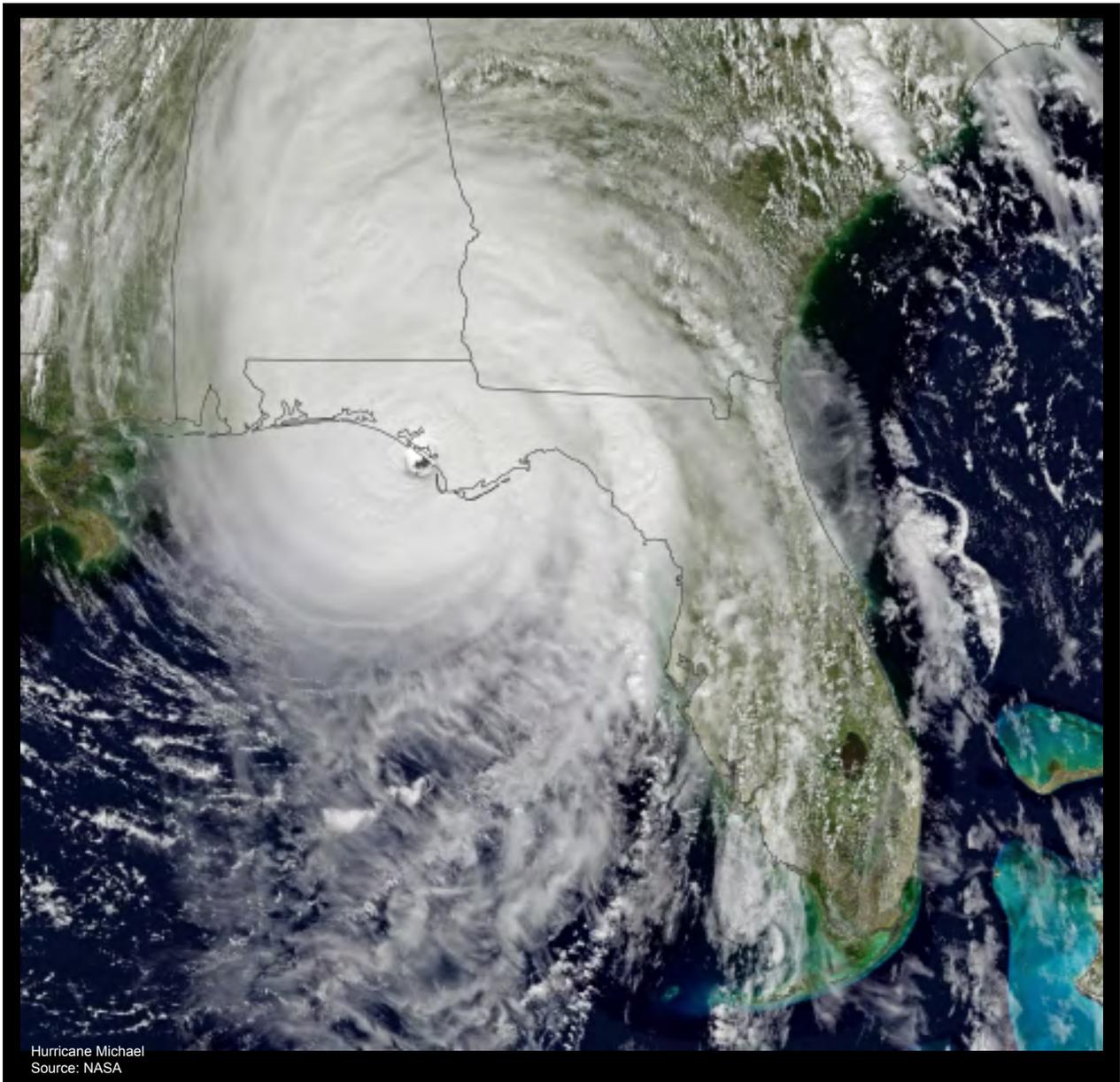


**Florida Hurricane Catastrophe Fund  
2019 Ratemaking Formula Report**

**Presented to the  
State Board of Administration of Florida  
March 19, 2019,  
Revised May 30, 2019**



Hurricane Michael  
Source: NASA

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**Florida Hurricane Catastrophe Fund**  
**2019 Ratemaking Formula Report**  
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Revised May 30

**Executive Summary**

1. **On April 2, 2019 the Trustees of the State Board of Administration of Florida approved the Florida Hurricane Catastrophe Fund (FHCF) Ratemaking Formula Report for the 2019-2020 contract year, as presented to the FHCF Advisory Council on March 19, 2019. On Month DD, 2019, CS/CS/CS/HB301 (HB301) was signed into law, increasing the FHCF's Loss Adjustment Expense allowance from 5% to 10% of reimbursed losses effective on all contracts effective June 1, 2019 and after. This updated Formula Report adjusts the March 19, 2019 Report for the impact of changes due to HB301.**
2. **Rates:** The Florida Hurricane Catastrophe Fund (FHCF) overall average rate change for the 2019-2020 (2019) Contract Year, after adjusting for company coverage selection changes, is projected to be a 5.07% increase. Paragon recommends an average 5.41% decrease in FHCF rates, based on coverage under Section 215.555, Florida Statutes.
3. **Coverage, Layer, and Retention Changes:**
  - a. