
32603	-	0.0000%	343,062	0.0045%	-	0.0000%	192,780	0.0023%	535,843	0.0021%
32605	-	0.0000%	4,455,106	0.0579%	-	0.0000%	2,566,341	0.0305%	7,021,447	0.0274%
32606	-	0.0000%	3,661,206	0.0476%	-	0.0000%	1,944,642	0.0231%	5,605,848	0.0219%
32607	-	0.0000%	3,175,793	0.0412%	-	0.0000%	1,718,583	0.0204%	4,894,376	0.0191%
32608	-	0.0000%	5,858,539	0.0761%	-	0.0000%	2,863,210	0.0340%	8,721,748	0.0341%
32609	-	0.0000%	1,319,571	0.0171%	-	0.0000%	781,412	0.0093%	2,100,983	0.0082%
32615	-	0.0000%	2,603,917	0.0338%	-	0.0000%	1,311,961	0.0156%	3,915,878	0.0153%
32617	-	0.0000%	1,049,969	0.0136%	-	0.0000%	489,742	0.0058%	1,539,710	0.0060%
32618	-	0.0000%	1,235,284	0.0160%	-	0.0000%	396,732	0.0047%	1,632,017	0.0064%
32619	-	0.0000%	566,566	0.0074%	-	0.0000%	154,616	0.0018%	721,182	0.0028%
32621	-	0.0000%	598,415	0.0078%	-	0.0000%	153,180	0.0018%	751,595	0.0029%
32622	-	0.0000%	136,162	0.0018%	-	0.0000%	90,681	0.0011%	226,842	0.0009%
32625	-	0.0000%	289,143	0.0038%	-	0.0000%	91,794	0.0011%	380,936	0.0015%
32626	-	0.0000%	1,027,793	0.0133%	-	0.0000%	272,730	0.0032%	1,300,522	0.0051%
32628	-	0.0000%	228,129	0.0030%	-	0.0000%	76,807	0.0009%	304,936	0.0012%
32631	-	0.0000%	100,853	0.0013%	-	0.0000%	68,895	0.0008%	169,748	0.0007%
32640	-	0.0000%	1,408,918	0.0183%	-	0.0000%	791,784	0.0094%	2,200,702	0.0086%
32641	-	0.0000%	979,349	0.0127%	-	0.0000%	580,569	0.0069%	1,559,919	0.0061%
32643	-	0.0000%	1,698,111	0.0221%	-	0.0000%	752,803	0.0089%	2,450,915	0.0096%
32648	-	0.0000%	46,528	0.0006%	-	0.0000%	15,559	0.0002%	62,087	0.0002%
32653	-	0.0000%	2,670,338	0.0347%	-	0.0000%	1,589,198	0.0189%	4,259,536	0.0166%
32656	-	0.0000%	1,335,780	0.0173%	-	0.0000%	876,059	0.0104%	2,211,839	0.0086%
32666	-	0.0000%	853,611	0.0111%	-	0.0000%	539,791	0.0064%	1,393,402	0.0054%
32667	-	0.0000%	885,830	0.0115%	-	0.0000%	452,048	0.0054%	1,337,878	0.0052%
32668	-	0.0000%	1,577,956	0.0205%	-	0.0000%	523,943	0.0062%	2,101,899	0.0082%
32669	-	0.0000%	2,694,471	0.0350%	-	0.0000%	999,782	0.0119%	3,694,253	0.0144%
32680	-	0.0000%	764,400	0.0099%	-	0.0000%	192,572	0.0023%	956,972	0.0037%
32686	-	0.0000%	1,320,225	0.0171%	-	0.0000%	595,954	0.0071%	1,916,180	0.0075%
32693	-	0.0000%	1,410,731	0.0183%	-	0.0000%	354,537	0.0042%	1,765,268	0.0069%

ZIP	Hurricane Charley		Hurricane Frances		Hurricane Ivan		Hurricane Jeanne		Total	
	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)
32694	-	0.0000%	150,336	0.0020%	-	0.0000%	99,290	0.0012%	249,626	0.0010%
32696	-	0.0000%	2,041,732	0.0265%	-	0.0000%	661,122	0.0078%	2,702,855	0.0106%
32701	6,825,589	0.0827%	4,930,104	0.0640%	-	0.0000%	3,886,544	0.0461%	15,642,237	0.0611%
32702	-	0.0000%	527,275	0.0068%	-	0.0000%	229,604	0.0027%	756,879	0.0030%
32703	5,980,890	0.0725%	15,750,714	0.2046%	-	0.0000%	13,402,707	0.1591%	35,134,311	0.1372%
32707	25,875,749	0.3136%	9,821,367	0.1276%	-	0.0000%	8,150,567	0.0968%	43,847,684	0.1712%
32708	47,598,602	0.5769%	15,250,125	0.1981%	-	0.0000%	12,875,249	0.1529%	75,723,975	0.2957%
32709	908,741	0.0110%	503,628	0.0065%	-	0.0000%	684,415	0.0081%	2,096,784	0.0082%
32712	3,277,520	0.0397%	14,401,557	0.1870%	-	0.0000%	11,381,755	0.1351%	29,060,833	0.1135%
32713	3,831,226	0.0464%	6,798,200	0.0883%	-	0.0000%	3,256,243	0.0387%	13,885,669	0.0542%
32714	7,827,791	0.0949%	8,407,552	0.1092%	-	0.0000%	6,609,816	0.0785%	22,845,159	0.0892%
32720	1,600,348	0.0194%	6,004,274	0.0780%	-	0.0000%	2,583,822	0.0307%	10,188,444	0.0398%
32724	2,861,796	0.0347%	7,027,319	0.0913%	-	0.0000%	2,881,126	0.0342%	12,770,241	0.0499%
32725	14,301,923	0.1733%	12,607,211	0.1637%	-	0.0000%	5,835,830	0.0693%	32,744,963	0.1279%
32726	-	0.0000%	7,254,869	0.0942%	-	0.0000%	4,687,301	0.0557%	11,942,170	0.0466%
32730	2,954,367	0.0358%	1,408,139	0.0183%	-	0.0000%	1,158,180	0.0138%	5,520,686	0.0216%
32732	16,262,409	0.1971%	2,068,207	0.0269%	-	0.0000%	1,387,406	0.0165%	19,718,022	0.0770%
32735	-	0.0000%	2,849,623	0.0370%	-	0.0000%	1,836,480	0.0218%	4,686,102	0.0183%
32736	-	0.0000%	3,828,545	0.0497%	-	0.0000%	1,951,045	0.0232%	5,779,591	0.0226%
32738	18,960,785	0.2298%	9,223,144	0.1198%	-	0.0000%	4,505,152	0.0535%	32,689,081	0.1277%
32744	569,295	0.0069%	671,690	0.0087%	-	0.0000%	301,902	0.0036%	1,542,887	0.0060%
32746	15,919,067	0.1929%	17,478,272	0.2270%	-	0.0000%	10,977,509	0.1303%	44,374,848	0.1733%
32750	8,733,795	0.1059%	8,786,811	0.1141%	-	0.0000%	6,436,610	0.0764%	23,957,216	0.0936%
32751	22,160,878	0.2686%	10,467,743	0.1360%	-	0.0000%	9,180,688	0.1090%	41,809,310	0.1633%
32754	3,220,879	0.0390%	2,039,053	0.0265%	-	0.0000%	2,174,501	0.0258%	7,434,434	0.0290%
32757	-	0.0000%	16,298,729	0.2117%	-	0.0000%	11,171,667	0.1326%	27,470,396	0.1073%
32759	1,463,192	0.0177%	535,770	0.0070%	-	0.0000%	364,818	0.0043%	2,363,780	0.0092%
32763	1,755,262	0.0213%	3,736,628	0.0485%	-	0.0000%	1,724,715	0.0205%	7,216,606	0.0282%
32764	2,800,668	0.0339%	684,772	0.0089%	-	0.0000%	378,480	0.0045%	3,863,921	0.0151%
32765	122,221,694	1.4813%	17,393,981	0.2259%	-	0.0000%	15,518,134	0.1843%	155,133,809	0.6058%
32766	45,333,504	0.5494%	5,412,978	0.0703%	-	0.0000%	4,918,007	0.0584%	55,664,489	0.2174%
32767	-	0.0000%	451,419	0.0059%	-	0.0000%	181,838	0.0022%	633,257	0.0025%

ZIP	Hurricane Charley		Hurricane Frances		Hurricane Ivan		Hurricane Jeanne		Total	
	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)
32771	14,659,091	0.1777%	13,207,116	0.1715%	-	0.0000%	8,002,489	0.0950%	35,868,696	0.1401%
32773	13,332,863	0.1616%	6,687,417	0.0869%	-	0.0000%	4,033,151	0.0479%	24,053,431	0.0939%
32776	511,435	0.0062%	3,838,074	0.0498%	-	0.0000%	2,406,159	0.0286%	6,755,668	0.0264%
32778	-	0.0000%	10,495,482	0.1363%	-	0.0000%	8,044,746	0.0955%	18,540,228	0.0724%
32779	10,078,215	0.1221%	16,649,690	0.2162%	-	0.0000%	12,794,958	0.1519%	39,522,863	0.1543%
32780	5,086,534	0.0616%	11,718,427	0.1522%	-	0.0000%	15,990,961	0.1899%	32,795,922	0.1281%
32784	-	0.0000%	3,233,564	0.0420%	-	0.0000%	1,721,828	0.0204%	4,955,392	0.0194%
32789	54,015,298	0.6547%	19,144,182	0.2486%	-	0.0000%	18,642,689	0.2214%	91,802,169	0.3585%
32792	41,355,218	0.5012%	12,046,282	0.1565%	-	0.0000%	11,853,252	0.1407%	65,254,751	0.2548%
32796	3,194,337	0.0387%	4,112,379	0.0534%	-	0.0000%	5,369,022	0.0637%	12,675,738	0.0495%
32798	77,022	0.0009%	1,527,806	0.0198%	-	0.0000%	1,197,498	0.0142%	2,802,326	0.0109%
32801	8,045,243	0.0975%	2,532,239	0.0329%	-	0.0000%	2,973,388	0.0353%	13,550,870	0.0529%
32803	29,603,997	0.3588%	8,701,854	0.1130%	-	0.0000%	10,226,515	0.1214%	48,532,367	0.1895%
32804	18,421,173	0.2233%	9,489,584	0.1232%	-	0.0000%	10,249,469	0.1217%	38,160,226	0.1490%
32805	8,027,800	0.0973%	3,379,102	0.0439%	-	0.0000%	4,340,910	0.0515%	15,747,812	0.0615%
32806	51,169,632	0.6202%	11,922,849	0.1549%	-	0.0000%	15,131,701	0.1797%	78,224,182	0.3055%
32807	33,069,641	0.4008%	6,197,454	0.0805%	-	0.0000%	7,349,463	0.0873%	46,616,558	0.1820%
32808	8,989,288	0.1090%	7,752,994	0.1007%	-	0.0000%	8,661,868	0.1028%	25,404,149	0.0992%
32809	28,304,250	0.3431%	6,239,448	0.0810%	-	0.0000%	9,328,286	0.1108%	43,871,983	0.1713%
32810	7,619,552	0.0923%	7,345,830	0.0954%	-	0.0000%	6,799,691	0.0807%	21,765,073	0.0850%
32811	5,202,018	0.0630%	3,077,222	0.0400%	-	0.0000%	3,959,360	0.0470%	12,238,600	0.0478%
32812	63,411,000	0.7685%	10,834,728	0.1407%	-	0.0000%	14,920,355	0.1772%	89,166,083	0.3482%
32814	9,250,035	0.1121%	2,321,209	0.0301%	-	0.0000%	2,478,014	0.0294%	14,049,258	0.0549%
32815	671	0.0000%	1,113	0.0000%	-	0.0000%	1,467	0.0000%	3,251	0.0000%
32817	50,059,564	0.6067%	8,678,011	0.1127%	-	0.0000%	8,834,769	0.1049%	67,572,344	0.2639%
32818	7,839,657	0.0950%	10,539,552	0.1369%	-	0.0000%	11,779,965	0.1399%	30,159,174	0.1178%
32819	25,748,477	0.3121%	13,832,434	0.1797%	-	0.0000%	20,893,896	0.2481%	60,474,807	0.2362%
32820	14,020,285	0.1699%	2,174,051	0.0282%	-	0.0000%	2,628,106	0.0312%	18,822,442	0.0735%
32821	11,132,271	0.1349%	3,881,209	0.0504%	-	0.0000%	6,995,639	0.0831%	22,009,119	0.0860%
32822	52,723,181	0.6390%	7,966,680	0.1035%	-	0.0000%	10,900,141	0.1294%	71,590,001	0.2796%
32824	77,205,104	0.9357%	10,265,461	0.1333%	-	0.0000%	19,289,104	0.2290%	106,759,669	0.4169%
32825	112,628,955	1.3651%	13,974,063	0.1815%	-	0.0000%	16,847,439	0.2000%	143,450,457	0.5602%

ZIP	Hurricane Charley		Hurricane Frances		Hurricane Ivan		Hurricane Jeanne		Total	
	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)
32826	45,610,519	0.5528%	4,557,230	0.0592%	-	0.0000%	4,860,755	0.0577%	55,028,504	0.2149%
32827	47,641,498	0.5774%	3,908,374	0.0508%	-	0.0000%	6,499,072	0.0772%	58,048,944	0.2267%
32828	145,339,134	1.7615%	15,800,751	0.2052%	-	0.0000%	19,883,803	0.2361%	181,023,689	0.7069%
32829	49,618,808	0.6014%	4,446,407	0.0577%	-	0.0000%	6,305,133	0.0749%	60,370,347	0.2358%
32830	9,715	0.0001%	8,548	0.0001%	-	0.0000%	14,743	0.0002%	33,006	0.0001%
32831	41,882	0.0005%	11,208	0.0001%	-	0.0000%	16,104	0.0002%	69,194	0.0003%
32832	38,826,132	0.4706%	5,570,674	0.0724%	-	0.0000%	9,526,572	0.1131%	53,923,378	0.2106%
32833	9,008,879	0.1092%	2,776,974	0.0361%	-	0.0000%	3,770,129	0.0448%	15,555,982	0.0608%
32834	-	0.0000%	-	0.0000%	-	0.0000%	-	0.0000%	-	0.0000%
32835	13,926,154	0.1688%	10,847,103	0.1409%	-	0.0000%	14,364,108	0.1706%	39,137,364	0.1528%
32836	21,527,863	0.2609%	11,159,089	0.1449%	-	0.0000%	19,323,253	0.2294%	52,010,206	0.2031%
32837	70,018,449	0.8486%	15,007,365	0.1949%	-	0.0000%	28,767,627	0.3416%	113,793,441	0.4444%
32839	18,027,227	0.2185%	4,864,527	0.0632%	-	0.0000%	7,232,170	0.0859%	30,123,925	0.1176%
32901	483,405	0.0059%	17,990,365	0.2337%	-	0.0000%	36,802,952	0.4370%	55,276,722	0.2159%
32903	648,010	0.0079%	36,198,843	0.4701%	-	0.0000%	63,998,762	0.7599%	100,845,615	0.3938%
32904	1,088,777	0.0132%	28,553,008	0.3708%	-	0.0000%	57,956,524	0.6881%	87,598,309	0.3421%
32905	470,322	0.0057%	22,126,463	0.2874%	-	0.0000%	41,956,617	0.4982%	64,553,403	0.2521%
32907	1,459,033	0.0177%	48,264,479	0.6269%	-	0.0000%	100,735,345	1.1961%	150,458,857	0.5876%
32908	401,977	0.0049%	15,148,045	0.1967%	-	0.0000%	31,730,201	0.3767%	47,280,224	0.1846%
32909	1,045,637	0.0127%	37,345,667	0.4850%	-	0.0000%	71,035,116	0.8434%	109,426,420	0.4273%
32920	450,101	0.0055%	6,878,016	0.0893%	-	0.0000%	11,169,225	0.1326%	18,497,342	0.0722%
32922	412,188	0.0050%	3,481,287	0.0452%	-	0.0000%	6,310,841	0.0749%	10,204,316	0.0399%
32925	287	0.0000%	13,275	0.0002%	-	0.0000%	23,353	0.0003%	36,915	0.0001%
32926	1,481,472	0.0180%	8,740,114	0.1135%	-	0.0000%	14,906,299	0.1770%	25,127,885	0.0981%
32927	2,173,236	0.0263%	8,784,699	0.1141%	-	0.0000%	13,612,830	0.1616%	24,570,765	0.0960%
32931	805,661	0.0098%	17,203,430	0.2234%	-	0.0000%	29,076,973	0.3452%	47,086,064	0.1839%
32934	918,654	0.0111%	19,253,658	0.2501%	-	0.0000%	39,446,165	0.4684%	59,618,477	0.2328%
32935	1,165,995	0.0141%	39,941,087	0.5188%	-	0.0000%	74,818,487	0.8883%	115,925,569	0.4527%
32937	1,213,488	0.0147%	37,743,055	0.4902%	-	0.0000%	69,476,913	0.8249%	108,433,456	0.4235%
32940	2,431,465	0.0295%	37,613,221	0.4885%	-	0.0000%	75,936,418	0.9016%	115,981,104	0.4529%
32948	-	0.0000%	6,499,152	0.0844%	-	0.0000%	10,168,927	0.1207%	16,668,080	0.0651%
32949	-	0.0000%	5,238,248	0.0680%	-	0.0000%	8,713,418	0.1035%	13,951,666	0.0545%

ZIP	Hurricane Charley		Hurricane Frances		Hurricane Ivan		Hurricane Jeanne		Total	
	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)
32950	151,368	0.0018%	7,658,114	0.0995%	-	0.0000%	13,423,110	0.1594%	21,232,592	0.0829%
32951	473,084	0.0057%	42,790,563	0.5558%	-	0.0000%	71,324,764	0.8469%	114,588,412	0.4475%
32952	1,842,927	0.0223%	30,118,760	0.3912%	-	0.0000%	52,593,382	0.6245%	84,555,069	0.3302%
32953	1,576,800	0.0191%	13,709,200	0.1781%	-	0.0000%	23,833,387	0.2830%	39,119,387	0.1528%
32955	2,333,643	0.0283%	31,972,581	0.4153%	-	0.0000%	61,483,197	0.7300%	95,789,420	0.3741%
32958	-	0.0000%	75,620,596	0.9822%	-	0.0000%	113,729,208	1.3504%	189,349,804	0.7395%
32960	-	0.0000%	40,643,089	0.5279%	-	0.0000%	66,573,135	0.7904%	107,216,224	0.4187%
32962	-	0.0000%	50,835,518	0.6602%	-	0.0000%	81,006,902	0.9618%	131,842,420	0.5149%
32963	-	0.0000%	204,040,614	2.6501%	-	0.0000%	320,047,383	3.8000%	524,087,997	2.0467%
32966	-	0.0000%	54,238,743	0.7044%	-	0.0000%	82,186,790	0.9758%	136,425,533	0.5328%
32967	-	0.0000%	70,818,410	0.9198%	-	0.0000%	107,458,772	1.2759%	178,277,182	0.6962%
32968	-	0.0000%	56,118,645	0.7289%	-	0.0000%	82,720,997	0.9822%	138,839,642	0.5422%
32976	-	0.0000%	20,800,996	0.2702%	-	0.0000%	32,077,742	0.3809%	52,878,738	0.2065%
33001	-	0.0000%	-	0.0000%	-	0.0000%	-	0.0000%	-	0.0000%
33004	-	0.0000%	2,608,194	0.0339%	-	0.0000%	711,704	0.0085%	3,319,898	0.0130%
33009	-	0.0000%	3,979,825	0.0517%	-	0.0000%	1,151,798	0.0137%	5,131,623	0.0200%
33010	-	0.0000%	1,165,206	0.0151%	-	0.0000%	541,522	0.0064%	1,706,729	0.0067%
33012	-	0.0000%	2,517,987	0.0327%	-	0.0000%	1,105,722	0.0131%	3,623,709	0.0142%
33013	-	0.0000%	1,514,248	0.0197%	-	0.0000%	672,939	0.0080%	2,187,187	0.0085%
33014	-	0.0000%	2,508,288	0.0326%	-	0.0000%	1,027,771	0.0122%	3,536,059	0.0138%
33015	-	0.0000%	4,782,653	0.0621%	-	0.0000%	1,830,759	0.0217%	6,613,413	0.0258%
33016	-	0.0000%	1,835,763	0.0238%	-	0.0000%	856,566	0.0102%	2,692,329	0.0105%
33018	-	0.0000%	3,009,726	0.0391%	-	0.0000%	1,289,526	0.0153%	4,299,252	0.0168%
33019	-	0.0000%	4,778,250	0.0621%	-	0.0000%	1,342,907	0.0159%	6,121,157	0.0239%
33020	-	0.0000%	4,910,028	0.0638%	-	0.0000%	1,422,521	0.0169%	6,332,549	0.0247%
33021	-	0.0000%	9,960,995	0.1294%	-	0.0000%	2,976,990	0.0353%	12,937,985	0.0505%
33023	-	0.0000%	8,780,234	0.1140%	-	0.0000%	2,815,272	0.0334%	11,595,506	0.0453%
33024	-	0.0000%	11,567,189	0.1502%	-	0.0000%	3,689,854	0.0438%	15,257,043	0.0596%
33025	-	0.0000%	6,302,653	0.0819%	-	0.0000%	2,206,600	0.0262%	8,509,254	0.0332%
33026	-	0.0000%	6,730,294	0.0874%	-	0.0000%	2,304,955	0.0274%	9,035,249	0.0353%
33027	-	0.0000%	10,013,999	0.1301%	-	0.0000%	4,063,445	0.0482%	14,077,444	0.0550%
33028	-	0.0000%	6,396,211	0.0831%	-	0.0000%	2,356,408	0.0280%	8,752,619	0.0342%

ZIP	Hurricane Charley		Hurricane Frances		Hurricane Ivan		Hurricane Jeanne		Total	
	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)
33029	-	0.0000%	13,695,160	0.1779%	-	0.0000%	4,674,657	0.0555%	18,369,817	0.0717%
33030	-	0.0000%	561,553	0.0073%	-	0.0000%	-	0.0000%	561,553	0.0022%
33031	-	0.0000%	354,352	0.0046%	-	0.0000%	-	0.0000%	354,352	0.0014%
33032	-	0.0000%	958,278	0.0124%	-	0.0000%	-	0.0000%	958,278	0.0037%
33033	-	0.0000%	1,085,152	0.0141%	-	0.0000%	-	0.0000%	1,085,152	0.0042%
33034	-	0.0000%	181,473	0.0024%	-	0.0000%	-	0.0000%	181,473	0.0007%
33035	-	0.0000%	267,870	0.0035%	-	0.0000%	-	0.0000%	267,870	0.0010%
33036	-	0.0000%	-	0.0000%	-	0.0000%	-	0.0000%	-	0.0000%
33037	-	0.0000%	-	0.0000%	-	0.0000%	-	0.0000%	-	0.0000%
33039	-	0.0000%	2,029	0.0000%	-	0.0000%	-	0.0000%	2,029	0.0000%
33040	-	0.0000%	-	0.0000%	-	0.0000%	-	0.0000%	-	0.0000%
33042	-	0.0000%	-	0.0000%	-	0.0000%	-	0.0000%	-	0.0000%
33043	-	0.0000%	-	0.0000%	-	0.0000%	-	0.0000%	-	0.0000%
33050	-	0.0000%	-	0.0000%	-	0.0000%	-	0.0000%	-	0.0000%
33051	-	0.0000%	-	0.0000%	-	0.0000%	-	0.0000%	-	0.0000%
33054	-	0.0000%	1,415,408	0.0184%	-	0.0000%	526,998	0.0063%	1,942,406	0.0076%
33055	-	0.0000%	3,809,768	0.0495%	-	0.0000%	1,312,902	0.0156%	5,122,670	0.0200%
33056	-	0.0000%	3,225,145	0.0419%	-	0.0000%	1,106,042	0.0131%	4,331,187	0.0169%
33060	-	0.0000%	12,754,592	0.1657%	-	0.0000%	4,072,878	0.0484%	16,827,469	0.0657%
33062	-	0.0000%	17,917,375	0.2327%	-	0.0000%	5,079,850	0.0603%	22,997,225	0.0898%
33063	-	0.0000%	24,313,398	0.3158%	-	0.0000%	8,251,084	0.0980%	32,564,481	0.1272%
33064	-	0.0000%	34,263,237	0.4450%	-	0.0000%	12,075,419	0.1434%	46,338,656	0.1810%
33065	-	0.0000%	25,078,312	0.3257%	-	0.0000%	9,165,090	0.1088%	34,243,402	0.1337%
33066	-	0.0000%	7,731,206	0.1004%	-	0.0000%	2,589,166	0.0307%	10,320,372	0.0403%
33067	-	0.0000%	35,724,571	0.4640%	-	0.0000%	13,158,673	0.1562%	48,883,245	0.1909%
33068	-	0.0000%	15,347,472	0.1993%	-	0.0000%	5,346,688	0.0635%	20,694,160	0.0808%
33069	-	0.0000%	6,462,199	0.0839%	-	0.0000%	1,948,577	0.0231%	8,410,776	0.0328%
33070	-	0.0000%	-	0.0000%	-	0.0000%	-	0.0000%	-	0.0000%
33071	-	0.0000%	28,401,381	0.3689%	-	0.0000%	10,020,607	0.1190%	38,421,988	0.1500%
33073	-	0.0000%	22,229,704	0.2887%	-	0.0000%	8,006,253	0.0951%	30,235,958	0.1181%
33076	-	0.0000%	44,298,326	0.5753%	-	0.0000%	15,734,984	0.1868%	60,033,309	0.2344%
33109	-	0.0000%	420,898	0.0055%	-	0.0000%	153,578	0.0018%	574,476	0.0022%

ZIP	Hurricane Charley		Hurricane Frances		Hurricane Ivan		Hurricane Jeanne		Total	
	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)
33122	-	0.0000%	2,897	0.0000%	-	0.0000%	1,255	0.0000%	4,153	0.0000%
33125	-	0.0000%	1,083,652	0.0141%	-	0.0000%	549,359	0.0065%	1,633,011	0.0064%
33126	-	0.0000%	804,315	0.0104%	-	0.0000%	436,921	0.0052%	1,241,236	0.0048%
33127	-	0.0000%	757,114	0.0098%	-	0.0000%	343,315	0.0041%	1,100,429	0.0043%
33128	-	0.0000%	51,416	0.0007%	-	0.0000%	26,095	0.0003%	77,511	0.0003%
33129	-	0.0000%	639,598	0.0083%	-	0.0000%	381,826	0.0045%	1,021,424	0.0040%
33130	-	0.0000%	242,468	0.0031%	-	0.0000%	149,728	0.0018%	392,197	0.0015%
33131	-	0.0000%	324,631	0.0042%	-	0.0000%	288,802	0.0034%	613,432	0.0024%
33132	-	0.0000%	173,684	0.0023%	-	0.0000%	133,666	0.0016%	307,350	0.0012%
33133	-	0.0000%	2,480,931	0.0322%	-	0.0000%	1,380,397	0.0164%	3,861,328	0.0151%
33134	-	0.0000%	2,453,597	0.0319%	-	0.0000%	1,367,366	0.0162%	3,820,963	0.0149%
33135	-	0.0000%	659,997	0.0086%	-	0.0000%	341,283	0.0041%	1,001,281	0.0039%
33136	-	0.0000%	125,049	0.0016%	-	0.0000%	63,991	0.0008%	189,040	0.0007%
33137	-	0.0000%	1,050,361	0.0136%	-	0.0000%	417,074	0.0050%	1,467,436	0.0057%
33138	-	0.0000%	2,382,740	0.0309%	-	0.0000%	919,904	0.0109%	3,302,645	0.0129%
33139	-	0.0000%	3,170,312	0.0412%	-	0.0000%	1,045,226	0.0124%	4,215,538	0.0165%
33140	-	0.0000%	5,613,094	0.0729%	-	0.0000%	1,566,234	0.0186%	7,179,328	0.0280%
33141	-	0.0000%	3,901,152	0.0507%	-	0.0000%	1,022,533	0.0121%	4,923,685	0.0192%
33142	-	0.0000%	1,331,286	0.0173%	-	0.0000%	606,526	0.0072%	1,937,812	0.0076%
33143	-	0.0000%	2,757,482	0.0358%	-	0.0000%	1,678,195	0.0199%	4,435,677	0.0173%
33144	-	0.0000%	904,767	0.0118%	-	0.0000%	501,830	0.0060%	1,406,597	0.0055%
33145	-	0.0000%	1,152,772	0.0150%	-	0.0000%	623,402	0.0074%	1,776,174	0.0069%
33146	-	0.0000%	1,253,043	0.0163%	-	0.0000%	745,514	0.0089%	1,998,557	0.0078%
33147	-	0.0000%	1,749,972	0.0227%	-	0.0000%	745,786	0.0089%	2,495,758	0.0097%
33149	-	0.0000%	1,358,093	0.0176%	-	0.0000%	731,551	0.0087%	2,089,644	0.0082%
33150	-	0.0000%	1,014,022	0.0132%	-	0.0000%	420,776	0.0050%	1,434,798	0.0056%
33154	-	0.0000%	4,165,520	0.0541%	-	0.0000%	1,160,173	0.0138%	5,325,693	0.0208%
33155	-	0.0000%	2,147,896	0.0279%	-	0.0000%	1,207,620	0.0143%	3,355,516	0.0131%
33156	-	0.0000%	4,261,144	0.0553%	-	0.0000%	2,737,972	0.0325%	6,999,116	0.0273%
33157	-	0.0000%	2,928,524	0.0380%	-	0.0000%	1,780,766	0.0211%	4,709,290	0.0184%
33158	-	0.0000%	666,691	0.0087%	-	0.0000%	434,034	0.0052%	1,100,725	0.0043%
33160	-	0.0000%	3,967,049	0.0515%	-	0.0000%	1,235,824	0.0147%	5,202,873	0.0203%

ZIP	Hurricane Charley Personal & Commercial Residential Monetary Contribution ($)	Hurricane Charley Percent of Losses (%)	Hurricane Frances Personal & Commercial Residential Monetary Contribution ($)	Hurricane Frances Percent of Losses (%)	Hurricane Ivan Personal & Commercial Residential Monetary Contribution ($)	Hurricane Ivan Percent of Losses (%)	Hurricane Jeanne Personal & Commercial Residential Monetary Contribution ($)	Hurricane Jeanne Percent of Losses (%)	Total Personal & Commercial Residential Monetary Contribution ($)	Total Percent of Losses (%)
33161	-	0.0000%	2,850,465	0.0370%	-	0.0000%	1,046,912	0.0124%	3,897,377	0.0152%
33162	-	0.0000%	3,337,418	0.0433%	-	0.0000%	1,116,402	0.0133%	4,453,820	0.0174%
33165	-	0.0000%	2,455,464	0.0319%	-	0.0000%	1,421,194	0.0169%	3,876,658	0.0151%
33166	-	0.0000%	1,117,700	0.0145%	-	0.0000%	541,679	0.0064%	1,659,379	0.0065%
33167	-	0.0000%	1,083,078	0.0141%	-	0.0000%	417,403	0.0050%	1,500,482	0.0059%
33168	-	0.0000%	1,661,954	0.0216%	-	0.0000%	620,944	0.0074%	2,282,898	0.0089%
33169	-	0.0000%	3,598,906	0.0467%	-	0.0000%	1,220,070	0.0145%	4,818,976	0.0188%
33170	-	0.0000%	368,369	0.0048%	-	0.0000%	-	0.0000%	368,369	0.0014%
33172	-	0.0000%	497,905	0.0065%	-	0.0000%	281,768	0.0033%	779,674	0.0030%
33173	-	0.0000%	1,523,848	0.0198%	-	0.0000%	938,546	0.0111%	2,462,394	0.0096%
33174	-	0.0000%	945,040	0.0123%	-	0.0000%	524,631	0.0062%	1,469,671	0.0057%
33175	-	0.0000%	2,512,950	0.0326%	-	0.0000%	1,508,082	0.0179%	4,021,032	0.0157%
33176	-	0.0000%	2,815,282	0.0366%	-	0.0000%	1,803,012	0.0214%	4,618,293	0.0180%
33177	-	0.0000%	1,731,087	0.0225%	-	0.0000%	1,058,664	0.0126%	2,789,752	0.0109%
33178	-	0.0000%	2,705,063	0.0351%	-	0.0000%	1,349,565	0.0160%	4,054,628	0.0158%
33179	-	0.0000%	4,471,867	0.0581%	-	0.0000%	1,443,287	0.0171%	5,915,155	0.0231%
33180	-	0.0000%	3,327,003	0.0432%	-	0.0000%	1,060,088	0.0126%	4,387,091	0.0171%
33181	-	0.0000%	1,412,694	0.0183%	-	0.0000%	481,916	0.0057%	1,894,610	0.0074%
33182	-	0.0000%	963,176	0.0125%	-	0.0000%	498,746	0.0059%	1,461,922	0.0057%
33183	-	0.0000%	1,193,793	0.0155%	-	0.0000%	746,358	0.0089%	1,940,151	0.0076%
33184	-	0.0000%	892,883	0.0116%	-	0.0000%	528,376	0.0063%	1,421,258	0.0056%
33185	-	0.0000%	1,609,747	0.0209%	-	0.0000%	1,030,336	0.0122%	2,640,083	0.0103%
33186	-	0.0000%	2,825,745	0.0367%	-	0.0000%	1,811,406	0.0215%	4,637,152	0.0181%
33187	-	0.0000%	828,561	0.0108%	-	0.0000%	448,985	0.0053%	1,277,547	0.0050%
33189	-	0.0000%	826,385	0.0107%	-	0.0000%	-	0.0000%	826,385	0.0032%
33190	-	0.0000%	324,607	0.0042%	-	0.0000%	-	0.0000%	324,607	0.0013%
33191	-	0.0000%	-	0.0000%	-	0.0000%	-	0.0000%	-	0.0000%
33193	-	0.0000%	1,580,326	0.0205%	-	0.0000%	954,343	0.0113%	2,534,669	0.0099%
33194	-	0.0000%	323,352	0.0042%	-	0.0000%	198,260	0.0024%	521,611	0.0020%
33196	-	0.0000%	2,050,637	0.0266%	-	0.0000%	1,192,433	0.0142%	3,243,070	0.0127%
33199	-	0.0000%	-	0.0000%	-	0.0000%	-	0.0000%	-	0.0000%
33301	-	0.0000%	10,506,035	0.1365%	-	0.0000%	2,744,358	0.0326%	13,250,393	0.0517%

ZIP	Hurricane Charley		Hurricane Frances		Hurricane Ivan		Hurricane Jeanne		Total	
	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)
33304	-	0.0000%	7,045,882	0.0915%	-	0.0000%	1,851,386	0.0220%	8,897,268	0.0347%
33305	-	0.0000%	7,041,138	0.0914%	-	0.0000%	1,970,368	0.0234%	9,011,506	0.0352%
33306	-	0.0000%	2,259,341	0.0293%	-	0.0000%	678,125	0.0081%	2,937,465	0.0115%
33308	-	0.0000%	18,793,909	0.2441%	-	0.0000%	5,615,049	0.0667%	24,408,957	0.0953%
33309	-	0.0000%	11,510,734	0.1495%	-	0.0000%	3,659,782	0.0435%	15,170,515	0.0592%
33311	-	0.0000%	12,090,367	0.1570%	-	0.0000%	3,423,280	0.0406%	15,513,646	0.0606%
33312	-	0.0000%	13,459,816	0.1748%	-	0.0000%	3,805,469	0.0452%	17,265,285	0.0674%
33313	-	0.0000%	9,441,938	0.1226%	-	0.0000%	2,836,355	0.0337%	12,278,294	0.0479%
33314	-	0.0000%	3,376,850	0.0439%	-	0.0000%	994,498	0.0118%	4,371,348	0.0171%
33315	-	0.0000%	3,985,016	0.0518%	-	0.0000%	1,106,709	0.0131%	5,091,725	0.0199%
33316	-	0.0000%	8,201,972	0.1065%	-	0.0000%	2,050,105	0.0243%	10,252,077	0.0400%
33317	-	0.0000%	13,270,205	0.1724%	-	0.0000%	4,039,016	0.0480%	17,309,221	0.0676%
33319	-	0.0000%	13,438,826	0.1745%	-	0.0000%	4,309,498	0.0512%	17,748,324	0.0693%
33321	-	0.0000%	20,483,945	0.2660%	-	0.0000%	7,171,287	0.0851%	27,655,232	0.1080%
33322	-	0.0000%	14,354,720	0.1864%	-	0.0000%	4,524,615	0.0537%	18,879,335	0.0737%
33323	-	0.0000%	10,080,563	0.1309%	-	0.0000%	3,171,262	0.0377%	13,251,825	0.0518%
33324	-	0.0000%	13,179,590	0.1712%	-	0.0000%	4,248,483	0.0504%	17,428,073	0.0681%
33325	-	0.0000%	9,976,048	0.1296%	-	0.0000%	3,250,453	0.0386%	13,226,501	0.0517%
33326	-	0.0000%	11,307,273	0.1469%	-	0.0000%	3,766,941	0.0447%	15,074,215	0.0589%
33327	-	0.0000%	15,365,214	0.1996%	-	0.0000%	4,584,716	0.0544%	19,949,931	0.0779%
33328	-	0.0000%	10,482,032	0.1361%	-	0.0000%	3,304,230	0.0392%	13,786,262	0.0538%
33330	-	0.0000%	6,585,534	0.0855%	-	0.0000%	2,338,536	0.0278%	8,924,069	0.0349%
33331	-	0.0000%	7,862,425	0.1021%	-	0.0000%	2,987,815	0.0355%	10,850,240	0.0424%
33332	-	0.0000%	4,768,082	0.0619%	-	0.0000%	1,662,224	0.0197%	6,430,306	0.0251%
33334	-	0.0000%	10,576,825	0.1374%	-	0.0000%	3,355,387	0.0398%	13,932,212	0.0544%
33351	-	0.0000%	10,018,198	0.1301%	-	0.0000%	3,271,321	0.0388%	13,289,519	0.0519%
33388	-	0.0000%	-	0.0000%	-	0.0000%	-	0.0000%	-	0.0000%
33401	-	0.0000%	23,040,776	0.2993%	-	0.0000%	23,301,325	0.2767%	46,342,101	0.1810%
33403	-	0.0000%	9,166,941	0.1191%	-	0.0000%	10,645,891	0.1264%	19,812,831	0.0774%
33404	-	0.0000%	29,098,256	0.3779%	-	0.0000%	33,087,942	0.3929%	62,186,198	0.2429%
33405	-	0.0000%	22,492,498	0.2921%	-	0.0000%	22,111,238	0.2625%	44,603,735	0.1742%
33406	-	0.0000%	22,237,358	0.2888%	-	0.0000%	19,872,936	0.2360%	42,110,294	0.1645%

ZIP	Hurricane Charley		Hurricane Frances		Hurricane Ivan		Hurricane Jeanne		Total	
	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)
33407	-	0.0000%	22,775,824	0.2958%	-	0.0000%	24,174,592	0.2870%	46,950,417	0.1834%
33408	-	0.0000%	52,558,999	0.6826%	-	0.0000%	65,471,524	0.7774%	118,030,523	0.4609%
33409	-	0.0000%	21,885,314	0.2842%	-	0.0000%	21,122,158	0.2508%	43,007,472	0.1680%
33410	-	0.0000%	82,696,295	1.0741%	-	0.0000%	96,922,788	1.1508%	179,619,082	0.7015%
33411	-	0.0000%	127,782,405	1.6596%	-	0.0000%	111,383,390	1.3225%	239,165,794	0.9340%
33412	-	0.0000%	57,196,361	0.7429%	-	0.0000%	55,340,938	0.6571%	112,537,299	0.4395%
33413	-	0.0000%	20,468,360	0.2658%	-	0.0000%	17,647,374	0.2095%	38,115,734	0.1489%
33414	-	0.0000%	136,900,064	1.7780%	-	0.0000%	110,040,013	1.3065%	246,940,078	0.9644%
33415	-	0.0000%	27,996,696	0.3636%	-	0.0000%	23,703,261	0.2814%	51,699,957	0.2019%
33417	-	0.0000%	23,067,662	0.2996%	-	0.0000%	20,897,507	0.2481%	43,965,169	0.1717%
33418	-	0.0000%	146,174,930	1.8985%	-	0.0000%	159,343,743	1.8920%	305,518,672	1.1931%
33426	-	0.0000%	22,211,660	0.2885%	-	0.0000%	15,689,970	0.1863%	37,901,630	0.1480%
33428	-	0.0000%	44,049,309	0.5721%	-	0.0000%	17,987,724	0.2136%	62,037,033	0.2423%
33430	-	0.0000%	7,822,860	0.1016%	-	0.0000%	5,916,527	0.0702%	13,739,386	0.0537%
33431	-	0.0000%	24,235,412	0.3148%	-	0.0000%	10,728,822	0.1274%	34,964,234	0.1365%
33432	-	0.0000%	36,161,979	0.4697%	-	0.0000%	13,649,578	0.1621%	49,811,557	0.1945%
33433	-	0.0000%	50,451,233	0.6553%	-	0.0000%	20,650,450	0.2452%	71,101,683	0.2777%
33434	-	0.0000%	35,319,117	0.4587%	-	0.0000%	15,462,358	0.1836%	50,781,475	0.1983%
33435	-	0.0000%	33,079,871	0.4296%	-	0.0000%	23,158,406	0.2750%	56,238,278	0.2196%
33436	-	0.0000%	61,734,687	0.8018%	-	0.0000%	43,513,005	0.5166%	105,247,692	0.4110%
33437	-	0.0000%	91,808,062	1.1924%	-	0.0000%	58,925,675	0.6996%	150,733,737	0.5887%
33438	-	0.0000%	693,775	0.0090%	-	0.0000%	623,916	0.0074%	1,317,690	0.0051%
33440	-	0.0000%	9,407,334	0.1222%	-	0.0000%	8,169,995	0.0970%	17,577,329	0.0686%
33441	-	0.0000%	14,810,242	0.1924%	-	0.0000%	5,583,234	0.0663%	20,393,477	0.0796%
33442	-	0.0000%	19,304,645	0.2507%	-	0.0000%	7,287,580	0.0865%	26,592,224	0.1038%
33444	-	0.0000%	18,102,803	0.2351%	-	0.0000%	10,527,936	0.1250%	28,630,739	0.1118%
33445	-	0.0000%	39,640,968	0.5149%	-	0.0000%	22,354,992	0.2654%	61,995,960	0.2421%
33446	-	0.0000%	72,702,219	0.9442%	-	0.0000%	37,462,200	0.4448%	110,164,419	0.4302%
33449	-	0.0000%	26,942,235	0.3499%	-	0.0000%	20,075,458	0.2384%	47,017,693	0.1836%
33455	-	0.0000%	86,818,157	1.1276%	-	0.0000%	115,845,671	1.3755%	202,663,828	0.7915%
33458	-	0.0000%	117,201,445	1.5222%	-	0.0000%	137,730,091	1.6353%	254,931,536	0.9956%
33460	-	0.0000%	24,057,463	0.3125%	-	0.0000%	20,973,871	0.2490%	45,031,334	0.1759%

ZIP	Hurricane Charley		Hurricane Frances		Hurricane Ivan		Hurricane Jeanne		Total	
	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)
33461	-	0.0000%	23,655,171	0.3072%	-	0.0000%	19,466,510	0.2311%	43,121,682	0.1684%
33462	-	0.0000%	43,572,487	0.5659%	-	0.0000%	34,047,163	0.4043%	77,619,651	0.3031%
33463	-	0.0000%	57,094,434	0.7415%	-	0.0000%	44,671,972	0.5304%	101,766,406	0.3974%
33467	-	0.0000%	106,268,149	1.3802%	-	0.0000%	80,999,917	0.9617%	187,268,067	0.7313%
33469	-	0.0000%	56,135,301	0.7291%	-	0.0000%	73,758,292	0.8758%	129,893,593	0.5073%
33470	-	0.0000%	76,727,723	0.9965%	-	0.0000%	70,082,067	0.8321%	146,809,791	0.5733%
33471	108,887	0.0013%	4,102,768	0.0533%	-	0.0000%	4,615,751	0.0548%	8,827,406	0.0345%
33472	-	0.0000%	36,950,853	0.4799%	-	0.0000%	26,287,384	0.3121%	63,238,237	0.2470%
33473	-	0.0000%	19,593,201	0.2545%	-	0.0000%	12,347,356	0.1466%	31,940,557	0.1247%
33476	-	0.0000%	3,660,923	0.0475%	-	0.0000%	3,196,314	0.0380%	6,857,236	0.0268%
33477	-	0.0000%	68,031,615	0.8836%	-	0.0000%	88,033,768	1.0453%	156,065,382	0.6095%
33478	-	0.0000%	34,899,339	0.4533%	-	0.0000%	38,193,110	0.4535%	73,092,449	0.2854%
33480	-	0.0000%	151,040,751	1.9617%	-	0.0000%	153,643,622	1.8243%	304,684,373	1.1899%
33483	-	0.0000%	36,225,105	0.4705%	-	0.0000%	20,184,107	0.2397%	56,409,211	0.2203%
33484	-	0.0000%	36,353,324	0.4722%	-	0.0000%	19,703,580	0.2339%	56,056,904	0.2189%
33486	-	0.0000%	26,432,189	0.3433%	-	0.0000%	11,152,732	0.1324%	37,584,921	0.1468%
33487	-	0.0000%	35,484,638	0.4609%	-	0.0000%	16,692,831	0.1982%	52,177,468	0.2038%
33493	-	0.0000%	1,368,170	0.0178%	-	0.0000%	993,869	0.0118%	2,362,039	0.0092%
33496	-	0.0000%	79,331,145	1.0303%	-	0.0000%	37,049,245	0.4399%	116,380,390	0.4545%
33498	-	0.0000%	32,930,367	0.4277%	-	0.0000%	15,326,261	0.1820%	48,256,628	0.1885%
33510	-	0.0000%	3,490,192	0.0453%	-	0.0000%	5,237,958	0.0622%	8,728,150	0.0341%
33511	-	0.0000%	6,140,782	0.0798%	-	0.0000%	9,306,143	0.1105%	15,446,925	0.0603%
33513	-	0.0000%	1,773,698	0.0230%	-	0.0000%	1,562,502	0.0186%	3,336,201	0.0130%
33514	-	0.0000%	279,930	0.0036%	-	0.0000%	274,519	0.0033%	554,450	0.0022%
33523	-	0.0000%	3,031,317	0.0394%	-	0.0000%	3,540,364	0.0420%	6,571,680	0.0257%
33525	-	0.0000%	4,591,038	0.0596%	-	0.0000%	5,908,720	0.0702%	10,499,758	0.0410%
33527	-	0.0000%	1,939,239	0.0252%	-	0.0000%	3,024,392	0.0359%	4,963,631	0.0194%
33534	-	0.0000%	882,155	0.0115%	-	0.0000%	1,199,933	0.0142%	2,082,088	0.0081%
33538	-	0.0000%	837,671	0.0109%	-	0.0000%	627,144	0.0074%	1,464,816	0.0057%
33540	-	0.0000%	1,591,084	0.0207%	-	0.0000%	2,527,722	0.0300%	4,118,806	0.0161%
33541	-	0.0000%	4,298,844	0.0558%	-	0.0000%	6,158,335	0.0731%	10,457,178	0.0408%
33542	-	0.0000%	3,635,093	0.0472%	-	0.0000%	5,549,131	0.0659%	9,184,224	0.0359%

ZIP	Hurricane Charley		Hurricane Frances		Hurricane Ivan		Hurricane Jeanne		Total	
	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)
33543	-	0.0000%	5,125,904	0.0666%	-	0.0000%	6,125,467	0.0727%	11,251,371	0.0439%
33544	-	0.0000%	4,015,220	0.0521%	-	0.0000%	4,301,475	0.0511%	8,316,695	0.0325%
33545	-	0.0000%	2,448,426	0.0318%	-	0.0000%	2,919,575	0.0347%	5,368,001	0.0210%
33547	-	0.0000%	4,549,216	0.0591%	-	0.0000%	7,527,859	0.0894%	12,077,075	0.0472%
33548	-	0.0000%	1,604,620	0.0208%	-	0.0000%	1,528,854	0.0182%	3,133,473	0.0122%
33549	-	0.0000%	3,325,745	0.0432%	-	0.0000%	3,374,179	0.0401%	6,699,924	0.0262%
33556	-	0.0000%	6,222,991	0.0808%	-	0.0000%	5,203,198	0.0618%	11,426,188	0.0446%
33558	-	0.0000%	4,184,005	0.0543%	-	0.0000%	3,695,164	0.0439%	7,879,169	0.0308%
33559	-	0.0000%	1,947,259	0.0253%	-	0.0000%	2,133,278	0.0253%	4,080,537	0.0159%
33563	-	0.0000%	2,623,418	0.0341%	-	0.0000%	4,690,556	0.0557%	7,313,973	0.0286%
33565	-	0.0000%	2,928,430	0.0380%	-	0.0000%	4,875,280	0.0579%	7,803,709	0.0305%
33566	-	0.0000%	3,764,081	0.0489%	-	0.0000%	6,897,554	0.0819%	10,661,635	0.0416%
33567	-	0.0000%	1,578,374	0.0205%	-	0.0000%	2,877,161	0.0342%	4,455,534	0.0174%
33569	-	0.0000%	4,444,587	0.0577%	-	0.0000%	6,652,266	0.0790%	11,096,853	0.0433%
33570	-	0.0000%	1,883,273	0.0245%	-	0.0000%	2,400,174	0.0285%	4,283,447	0.0167%
33572	-	0.0000%	3,396,884	0.0441%	-	0.0000%	4,589,572	0.0545%	7,986,456	0.0312%
33573	-	0.0000%	2,994,728	0.0389%	-	0.0000%	3,992,431	0.0474%	6,987,159	0.0273%
33576	-	0.0000%	1,229,118	0.0160%	-	0.0000%	1,426,072	0.0169%	2,655,190	0.0104%
33578	-	0.0000%	3,216,204	0.0418%	-	0.0000%	4,610,189	0.0547%	7,826,393	0.0306%
33579	-	0.0000%	2,588,441	0.0336%	-	0.0000%	3,812,175	0.0453%	6,400,615	0.0250%
33584	-	0.0000%	3,611,967	0.0469%	-	0.0000%	5,395,392	0.0641%	9,007,359	0.0352%
33585	-	0.0000%	313,907	0.0041%	-	0.0000%	267,885	0.0032%	581,792	0.0023%
33592	-	0.0000%	1,167,443	0.0152%	-	0.0000%	1,568,720	0.0186%	2,736,163	0.0107%
33594	-	0.0000%	6,554,591	0.0851%	-	0.0000%	10,067,405	0.1195%	16,621,996	0.0649%
33596	-	0.0000%	5,278,081	0.0686%	-	0.0000%	8,190,385	0.0972%	13,468,467	0.0526%
33597	-	0.0000%	981,461	0.0127%	-	0.0000%	1,018,628	0.0121%	2,000,090	0.0078%
33598	-	0.0000%	990,418	0.0129%	-	0.0000%	1,454,512	0.0173%	2,444,930	0.0095%
33602	-	0.0000%	1,316,305	0.0171%	-	0.0000%	1,449,765	0.0172%	2,766,070	0.0108%
33603	-	0.0000%	1,780,626	0.0231%	-	0.0000%	1,948,726	0.0231%	3,729,351	0.0146%
33604	-	0.0000%	3,006,623	0.0390%	-	0.0000%	3,236,082	0.0384%	6,242,704	0.0244%
33605	-	0.0000%	950,635	0.0123%	-	0.0000%	1,134,170	0.0135%	2,084,805	0.0081%
33606	-	0.0000%	3,390,670	0.0440%	-	0.0000%	3,723,911	0.0442%	7,114,581	0.0278%

ZIP	Hurricane Charley		Hurricane Frances		Hurricane Ivan		Hurricane Jeanne		Total	
	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)
33607	-	0.0000%	1,421,172	0.0185%	-	0.0000%	1,478,132	0.0176%	2,899,305	0.0113%
33609	-	0.0000%	3,048,804	0.0396%	-	0.0000%	3,167,790	0.0376%	6,216,595	0.0243%
33610	-	0.0000%	2,196,902	0.0285%	-	0.0000%	2,767,119	0.0329%	4,964,021	0.0194%
33611	-	0.0000%	4,142,941	0.0538%	-	0.0000%	4,382,639	0.0520%	8,525,580	0.0333%
33612	-	0.0000%	2,955,936	0.0384%	-	0.0000%	3,154,900	0.0375%	6,110,836	0.0239%
33613	-	0.0000%	2,939,734	0.0382%	-	0.0000%	3,093,447	0.0367%	6,033,181	0.0236%
33614	-	0.0000%	2,659,305	0.0345%	-	0.0000%	2,721,784	0.0323%	5,381,089	0.0210%
33615	-	0.0000%	4,045,645	0.0525%	-	0.0000%	3,576,028	0.0425%	7,621,673	0.0298%
33616	-	0.0000%	1,179,295	0.0153%	-	0.0000%	1,127,116	0.0134%	2,306,410	0.0090%
33617	-	0.0000%	3,820,656	0.0496%	-	0.0000%	4,675,580	0.0555%	8,496,236	0.0332%
33618	-	0.0000%	4,465,473	0.0580%	-	0.0000%	4,294,653	0.0510%	8,760,126	0.0342%
33619	-	0.0000%	1,957,348	0.0254%	-	0.0000%	2,745,748	0.0326%	4,703,096	0.0184%
33620	-	0.0000%	1,209	0.0000%	-	0.0000%	1,404	0.0000%	2,613	0.0000%
33621	-	0.0000%	7,233	0.0001%	-	0.0000%	7,842	0.0001%	15,075	0.0001%
33624	-	0.0000%	5,680,009	0.0738%	-	0.0000%	5,310,854	0.0631%	10,990,862	0.0429%
33625	-	0.0000%	2,884,187	0.0375%	-	0.0000%	2,633,780	0.0313%	5,517,967	0.0215%
33626	-	0.0000%	4,638,486	0.0602%	-	0.0000%	3,861,824	0.0459%	8,500,310	0.0332%
33629	-	0.0000%	6,073,649	0.0789%	-	0.0000%	6,364,600	0.0756%	12,438,249	0.0486%
33634	-	0.0000%	1,857,399	0.0241%	-	0.0000%	1,690,739	0.0201%	3,548,138	0.0139%
33635	-	0.0000%	1,454,673	0.0189%	-	0.0000%	1,223,807	0.0145%	2,678,480	0.0105%
33637	-	0.0000%	1,055,585	0.0137%	-	0.0000%	1,380,884	0.0164%	2,436,470	0.0095%
33647	-	0.0000%	9,760,554	0.1268%	-	0.0000%	11,258,725	0.1337%	21,019,278	0.0821%
33701	-	0.0000%	920,802	0.0120%	-	0.0000%	817,745	0.0097%	1,738,547	0.0068%
33702	-	0.0000%	2,662,179	0.0346%	-	0.0000%	2,242,202	0.0266%	4,904,381	0.0192%
33703	-	0.0000%	3,388,705	0.0440%	-	0.0000%	2,890,101	0.0343%	6,278,806	0.0245%
33704	-	0.0000%	2,640,050	0.0343%	-	0.0000%	2,209,600	0.0262%	4,849,650	0.0189%
33705	-	0.0000%	1,799,792	0.0234%	-	0.0000%	1,594,086	0.0189%	3,393,878	0.0133%
33706	-	0.0000%	4,121,380	0.0535%	-	0.0000%	2,857,054	0.0339%	6,978,434	0.0273%
33707	-	0.0000%	2,743,643	0.0356%	-	0.0000%	2,009,438	0.0239%	4,753,081	0.0186%
33708	-	0.0000%	2,732,472	0.0355%	-	0.0000%	1,647,976	0.0196%	4,380,448	0.0171%
33709	-	0.0000%	1,666,327	0.0216%	-	0.0000%	1,232,818	0.0146%	2,899,144	0.0113%
33710	-	0.0000%	3,241,675	0.0421%	-	0.0000%	2,416,528	0.0287%	5,658,203	0.0221%

ZIP	Hurricane Charley		Hurricane Frances		Hurricane Ivan		Hurricane Jeanne		Total	
	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)
33711	-	0.0000%	1,143,636	0.0149%	-	0.0000%	944,306	0.0112%	2,087,942	0.0082%
33712	-	0.0000%	1,314,624	0.0171%	-	0.0000%	1,140,060	0.0135%	2,454,684	0.0096%
33713	-	0.0000%	2,294,328	0.0298%	-	0.0000%	1,821,655	0.0216%	4,115,983	0.0161%
33714	-	0.0000%	1,001,152	0.0130%	-	0.0000%	784,430	0.0093%	1,785,582	0.0070%
33715	-	0.0000%	2,599,323	0.0338%	-	0.0000%	1,842,083	0.0219%	4,441,406	0.0173%
33716	-	0.0000%	347,558	0.0045%	-	0.0000%	306,573	0.0036%	654,131	0.0026%
33755	-	0.0000%	2,445,670	0.0318%	-	0.0000%	1,483,014	0.0176%	3,928,684	0.0153%
33756	-	0.0000%	3,670,100	0.0477%	-	0.0000%	2,293,504	0.0272%	5,963,604	0.0233%
33759	-	0.0000%	1,650,547	0.0214%	-	0.0000%	1,129,110	0.0134%	2,779,656	0.0109%
33760	-	0.0000%	941,395	0.0122%	-	0.0000%	669,369	0.0079%	1,610,764	0.0063%
33761	-	0.0000%	2,575,690	0.0335%	-	0.0000%	1,717,684	0.0204%	4,293,373	0.0168%
33762	-	0.0000%	911,768	0.0118%	-	0.0000%	702,461	0.0083%	1,614,229	0.0063%
33763	-	0.0000%	1,595,954	0.0207%	-	0.0000%	1,033,171	0.0123%	2,629,125	0.0103%
33764	-	0.0000%	2,748,096	0.0357%	-	0.0000%	1,864,637	0.0221%	4,612,733	0.0180%
33765	-	0.0000%	1,074,777	0.0140%	-	0.0000%	697,048	0.0083%	1,771,825	0.0069%
33767	-	0.0000%	2,687,920	0.0349%	-	0.0000%	1,349,641	0.0160%	4,037,561	0.0158%
33770	-	0.0000%	2,823,785	0.0367%	-	0.0000%	1,722,376	0.0205%	4,546,161	0.0178%
33771	-	0.0000%	1,809,609	0.0235%	-	0.0000%	1,134,789	0.0135%	2,944,398	0.0115%
33772	-	0.0000%	2,639,755	0.0343%	-	0.0000%	1,674,059	0.0199%	4,313,814	0.0168%
33773	-	0.0000%	1,682,848	0.0219%	-	0.0000%	1,145,254	0.0136%	2,828,101	0.0110%
33774	-	0.0000%	2,402,096	0.0312%	-	0.0000%	1,433,930	0.0170%	3,836,026	0.0150%
33776	-	0.0000%	2,150,496	0.0279%	-	0.0000%	1,317,019	0.0156%	3,467,515	0.0135%
33777	-	0.0000%	2,091,098	0.0272%	-	0.0000%	1,433,811	0.0170%	3,524,909	0.0138%
33778	-	0.0000%	1,471,692	0.0191%	-	0.0000%	918,822	0.0109%	2,390,513	0.0093%
33781	-	0.0000%	1,664,507	0.0216%	-	0.0000%	1,252,662	0.0149%	2,917,169	0.0114%
33782	-	0.0000%	2,040,499	0.0265%	-	0.0000%	1,511,976	0.0180%	3,552,474	0.0139%
33785	-	0.0000%	1,599,145	0.0208%	-	0.0000%	850,687	0.0101%	2,449,832	0.0096%
33786	-	0.0000%	2,107,808	0.0274%	-	0.0000%	1,092,037	0.0130%	3,199,845	0.0125%
33801	1,191,754	0.0144%	6,016,317	0.0781%	-	0.0000%	12,946,696	0.1537%	20,154,767	0.0787%
33803	1,660,173	0.0201%	8,212,622	0.1067%	-	0.0000%	18,266,489	0.2169%	28,139,284	0.1099%
33805	479,611	0.0058%	3,614,601	0.0469%	-	0.0000%	7,724,466	0.0917%	11,818,679	0.0462%
33809	870,076	0.0105%	6,568,870	0.0853%	-	0.0000%	13,074,196	0.1552%	20,513,142	0.0801%

ZIP	Hurricane Charley		Hurricane Frances		Hurricane Ivan		Hurricane Jeanne		Total	
	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)
33810	-	0.0000%	10,598,589	0.1377%	-	0.0000%	20,545,849	0.2439%	31,144,437	0.1216%
33811	1,041,500	0.0126%	5,165,856	0.0671%	-	0.0000%	11,005,535	0.1307%	17,212,891	0.0672%
33812	3,983,497	0.0483%	5,210,470	0.0677%	-	0.0000%	12,392,825	0.1471%	21,586,792	0.0843%
33813	4,044,707	0.0490%	13,364,801	0.1736%	-	0.0000%	30,496,030	0.3621%	47,905,537	0.1871%
33815	173,698	0.0021%	1,374,025	0.0178%	-	0.0000%	2,859,273	0.0339%	4,406,996	0.0172%
33823	8,814,715	0.1068%	9,273,031	0.1204%	-	0.0000%	21,498,421	0.2553%	39,586,166	0.1546%
33825	37,018,413	0.4487%	9,083,814	0.1180%	-	0.0000%	26,270,123	0.3119%	72,372,351	0.2826%
33827	31,376,104	0.3803%	2,381,856	0.0309%	-	0.0000%	7,115,791	0.0845%	40,873,752	0.1596%
33830	37,671,339	0.4566%	9,067,294	0.1178%	-	0.0000%	22,847,004	0.2713%	69,585,637	0.2717%
33834	15,314,311	0.1856%	913,533	0.0119%	-	0.0000%	2,366,992	0.0281%	18,594,835	0.0726%
33837	23,080,434	0.2797%	7,728,470	0.1004%	-	0.0000%	18,418,357	0.2187%	49,227,262	0.1922%
33838	8,521,569	0.1033%	1,412,928	0.0184%	-	0.0000%	3,827,895	0.0455%	13,762,392	0.0537%
33839	4,374,764	0.0530%	1,198,121	0.0156%	-	0.0000%	3,090,771	0.0367%	8,663,656	0.0338%
33841	31,077,300	0.3767%	2,371,466	0.0308%	-	0.0000%	6,375,534	0.0757%	39,824,299	0.1555%
33843	23,757,204	0.2879%	3,761,347	0.0489%	-	0.0000%	10,745,144	0.1276%	38,263,695	0.1494%
33844	63,582,054	0.7706%	11,216,285	0.1457%	-	0.0000%	29,636,684	0.3519%	104,435,023	0.4078%
33849	-	0.0000%	138,309	0.0018%	-	0.0000%	243,416	0.0029%	381,725	0.0015%
33850	5,796,534	0.0703%	3,206,551	0.0416%	-	0.0000%	7,479,043	0.0888%	16,482,128	0.0644%
33852	7,906,679	0.0958%	23,875,414	0.3101%	-	0.0000%	50,363,643	0.5980%	82,145,736	0.3208%
33853	65,248,380	0.7908%	4,886,756	0.0635%	-	0.0000%	14,180,367	0.1684%	84,315,504	0.3293%
33857	177,556	0.0022%	2,044,572	0.0266%	-	0.0000%	3,862,729	0.0459%	6,084,857	0.0238%
33859	57,941,583	0.7023%	4,296,565	0.0558%	-	0.0000%	11,749,706	0.1395%	73,987,854	0.2889%
33860	1,147,938	0.0139%	5,458,152	0.0709%	-	0.0000%	11,785,673	0.1399%	18,391,763	0.0718%
33865	1,783,431	0.0216%	123,153	0.0016%	-	0.0000%	273,514	0.0032%	2,180,098	0.0085%
33868	474,524	0.0058%	2,369,268	0.0308%	-	0.0000%	4,817,295	0.0572%	7,661,086	0.0299%
33870	17,534,453	0.2125%	11,249,967	0.1461%	-	0.0000%	28,505,952	0.3385%	57,290,371	0.2237%
33872	21,371,227	0.2590%	7,439,998	0.0966%	-	0.0000%	19,786,708	0.2349%	48,597,933	0.1898%
33873	99,651,117	1.2078%	2,647,799	0.0344%	-	0.0000%	7,221,687	0.0857%	109,520,603	0.4277%
33875	8,788,836	0.1065%	5,029,065	0.0653%	-	0.0000%	13,309,880	0.1580%	27,127,782	0.1059%
33876	2,751,441	0.0333%	4,975,023	0.0646%	-	0.0000%	11,394,004	0.1353%	19,120,467	0.0747%
33880	33,326,283	0.4039%	10,882,929	0.1413%	-	0.0000%	27,639,280	0.3282%	71,848,491	0.2806%
33881	29,714,701	0.3601%	12,566,144	0.1632%	-	0.0000%	30,780,275	0.3655%	73,061,120	0.2853%

ZIP	Hurricane Charley		Hurricane Frances		Hurricane Ivan		Hurricane Jeanne		Total	
	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)
33884	106,618,217	1.2922%	16,626,188	0.2159%	-	0.0000%	45,007,564	0.5344%	168,251,969	0.6571%
33890	73,119,017	0.8862%	1,015,331	0.0132%	-	0.0000%	2,682,234	0.0318%	76,816,582	0.3000%
33896	6,422,571	0.0778%	3,012,698	0.0391%	-	0.0000%	6,887,400	0.0818%	16,322,668	0.0637%
33897	4,426,648	0.0537%	5,865,254	0.0762%	-	0.0000%	11,837,387	0.1405%	22,129,289	0.0864%
33898	118,012,027	1.4303%	9,449,970	0.1227%	-	0.0000%	27,715,999	0.3291%	155,177,997	0.6060%
33901	16,290,185	0.1974%	1,028,572	0.0134%	-	0.0000%	1,395,110	0.0166%	18,713,867	0.0731%
33903	35,806,068	0.4340%	1,018,332	0.0132%	-	0.0000%	1,482,646	0.0176%	38,307,046	0.1496%
33904	118,972,782	1.4420%	2,594,741	0.0337%	-	0.0000%	3,039,768	0.0361%	124,607,291	0.4866%
33905	9,054,872	0.1097%	1,815,036	0.0236%	-	0.0000%	2,356,683	0.0280%	13,226,591	0.0517%
33907	7,971,804	0.0966%	724,692	0.0094%	-	0.0000%	886,755	0.0105%	9,583,251	0.0374%
33908	43,913,743	0.5322%	2,773,170	0.0360%	-	0.0000%	3,001,362	0.0356%	49,688,275	0.1940%
33909	68,625,487	0.8317%	1,335,188	0.0173%	-	0.0000%	1,730,812	0.0206%	71,691,487	0.2800%
33912	9,617,132	0.1166%	1,757,016	0.0228%	-	0.0000%	2,043,611	0.0243%	13,417,759	0.0524%
33913	5,464,269	0.0662%	2,103,858	0.0273%	-	0.0000%	2,498,005	0.0297%	10,066,133	0.0393%
33914	185,711,483	2.2508%	2,956,420	0.0384%	-	0.0000%	3,298,972	0.0392%	191,966,875	0.7497%
33916	4,268,058	0.0517%	412,693	0.0054%	-	0.0000%	528,098	0.0063%	5,208,848	0.0203%
33917	34,491,066	0.4180%	1,583,646	0.0206%	-	0.0000%	2,194,694	0.0261%	38,269,405	0.1495%
33919	33,032,963	0.4004%	1,960,346	0.0255%	-	0.0000%	2,329,678	0.0277%	37,322,987	0.1458%
33920	877,183	0.0106%	661,114	0.0086%	-	0.0000%	900,649	0.0107%	2,438,946	0.0095%
33922	102,997,112	1.2483%	264,730	0.0034%	-	0.0000%	264,222	0.0031%	103,526,064	0.4043%
33924	241,895,498	2.9318%	1,843,945	0.0239%	-	0.0000%	1,561,203	0.0185%	245,300,645	0.9580%
33928	5,736,184	0.0695%	2,081,536	0.0270%	-	0.0000%	2,143,660	0.0255%	9,961,380	0.0389%
33931	12,735,411	0.1544%	704,502	0.0092%	-	0.0000%	736,981	0.0088%	14,176,894	0.0554%
33935	664,392	0.0081%	3,686,531	0.0479%	-	0.0000%	5,257,283	0.0624%	9,608,207	0.0375%
33936	1,854,770	0.0225%	1,514,892	0.0197%	-	0.0000%	1,970,550	0.0234%	5,340,211	0.0209%
33946	32,104,265	0.3891%	529,312	0.0069%	-	0.0000%	492,336	0.0058%	33,125,914	0.1294%
33947	49,976,693	0.6057%	942,484	0.0122%	-	0.0000%	1,035,787	0.0123%	51,954,963	0.2029%
33948	123,713,032	1.4994%	1,356,150	0.0176%	-	0.0000%	1,762,192	0.0209%	126,831,374	0.4953%
33950	686,014,350	8.3146%	2,778,913	0.0361%	-	0.0000%	3,950,191	0.0469%	692,743,454	2.7053%
33952	280,378,179	3.3982%	2,201,528	0.0286%	-	0.0000%	3,006,115	0.0357%	285,585,822	1.1153%
33953	34,093,004	0.4132%	601,610	0.0078%	-	0.0000%	755,769	0.0090%	35,450,384	0.1384%
33954	84,531,425	1.0245%	847,272	0.0110%	-	0.0000%	1,179,475	0.0140%	86,558,173	0.3380%

ZIP	Hurricane Charley		Hurricane Frances		Hurricane Ivan		Hurricane Jeanne		Total	
	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)
33955	199,615,954	2.4194%	988,215	0.0128%	-	0.0000%	1,304,984	0.0155%	201,909,153	0.7885%
33956	35,705,790	0.4328%	254,932	0.0033%	-	0.0000%	231,582	0.0027%	36,192,303	0.1413%
33957	245,119,652	2.9709%	1,309,012	0.0170%	-	0.0000%	1,183,905	0.0141%	247,612,569	0.9670%
33960	93,736	0.0011%	421,605	0.0055%	-	0.0000%	759,579	0.0090%	1,274,920	0.0050%
33966	3,712,818	0.0450%	641,960	0.0083%	-	0.0000%	772,082	0.0092%	5,126,860	0.0200%
33967	3,968,605	0.0481%	1,217,698	0.0158%	-	0.0000%	1,304,770	0.0155%	6,491,072	0.0253%
33971	2,725,077	0.0330%	1,490,766	0.0194%	-	0.0000%	1,880,678	0.0223%	6,096,522	0.0238%
33972	815,558	0.0099%	1,042,306	0.0135%	-	0.0000%	1,305,984	0.0155%	3,163,848	0.0124%
33973	830,252	0.0101%	374,013	0.0049%	-	0.0000%	452,075	0.0054%	1,656,341	0.0065%
33974	698,702	0.0085%	893,501	0.0116%	-	0.0000%	1,110,391	0.0132%	2,702,594	0.0106%
33976	963,654	0.0117%	679,239	0.0088%	-	0.0000%	841,690	0.0100%	2,484,584	0.0097%
33980	200,592,566	2.4312%	956,930	0.0124%	-	0.0000%	1,520,390	0.0181%	203,069,886	0.7930%
33981	76,217,838	0.9238%	825,240	0.0107%	-	0.0000%	1,011,505	0.0120%	78,054,583	0.3048%
33982	264,533,409	3.2062%	1,041,632	0.0135%	-	0.0000%	1,855,136	0.0220%	267,430,177	1.0444%
33983	162,509,148	1.9696%	1,540,180	0.0200%	-	0.0000%	2,346,576	0.0279%	166,395,904	0.6498%
33990	81,688,228	0.9901%	1,726,298	0.0224%	-	0.0000%	2,147,500	0.0255%	85,562,026	0.3341%
33991	110,457,744	1.3388%	1,296,928	0.0168%	-	0.0000%	1,442,878	0.0171%	113,197,550	0.4421%
33993	175,933,357	2.1323%	1,497,684	0.0195%	-	0.0000%	1,831,425	0.0217%	179,262,466	0.7001%
34102	3,601,261	0.0436%	1,733,095	0.0225%	-	0.0000%	1,679,681	0.0199%	7,014,037	0.0274%
34103	2,020,124	0.0245%	1,027,382	0.0133%	-	0.0000%	1,011,797	0.0120%	4,059,304	0.0159%
34104	1,553,172	0.0188%	1,004,898	0.0131%	-	0.0000%	964,886	0.0115%	3,522,956	0.0138%
34105	2,586,084	0.0313%	1,615,836	0.0210%	-	0.0000%	1,564,239	0.0186%	5,766,158	0.0225%
34108	4,247,486	0.0515%	1,930,196	0.0251%	-	0.0000%	1,919,950	0.0228%	8,097,631	0.0316%
34109	2,929,637	0.0355%	1,710,885	0.0222%	-	0.0000%	1,659,706	0.0197%	6,300,228	0.0246%
34110	4,612,766	0.0559%	2,363,067	0.0307%	-	0.0000%	2,342,208	0.0278%	9,318,041	0.0364%
34112	1,818,345	0.0220%	1,104,802	0.0143%	-	0.0000%	1,045,048	0.0124%	3,968,195	0.0155%
34113	1,387,069	0.0168%	1,025,927	0.0133%	-	0.0000%	954,320	0.0113%	3,367,316	0.0132%
34114	1,020,907	0.0124%	851,339	0.0111%	-	0.0000%	765,177	0.0091%	2,637,423	0.0103%
34116	979,349	0.0119%	799,287	0.0104%	-	0.0000%	764,265	0.0091%	2,542,901	0.0099%
34117	696,390	0.0084%	820,131	0.0107%	-	0.0000%	771,334	0.0092%	2,287,854	0.0089%
34119	3,820,061	0.0463%	2,885,282	0.0375%	-	0.0000%	2,788,416	0.0331%	9,493,758	0.0371%
34120	1,786,016	0.0216%	2,155,519	0.0280%	-	0.0000%	2,059,604	0.0245%	6,001,138	0.0234%

ZIP	Hurricane Charley		Hurricane Frances		Hurricane Ivan		Hurricane Jeanne		Total	
	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)
34134	5,728,981	0.0694%	2,230,165	0.0290%	-	0.0000%	2,257,308	0.0268%	10,216,454	0.0399%
34135	5,649,620	0.0685%	3,102,051	0.0403%	-	0.0000%	3,077,256	0.0365%	11,828,927	0.0462%
34138	-	0.0000%	6,976	0.0001%	-	0.0000%	4,854	0.0001%	11,829	0.0000%
34139	-	0.0000%	19,412	0.0003%	-	0.0000%	16,121	0.0002%	35,533	0.0001%
34141	-	0.0000%	9,186	0.0001%	-	0.0000%	7,363	0.0001%	16,549	0.0001%
34142	164,506	0.0020%	446,948	0.0058%	-	0.0000%	442,156	0.0052%	1,053,610	0.0041%
34145	2,139,986	0.0259%	1,578,228	0.0205%	-	0.0000%	1,266,903	0.0150%	4,985,118	0.0195%
34201	-	0.0000%	886,517	0.0115%	-	0.0000%	1,037,337	0.0123%	1,923,855	0.0075%
34202	-	0.0000%	3,660,946	0.0475%	-	0.0000%	4,505,411	0.0535%	8,166,358	0.0319%
34203	-	0.0000%	2,529,172	0.0328%	-	0.0000%	2,822,096	0.0335%	5,351,268	0.0209%
34205	-	0.0000%	1,646,011	0.0214%	-	0.0000%	1,687,826	0.0200%	3,333,837	0.0130%
34207	-	0.0000%	1,210,302	0.0157%	-	0.0000%	1,207,634	0.0143%	2,417,937	0.0094%
34208	-	0.0000%	1,840,756	0.0239%	-	0.0000%	2,049,684	0.0243%	3,890,440	0.0152%
34209	-	0.0000%	3,593,696	0.0467%	-	0.0000%	3,362,445	0.0399%	6,956,142	0.0272%
34210	-	0.0000%	1,175,067	0.0153%	-	0.0000%	1,104,001	0.0131%	2,279,068	0.0089%
34211	-	0.0000%	540,710	0.0070%	-	0.0000%	711,448	0.0084%	1,252,158	0.0049%
34212	-	0.0000%	2,122,675	0.0276%	-	0.0000%	2,710,940	0.0322%	4,833,615	0.0189%
34215	-	0.0000%	144,608	0.0019%	-	0.0000%	128,088	0.0015%	272,696	0.0011%
34216	-	0.0000%	534,171	0.0069%	-	0.0000%	410,098	0.0049%	944,269	0.0037%
34217	-	0.0000%	1,582,244	0.0206%	-	0.0000%	1,232,620	0.0146%	2,814,865	0.0110%
34219	-	0.0000%	2,628,402	0.0341%	-	0.0000%	3,571,297	0.0424%	6,199,700	0.0242%
34221	-	0.0000%	3,169,869	0.0412%	-	0.0000%	3,385,251	0.0402%	6,555,121	0.0256%
34222	-	0.0000%	907,404	0.0118%	-	0.0000%	1,075,305	0.0128%	1,982,709	0.0077%
34223	6,490,311	0.0787%	1,634,547	0.0212%	-	0.0000%	1,594,942	0.0189%	9,719,800	0.0380%
34224	35,602,167	0.4315%	1,059,475	0.0138%	-	0.0000%	1,117,170	0.0133%	37,778,811	0.1475%
34228	-	0.0000%	2,862,267	0.0372%	-	0.0000%	2,528,913	0.0300%	5,391,180	0.0211%
34229	-	0.0000%	1,240,790	0.0161%	-	0.0000%	1,291,523	0.0153%	2,532,312	0.0099%
34231	-	0.0000%	2,474,226	0.0321%	-	0.0000%	2,615,959	0.0311%	5,090,185	0.0199%
34232	-	0.0000%	2,124,633	0.0276%	-	0.0000%	2,449,957	0.0291%	4,574,591	0.0179%
34233	-	0.0000%	1,348,632	0.0175%	-	0.0000%	1,513,011	0.0180%	2,861,644	0.0112%
34234	-	0.0000%	844,658	0.0110%	-	0.0000%	863,736	0.0103%	1,708,394	0.0067%
34235	-	0.0000%	1,100,660	0.0143%	-	0.0000%	1,274,065	0.0151%	2,374,725	0.0093%

ZIP	Hurricane Charley		Hurricane Frances		Hurricane Ivan		Hurricane Jeanne		Total	
	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)
34236	-	0.0000%	1,779,238	0.0231%	-	0.0000%	1,785,991	0.0212%	3,565,228	0.0139%
34237	-	0.0000%	521,675	0.0068%	-	0.0000%	556,143	0.0066%	1,077,818	0.0042%
34238	-	0.0000%	2,201,618	0.0286%	-	0.0000%	2,439,732	0.0290%	4,641,350	0.0181%
34239	-	0.0000%	1,354,319	0.0176%	-	0.0000%	1,432,672	0.0170%	2,786,991	0.0109%
34240	-	0.0000%	1,767,672	0.0230%	-	0.0000%	2,174,359	0.0258%	3,942,031	0.0154%
34241	-	0.0000%	1,695,936	0.0220%	-	0.0000%	2,032,941	0.0241%	3,728,878	0.0146%
34242	-	0.0000%	1,940,400	0.0252%	-	0.0000%	1,947,810	0.0231%	3,888,209	0.0152%
34243	-	0.0000%	2,621,079	0.0340%	-	0.0000%	2,879,010	0.0342%	5,500,089	0.0215%
34250	-	0.0000%	99,167	0.0013%	-	0.0000%	100,588	0.0012%	199,756	0.0008%
34251	1,257,288	0.0152%	920,729	0.0120%	-	0.0000%	1,515,952	0.0180%	3,693,968	0.0144%
34266	448,273,801	5.4331%	3,736,733	0.0485%	-	0.0000%	8,747,472	0.1039%	460,758,007	1.7994%
34269	69,991,679	0.8483%	450,336	0.0058%	-	0.0000%	792,493	0.0094%	71,234,507	0.2782%
34275	-	0.0000%	1,854,809	0.0241%	-	0.0000%	1,909,813	0.0227%	3,764,622	0.0147%
34285	650,808	0.0079%	1,422,790	0.0185%	-	0.0000%	1,414,890	0.0168%	3,488,488	0.0136%
34286	63,870,523	0.7741%	1,533,705	0.0199%	-	0.0000%	1,929,049	0.0229%	67,333,277	0.2630%
34287	36,160,253	0.4383%	1,557,850	0.0202%	-	0.0000%	2,000,338	0.0238%	39,718,441	0.1551%
34288	52,689,515	0.6386%	957,221	0.0124%	-	0.0000%	1,281,107	0.0152%	54,927,844	0.2145%
34289	11,519,979	0.1396%	166,761	0.0022%	-	0.0000%	231,867	0.0028%	11,918,606	0.0465%
34291	4,095,672	0.0496%	415,023	0.0054%	-	0.0000%	509,456	0.0060%	5,020,152	0.0196%
34292	1,212,797	0.0147%	1,511,220	0.0196%	-	0.0000%	1,677,674	0.0199%	4,401,690	0.0172%
34293	2,516,405	0.0305%	2,694,918	0.0350%	-	0.0000%	2,890,455	0.0343%	8,101,778	0.0316%
34420	-	0.0000%	3,423,461	0.0445%	-	0.0000%	1,981,404	0.0235%	5,404,865	0.0211%
34428	-	0.0000%	1,548,450	0.0201%	-	0.0000%	789,064	0.0094%	2,337,513	0.0091%
34429	-	0.0000%	2,067,658	0.0269%	-	0.0000%	1,059,853	0.0126%	3,127,512	0.0122%
34431	-	0.0000%	1,892,793	0.0246%	-	0.0000%	911,201	0.0108%	2,803,993	0.0110%
34432	-	0.0000%	3,252,312	0.0422%	-	0.0000%	1,744,657	0.0207%	4,996,969	0.0195%
34433	-	0.0000%	1,296,690	0.0168%	-	0.0000%	687,165	0.0082%	1,983,854	0.0077%
34434	-	0.0000%	1,594,917	0.0207%	-	0.0000%	994,535	0.0118%	2,589,452	0.0101%
34436	-	0.0000%	1,418,906	0.0184%	-	0.0000%	1,025,111	0.0122%	2,444,016	0.0095%
34442	-	0.0000%	3,882,491	0.0504%	-	0.0000%	2,442,787	0.0290%	6,325,278	0.0247%
34446	-	0.0000%	4,024,535	0.0523%	-	0.0000%	2,449,391	0.0291%	6,473,926	0.0253%
34448	-	0.0000%	1,799,681	0.0234%	-	0.0000%	969,653	0.0115%	2,769,334	0.0108%

ZIP	Hurricane Charley		Hurricane Frances		Hurricane Ivan		Hurricane Jeanne		Total	
	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)
34449	-	0.0000%	429,451	0.0056%	-	0.0000%	177,054	0.0021%	606,505	0.0024%
34450	-	0.0000%	2,174,776	0.0282%	-	0.0000%	1,512,111	0.0180%	3,686,886	0.0144%
34452	-	0.0000%	1,983,698	0.0258%	-	0.0000%	1,384,491	0.0164%	3,368,189	0.0132%
34453	-	0.0000%	1,932,068	0.0251%	-	0.0000%	1,249,819	0.0148%	3,181,887	0.0124%
34461	-	0.0000%	2,360,100	0.0307%	-	0.0000%	1,442,760	0.0171%	3,802,860	0.0149%
34465	-	0.0000%	3,916,932	0.0509%	-	0.0000%	2,417,664	0.0287%	6,334,596	0.0247%
34470	-	0.0000%	3,299,111	0.0428%	-	0.0000%	1,695,264	0.0201%	4,994,375	0.0195%
34471	-	0.0000%	6,935,835	0.0901%	-	0.0000%	3,609,676	0.0429%	10,545,511	0.0412%
34472	-	0.0000%	5,047,166	0.0656%	-	0.0000%	2,875,366	0.0341%	7,922,532	0.0309%
34473	-	0.0000%	3,534,745	0.0459%	-	0.0000%	2,338,896	0.0278%	5,873,641	0.0229%
34474	-	0.0000%	2,796,138	0.0363%	-	0.0000%	1,455,878	0.0173%	4,252,015	0.0166%
34475	-	0.0000%	1,264,857	0.0164%	-	0.0000%	634,972	0.0075%	1,899,829	0.0074%
34476	-	0.0000%	7,079,851	0.0920%	-	0.0000%	3,925,942	0.0466%	11,005,793	0.0430%
34479	-	0.0000%	2,706,146	0.0351%	-	0.0000%	1,330,524	0.0158%	4,036,671	0.0158%
34480	-	0.0000%	4,948,615	0.0643%	-	0.0000%	2,767,193	0.0329%	7,715,808	0.0301%
34481	-	0.0000%	4,860,119	0.0631%	-	0.0000%	2,555,609	0.0303%	7,415,728	0.0290%
34482	-	0.0000%	5,297,623	0.0688%	-	0.0000%	2,449,669	0.0291%	7,747,293	0.0303%
34484	-	0.0000%	1,258,929	0.0164%	-	0.0000%	871,432	0.0103%	2,130,361	0.0083%
34488	-	0.0000%	1,414,139	0.0184%	-	0.0000%	685,488	0.0081%	2,099,627	0.0082%
34491	-	0.0000%	8,367,298	0.1087%	-	0.0000%	5,575,543	0.0662%	13,942,841	0.0545%
34498	-	0.0000%	154,124	0.0020%	-	0.0000%	62,471	0.0007%	216,595	0.0008%
34601	-	0.0000%	3,352,551	0.0435%	-	0.0000%	2,531,677	0.0301%	5,884,228	0.0230%
34602	-	0.0000%	1,612,304	0.0209%	-	0.0000%	1,518,210	0.0180%	3,130,514	0.0122%
34604	-	0.0000%	1,691,216	0.0220%	-	0.0000%	1,291,630	0.0153%	2,982,845	0.0116%
34606	-	0.0000%	6,134,252	0.0797%	-	0.0000%	3,657,226	0.0434%	9,791,479	0.0382%
34607	-	0.0000%	2,212,877	0.0287%	-	0.0000%	1,256,861	0.0149%	3,469,738	0.0136%
34608	-	0.0000%	6,851,157	0.0890%	-	0.0000%	4,433,927	0.0526%	11,285,085	0.0441%
34609	-	0.0000%	9,224,250	0.1198%	-	0.0000%	6,479,497	0.0769%	15,703,747	0.0613%
34610	-	0.0000%	2,027,966	0.0263%	-	0.0000%	1,405,934	0.0167%	3,433,900	0.0134%
34613	-	0.0000%	4,274,515	0.0555%	-	0.0000%	2,612,670	0.0310%	6,887,185	0.0269%
34614	-	0.0000%	1,169,681	0.0152%	-	0.0000%	756,726	0.0090%	1,926,407	0.0075%
34637	-	0.0000%	1,230,850	0.0160%	-	0.0000%	1,102,463	0.0131%	2,333,314	0.0091%

ZIP	Hurricane Charley		Hurricane Frances		Hurricane Ivan		Hurricane Jeanne		Total	
	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)
34638	-	0.0000%	3,777,557	0.0491%	-	0.0000%	3,332,471	0.0396%	7,110,028	0.0278%
34639	-	0.0000%	5,132,879	0.0667%	-	0.0000%	5,093,180	0.0605%	10,226,060	0.0399%
34652	-	0.0000%	3,476,324	0.0452%	-	0.0000%	2,019,032	0.0240%	5,495,356	0.0215%
34653	-	0.0000%	3,662,584	0.0476%	-	0.0000%	2,240,977	0.0266%	5,903,561	0.0231%
34654	-	0.0000%	3,383,415	0.0439%	-	0.0000%	2,372,892	0.0282%	5,756,307	0.0225%
34655	-	0.0000%	7,449,120	0.0967%	-	0.0000%	5,271,022	0.0626%	12,720,142	0.0497%
34667	-	0.0000%	6,148,263	0.0799%	-	0.0000%	3,427,991	0.0407%	9,576,253	0.0374%
34668	-	0.0000%	6,064,241	0.0788%	-	0.0000%	3,401,922	0.0404%	9,466,162	0.0370%
34669	-	0.0000%	1,887,800	0.0245%	-	0.0000%	1,225,350	0.0145%	3,113,150	0.0122%
34677	-	0.0000%	3,132,651	0.0407%	-	0.0000%	2,286,770	0.0272%	5,419,421	0.0212%
34683	-	0.0000%	6,324,486	0.0821%	-	0.0000%	3,951,044	0.0469%	10,275,530	0.0401%
34684	-	0.0000%	3,787,557	0.0492%	-	0.0000%	2,385,353	0.0283%	6,172,910	0.0241%
34685	-	0.0000%	3,366,091	0.0437%	-	0.0000%	2,412,088	0.0286%	5,778,180	0.0226%
34688	-	0.0000%	1,997,638	0.0259%	-	0.0000%	1,426,270	0.0169%	3,423,908	0.0134%
34689	-	0.0000%	4,190,514	0.0544%	-	0.0000%	2,437,283	0.0289%	6,627,798	0.0259%
34690	-	0.0000%	1,465,414	0.0190%	-	0.0000%	896,121	0.0106%	2,361,535	0.0092%
34691	-	0.0000%	2,612,893	0.0339%	-	0.0000%	1,467,168	0.0174%	4,080,061	0.0159%
34695	-	0.0000%	3,126,609	0.0406%	-	0.0000%	2,111,155	0.0251%	5,237,764	0.0205%
34698	-	0.0000%	5,394,175	0.0701%	-	0.0000%	3,281,294	0.0390%	8,675,469	0.0339%
34705	-	0.0000%	1,015,107	0.0132%	-	0.0000%	956,911	0.0114%	1,972,018	0.0077%
34711	1,964,267	0.0238%	31,132,605	0.4043%	-	0.0000%	43,994,453	0.5224%	77,091,325	0.3011%
34714	1,018,181	0.0123%	3,910,532	0.0508%	-	0.0000%	6,873,305	0.0816%	11,802,018	0.0461%
34715	-	0.0000%	7,408,941	0.0962%	-	0.0000%	8,682,410	0.1031%	16,091,351	0.0628%
34731	-	0.0000%	3,889,161	0.0505%	-	0.0000%	2,937,233	0.0349%	6,826,395	0.0267%
34734	1,210,933	0.0147%	1,848,205	0.0240%	-	0.0000%	2,414,741	0.0287%	5,473,879	0.0214%
34736	-	0.0000%	3,674,837	0.0477%	-	0.0000%	4,282,213	0.0508%	7,957,050	0.0311%
34737	-	0.0000%	2,409,106	0.0313%	-	0.0000%	2,130,653	0.0253%	4,539,758	0.0177%
34739	101,834	0.0012%	1,122,240	0.0146%	-	0.0000%	2,496,884	0.0296%	3,720,958	0.0145%
34741	40,853,865	0.4952%	6,702,963	0.0871%	-	0.0000%	14,417,406	0.1712%	61,974,234	0.2420%
34743	118,954,395	1.4417%	10,504,062	0.1364%	-	0.0000%	21,942,497	0.2605%	151,400,953	0.5913%
34744	236,933,705	2.8717%	20,673,319	0.2685%	-	0.0000%	45,153,065	0.5361%	302,760,089	1.1824%
34746	99,519,304	1.2062%	13,707,188	0.1780%	-	0.0000%	34,178,300	0.4058%	147,404,792	0.5757%

ZIP	Hurricane Charley		Hurricane Frances		Hurricane Ivan		Hurricane Jeanne		Total	
	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)
34747	25,649,576	0.3109%	9,930,656	0.1290%	-	0.0000%	21,041,335	0.2498%	56,621,567	0.2211%
34748	-	0.0000%	18,423,416	0.2393%	-	0.0000%	16,570,702	0.1968%	34,994,119	0.1367%
34753	-	0.0000%	1,159,851	0.0151%	-	0.0000%	1,448,273	0.0172%	2,608,124	0.0102%
34756	179,507	0.0022%	2,760,759	0.0359%	-	0.0000%	3,161,117	0.0375%	6,101,383	0.0238%
34758	52,274,994	0.6336%	7,585,990	0.0985%	-	0.0000%	20,099,221	0.2386%	79,960,204	0.3123%
34759	132,654,842	1.6078%	9,147,014	0.1188%	-	0.0000%	24,553,856	0.2915%	166,355,712	0.6497%
34761	4,811,992	0.0583%	11,822,419	0.1535%	-	0.0000%	13,672,039	0.1623%	30,306,450	0.1184%
34762	-	0.0000%	214,923	0.0028%	-	0.0000%	174,918	0.0021%	389,842	0.0015%
34769	55,185,324	0.6689%	12,735,203	0.1654%	-	0.0000%	28,933,149	0.3435%	96,853,676	0.3782%
34771	20,758,639	0.2516%	7,391,004	0.0960%	-	0.0000%	17,939,881	0.2130%	46,089,524	0.1800%
34772	44,550,288	0.5400%	10,320,423	0.1340%	-	0.0000%	28,626,938	0.3399%	83,497,649	0.3261%
34773	321,307	0.0039%	1,318,442	0.0171%	-	0.0000%	3,388,648	0.0402%	5,028,398	0.0196%
34785	-	0.0000%	2,551,355	0.0331%	-	0.0000%	1,895,931	0.0225%	4,447,285	0.0174%
34786	17,249,728	0.2091%	24,369,793	0.3165%	-	0.0000%	36,407,264	0.4323%	78,026,786	0.3047%
34787	4,913,375	0.0596%	19,092,314	0.2480%	-	0.0000%	26,462,298	0.3142%	50,467,987	0.1971%
34788	-	0.0000%	7,943,244	0.1032%	-	0.0000%	5,572,233	0.0662%	13,515,477	0.0528%
34797	-	0.0000%	1,459,206	0.0190%	-	0.0000%	1,149,550	0.0136%	2,608,756	0.0102%
34945	-	0.0000%	16,010,886	0.2079%	-	0.0000%	22,100,844	0.2624%	38,111,730	0.1488%
34946	-	0.0000%	8,330,109	0.1082%	-	0.0000%	12,434,465	0.1476%	20,764,574	0.0811%
34947	-	0.0000%	10,513,417	0.1365%	-	0.0000%	15,526,019	0.1843%	26,039,436	0.1017%
34949	-	0.0000%	33,017,201	0.4288%	-	0.0000%	56,457,746	0.6703%	89,474,946	0.3494%
34950	-	0.0000%	15,680,364	0.2037%	-	0.0000%	23,631,658	0.2806%	39,312,023	0.1535%
34951	-	0.0000%	47,104,629	0.6118%	-	0.0000%	69,956,262	0.8306%	117,060,892	0.4572%
34952	-	0.0000%	90,518,197	1.1756%	-	0.0000%	125,644,426	1.4918%	216,162,623	0.8442%
34953	-	0.0000%	171,769,140	2.2309%	-	0.0000%	228,117,961	2.7085%	399,887,101	1.5617%
34956	-	0.0000%	8,579,203	0.1114%	-	0.0000%	9,502,619	0.1128%	18,081,822	0.0706%
34957	-	0.0000%	71,848,747	0.9332%	-	0.0000%	104,608,040	1.2421%	176,456,787	0.6891%
34972	282,475	0.0034%	25,846,597	0.3357%	-	0.0000%	32,864,822	0.3902%	58,993,894	0.2304%
34974	514,313	0.0062%	53,136,292	0.6901%	-	0.0000%	59,801,801	0.7101%	113,452,406	0.4431%
34981	-	0.0000%	6,578,596	0.0854%	-	0.0000%	9,349,497	0.1110%	15,928,093	0.0622%
34982	-	0.0000%	46,530,867	0.6043%	-	0.0000%	68,491,593	0.8132%	115,022,460	0.4492%
34983	-	0.0000%	92,637,775	1.2032%	-	0.0000%	129,342,232	1.5357%	221,980,007	0.8669%

ZIP	Hurricane Charley		Hurricane Frances		Hurricane Ivan		Hurricane Jeanne		Total	
	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)	Personal & Commercial Residential Monetary Contribution ($)	Percent of Losses (%)
34984	-	0.0000%	44,095,353	0.5727%	-	0.0000%	60,167,468	0.7144%	104,262,821	0.4072%
34986	-	0.0000%	104,331,172	1.3550%	-	0.0000%	143,835,478	1.7078%	248,166,651	0.9692%
34987	-	0.0000%	31,873,956	0.4140%	-	0.0000%	41,149,485	0.4886%	73,023,440	0.2852%
34990	-	0.0000%	147,581,512	1.9168%	-	0.0000%	184,042,927	2.1852%	331,624,439	1.2951%
34994	-	0.0000%	40,805,395	0.5300%	-	0.0000%	58,141,965	0.6903%	98,947,360	0.3864%
34996	-	0.0000%	71,943,334	0.9344%	-	0.0000%	100,169,901	1.1894%	172,113,235	0.6721%
34997	-	0.0000%	108,124,234	1.4043%	-	0.0000%	143,378,748	1.7024%	251,502,981	0.9822%

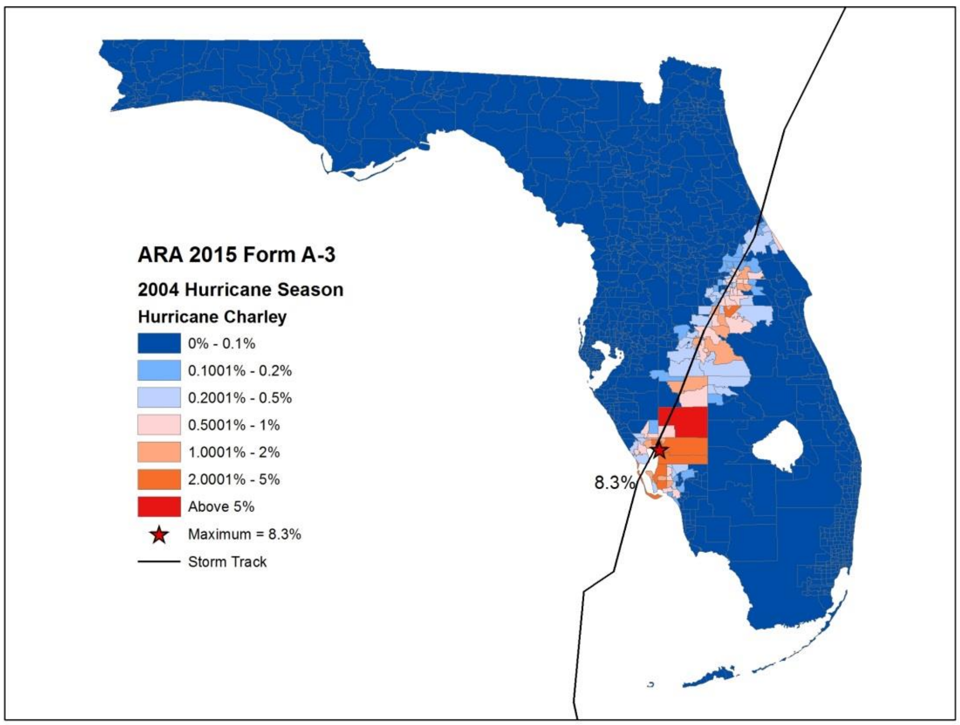


Figure 57. Percentage of Total Personal and Commercial Residential Modeled Losses by ZIP Code for Hurricane Charley

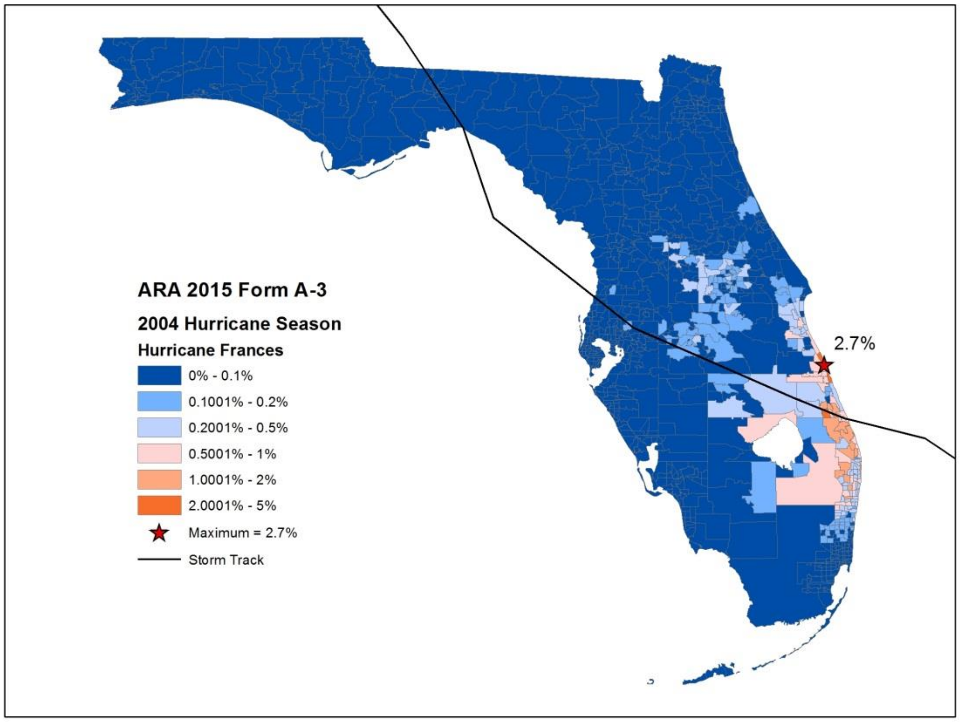


Figure 58. Percentage of Total Personal and Commercial Residential Modeled Losses by ZIP Code for Hurricane Frances

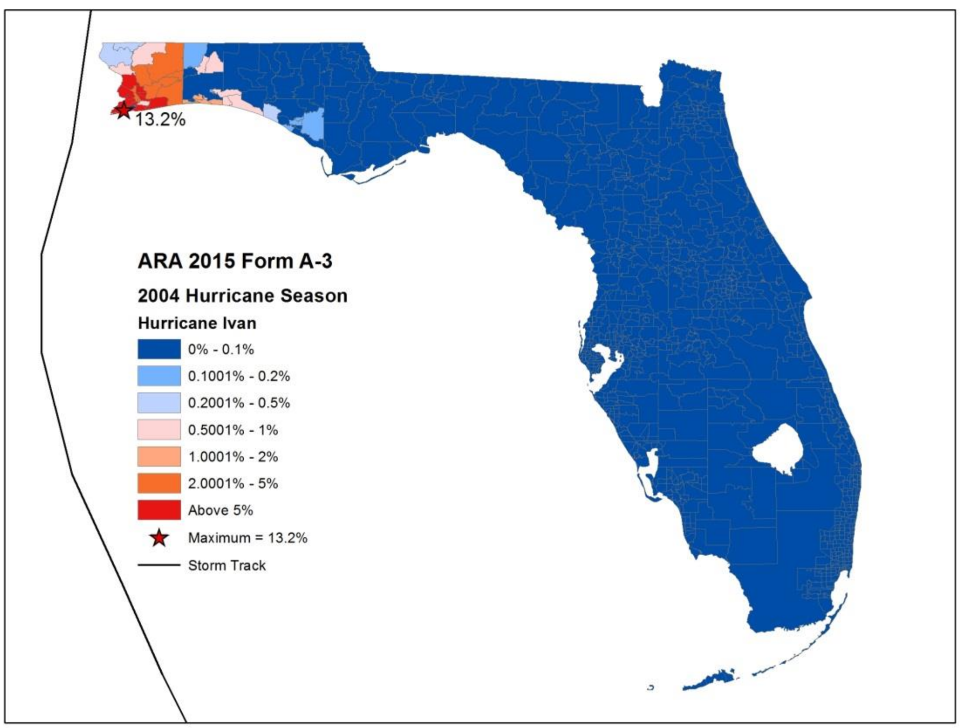


Figure 59. Percentage of Total Personal and Commercial Residential Modeled Losses by ZIP Code for Hurricane Ivan

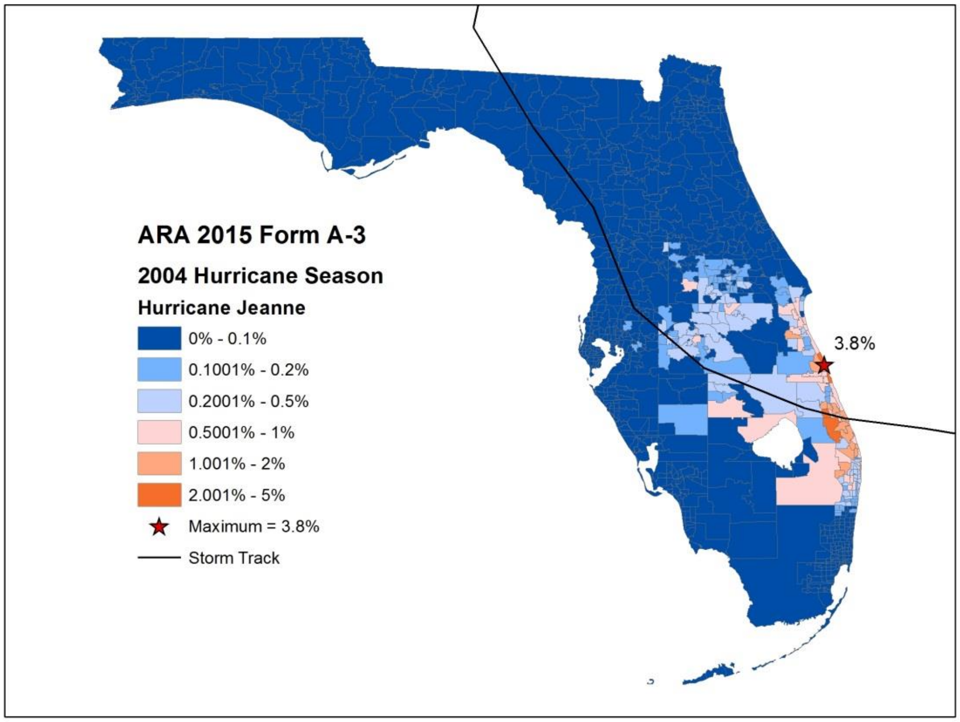


Figure 60. Percentage of Total Personal and Commercial Residential Modeled Losses by ZIP Code for Hurricane Jeanne

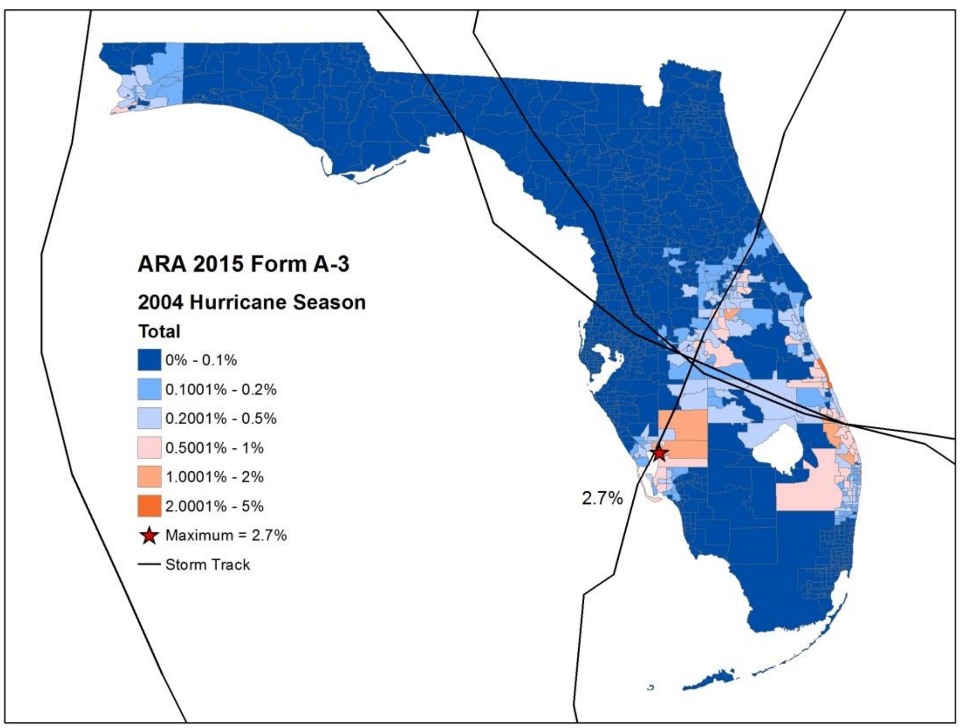


Figure 61. Percentage of Total Personal and Commercial Residential Modeled Losses by ZIP Code for All Four of the 2004 Hurricanes

Form A-4: Output Ranges

A. Provide personal and commercial residential output ranges in the format shown in the file named "2015FormA4.xlsx" by using an automated program or script. Provide this form in Excel format. The file name shall include the abbreviated name of the modeling organization, the standards year, and the form name. Also include Form A-4, Output Ranges, in a submission appendix.

B. Provide loss costs rounded to three decimal places by county. Within each county, loss costs shall be shown separately per $1,000 of exposure for frame owners, masonry owners, frame renters, masonry renters, frame condo unit owners, masonry condo unit owners, manufactured home, and commercial residential. For each of these categories using ZIP Code centroids, the output range shall show the highest loss cost, the lowest loss cost, and the weighted average loss cost. The aggregate residential exposure data for this form shall be developed from the information in the file named "hlpm2012c.exe," except for insured value and deductibles information. Insured values shall be based on the output range specifications below. Deductible amounts of 0% and as specified in the output range specifications will be assumed to be uniformly applied to all risks. When calculating the weighted average loss costs, weight the loss costs by the total insured value calculated above. Include the statewide range of loss costs (i.e., low, high, and weighted average).

C. If a modeling organization has loss costs for a ZIP Code for which there is no exposure, give the loss costs zero weight (i.e., assume the exposure in that ZIP Code is zero). Provide a list in the submission document of those ZIP Codes where this occurs.

D. If a modeling organization does not have loss costs for a ZIP Code for which there is some exposure, do not assume such loss costs are zero, but use only the exposures for which there are loss costs in calculating the weighted average loss costs. Provide a list in the submission document of the ZIP Codes where this occurs.

E. NA shall be used in cells to signify no exposure.

F. All anomalies in loss costs that are not consistent with the requirements of Standard A-6 , Loss Outputs and Logical Relationships to Risk, and have been explained in Disclosure A-6.12 shall be shaded.

G. Indicate if per diem is used in producing loss costs for Coverage D (ALE) in the personal residential output ranges. If a per diem rate is used in the submission, a rate of $150.00 per day per policy shall be used.

Loss costs are provided in the file named ARA15aFormA4_revised_2016-11-14.xlsx. Per diem is not used in producing loss costs for Coverage D (ALE).

Output Range Specifications

Policy Type	Assumptions
Owners	**Coverage A = Building** • Coverage A limit = $100,000 • Replacement Cost included subject to Coverage A limit • Ordinance or Law not included **Coverage B = Appurtenant Structures** • Coverage B limit = 10% of Coverage A limit • Replacement Cost included subject to Coverage B limit • Ordinance or Law not included **Coverage C = Contents** • Coverage C limit = 50% of Coverage A limit • Replacement Cost included subject to Coverage C limit **Coverage D = Time Element** • Coverage D limit = 20% of Coverage A limit • Time Element = 12 months • Per Diem = $150.00/day per policy, if used ✧ Dominant Coverage = A ✧ Loss costs per $1,000 shall be related to the Coverage A limit ✧ Loss costs for the various specified deductibles shall be determined based on annual deductibles ✧ 2% Deductible of Coverage A ✧ All-other perils deductible shall be $500
Renters	**Coverage C = Contents** • Coverage C limit = $25,000 • Replacement Cost included subject to Coverage C limit **Coverage D = Time Element** • Coverage D limit = 40% of Coverage C limit • Time Element = 12 months • Per Diem = $150.00/day per policy, if used ✧ Dominant Coverage = C ✧ Loss costs per $1,000 shall be related to the Coverage C limit ✧ Loss costs for the various specified deductibles shall be determined based on annual deductibles ✧ 2 % Deductible on Coverage C ✧ All-other perils deductible shall be $500

Policy Type	Assumptions
Condo Unit Owners	**Coverage A = Building** • Coverage A limit = 10% of Coverage C limit • Replacement Cost included subject to Coverage A limit **Coverage C = Contents** • Coverage C limit = $50,000 • Replacement Cost included subject to Coverage C limit **Coverage D = Time Element** • Coverage D limit = 40% of Coverage C limit • Time Element = 12 months • Per Diem = $150.00/day per policy, if used ✧ Dominant Coverage = C ✧ Loss costs per $1,000 shall be related to the Coverage C limit ✧ Loss costs for the various specified deductibles shall be determined based on annual deductibles ✧ 2% Deductible of Coverage C ✧ All-other perils deductible shall be $500
Manufactured Home	**Coverage A = Structure** • Coverage A limit = $50,000 • Replacement Cost included subject to Coverage A limit **Coverage B = Appurtenant Structures** • Coverage B limit = 10% of Coverage A limit • Replacement Cost included subject to Coverage B limit **Coverage C = Contents** • Coverage C limit = 50% of Coverage A limit • Replacement Cost included subject to Coverage C limit **Coverage D = Time Element** • Coverage D limit =- 20% of Coverage A limit • Time Element = 12 months • Per Diem = $150.00/day per policy, if used ✧ Dominant Coverage = A ✧ Loss costs per $1,000 shall be related to the Coverage A limit ✧ Loss costs for the various specified deductibles shall be determined based on annual deductibles ✧ 2% Deductible of Coverage A ✧ All-other perils deductible shall be $500
Commercial Residential	**Coverage A = Building** • Coverage A limit = $750,000 • Replacement Cost included subject to Coverage A limit **Coverage C = Contents** • Coverage C limit = 5% of Coverage A limit • Replacement Cost included subject to Coverage C limit **Coverage D = Time Element** • Coverage D limit = 20% of Coverage A limit • Time Element = 12 months • Per Diem = $150.00/day per policy, if used ✧ Dominant Coverage = A ✧ Loss costs per $1,000 shall be related to the Coverage A limit ✧ Loss costs for the various specified deductibles shall be determined based on annual deductibles ✧ 3% Deductible of Coverage A ✧ All-other perils deductible shall be $500

Form A-4 Output Ranges (2012 FHCF Exposure Data)

LOSS COSTS PER $1000 for 0% Deductible

Modeling Organization: ARA
Model Name & Version Number: HurLoss 8.0.a
Model Release Date: 11/14/2016

County	Loss Costs	Frame Owners	Masonry Owners	Manufactured Homes	Frame Renters	Masonry Renters	Frame Condo Unit	Masrony Condo Unit	Commercial Residential
Alachua	LOW	0.443	0.436	1.796	0.047	0.043	0.107	0.117	0.362
	AVERAGE	0.728	0.730	2.361	0.098	0.097	0.184	0.179	0.472
	HIGH	1.101	1.075	2.960	0.132	0.126	0.215	0.213	0.738
Baker	LOW	0.296	0.292	1.029	0.053	0.052	NA	NA	NA
	AVERAGE	0.482	0.485	1.330	0.069	0.070	NA	NA	NA
	HIGH	0.631	0.620	1.467	0.077	0.074	NA	NA	NA
Bay	LOW	0.675	0.720	3.199	0.094	0.090	0.222	0.181	0.677
	AVERAGE	1.560	1.501	4.455	0.208	0.211	0.472	0.427	1.311
	HIGH	2.770	2.704	7.899	0.422	0.400	0.637	0.613	2.131
Bradford	LOW	0.418	0.412	1.619	0.059	0.058	NA	NA	NA
	AVERAGE	0.643	0.653	1.851	0.088	0.082	NA	NA	NA
	HIGH	0.841	0.826	2.020	0.099	0.086	NA	NA	NA
Brevard	LOW	2.372	2.343	7.336	0.190	0.140	0.501	0.406	1.165
	AVERAGE	5.182	5.304	12.511	0.881	0.863	1.332	1.709	3.808
	HIGH	10.585	10.355	22.683	2.177	2.111	2.953	2.876	5.877
Broward	LOW	6.645	6.447	23.753	0.478	0.422	1.177	1.077	2.939
	AVERAGE	8.854	8.432	26.220	1.357	1.380	2.197	2.161	6.278
	HIGH	11.922	11.813	31.742	2.389	2.250	3.377	3.207	8.808
Calhoun	LOW	0.412	0.408	1.559	0.075	0.088	NA	NA	NA
	AVERAGE	0.660	0.655	1.977	0.094	0.093	NA	NA	NA
	HIGH	0.953	0.936	2.367	0.117	0.095	NA	NA	NA
Charlotte	LOW	3.456	3.399	11.732	0.236	0.203	0.609	0.535	1.748
	AVERAGE	5.087	4.739	13.961	0.802	0.725	1.352	1.081	3.076
	HIGH	6.887	6.737	15.502	1.254	1.207	1.769	1.713	3.890
Citrus	LOW	0.812	0.800	3.575	0.116	0.100	0.228	0.205	0.895
	AVERAGE	1.427	1.313	4.274	0.232	0.211	0.396	0.396	1.161
	HIGH	1.908	1.864	4.914	0.302	0.286	0.454	0.438	1.298
Clay	LOW	0.448	0.445	1.864	0.056	0.052	0.110	0.107	0.393
	AVERAGE	0.759	0.764	2.075	0.103	0.104	0.171	0.166	0.496
	HIGH	1.159	1.135	2.978	0.134	0.126	0.229	0.220	0.582
Collier	LOW	3.534	3.481	12.352	0.350	0.314	0.705	0.640	2.051
	AVERAGE	6.542	6.287	17.311	1.391	1.301	2.090	1.954	4.808
	HIGH	14.265	11.182	34.346	3.148	3.065	3.987	3.889	8.774
Columbia	LOW	0.275	0.274	1.010	0.027	0.025	0.118	0.115	0.261
	AVERAGE	0.494	0.490	1.576	0.061	0.058	0.120	0.118	0.267
	HIGH	0.710	0.696	1.804	0.078	0.069	0.125	0.120	0.293
DeSoto	LOW	3.685	3.622	11.614	0.416	0.299	0.726	0.637	2.708
	AVERAGE	5.422	5.144	13.669	0.796	0.693	1.075	0.915	2.812
	HIGH	6.556	6.430	14.079	0.854	0.817	1.334	1.292	3.140
Dixie	LOW	0.320	0.334	1.299	0.058	0.073	0.101	0.106	0.264
	AVERAGE	0.539	0.511	1.560	0.084	0.080	0.113	0.114	0.279
	HIGH	0.667	0.654	1.589	0.094	0.091	0.122	0.156	0.374

County	Loss Costs	Frame Owners	Masonry Owners	Manufactured Homes	Frame Renters	Masonry Renters	Frame Condo Unit	Masrony Condo Unit	Commercial Residential
Duval	LOW	0.391	0.409	1.602	0.053	0.040	0.122	0.110	0.333
	AVERAGE	0.953	0.959	2.373	0.156	0.152	0.234	0.237	0.667
	HIGH	1.706	1.704	4.783	0.331	0.318	0.452	0.439	1.246
Escambia	LOW	1.563	1.529	7.503	0.180	0.168	0.654	0.552	1.708
	AVERAGE	3.980	4.005	11.107	0.936	0.945	1.582	1.649	3.995
	HIGH	6.560	6.250	18.518	1.895	1.838	2.396	2.332	5.637
Flagler	LOW	0.861	0.849	3.820	0.113	0.097	0.221	0.216	0.594
	AVERAGE	1.337	1.204	4.551	0.200	0.178	0.385	0.312	0.927
	HIGH	2.114	2.067	5.351	0.329	0.315	0.503	0.487	1.418
Franklin	LOW	0.300	0.310	1.203	0.065	0.067	0.110	0.109	0.243
	AVERAGE	0.524	0.550	1.537	0.093	0.085	0.124	0.136	0.254
	HIGH	0.943	0.924	2.562	0.120	0.114	0.203	0.146	0.255
Gadsden	LOW	0.227	0.233	0.825	0.042	0.043	NA	0.099	0.142
	AVERAGE	0.348	0.360	0.954	0.054	0.054	NA	0.099	0.166
	HIGH	0.499	0.491	1.169	0.063	0.062	NA	0.099	0.180
Gilchrist	LOW	0.424	0.388	1.783	0.050	0.054	NA	0.144	NA
	AVERAGE	0.687	0.684	2.143	0.099	0.093	NA	0.144	NA
	HIGH	0.888	0.868	2.326	0.106	0.101	NA	0.144	NA
Glades	LOW	5.176	4.463	12.575	0.918	0.451	NA	NA	NA
	AVERAGE	7.114	6.958	18.204	0.918	0.803	NA	NA	NA
	HIGH	8.587	8.443	18.425	0.918	0.874	NA	NA	NA
Gulf	LOW	0.465	0.463	1.942	0.089	0.088	0.160	0.160	0.266
	AVERAGE	0.662	0.693	1.958	0.114	0.110	0.173	0.166	0.374
	HIGH	0.850	0.837	1.987	0.122	0.119	0.205	0.201	0.420
Hamilton	LOW	0.224	0.221	0.875	0.032	0.040	NA	NA	NA
	AVERAGE	0.330	0.332	0.937	0.043	0.042	NA	NA	NA
	HIGH	0.456	0.449	1.045	0.053	0.051	NA	NA	NA
Hardee	LOW	2.746	2.656	9.649	0.245	0.175	NA	0.912	1.671
	AVERAGE	4.363	4.195	10.582	0.522	0.488	NA	0.912	1.864
	HIGH	4.745	4.676	11.506	0.586	0.559	NA	0.912	2.056
Hendry	LOW	5.116	5.046	17.809	0.325	0.302	0.977	0.676	3.011
	AVERAGE	6.655	6.414	17.984	0.825	0.730	1.356	1.183	3.437
	HIGH	8.365	8.212	18.172	1.008	0.966	1.582	1.532	3.692
Hernando	LOW	1.420	1.313	4.819	0.166	0.122	0.480	0.343	1.130
	AVERAGE	2.492	2.472	5.380	0.326	0.319	0.616	0.605	1.383
	HIGH	3.058	3.002	6.647	0.458	0.438	0.719	0.701	1.704
Highlands	LOW	2.536	2.395	7.311	0.140	0.130	0.524	0.406	1.441
	AVERAGE	4.274	4.104	10.010	0.395	0.353	0.782	0.777	2.001
	HIGH	6.685	6.580	14.075	0.625	0.595	1.110	1.134	2.737
Hillsborough	LOW	1.473	1.459	5.297	0.143	0.116	0.330	0.334	1.282
	AVERAGE	3.242	3.074	7.417	0.418	0.403	0.723	0.718	1.906
	HIGH	5.177	5.076	10.246	0.871	0.832	1.311	1.265	3.468
Holmes	LOW	0.619	0.613	2.817	0.090	0.128	0.236	NA	0.572
	AVERAGE	1.032	1.019	3.043	0.155	0.140	0.236	NA	0.572
	HIGH	1.535	1.507	3.622	0.207	0.200	0.236	NA	0.572
Indian River	LOW	4.973	4.883	15.657	0.316	0.302	1.019	0.757	3.227
	AVERAGE	7.478	7.028	19.244	1.440	1.377	2.155	2.300	5.733
	HIGH	12.320	12.028	25.887	2.848	2.765	3.754	3.656	7.180

County	Loss Costs	Frame Owners	Masonry Owners	Manufactured Homes	Frame Renters	Masonry Renters	Frame Condo Unit	Masrony Condo Unit	Commercial Residential
Jackson	LOW	0.338	0.350	1.453	0.041	0.047	NA	0.112	0.276
	AVERAGE	0.641	0.651	1.978	0.072	0.070	NA	0.137	0.393
	HIGH	1.035	1.017	2.539	0.107	0.088	NA	0.162	0.438
Jefferson	LOW	0.207	0.206	0.768	0.034	0.034	0.083	NA	NA
	AVERAGE	0.292	0.288	0.791	0.043	0.042	0.083	NA	NA
	HIGH	0.360	0.355	0.794	0.051	0.050	0.083	NA	NA
Lafayette	LOW	0.273	0.274	1.040	0.042	0.050	0.104	NA	NA
	AVERAGE	0.381	0.378	1.059	0.054	0.053	0.104	NA	NA
	HIGH	0.460	0.452	1.059	0.055	0.054	0.104	NA	NA
Lake	LOW	0.975	0.920	3.295	0.087	0.078	0.261	0.255	0.941
	AVERAGE	2.615	2.574	6.049	0.235	0.224	0.584	0.559	1.404
	HIGH	3.812	3.765	8.938	0.434	0.414	0.692	0.672	1.881
Lee	LOW	3.925	3.855	13.472	0.250	0.221	0.621	0.578	2.044
	AVERAGE	6.682	5.739	15.161	1.155	0.990	1.873	1.619	4.197
	HIGH	12.072	11.750	27.087	3.392	3.300	4.284	4.176	7.650
Leon	LOW	0.231	0.231	0.860	0.038	0.038	0.080	0.078	0.096
	AVERAGE	0.345	0.345	0.893	0.050	0.051	0.092	0.094	0.164
	HIGH	0.432	0.425	0.976	0.062	0.061	0.106	0.107	0.187
Levy	LOW	0.493	0.484	2.223	0.071	0.058	0.147	0.166	0.557
	AVERAGE	1.006	1.032	3.383	0.159	0.158	0.224	0.221	0.668
	HIGH	1.742	1.702	5.158	0.289	0.275	0.256	0.248	0.861
Liberty	LOW	0.316	0.313	1.109	0.069	0.084	NA	NA	NA
	AVERAGE	0.466	0.469	1.203	0.083	0.084	NA	NA	NA
	HIGH	0.599	0.590	1.257	0.085	0.084	NA	NA	NA
Madison	LOW	0.209	0.208	0.783	0.023	0.029	NA	NA	NA
	AVERAGE	0.307	0.305	0.872	0.039	0.039	NA	NA	NA
	HIGH	0.419	0.412	1.040	0.044	0.043	NA	NA	NA
Manatee	LOW	2.631	2.586	10.407	0.194	0.165	0.435	0.424	1.520
	AVERAGE	5.131	4.416	11.911	0.786	0.678	1.471	1.419	3.723
	HIGH	8.982	8.845	22.568	2.110	2.049	2.838	2.768	6.548
Marion	LOW	0.633	0.627	2.645	0.077	0.045	0.189	0.156	0.548
	AVERAGE	1.403	1.270	4.056	0.165	0.154	0.304	0.344	0.893
	HIGH	1.950	1.907	5.414	0.280	0.264	0.433	0.415	1.182
Martin	LOW	6.529	6.395	22.829	0.484	0.468	1.145	1.051	3.186
	AVERAGE	9.865	9.362	26.138	2.191	2.056	3.122	3.350	7.177
	HIGH	14.532	14.178	31.198	3.619	3.519	4.689	4.571	8.867
Miami-Dade	LOW	4.928	5.622	16.984	0.584	0.490	1.041	0.944	2.824
	AVERAGE	9.971	9.301	33.977	1.928	1.942	2.793	2.772	7.489
	HIGH	16.978	16.513	43.916	4.561	4.391	5.880	5.676	13.564
Monroe	LOW	8.361	8.157	31.536	2.044	0.736	1.604	1.486	3.907
	AVERAGE	12.810	12.414	34.712	5.101	4.756	4.778	5.055	9.464
	HIGH	19.557	19.138	44.726	7.846	7.732	7.290	9.124	13.149
Nassau	LOW	0.355	0.369	1.382	0.066	0.051	0.134	0.129	0.321
	AVERAGE	1.019	0.901	2.192	0.212	0.197	0.351	0.358	0.907
	HIGH	1.529	1.496	4.191	0.298	0.288	0.418	0.406	1.110
Okaloosa	LOW	1.004	0.988	4.248	0.174	0.186	0.366	0.330	0.992
	AVERAGE	2.752	2.872	6.523	0.537	0.585	0.966	1.047	2.851
	HIGH	5.142	5.019	15.729	1.225	1.183	1.618	1.570	4.631

County	Loss Costs	Frame Owners	Masonry Owners	Manufactured Homes	Frame Renters	Masonry Renters	Frame Condo Unit	Masrony Condo Unit	Commercial Residential
Okeechobee	LOW	5.085	5.021	16.014	0.424	0.300	0.847	0.759	3.016
	AVERAGE	6.665	6.372	16.677	0.791	0.712	1.083	1.325	3.395
	HIGH	8.219	8.064	16.828	0.860	0.816	1.459	1.407	3.714
Orange	LOW	1.264	1.253	4.489	0.072	0.069	0.251	0.243	0.695
	AVERAGE	2.535	2.560	6.098	0.240	0.225	0.465	0.455	1.209
	HIGH	3.300	3.252	7.198	0.385	0.411	0.599	0.582	1.539
Osceola	LOW	1.256	1.249	4.496	0.101	0.106	0.274	0.270	0.570
	AVERAGE	2.768	2.797	7.636	0.251	0.233	0.455	0.420	1.217
	HIGH	5.474	5.382	12.297	0.684	0.535	0.883	0.855	2.125
Palm Beach	LOW	6.422	6.229	23.214	0.501	0.453	1.191	1.101	3.028
	AVERAGE	9.333	8.844	28.414	1.643	1.538	2.538	2.371	6.739
	HIGH	15.593	15.082	38.233	3.833	3.674	5.046	4.856	12.086
Pasco	LOW	1.457	1.443	5.255	0.146	0.136	0.322	0.324	1.183
	AVERAGE	2.647	2.741	6.708	0.319	0.336	0.610	0.696	1.805
	HIGH	3.627	3.554	7.837	0.534	0.511	0.833	0.805	2.144
Pinellas	LOW	1.785	1.762	7.338	0.151	0.137	0.376	0.353	1.285
	AVERAGE	4.626	4.313	9.973	0.702	0.715	1.224	1.238	3.011
	HIGH	8.870	8.736	17.941	2.121	2.062	2.839	2.770	6.461
Polk	LOW	1.339	1.329	4.827	0.089	0.075	0.272	0.269	0.926
	AVERAGE	3.018	2.897	7.442	0.273	0.279	0.483	0.552	1.485
	HIGH	4.855	4.784	11.307	0.528	0.505	0.952	0.925	2.034
Putnam	LOW	0.553	0.545	2.210	0.069	0.061	0.189	0.147	0.601
	AVERAGE	0.991	0.997	2.957	0.141	0.134	0.267	0.219	0.658
	HIGH	1.522	1.491	3.822	0.168	0.161	0.288	0.275	0.728
St. Johns	LOW	0.593	0.584	2.621	0.057	0.053	0.143	0.141	0.457
	AVERAGE	1.145	1.327	3.696	0.198	0.204	0.390	0.454	1.118
	HIGH	2.552	2.500	7.545	0.475	0.459	0.672	0.653	1.934
St. Lucie	LOW	5.884	5.323	17.448	0.651	0.360	1.011	0.908	3.121
	AVERAGE	8.532	7.768	21.676	1.728	1.325	2.496	2.334	5.933
	HIGH	13.331	12.987	28.180	3.141	3.041	4.124	4.007	7.972
Santa Rosa	LOW	1.505	1.628	7.158	0.187	0.240	0.479	0.393	1.255
	AVERAGE	3.298	3.451	10.041	0.785	0.751	2.061	1.822	4.117
	HIGH	7.407	7.230	21.630	2.304	2.246	2.866	2.799	6.860
Sarasota	LOW	2.867	2.827	10.267	0.204	0.190	0.502	0.484	1.586
	AVERAGE	4.598	4.283	12.332	0.684	0.638	1.249	1.181	3.032
	HIGH	8.186	7.995	16.932	1.474	1.419	2.080	2.015	4.602
Seminole	LOW	1.186	1.177	4.979	0.125	0.116	0.274	0.273	0.664
	AVERAGE	2.357	2.373	5.614	0.247	0.237	0.463	0.456	1.095
	HIGH	3.207	3.152	6.717	0.384	0.368	0.615	0.581	1.612
Sumter	LOW	1.181	1.109	3.965	0.089	0.060	0.279	0.237	0.928
	AVERAGE	1.758	1.697	4.460	0.148	0.156	0.379	0.308	1.063
	HIGH	2.545	2.501	5.558	0.281	0.328	0.422	0.426	1.285
Suwannee	LOW	0.271	0.267	1.171	0.026	0.030	0.091	0.090	0.229
	AVERAGE	0.437	0.435	1.370	0.044	0.044	0.091	0.090	0.316
	HIGH	0.684	0.670	1.893	0.069	0.066	0.091	0.090	0.369
Taylor	LOW	0.220	0.235	0.783	0.039	0.045	0.076	0.087	0.214
	AVERAGE	0.351	0.348	0.991	0.051	0.050	0.096	0.100	0.214
	HIGH	0.473	0.465	1.087	0.066	0.064	0.118	0.112	0.214

County	Loss Costs	Frame Owners	Masonry Owners	Manufactured Homes	Frame Renters	Masonry Renters	Frame Condo Unit	Masrony Condo Unit	Commercial Residential
Union	LOW	0.382	0.374	1.435	0.055	0.047	0.112	0.110	0.331
	AVERAGE	0.544	0.545	1.571	0.077	0.073	0.112	0.110	0.331
	HIGH	0.666	0.655	1.590	0.081	0.079	0.112	0.110	0.331
Volusia	LOW	0.996	0.984	3.381	0.120	0.108	0.275	0.270	0.514
	AVERAGE	2.635	2.516	5.670	0.318	0.324	0.819	0.964	1.850
	HIGH	5.698	5.625	13.051	1.074	1.042	1.552	1.515	3.528
Wakulla	LOW	0.249	0.248	0.939	0.044	0.048	0.093	0.097	0.171
	AVERAGE	0.360	0.372	0.989	0.057	0.056	0.119	0.138	0.302
	HIGH	0.681	0.668	1.782	0.082	0.085	0.151	0.147	0.348
Walton	LOW	0.969	0.958	4.248	0.134	0.128	0.282	0.265	0.954
	AVERAGE	2.061	1.913	5.359	0.320	0.311	0.748	0.641	2.258
	HIGH	3.808	3.709	10.660	0.676	0.642	0.971	0.932	3.117
Washington	LOW	0.691	0.682	2.857	0.087	0.084	0.276	NA	0.597
	AVERAGE	1.067	1.083	3.297	0.145	0.136	0.276	NA	0.647
	HIGH	1.588	1.421	3.660	0.238	0.231	0.276	NA	0.743
Statewide	LOW	0.207	0.206	0.768	0.023	0.025	0.076	0.078	0.096
	AVERAGE	2.956	5.008	8.822	0.464	0.779	0.954	1.762	4.624
	HIGH	19.557	19.138	44.726	7.846	7.732	7.290	9.124	13.564

Form A-4 Output Ranges (2012 FHCF Exposure Data)
LOSS COSTS PER $1000 with Specified Deductibles

Modeling Organization: ARA
Model Name & Version Number: HurLoss 8.0.a
Model Release Date: 11/14/2016

County	Loss Costs	Frame Owners	Masonry Owners	Manufactured Homes	Frame Renters	Masonry Renters	Frame Condo Unit	Masrony Condo Unit	Commercial Residential
Alachua	LOW	0.158	0.165	1.242	0.004	0.003	0.009	0.008	0.250
	AVERAGE	0.372	0.369	1.721	0.029	0.027	0.044	0.041	0.345
	HIGH	0.667	0.643	2.270	0.076	0.070	0.101	0.094	0.602
Baker	LOW	0.075	0.074	0.636	0.001	0.002	NA	NA	NA
	AVERAGE	0.203	0.204	0.867	0.011	0.014	NA	NA	NA
	HIGH	0.303	0.294	0.971	0.018	0.016	NA	NA	NA
Bay	LOW	0.262	0.270	2.290	0.006	0.007	0.016	0.013	0.410
	AVERAGE	0.894	0.849	3.365	0.085	0.091	0.185	0.161	0.996
	HIGH	1.832	1.769	6.415	0.276	0.261	0.353	0.332	1.767
Bradford	LOW	0.141	0.137	1.082	0.007	0.006	NA	NA	NA
	AVERAGE	0.306	0.312	1.272	0.025	0.022	NA	NA	NA
	HIGH	0.434	0.421	1.399	0.028	0.025	NA	NA	NA
Brevard	LOW	1.416	1.387	5.818	0.057	0.047	0.139	0.069	0.764
	AVERAGE	3.802	3.886	10.576	0.620	0.610	0.808	1.114	3.156
	HIGH	8.537	8.313	20.156	1.770	1.717	2.205	2.135	5.041
Broward	LOW	4.960	4.763	21.285	0.154	0.128	0.417	0.323	2.055
	AVERAGE	6.975	6.556	23.686	0.906	0.924	1.358	1.320	5.326
	HIGH	9.837	9.581	29.048	1.848	1.722	2.440	2.276	7.408
Calhoun	LOW	0.105	0.102	0.962	0.002	0.006	NA	NA	NA
	AVERAGE	0.274	0.270	1.295	0.011	0.009	NA	NA	NA
	HIGH	0.480	0.465	1.612	0.022	0.019	NA	NA	NA
Charlotte	LOW	2.353	2.296	10.077	0.068	0.048	0.186	0.133	1.230
	AVERAGE	3.840	3.513	12.180	0.538	0.475	0.827	0.592	2.531
	HIGH	5.418	5.256	13.579	0.915	0.876	1.185	1.133	3.294
Citrus	LOW	0.386	0.351	2.712	0.021	0.004	0.047	0.042	0.681
	AVERAGE	0.878	0.780	3.379	0.105	0.089	0.172	0.173	0.927
	HIGH	1.251	1.204	3.987	0.192	0.180	0.250	0.234	1.055
Clay	LOW	0.145	0.141	1.266	0.003	0.004	0.007	0.012	0.271
	AVERAGE	0.380	0.382	1.434	0.038	0.038	0.046	0.041	0.358
	HIGH	0.672	0.650	2.192	0.072	0.067	0.095	0.088	0.452
Collier	LOW	2.323	2.272	10.593	0.103	0.046	0.177	0.142	1.423
	AVERAGE	5.116	4.870	15.433	1.028	0.954	1.449	1.315	4.082
	HIGH	12.083	9.323	31.737	2.694	2.622	3.246	3.154	7.706
Columbia	LOW	0.067	0.066	0.635	0.001	0.001	0.011	0.009	0.177
	AVERAGE	0.233	0.229	1.099	0.013	0.014	0.022	0.017	0.182
	HIGH	0.387	0.374	1.288	0.034	0.028	0.042	0.026	0.209
DeSoto	LOW	2.536	2.474	9.886	0.242	0.150	0.289	0.237	2.162
	AVERAGE	4.025	3.781	11.697	0.551	0.466	0.576	0.450	2.293
	HIGH	4.977	4.854	12.059	0.600	0.572	0.813	0.774	2.588
Dixie	LOW	0.108	0.121	0.906	0.006	0.018	0.008	0.009	0.183
	AVERAGE	0.268	0.247	1.117	0.025	0.023	0.015	0.015	0.195
	HIGH	0.357	0.346	1.141	0.032	0.030	0.018	0.041	0.279

County	Loss Costs	Frame Owners	Masonry Owners	Manufactured Homes	Frame Renters	Masonry Renters	Frame Condo Unit	Masrony Condo Unit	Commercial Residential
Duval	LOW	0.120	0.136	1.070	0.005	0.004	0.008	0.010	0.207
	AVERAGE	0.546	0.551	1.727	0.083	0.084	0.089	0.098	0.509
	HIGH	1.133	1.125	3.829	0.250	0.242	0.292	0.282	1.050
Escambia	LOW	0.860	0.830	6.082	0.056	0.047	0.293	0.216	1.140
	AVERAGE	2.893	2.911	9.447	0.671	0.687	1.110	1.182	3.338
	HIGH	5.125	4.960	16.415	1.578	1.535	1.871	1.814	4.946
Flagler	LOW	0.360	0.350	2.818	0.008	0.006	0.020	0.017	0.386
	AVERAGE	0.736	0.628	3.436	0.080	0.062	0.144	0.094	0.693
	HIGH	1.327	1.283	4.139	0.198	0.188	0.251	0.238	1.165
Franklin	LOW	0.073	0.077	0.765	0.005	0.012	0.004	0.003	0.156
	AVERAGE	0.226	0.246	1.031	0.031	0.025	0.012	0.018	0.170
	HIGH	0.519	0.501	1.862	0.061	0.057	0.079	0.033	0.171
Gadsden	LOW	0.041	0.047	0.472	0.000	0.002	NA	0.007	0.087
	AVERAGE	0.116	0.123	0.557	0.005	0.005	NA	0.007	0.100
	HIGH	0.212	0.205	0.712	0.008	0.007	NA	0.007	0.112
Gilchrist	LOW	0.187	0.155	1.289	0.015	0.021	NA	0.047	NA
	AVERAGE	0.383	0.378	1.595	0.052	0.047	NA	0.047	NA
	HIGH	0.526	0.507	1.751	0.058	0.054	NA	0.047	NA
Glades	LOW	3.657	3.002	10.390	0.584	0.242	NA	NA	NA
	AVERAGE	5.261	5.100	15.611	0.584	0.495	NA	NA	NA
	HIGH	6.526	6.385	15.815	0.584	0.552	NA	NA	NA
Gulf	LOW	0.119	0.117	1.262	0.003	0.003	0.003	0.005	0.147
	AVERAGE	0.267	0.287	1.280	0.015	0.013	0.014	0.010	0.247
	HIGH	0.393	0.382	1.310	0.019	0.017	0.028	0.026	0.307
Hamilton	LOW	0.065	0.063	0.551	0.003	0.006	NA	NA	NA
	AVERAGE	0.132	0.131	0.594	0.007	0.007	NA	NA	NA
	HIGH	0.207	0.201	0.672	0.009	0.008	NA	NA	NA
Hardee	LOW	1.701	1.630	7.928	0.121	0.069	NA	0.450	1.168
	AVERAGE	3.069	2.919	8.711	0.314	0.290	NA	0.450	1.368
	HIGH	3.395	3.328	9.594	0.362	0.344	NA	0.450	1.568
Hendry	LOW	3.554	3.485	15.439	0.147	0.122	0.382	0.149	2.285
	AVERAGE	4.932	4.681	15.518	0.529	0.448	0.698	0.555	2.709
	HIGH	6.327	6.177	15.603	0.704	0.671	0.956	0.911	2.964
Hernando	LOW	0.808	0.710	3.804	0.045	0.015	0.184	0.104	0.857
	AVERAGE	1.721	1.707	4.344	0.166	0.171	0.298	0.292	1.107
	HIGH	2.209	2.156	5.498	0.287	0.272	0.395	0.377	1.396
Highlands	LOW	1.458	1.331	5.604	0.032	0.010	0.146	0.060	1.071
	AVERAGE	2.895	2.743	8.043	0.201	0.169	0.320	0.309	1.543
	HIGH	4.896	4.793	11.753	0.373	0.351	0.549	0.518	2.172
Hillsborough	LOW	0.773	0.760	4.140	0.020	0.017	0.031	0.041	0.934
	AVERAGE	2.282	2.123	6.045	0.220	0.210	0.337	0.327	1.522
	HIGH	3.998	3.900	8.728	0.629	0.599	0.846	0.805	3.000
Holmes	LOW	0.211	0.205	1.946	0.009	0.030	0.047	NA	0.400
	AVERAGE	0.501	0.491	2.127	0.035	0.032	0.047	NA	0.400
	HIGH	0.834	0.809	2.602	0.050	0.045	0.047	NA	0.400
Indian River	LOW	3.514	3.424	13.490	0.105	0.097	0.450	0.226	2.360
	AVERAGE	5.811	5.359	16.934	1.074	1.030	1.453	1.569	4.881
	HIGH	10.151	9.865	23.266	2.379	2.309	2.925	2.834	6.231

County	Loss Costs	Frame Owners	Masonry Owners	Manufactured Homes	Frame Renters	Masonry Renters	Frame Condo Unit	Masrony Condo Unit	Commercial Residential
Jackson	LOW	0.098	0.107	0.908	0.004	0.008	NA	0.016	0.170
	AVERAGE	0.278	0.282	1.302	0.014	0.013	NA	0.023	0.262
	HIGH	0.523	0.507	1.734	0.024	0.022	NA	0.032	0.300
Jefferson	LOW	0.045	0.045	0.465	0.002	0.001	0.008	NA	NA
	AVERAGE	0.106	0.103	0.480	0.006	0.005	0.008	NA	NA
	HIGH	0.150	0.145	0.482	0.006	0.006	0.008	NA	NA
Lafayette	LOW	0.088	0.086	0.686	0.004	0.008	0.016	NA	NA
	AVERAGE	0.162	0.160	0.698	0.010	0.009	0.016	NA	NA
	HIGH	0.216	0.210	0.698	0.011	0.010	0.016	NA	NA
Lake	LOW	0.410	0.362	2.293	0.007	0.014	0.032	0.029	0.698
	AVERAGE	1.703	1.651	4.717	0.115	0.107	0.252	0.233	1.080
	HIGH	2.655	2.611	7.267	0.258	0.245	0.320	0.303	1.552
Lee	LOW	2.745	2.675	11.751	0.072	0.061	0.176	0.149	1.466
	AVERAGE	5.264	4.376	13.334	0.844	0.703	1.282	1.041	3.536
	HIGH	10.276	9.960	24.969	2.936	2.854	3.542	3.440	6.769
Leon	LOW	0.053	0.052	0.504	0.000	0.001	0.002	0.002	0.045
	AVERAGE	0.130	0.129	0.538	0.008	0.007	0.008	0.009	0.103
	HIGH	0.189	0.183	0.607	0.011	0.011	0.015	0.014	0.133
Levy	LOW	0.221	0.213	1.675	0.023	0.022	0.030	0.046	0.414
	AVERAGE	0.610	0.626	2.653	0.094	0.096	0.086	0.083	0.518
	HIGH	1.167	1.129	4.201	0.205	0.196	0.112	0.106	0.684
Liberty	LOW	0.064	0.063	0.641	0.001	0.004	NA	NA	NA
	AVERAGE	0.158	0.159	0.704	0.005	0.004	NA	NA	NA
	HIGH	0.242	0.236	0.741	0.005	0.004	NA	NA	NA
Madison	LOW	0.056	0.054	0.483	0.002	0.002	NA	NA	NA
	AVERAGE	0.122	0.120	0.552	0.007	0.006	NA	NA	NA
	HIGH	0.199	0.193	0.684	0.012	0.010	NA	NA	NA
Manatee	LOW	1.708	1.663	8.864	0.048	0.045	0.117	0.100	1.057
	AVERAGE	3.913	3.272	10.287	0.538	0.447	0.958	0.906	3.134
	HIGH	7.390	7.256	20.464	1.709	1.662	2.146	2.081	5.821
Marion	LOW	0.225	0.204	1.821	0.009	0.003	0.029	0.024	0.378
	AVERAGE	0.841	0.734	3.094	0.075	0.068	0.101	0.161	0.681
	HIGH	1.278	1.233	4.365	0.186	0.175	0.242	0.228	0.954
Martin	LOW	4.837	4.704	20.458	0.165	0.154	0.409	0.349	2.263
	AVERAGE	7.973	7.468	23.630	1.703	1.591	2.253	2.483	6.193
	HIGH	12.236	11.888	28.519	3.068	2.982	3.754	3.643	7.774
Miami-Dade	LOW	3.463	4.105	14.889	0.280	0.196	0.410	0.323	1.953
	AVERAGE	8.081	7.426	31.414	1.459	1.467	1.926	1.901	6.426
	HIGH	14.529	14.075	40.999	3.915	3.762	4.825	4.629	11.856
Monroe	LOW	6.744	6.541	29.212	1.564	0.370	0.940	0.685	3.034
	AVERAGE	11.019	10.583	32.358	4.552	4.207	3.961	4.133	8.368
	HIGH	17.382	17.135	42.132	7.173	7.071	6.395	8.132	11.918
Nassau	LOW	0.100	0.112	0.904	0.003	0.010	0.039	0.024	0.233
	AVERAGE	0.628	0.531	1.611	0.149	0.136	0.219	0.220	0.720
	HIGH	1.018	0.987	3.349	0.228	0.222	0.276	0.266	0.935
Okaloosa	LOW	0.447	0.434	3.151	0.021	0.017	0.072	0.083	0.593
	AVERAGE	1.825	1.929	5.186	0.320	0.370	0.571	0.650	2.313
	HIGH	3.828	3.709	13.693	0.963	0.932	1.162	1.121	4.008

County	Loss Costs	Frame Owners	Masonry Owners	Manufactured Homes	Frame Renters	Masonry Renters	Frame Condo Unit	Masrony Condo Unit	Commercial Residential
Okeechobee	LOW	3.475	3.411	13.605	0.216	0.128	0.296	0.230	2.297
	AVERAGE	4.893	4.621	14.203	0.484	0.426	0.479	0.667	2.676
	HIGH	6.225	6.073	14.340	0.538	0.505	0.780	0.734	2.996
Orange	LOW	0.576	0.566	3.186	0.009	0.009	0.030	0.017	0.397
	AVERAGE	1.554	1.566	4.628	0.092	0.082	0.139	0.132	0.893
	HIGH	2.178	2.131	5.613	0.178	0.187	0.239	0.224	1.227
Osceola	LOW	0.498	0.492	3.144	0.010	0.006	0.019	0.017	0.312
	AVERAGE	1.716	1.729	5.935	0.096	0.086	0.119	0.099	0.887
	HIGH	3.927	3.849	10.173	0.424	0.321	0.415	0.392	1.677
Palm Beach	LOW	4.728	4.564	20.795	0.204	0.178	0.443	0.370	2.130
	AVERAGE	7.431	6.924	25.783	1.185	1.088	1.696	1.532	5.745
	HIGH	13.131	12.637	35.302	3.219	3.076	4.015	3.832	10.429
Pasco	LOW	0.779	0.765	4.124	0.024	0.020	0.053	0.047	0.827
	AVERAGE	1.809	1.893	5.441	0.157	0.169	0.270	0.343	1.469
	HIGH	2.612	2.549	6.456	0.323	0.306	0.448	0.424	1.812
Pinellas	LOW	1.061	1.038	6.113	0.045	0.020	0.092	0.053	0.889
	AVERAGE	3.518	3.233	8.543	0.463	0.481	0.765	0.774	2.525
	HIGH	7.307	7.175	16.109	1.730	1.684	2.164	2.101	5.752
Polk	LOW	0.599	0.590	3.489	0.012	0.005	0.025	0.017	0.553
	AVERAGE	1.956	1.850	5.830	0.116	0.125	0.156	0.198	1.128
	HIGH	3.387	3.330	9.237	0.300	0.285	0.449	0.425	1.654
Putnam	LOW	0.202	0.197	1.517	0.010	0.008	0.020	0.017	0.438
	AVERAGE	0.507	0.507	2.100	0.045	0.040	0.078	0.047	0.481
	HIGH	0.866	0.838	2.795	0.082	0.077	0.110	0.103	0.534
St. Johns	LOW	0.240	0.232	1.891	0.006	0.006	0.013	0.012	0.298
	AVERAGE	0.663	0.789	2.779	0.118	0.121	0.211	0.255	0.880
	HIGH	1.733	1.683	6.159	0.359	0.348	0.437	0.423	1.640
St. Lucie	LOW	4.279	3.769	15.237	0.364	0.128	0.348	0.297	2.211
	AVERAGE	6.752	6.002	19.275	1.303	0.950	1.715	1.568	5.021
	HIGH	11.104	10.764	25.478	2.628	2.542	3.240	3.130	6.946
Santa Rosa	LOW	0.801	0.869	5.756	0.049	0.055	0.129	0.057	0.826
	AVERAGE	2.282	2.417	8.427	0.530	0.505	1.541	1.325	3.452
	HIGH	5.866	5.731	19.330	1.953	1.908	2.293	2.234	6.063
Sarasota	LOW	1.854	1.815	8.733	0.052	0.041	0.115	0.097	1.070
	AVERAGE	3.425	3.129	10.689	0.422	0.391	0.746	0.682	2.503
	HIGH	6.597	6.409	15.037	1.149	1.103	1.483	1.423	3.933
Seminole	LOW	0.500	0.492	3.650	0.004	0.004	0.025	0.021	0.382
	AVERAGE	1.421	1.426	4.212	0.086	0.079	0.131	0.128	0.809
	HIGH	2.106	2.054	5.191	0.185	0.175	0.248	0.232	1.300
Sumter	LOW	0.570	0.504	2.933	0.018	0.011	0.072	0.037	0.710
	AVERAGE	1.073	1.018	3.395	0.061	0.059	0.130	0.099	0.803
	HIGH	1.701	1.659	4.376	0.150	0.194	0.149	0.160	1.043
Suwannee	LOW	0.092	0.090	0.781	0.005	0.004	0.016	0.015	0.160
	AVERAGE	0.208	0.205	0.945	0.014	0.013	0.016	0.015	0.231
	HIGH	0.382	0.370	1.381	0.029	0.025	0.016	0.015	0.275
Taylor	LOW	0.062	0.068	0.483	0.003	0.007	0.006	0.005	0.145
	AVERAGE	0.151	0.149	0.658	0.011	0.011	0.012	0.012	0.145
	HIGH	0.232	0.224	0.738	0.018	0.017	0.025	0.019	0.145

County	Loss Costs	Frame Owners	Masonry Owners	Manufactured Homes	Frame Renters	Masonry Renters	Frame Condo Unit	Masrony Condo Unit	Commercial Residential
Union	LOW	0.120	0.117	0.940	0.005	0.001	0.013	0.012	0.237
	AVERAGE	0.250	0.249	1.068	0.017	0.017	0.013	0.012	0.237
	HIGH	0.335	0.324	1.085	0.022	0.020	0.013	0.012	0.237
Volusia	LOW	0.445	0.413	2.393	0.012	0.005	0.028	0.025	0.286
	AVERAGE	1.705	1.604	4.364	0.167	0.172	0.449	0.567	1.485
	HIGH	4.294	4.223	11.072	0.818	0.796	1.040	1.007	3.035
Wakulla	LOW	0.057	0.058	0.571	0.001	0.003	0.008	0.013	0.108
	AVERAGE	0.139	0.147	0.620	0.010	0.010	0.026	0.043	0.215
	HIGH	0.360	0.349	1.261	0.038	0.039	0.053	0.050	0.252
Walton	LOW	0.405	0.394	3.151	0.016	0.014	0.039	0.024	0.677
	AVERAGE	1.259	1.137	4.134	0.158	0.151	0.399	0.311	1.789
	HIGH	2.665	2.570	8.927	0.473	0.449	0.596	0.563	2.628
Washington	LOW	0.245	0.240	1.960	0.017	0.014	0.029	NA	0.403
	AVERAGE	0.538	0.546	2.351	0.042	0.039	0.029	NA	0.457
	HIGH	0.856	0.763	2.625	0.053	0.049	0.029	NA	0.568
Statewide	LOW	0.041	0.045	0.465	0.000	0.001	0.002	0.002	0.045
	AVERAGE	2.103	3.743	7.410	0.289	0.522	0.562	1.123	3.908
	HIGH	17.382	17.135	42.132	7.173	7.071	6.395	8.132	11.918

Form A-5: Percentage Change in Output Ranges

A. Provide summaries of the percentage change in the average loss costs output range data compiled in Form A-4, Output Ranges, relative to the equivalent data compiled from the previously accepted model in the format shown in the file named "2015FormA5.xlsx."

For the change in output range exhibit, provide the summary by:

- Statewide (overall percentage change),
- By region, as defined in Figure 62 – North, Central and South,
- By county, as defined in Figure 63 – Coastal and Inland.

B. Provide this form in Excel format. The file name should include the abbreviated name of the modeling organization, the standards year, and the form name. Also include Form A-5, Percentage Change in Output Ranges, in a submission appendix.

C. Provide color-coded maps by county reflecting the percentage changes in the average loss costs with specified deductibles for frame owners, masonry owners, frame renters, masonry renters, frame condo unit owners, masonry condo unit owners, manufactured home, and commercial residential from the output ranges from the previously accepted model.

Counties with a negative percentage change (reduction in loss costs) shall be indicated with shades of blue; counties with a positive percentage change (increase in loss costs) shall be indicated with shades of red; and counties with no percentage change shall be white. The larger the percentage change in the county, the more intense the color-shade.

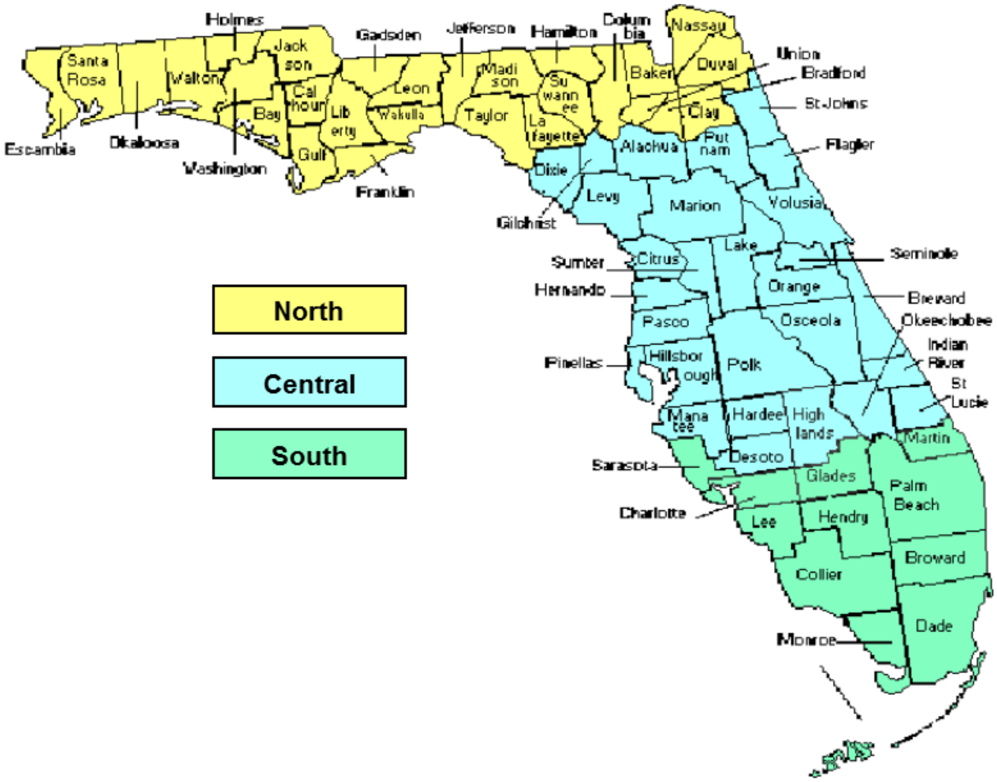


Figure 62. State of Florida by North/Central/South Regions

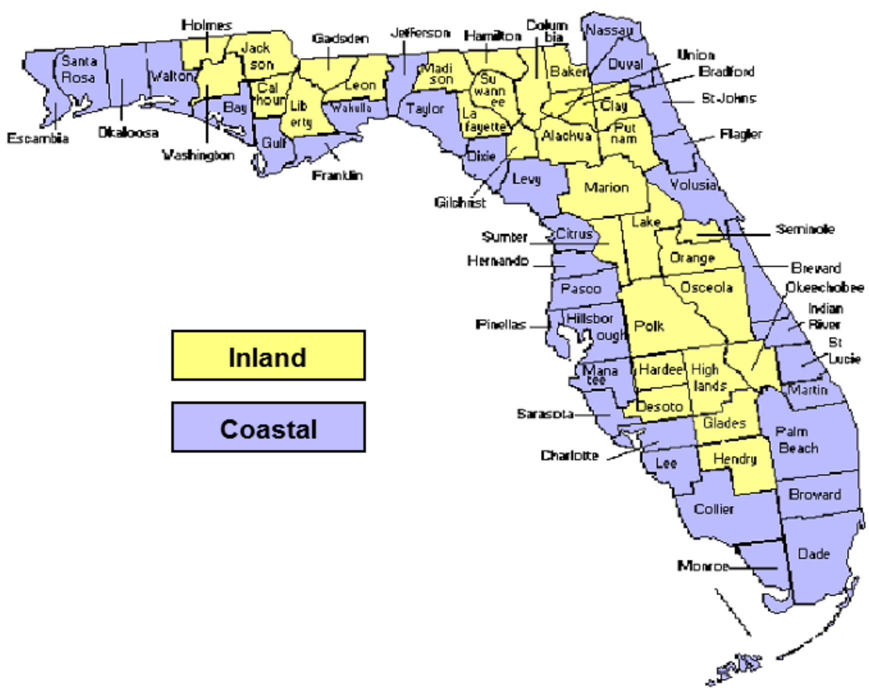


Figure 63. State of Florida by Coastal/Inland Counties

Form A-5 Percentage Change in Output Ranges

Modeling Organization: **ARA**
Model Name & Version Number: **HurLoss 8.0.a**
Model Release Date: **11/14/2016**

Percentage Change in $0 Deductible Output Ranges (version 8.0.a vs. 7.0.b)

Region	Frame Owners	Masonry Owners	Manufactured Homes	Frame Renters	Masonry Renters	Frame Condo Unit	Masrony Condo Unit	Commercial Residential
Coastal	2.0	1.5	1.6	2.7	1.8	2.0	1.8	1.9
Inland	-4.6	-6.1	-4.9	-8.5	-8.9	-7.5	-7.3	-8.9
North	1.5	2.6	-0.2	2.0	2.5	-4.8	-5.7	-3.4
Central	-0.5	-0.8	-1.7	-0.6	-0.1	0.9	1.4	0.3
South	2.4	1.3	1.6	1.7	1.2	2.7	1.8	2.1
Statewide	0.8	0.5	-0.4	0.7	0.9	0.9	1.6	1.7

Percentage Change in Specified Deductible Output Ranges (version 8.0.a vs. 7.0.b)

Region	Frame Owners	Masonry Owners	Manufactured Homes	Frame Renters	Masonry Renters	Frame Condo Unit	Masrony Condo Unit	Commercial Residential
Coastal	2.0	1.5	1.7	3.5	2.5	2.8	2.4	2.0
Inland	-6.1	-8.0	-5.6	-12.5	-13.1	-13.2	-11.9	-9.7
North	0.9	2.9	-0.4	1.9	2.8	-8.3	-9.6	-3.9
Central	-0.6	-1.1	-1.9	1.0	1.3	2.9	2.2	0.4
South	2.7	1.3	1.7	2.2	1.7	3.8	2.4	2.2
Statewide	0.7	0.5	-0.5	1.7	1.6	1.8	2.3	1.8

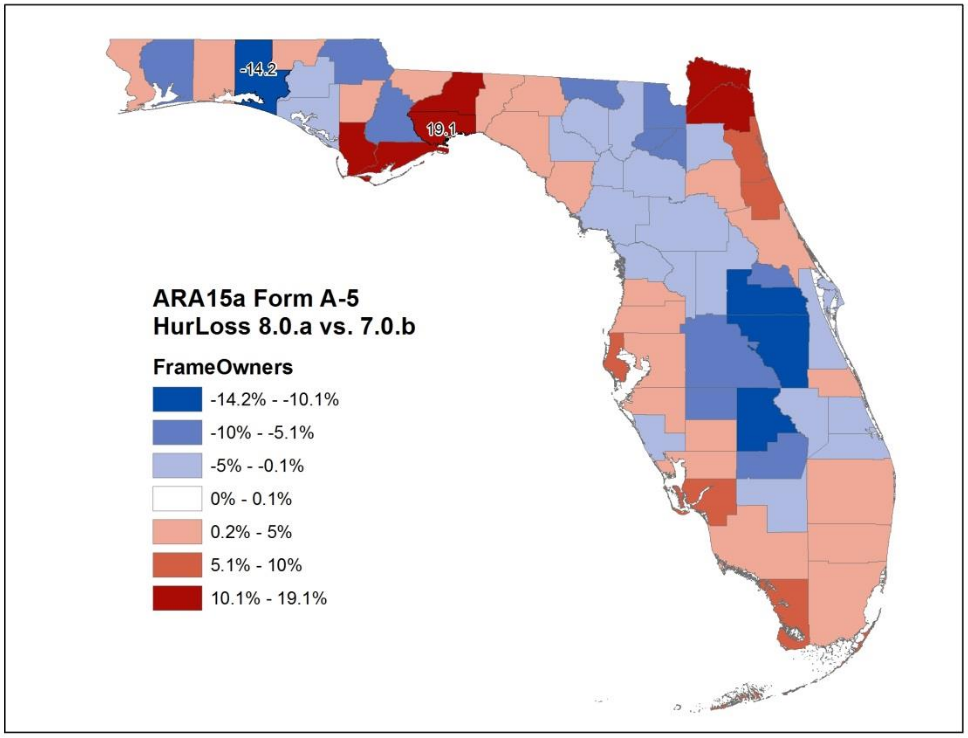


Figure 64. Frame Owners

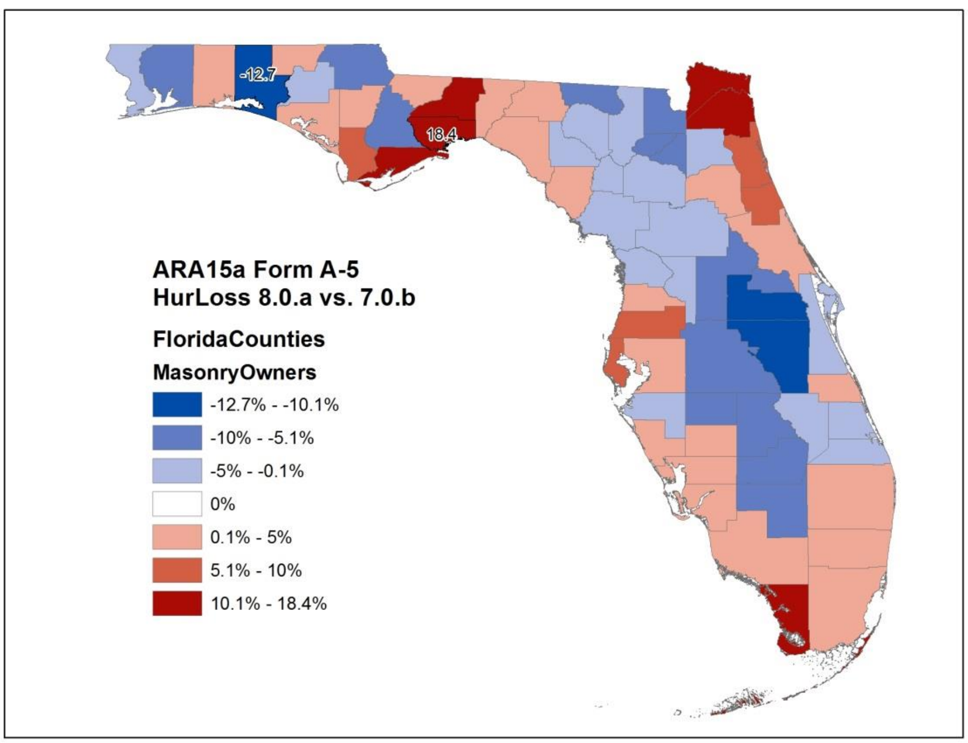


Figure 65. Masonry Owners

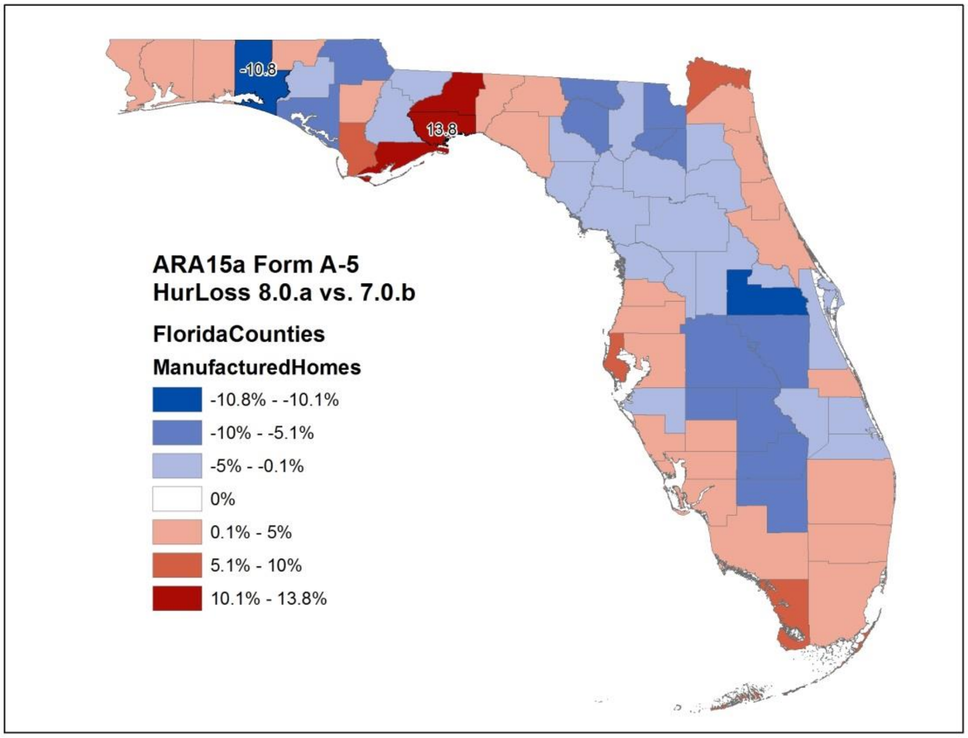


Figure 66. Manufactured Homes

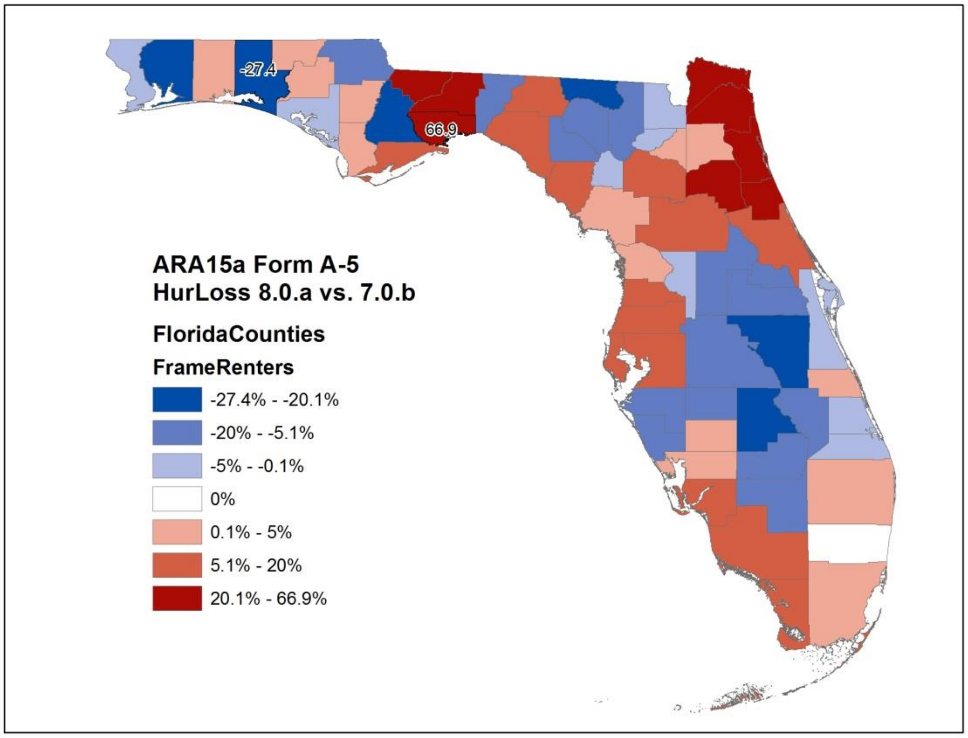


Figure 67. Frame Renters

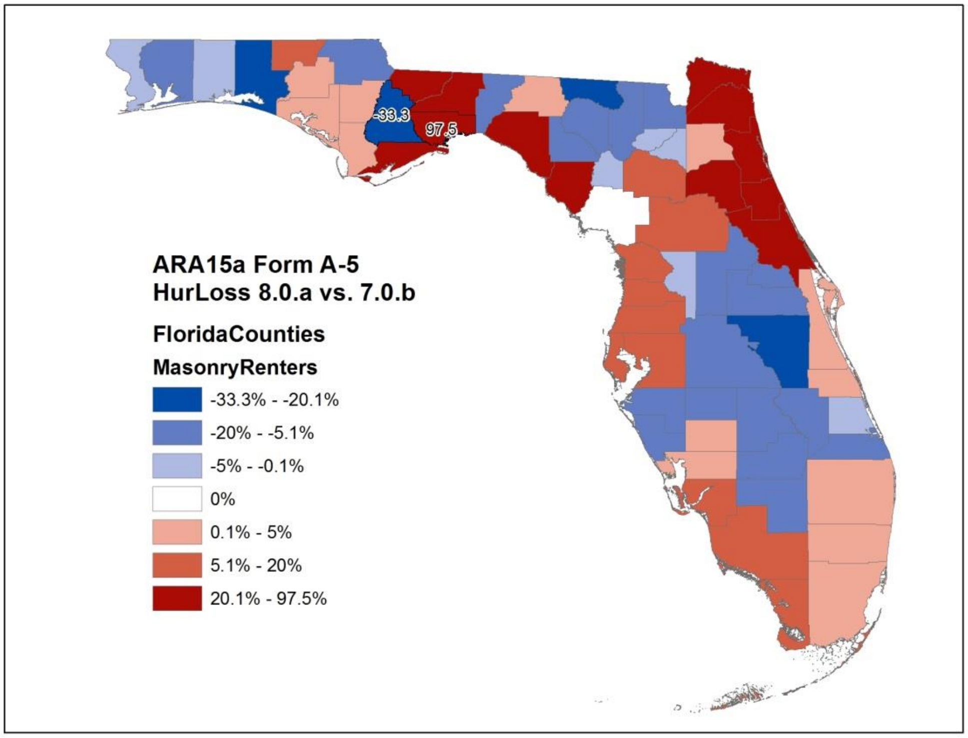


Figure 68. Masonry Renters

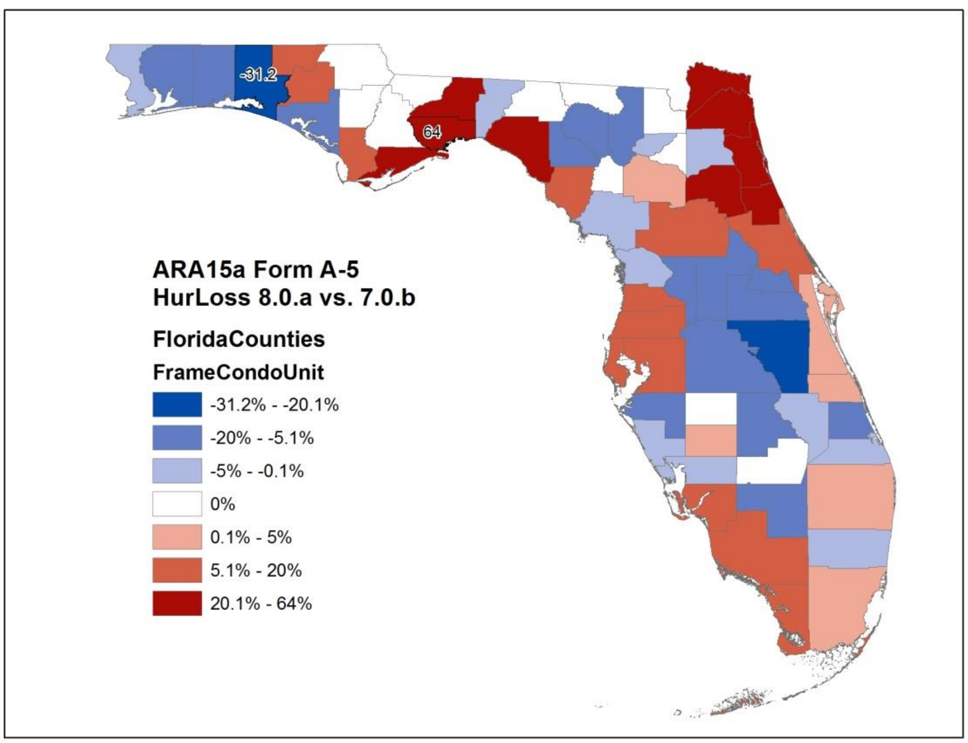


Figure 69. Frame Condo Unit Owners

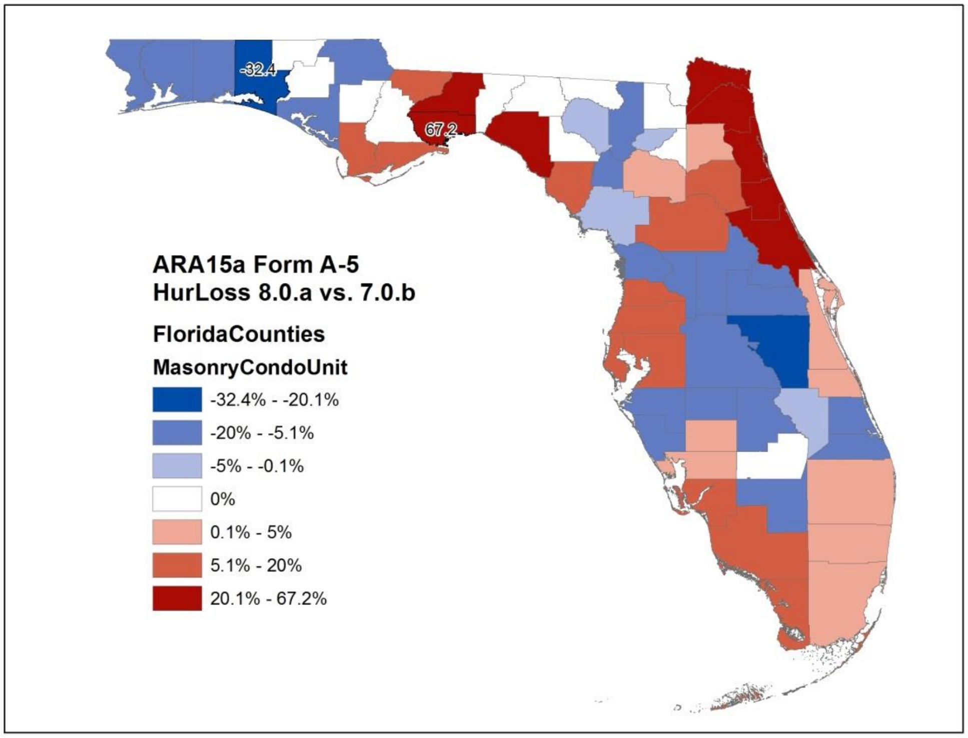


Figure 70. Masonry Condo Unit Owners

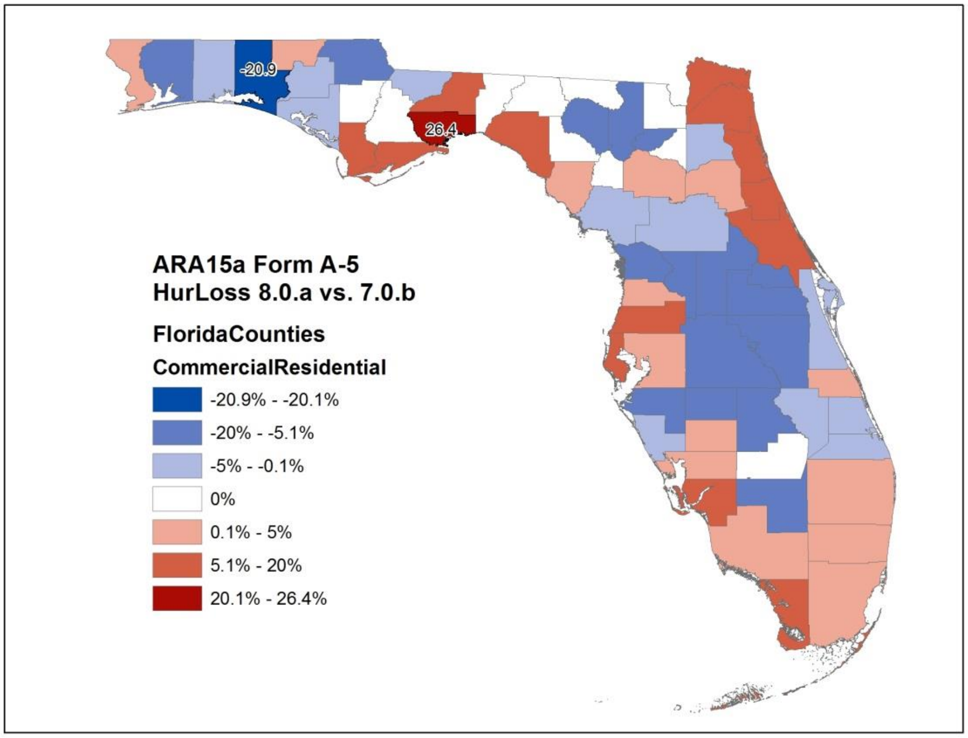


Figure 71. Commercial Residential

Form A-7: Percentage Change in Logical Relationship to Risk

A. Provide summaries of the percentage change in logical relationship to risk exhibits from the previously accepted model in the format shown in the file named "2015FormA7.xlsx."

B. Create exposure sets for each exhibit by modeling all of the coverages from the appropriate Notional Set listed below at each of the locations in "Location Grid B" as described in the file "NotionalInput15.xlsx." Refer to the Notional Policy Specifications provided in Form A-6, Logical Relationship to Risk, Trade Secret Item for additional modeling information. Explain any assumptions, deviations, and differences from the prescribed exposure information.

Exhibit	Notional Set
Deductible Sensitivity	Set 1
Construction Sensitivity	Set 2
Policy Form Sensitivity	Set 3
Coverage Sensitivity	Set 4
Building Code/Enforcement (Year Built) Sensitivity	Set 5
Building Strength Sensitivity	Set 6
Condo Unit Floor Sensitivity	Set 7
Number of Stories Sensitivity	Set 8

Models shall treat points in "Location Grid B" as coordinates that would result from a geocoding process. Models shall treat points by simulating loss at exact location or by using the nearest modeled parcel/street/cell in the model.

Provide the results statewide (overall percentage change) and by the regions defined in Form A-5, Percentage Change in Output Ranges.

C. Provide this form in Excel format. The file name shall include the abbreviated name of the modeling organization, the standards year, and the form name. Also include all tables in Form A-7, Percentage Change in Logical Relationship to Risk in a submission appendix.

Percentage changes are provided in the file named ARA15aFormA7_revised_2016-11-14.xlsx.

Form A-7: Percent Change in Logical Relationship to Risk - Deductibles

Modeling Organization: **ARA**

Model Name & Version Number: **HurLoss 8.0.a** (vs. 7.0.b)

Model Release Date: **11/14/2016**

Construction / Policy	Region	Percent Change in Loss Cost					
		$0	$500	1%	2%	5%	10%
Frame Owners	Coastal	0.8%	0.7%	0.7%	0.7%	0.7%	0.8%
	Inland	-5.1%	-5.9%	-6.3%	-6.8%	-7.9%	-9.0%
	North	3.5%	3.6%	3.8%	4.0%	4.6%	5.4%
	Central	-1.2%	-1.4%	-1.4%	-1.5%	-1.5%	-1.2%
	South	0.3%	0.2%	0.2%	0.2%	0.1%	0.2%
	Statewide	0.0%	-0.1%	-0.2%	-0.2%	-0.2%	0.0%
Masonry Owners	Coastal	0.8%	0.7%	0.7%	0.7%	0.7%	0.8%
	Inland	-5.1%	-5.9%	-6.3%	-6.8%	-7.9%	-9.1%
	North	3.5%	3.6%	3.8%	4.0%	4.6%	5.5%
	Central	-1.2%	-1.4%	-1.4%	-1.5%	-1.5%	-1.2%
	South	0.3%	0.2%	0.2%	0.2%	0.1%	0.1%
	Statewide	0.0%	-0.1%	-0.2%	-0.2%	-0.2%	0.0%
Manufactured Homes	Coastal	0.8%	0.8%	0.8%	0.8%	0.7%	0.7%
	Inland	-5.1%	-5.7%	-5.7%	-6.1%	-7.3%	-8.4%
	North	3.2%	3.3%	3.3%	3.5%	3.9%	4.4%
	Central	-1.2%	-1.3%	-1.3%	-1.4%	-1.6%	-1.6%
	South	0.4%	0.3%	0.3%	0.3%	0.3%	0.3%
	Statewide	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%
Frame Renters	Coastal	1.1%	1.2%	1.2%	1.2%	1.3%	1.4%
	Inland	-7.3%	-10.7%	-10.3%	-10.7%	-11.4%	-12.1%
	North	4.7%	6.2%	6.1%	6.2%	6.5%	6.8%
	Central	-0.4%	0.2%	-0.1%	0.2%	0.7%	1.1%
	South	0.2%	0.1%	0.1%	0.1%	0.0%	0.0%
	Statewide	0.3%	0.5%	0.4%	0.5%	0.6%	0.7%
Masonry Renters	Coastal	1.1%	1.2%	1.2%	1.2%	1.3%	1.4%
	Inland	-7.2%	-10.8%	-10.5%	-10.8%	-11.6%	-12.3%
	North	4.7%	6.3%	6.1%	6.3%	6.5%	6.7%
	Central	-0.4%	0.2%	0.0%	0.2%	0.7%	1.1%
	South	0.2%	0.0%	0.1%	0.0%	0.0%	0.0%
	Statewide	0.3%	0.5%	0.4%	0.5%	0.6%	0.7%
Frame Condo Unit	Coastal	1.1%	1.0%	1.0%	1.1%	1.2%	1.3%
	Inland	-5.8%	-9.4%	-9.4%	-10.1%	-10.9%	-11.8%
	North	4.4%	5.7%	5.7%	6.0%	6.4%	6.7%
	Central	-0.6%	-0.6%	-0.6%	-0.3%	0.3%	0.9%
	South	0.3%	0.1%	0.1%	0.1%	0.1%	0.0%
	Statewide	0.3%	0.2%	0.2%	0.3%	0.5%	0.6%
Masonry Condo Unit	Coastal	1.1%	1.0%	1.0%	1.1%	1.2%	1.3%
	Inland	-5.7%	-9.5%	-9.5%	-10.2%	-11.1%	-11.9%
	North	4.4%	5.7%	5.7%	6.0%	6.4%	6.7%
	Central	-0.6%	-0.6%	-0.6%	-0.3%	0.4%	0.9%
	South	0.3%	0.1%	0.1%	0.1%	0.0%	0.0%
	Statewide	0.3%	0.2%	0.2%	0.3%	0.5%	0.6%

Construction / Policy	Region	Percent Change in Loss Cost					
		$0	2%	3%	5%	10%	
Commercial Residential	Coastal	0.7%	0.7%	0.7%	0.7%	0.7%	
	Inland	-5.0%	-5.1%	-5.1%	-5.1%	-5.2%	
	North	3.0%	3.0%	3.0%	3.0%	3.0%	
	Central	-1.2%	-1.3%	-1.3%	-1.3%	-1.3%	
	South	0.3%	0.2%	0.2%	0.2%	0.2%	
	Statewide	-0.1%	-0.1%	-0.1%	-0.1%	-0.1%	

Form A-7: Percent Change in Logical Relationship to Risk - Construction

Modeling Organization: **ARA**
Model Name & Version Number: **HurLoss 8.0.a** (vs. 7.0.b)
Model Release Date: **11/14/2016**

Policy	Region	Percent Change in Loss Cost	
		Masonry	Frame
Owners	Coastal	0.8%	0.8%
	Inland	-5.1%	-5.1%
	North	3.5%	3.5%
	Central	-1.2%	-1.2%
	South	0.3%	0.3%
	Statewide	0.0%	0.0%
Renters	Coastal	1.1%	1.1%
	Inland	-7.2%	-7.3%
	North	4.7%	4.7%
	Central	-0.4%	-0.4%
	South	0.2%	0.2%
	Statewide	0.3%	0.3%
Condo Unit	Coastal	1.1%	1.1%
	Inland	-5.7%	-5.8%
	North	4.4%	4.4%
	Central	-0.6%	-0.6%
	South	0.3%	0.3%
	Statewide	0.3%	0.3%
Policy	**Region**	**Percent Change in Loss Cost**	
		Concrete	
Commercial Residential	Coastal	0.7%	
	Inland	-5.0%	
	North	3.0%	
	Central	-1.2%	
	South	0.3%	
	Statewide	-0.1%	

Form A-7: Percent Change in Logical Relationship to Risk - Policy Form

Modeling Organization: **ARA**
Model Name & Version Number: **HurLoss 8.0.a** (vs. 7.0.b)
Model Release Date: **11/14/2016**

Region	Percent Change in Loss Cost		
	Frame Owners	Masonry Owners	Manufactured Homes
Coastal	0.8%	0.8%	0.8%
Inland	-5.1%	-5.1%	-5.1%
North	3.5%	3.5%	3.2%
Central	-1.2%	-1.2%	-1.2%
South	0.3%	0.3%	0.4%
Statewide	0.0%	0.0%	0.1%

Form A-7: Percent Change in Logical Relationship to Risk - Coverage

Modeling Organization: **ARA**
Model Name & Version Number: **HurLoss 8.0.a** (vs. 7.0.b)
Model Release Date: **11/14/2016**

Construction / Policy	Region	Percent Change in Loss Cost			
		Coverage A	Coverage B	Coverage C	Coverage D
Frame Owners	Coastal	0.8%	0.8%	1.3%	1.2%
	Inland	-5.1%	-5.1%	-7.0%	-10.0%
	North	3.4%	3.4%	4.8%	6.1%
	Central	-1.2%	-1.2%	0.2%	0.3%
	South	0.3%	0.3%	0.1%	0.1%
	Statewide	0.0%	0.0%	0.5%	0.5%
Masonry Owners	Coastal	0.8%	0.8%	1.3%	1.2%
	Inland	-5.0%	-5.0%	-7.0%	-10.1%
	North	3.4%	3.4%	4.8%	6.2%
	Central	-1.2%	-1.2%	0.2%	0.4%
	South	0.3%	0.3%	0.1%	0.1%
	Statewide	-0.1%	-0.1%	0.5%	0.5%
Manufactured Homes	Coastal	0.8%	0.8%	0.9%	0.9%
	Inland	-4.8%	-4.8%	-8.5%	-8.8%
	North	3.0%	3.0%	4.5%	5.0%
	Central	-1.2%	-1.2%	-1.1%	-1.0%
	South	0.4%	0.4%	0.4%	0.3%
	Statewide	0.0%	0.0%	0.2%	0.2%
Frame Renters	Coastal	0.0%	0.0%	1.1%	1.0%
	Inland	0.0%	0.0%	-6.5%	-9.5%
	North	0.0%	0.0%	4.4%	5.8%
	Central	0.0%	0.0%	-0.4%	-0.5%
	South	0.0%	0.0%	0.2%	0.2%
	Statewide	0.0%	0.0%	0.3%	0.3%
Masonry Renters	Coastal	0.0%	0.0%	1.1%	1.0%
	Inland	0.0%	0.0%	-6.5%	-9.6%
	North	0.0%	0.0%	4.3%	5.9%
	Central	0.0%	0.0%	-0.4%	-0.4%
	South	0.0%	0.0%	0.2%	0.1%
	Statewide	0.0%	0.0%	0.3%	0.3%
Frame Condo Unit	Coastal	0.9%	0.0%	1.2%	1.1%
	Inland	-4.7%	0.0%	-6.8%	-9.8%
	North	3.6%	0.0%	4.6%	6.0%
	Central	-1.1%	0.0%	0.0%	0.0%
	South	0.4%	0.0%	0.2%	0.1%
	Statewide	0.1%	0.0%	0.5%	0.4%
Masonry Condo Unit	Coastal	0.9%	0.0%	1.2%	1.1%
	Inland	-4.7%	0.0%	-6.8%	-10.0%
	North	3.6%	0.0%	4.6%	6.1%
	Central	-1.1%	0.0%	0.0%	0.0%
	South	0.4%	0.0%	0.2%	0.1%
	Statewide	0.1%	0.0%	0.5%	0.4%
Commercial Residential	Coastal	0.7%	0.0%	0.8%	0.7%
	Inland	-5.0%	0.0%	-5.8%	-5.2%
	North	3.0%	0.0%	3.6%	3.0%
	Central	-1.2%	0.0%	-1.0%	-1.3%
	South	0.3%	0.0%	0.3%	0.2%
	Statewide	-0.1%	0.0%	0.1%	-0.1%

Form A-7: Percent Change in Logical Relationship to Risk - Building Code / Enforcement (Year Built) Sensitivity

Modeling Organization: **ARA**
Model Name & Version Number: **HurLoss 8.0.a** (vs. 7.0.b)
Model Release Date: **11/14/2016**

Construction / Policy	Region	Percent Change in Loss Cost		
		Year Built 1980	Year Built 1998	Year Built 2004
Frame Owners	Coastal	0.8%	0.7%	0.8%
	Inland	-5.2%	-5.0%	-5.3%
	North	3.5%	3.2%	3.7%
	Central	-1.1%	-1.2%	-1.2%
	South	0.3%	0.2%	0.4%
	Statewide	0.0%	-0.1%	0.0%
Masonry Owners	Coastal	0.8%	0.7%	0.8%
	Inland	-5.2%	-5.0%	-5.2%
	North	3.5%	3.2%	3.6%
	Central	-1.1%	-1.2%	-1.2%
	South	0.3%	0.2%	0.4%
	Statewide	0.0%	-0.1%	0.0%
Construction / Policy	Region	Percent Change in Loss Cost		
		Year Built 1974	Year Built 1992	Year Built 2004
Manufactured Homes	Coastal	0.8%	0.9%	0.8%
	Inland	-5.3%	-5.2%	-4.7%
	North	3.3%	3.3%	2.9%
	Central	-1.3%	-1.2%	-1.2%
	South	0.4%	0.4%	0.3%
	Statewide	0.1%	0.1%	0.0%
Construction / Policy	Region	Percent Change in Loss Cost		
		Year Built 1980	Year Built 1998	Year Built 2004
Frame Renters	Coastal	1.1%	1.1%	1.1%
	Inland	-7.4%	-7.3%	-6.1%
	North	4.8%	4.4%	4.2%
	Central	-0.4%	-0.7%	-0.5%
	South	0.2%	0.1%	0.3%
	Statewide	0.3%	0.1%	0.4%
Masonry Renters	Coastal	1.1%	1.1%	1.1%
	Inland	-7.4%	-7.2%	-6.0%
	North	4.8%	4.4%	4.1%
	Central	-0.4%	-0.7%	-0.5%
	South	0.1%	0.1%	0.3%
	Statewide	0.3%	0.1%	0.3%
Frame Condo Unit	Coastal	1.0%	1.0%	1.1%
	Inland	-6.0%	-5.7%	-4.9%
	North	4.4%	4.0%	4.2%
	Central	-0.6%	-0.8%	-0.6%
	South	0.3%	0.2%	0.4%
	Statewide	0.3%	0.1%	0.4%
Masonry Condo Unit	Coastal	1.0%	1.0%	1.1%
	Inland	-5.9%	-5.7%	-4.8%
	North	4.4%	4.0%	4.2%
	Central	-0.6%	-0.8%	-0.6%
	South	0.2%	0.2%	0.4%
	Statewide	0.3%	0.1%	0.4%
Commercial Residential	Coastal	0.7%	0.8%	0.7%
	Inland	-5.0%	-5.2%	-4.3%
	North	2.8%	3.4%	2.7%
	Central	-1.4%	-1.1%	-1.1%
	South	0.2%	0.3%	0.2%
	Statewide	-0.2%	0.0%	-0.1%

Form A-7: Percent Change in Logical Relationship to Risk - Building Strength

Modeling Organization: **ARA**
Model Name & Version Number: **HurLoss 8.0.a** (vs. 7.0.b)
Model Release Date: **11/14/2016**

Construction / Policy	Region	Percent Change in Loss Cost		
		Weak	Medium	Strong
Frame Owners	Coastal	0.9%	0.7%	1.0%
	Inland	-5.0%	-5.0%	-4.9%
	North	3.6%	3.2%	4.0%
	Central	-0.7%	-1.2%	-0.8%
	South	0.4%	0.3%	0.5%
	Statewide	0.2%	-0.1%	0.3%
Masonry Owners	Coastal	0.9%	0.7%	1.0%
	Inland	-5.0%	-5.0%	-4.8%
	North	3.6%	3.2%	3.9%
	Central	-0.7%	-1.2%	-0.8%
	South	0.3%	0.3%	0.5%
	Statewide	0.2%	-0.1%	0.3%
Manufactured Homes	Coastal	0.8%	0.9%	0.8%
	Inland	-5.3%	-5.2%	-4.7%
	North	3.3%	3.3%	2.9%
	Central	-1.3%	-1.2%	-1.2%
	South	0.4%	0.4%	0.3%
	Statewide	0.1%	0.1%	0.0%
Frame Renters	Coastal	1.0%	0.9%	1.0%
	Inland	-7.8%	-7.1%	-4.7%
	North	5.2%	4.3%	3.5%
	Central	0.1%	-0.8%	-0.5%
	South	0.3%	0.3%	0.4%
	Statewide	0.5%	0.3%	0.4%
Masonry Renters	Coastal	1.0%	0.9%	0.9%
	Inland	-7.8%	-7.1%	-4.4%
	North	5.2%	4.3%	3.3%
	Central	0.2%	-0.8%	-0.5%
	South	0.3%	0.3%	0.4%
	Statewide	0.5%	0.2%	0.4%
Frame Condo Unit	Coastal	1.0%	1.0%	0.9%
	Inland	-7.0%	-6.5%	-6.0%
	North	4.6%	4.4%	4.3%
	Central	-0.6%	-0.7%	-0.8%
	South	0.4%	0.4%	0.3%
	Statewide	0.4%	0.3%	0.2%
Masonry Condo Unit	Coastal	1.0%	1.0%	0.9%
	Inland	-7.1%	-6.4%	-5.5%
	North	4.6%	4.4%	4.2%
	Central	-0.6%	-0.6%	-0.7%
	South	0.4%	0.4%	0.3%
	Statewide	0.4%	0.3%	0.3%
Commercial Residential	Coastal	0.7%	0.8%	0.7%
	Inland	-5.0%	-5.2%	-4.4%
	North	2.8%	3.4%	2.6%
	Central	-1.4%	-1.1%	-1.2%
	South	0.2%	0.3%	0.2%
	Statewide	-0.2%	0.0%	-0.1%

Form A-7: Percent Change in Logical Relationship to Risk - Condo Unit Floor

Modeling Organization: **ARA**
Model Name & Version Number: **HurLoss 8.0.a** (vs. 7.0.b)
Model Release Date: **11/14/2016**

Construction / Policy	Region	Percent Change in Loss Cost			
		3rd Floor	9th Floor	15th Floor	20th Floor
Condo Unit A	Coastal	0.6%	0.6%	0.6%	0.6%
	Inland	-4.9%	-4.5%	-4.9%	-5.0%
	North	2.6%	2.4%	2.6%	2.6%
	Central	-1.4%	-1.4%	-1.4%	-1.5%
	South	0.2%	0.2%	0.2%	0.2%
	Statewide	-0.2%	-0.2%	-0.2%	-0.2%
Condo Unit B	Coastal	0.7%	0.6%	0.7%	0.7%
	Inland	-5.2%	-4.9%	-5.2%	-5.3%
	North	2.9%	2.6%	2.9%	2.9%
	Central	-1.4%	-1.4%	-1.4%	-1.4%
	South	0.2%	0.2%	0.2%	0.2%
	Statewide	-0.1%	-0.2%	-0.1%	-0.1%

Form A-7: Percent Change in Logical Relationship to Risk - Number of Stories

Modeling Organization: **ARA**

Model Name & Version Number: **HurLoss 8.0.a** (vs. 7.0.b)

Model Release Date: **11/14/2016**

Construction / Policy	Region	Percent Change in Loss Cost		
		1 Story	2 Story	
Frame Owners	Coastal	0.8%	0.9%	
	Inland	-5.1%	-5.2%	
	North	3.5%	3.6%	
	Central	-1.2%	-1.1%	
	South	0.3%	0.3%	
	Statewide	0.0%	0.0%	
Masonry Owners	Coastal	0.8%	0.9%	
	Inland	-5.1%	-5.2%	
	North	3.4%	3.6%	
	Central	-1.2%	-1.0%	
	South	0.3%	0.3%	
	Statewide	0.0%	0.0%	
Frame Renters	Coastal	1.1%	1.1%	
	Inland	-7.2%	-8.0%	
	North	4.6%	5.0%	
	Central	-0.5%	-0.4%	
	South	0.2%	0.1%	
	Statewide	0.3%	0.3%	
Masonry Renters	Coastal	1.1%	1.1%	
	Inland	-7.2%	-8.0%	
	North	4.6%	5.1%	
	Central	-0.5%	-0.3%	
	South	0.2%	0.1%	
	Statewide	0.3%	0.3%	
Construction / Policy	**Region**			
Commercial Residential	Coastal	0.8%	0.7%	0.7%
	Inland	-7.2%	-5.2%	-5.0%
	North	4.2%	3.1%	3.0%
	Central	-1.3%	-1.3%	-1.2%
	South	0.3%	0.3%	0.3%
	Statewide	0.1%	0.0%	-0.1%

Form A-8: Probable Maximum Loss for Florida

A. Provide a detailed explanation of how the Expected Annual Hurricane Losses and Return Periods are calculated.

B. Complete Part A showing the personal and commercial residential probable maximum loss for Florida. For the Expected Annual Hurricane Losses column, provide personal and commercial residential, zero deductible statewide loss costs based on the 2012 Florida Hurricane Catastrophe Fund's aggregate personal and commercial residential exposure data found in the file named "hlpm2012c.exe."

In the column, Return Period (Years), provide the return period associated with the average loss within the ranges indicated on a cumulative basis.

For example, if the average loss is $4,705 million for the range $4,501 million to $5,000 million, provide the return period associated with a loss that is $4,705 million or greater.

For each loss range in millions ($1,001-$1,500, $1,501-$2,000, $2,001-$2,500) the average loss within that range should be identified and then the return period associated with that loss calculated. The return period is then the reciprocal of the probability of the loss equaling or exceeding this average loss size.

The probability of equaling or exceeding the average of each range should be smaller as the ranges increase (and the average losses within the ranges increase). Therefore, the return period associated with each range and average loss within that range should be larger as the ranges increase. Return periods shall be based on cumulative probabilities.

A return period for an average loss of $4,705 million within the $4,501-$5,000 million range should be lower than the return period for an average loss of $5,455 million associated with a $5,001- $6,000 million range.

C. Provide a graphical comparison of the current submission Residential Return Periods loss curve to the previously accepted submission Residential Return Periods loss curve. Residential Return Period (Years) shall be shown on the y-axis on a log 10 scale with Losses in Billions shown on the x-axis. The legend shall indicate the corresponding submission with a solid line representing the current year and a dotted line representing the previously accepted submission.

D. Provide the estimated loss and uncertainty interval for each of the Personal and Commercial Residential Return Periods given in Part B, Annual Aggregate and Part C, Annual Occurrence. Describe how the uncertainty intervals are derived. Also, provide Parts B and C, the Conditional Tail Expectation, the expected value of losses greater than the Estimated Loss Level.

E. Provide this form in Excel format. The file name shall include the abbreviated name of the modeling organization, the standards year, and the form name. Also include Form A-8, Probable Maximum Loss for Florida, in a submission appendix.

A. Return time represents the mean return period associated with a storm producing a loss equal to or greater than the average loss within a given limit range (a_i). The return time is the reciprocal of the annual probability of exceedance associated with the loss level of interest, which is estimated as fraction of years in the 300,000 year simulation in which the maximum event loss is equal to or greater than the loss level of interest.

B. See Form A-8, Part A.

C. A graphical comparison of return times for the current submission and the previously accepted submission is provided in Figure 72.

D. See Form A-8, Part B and Part C. The uncertainty intervals given in Part B represent the 5^{th} and 95^{th} percentiles of the maximum loss observed in each consecutive *n*-year period of the 300,000 years of simulated losses, where *n* is 5, 10, ..., or 1,000 years.

E. See file ARA15aFormA8_revised_2016-11-14.xlsx.

Part A: Personal and Commercial Residential Probable Maximum Loss for Florida

LOSS RANGE (MILLIONS)			TOTAL LOSS	AVERAGE LOSS (MILLIONS)	NUMBER OF HURRICANES	EXPECTED ANNUAL HURRICANE LOSSES*	RETURN PERIOD (YEARS)
$ -	to	$ 500	18,260,954	94	192,323	73.0	1.9
$ 501	to	$ 1,000	16,766,419	716	23,395	67.1	2.8
$ 1,001	to	$ 1,500	15,240,054	1,228	12,404	61.0	3.2
$ 1,501	to	$ 2,000	14,430,274	1,735	8,315	57.7	3.5
$ 2,001	to	$ 2,500	13,816,664	2,238	6,173	55.3	3.8
$ 2,501	to	$ 3,000	13,524,168	2,739	4,936	54.1	4.0
$ 3,001	to	$ 3,500	12,876,453	3,241	3,972	51.5	4.2
$ 3,501	to	$ 4,000	13,173,633	3,739	3,523	52.7	4.4
$ 4,001	to	$ 4,500	12,923,575	4,244	3,045	51.7	4.6
$ 4,501	to	$ 5,000	12,372,899	4,746	2,607	49.5	4.8
$ 5,001	to	$ 6,000	26,572,178	5,483	4,846	106.3	5.1
$ 6,001	to	$ 7,000	25,807,177	6,482	3,981	103.2	5.5
$ 7,001	to	$ 8,000	26,338,189	7,488	3,517	105.4	5.9
$ 8,001	to	$ 9,000	26,082,203	8,490	3,072	104.3	6.3
$ 9,001	to	$ 10,000	26,670,726	9,477	2,814	106.7	6.7
$ 10,001	to	$ 11,000	26,240,072	10,491	2,501	105.0	7.2
$ 11,001	to	$ 12,000	25,737,311	11,479	2,242	103.0	7.6
$ 12,001	to	$ 13,000	25,839,280	12,488	2,069	103.4	8.1
$ 13,001	to	$ 14,000	25,189,118	13,477	1,869	100.8	8.5
$ 14,001	to	$ 15,000	25,883,011	14,484	1,787	103.5	9.0
$ 15,001	to	$ 16,000	24,319,121	15,499	1,569	97.3	9.5
$ 16,001	to	$ 17,000	24,101,467	16,496	1,461	96.4	10.0
$ 17,001	to	$ 18,000	22,880,781	17,492	1,308	91.5	10.5
$ 18,001	to	$ 19,000	23,429,006	18,506	1,266	93.7	11.1
$ 19,001	to	$ 20,000	23,314,003	19,493	1,196	93.3	11.6
$ 20,001	to	$ 21,000	21,851,103	20,479	1,067	87.4	12.2
$ 21,001	to	$ 22,000	22,273,573	21,499	1,036	89.1	12.8
$ 22,001	to	$ 23,000	22,172,821	22,487	986	88.7	13.4
$ 23,001	to	$ 24,000	22,303,879	23,502	949	89.2	14.1
$ 24,001	to	$ 25,000	19,397,108	24,491	792	77.6	14.8
$ 25,001	to	$ 26,000	19,961,437	25,493	783	79.9	15.4
$ 26,001	to	$ 27,000	20,240,321	26,492	764	81.0	16.1
$ 27,001	to	$ 28,000	19,465,078	27,493	708	77.9	16.8
$ 28,001	to	$ 29,000	19,032,859	28,492	668	76.1	17.6
$ 29,001	to	$ 30,000	16,532,335	29,469	561	66.1	18.3
$ 30,001	to	$ 35,000	86,499,769	32,324	2,676	346.0	20.7
$ 35,001	to	$ 40,000	77,057,503	37,388	2,061	308.2	25.3
$ 40,001	to	$ 45,000	66,247,361	42,357	1,564	265.0	30.6
$ 45,001	to	$ 50,000	60,012,106	47,402	1,266	240.1	36.7
$ 50,001	to	$ 55,000	54,776,233	52,417	1,045	219.1	43.9
$ 55,001	to	$ 60,000	49,597,649	57,404	864	198.4	52.3
$ 60,001	to	$ 65,000	48,919,693	62,477	783	195.7	62.9
$ 65,001	to	$ 70,000	42,176,781	67,375	626	168.7	76.1
$ 70,001	to	$ 75,000	38,480,681	72,468	531	153.9	91.8
$ 75,001	to	$ 80,000	33,296,664	77,434	430	133.2	112.0
$ 80,001	to	$ 90,000	57,357,558	84,848	676	229.4	147.7
$ 90,001	to	$ 100,000	39,596,171	94,727	418	158.4	220.7
$ 100,001	to	Maximum	120,948,439	128,123	944	483.8	728.9
Total			1,499,985,888		318,389	5,999.0	

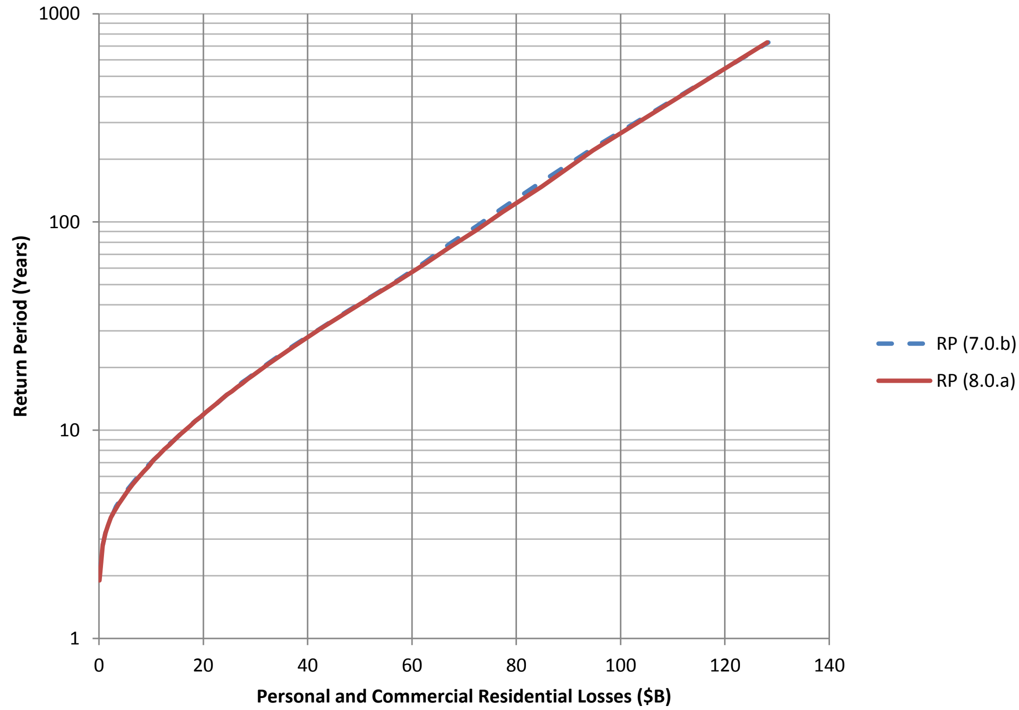


Figure 72. Comparison of Form A-8 Results to Prior Year's Submission

Part B: Personal and Commercial Residential Probable Maximum Loss for Florida (Annual Aggregate)

Return Period (Years)	Estimated Loss Level	Uncertainty Interval		Conditional Tail Expectation
		5%	95%	
Top Event	406,696,199,087	N/A	N/A	N/A
1000	150,336,202,837	111,413,059,853	245,957,232,692	176,484,885,377
500	129,350,862,737	95,661,192,574	221,676,784,376	157,352,993,712
250	108,942,265,797	76,199,566,237	196,388,269,153	136,341,469,695
100	82,012,278,023	50,115,957,100	168,963,090,374	108,847,750,001
50	62,237,365,457	30,520,525,552	149,721,901,359	88,550,719,440
20	34,861,533,215	11,435,521,270	121,626,017,262	61,254,899,042
10	18,164,305,944	2,623,460,048	101,165,718,197	41,752,883,493
5	5,698,694,469	251,037,360	81,306,622,837	24,682,709,272

Part C: Personal and Commercial Residential Probable Maximum Loss for Florida (Annual Occurrence)

Return Period (Years)	Estimated Loss Level	Uncertainty Interval		Conditional Tail Expectation
		5%	95%	
Top Event	294,214,342,927	N/A	N/A	N/A
1000	136,806,256,682	104,332,218,223	227,843,037,241	165,200,872,810
500	117,622,546,232	87,217,002,955	196,787,084,159	145,648,795,125
250	98,459,051,566	70,520,799,641	179,381,851,100	126,422,149,853
100	74,420,431,335	44,090,158,128	157,493,894,470	101,287,119,255
50	56,113,369,606	27,728,740,279	136,627,097,725	82,706,393,855
20	31,519,149,389	10,141,927,363	110,960,874,829	57,686,323,692
10	16,461,316,955	2,323,447,820	91,437,582,079	39,672,032,804
5	5,167,490,657	224,653,643	73,975,439,582	23,787,488,703

Appendix B - Acronymns

Acronymns

A – Building Loss

AAL – Average Annual Loss

ACV – Actual Cash Value

ALE – Additional Living Expenses

AMSS – Advanced Modeling and Software Systems

ANOVA –

ARA - Applied Research Associates, Inc.

ASCE – American Society of Civil Engineers

ASTM – American Society of Testing and materials

C – Contents Loss

C# – Programming Language

C++ – Programming Language

CoV – Coefficient of Variation

DEC – Digital Equipment Corporation

DoD – Department of Defense

DNA – Defense Nuclear Agency

EIT – Engineer in Training

EPA – Environmental Protection Agency

ESDU – Engineering Design Methodology

ESET NOS32 – Antivirus Software

FCAS – Fellow of the Casualty Actuarial Society

FCHLPM – Florida Commission on Hurricane Loss Projection Methodology

FEMA – Federal Emergency Management Agency

FIPS – Federal Information Processing Standards

FORTRAN – FORmula TRANslation, computer programming language

GIS – Geographical Information Systems

HadISST – Hadley Centre Sea Ice and Sea Surface Temperature Data Set

HAZUS – HAZards US

HURDAT – Hurricane Database

HURDAT2 – Hurricane Database 2

HurLoss – Hurricane Loss Estimation Software

IBHS – Insurance Institute for Business & Home Safety

IRIS – IntraRisk Inspection Service

LULC – Land use and land cover

MAAA – Member of the American Academy of Actuaries

MRLC – Multi-Resolution Land Use Consortium

NCAR – National Center for Atmospheric Research

NIBS – National Institute of Building Sciences

NIST – National Institute of Standards and Technology

NLCD – National Land Cover Database

NLCD – National Land Cover Database

NSF – National Science Foundation

NWS-38 – National Weather Service Technical Publication 38

PML – Probable Maximum Losses

PRA – Probabilistic Risk Assessment

QA – Quality Assessment

RAM – Random Access Memory

RCMP – Residential Construction Mitigation program

RMW – Radius of Maximum Winds

SAS – Statistical Analysis System

SST – Sea Surface Temperature

SSTD 12 – Standard for Hurricane-Resistant Construction

TIGER – Topologically Integrated Geographic Encoding and Referencing

TORSCR – TORmis SCoRe (TORMIS postprocessor code)

T-SQL – Transact-SQL (Structured Query Language)

UNICEDE/px – Data Format

VAPO – Vulnerability Assessment and Protection Option

ZIP – Zone Improvement Plan

Appendix C – Actuarial Review Letter

Actuarial Review Letter

PINNACLE
ACTUARIAL RESOURCES, INC.

2603 Camino Ramon, Suite 421
San Ramon, CA 94583
415.692.0938
pinnacleactuaries.com

Laura A. Maxwell, FCAS, MAAA
Consulting Actuary
lmaxwell@pinnacleactuaries.com

November 10, 2016

Francis M. Lavelle, Ph.D., P.E.
Vice President & Principal Engineer
Applied Research Associates, Inc.
8537 Six Forks Rd., Suite 600
Raleigh, NC 27615

RE: Form G-5 – Actuarial Standards Expert Certification

Dear Frank:

As requested by Applied Research Associates, Inc. (ARA), Pinnacle Actuarial Resources, Inc. (Pinnacle) has completed Form G-5 – Actuarial Standards Expert Certification for ARA's submission to the Florida Commission on Hurricane Loss Projection Methodology (the "Commission").

In our review, we relied on data provided by ARA regarding their 2016 Florida Hurricane Model. The data provided included:

- Hurricane Submission dated 11/1/2016 (pdf)
- Forms included in the submission (excel)
- Notification 7.0a error
- Responses to questions on 11/2/2016, 11/4/2016 and 11/8/2016

Our review of the model was based on generally accepted actuarial practices and procedures. There is an inherent uncertainty because the ultimate liability for claims is subject to the outcome of events to occur. No guarantee can or will be provided that the actual experience will match the modeled results. It is likely that future experience will deviate from the estimates. Pinnacle reviewed the input variables and model results for compliance with Actuarial Standard of Practice No. 38 – Using Models Outside the Actuary's Area of Expertise (Property and Casualty) and the actuarial standards of the Commission.

Actuarial Standard of Practice No. 38 (ASOP 38), paragraph 3.1 recommends that an actuary using a model that incorporates specialized knowledge outside the actuary's own area of expertise should

Commitment Beyond Numbers

- determine appropriate reliance on experts;
- have a basic understanding of the model;
- evaluate whether the model is appropriate for the intended application;
- determine that appropriate validation has occurred; and
- determine the appropriate use of the model.

Section A, Actuarial Standards of ARA's Florida Commission On Hurricane Loss Projection Methodology report provides most of the documentation necessary to review the model according to ASOP 38.

Appropriate Reliance on Experts (ASOP 38, Paragraph 3.2)

- Item G2 of ARA's Florida Commission On Hurricane Loss Projection Methodology report demonstrates that ARA's staff are experts in the applicable field.
- Item G2 also describes external peer reviews of model components.
- The model has been previously accepted by the Commission. Changes from the approved model include one correction, database updates and methodology changes. The largest impact is from the correction. The other changes have minimum impact.

Understanding of the Model (ASOP 38, Paragraph 3.3)

- Basic components are unchanged since Pinnacle's prior review.
- User inputs are provided in ARA's Florida Commission On Hurricane Loss Projection Methodology report. Section A-1 is modeling input data.
- Model output is included in ARA's Florida Commission On Hurricane Loss Projection Methodology report. All forms and maps were reviewed for reasonability. This included location, deductibles, construction, policy form, coverage, building code, building strength, condo unit floor and number of stories. Explanations for anomalies were provided in the response to Pinnacle's questions.

Appropriateness of the Model for Intended Application (ASOP 38, Paragraph 3.4)

ARA's Florida Commission On Hurricane Loss Projection Methodology report includes comparisons of actual losses versus modeled loss for historical hurricanes.

Appropriate Validation (ASOP 38, Paragraph 3.5)

Output was reviewed to determine how historical observations compare to results produced by the model and the consistency and reasonableness of relationships among various output results.

Appropriate Use of The Model (ASOP 38, Paragraph 3.6)
This model is to be used for modeling hurricane loss projections in Florida.

Pinnacle's report is intended solely for the ARA's submission to the Commission. This distribution is granted on the condition that all recipients are made aware that Pinnacle is available to answer any questions regarding the report. Third parties reading this report should recognize that the furnishing of this report is not a substitute for their own due diligence and should place no reliance on this report or the data contained herein that would result in the creation of any duty or liability by Pinnacle to the third party.

Laura Maxwell, the undersigned, is a member in good standing of the American Academy of Actuaries and meets its qualification standards to produce this report.

We appreciate the opportunity to be of service to ARA.

Sincerely,

Laura A. Maxwell

Laura A. Maxwell, FCAS, MAAA
Consulting Actuary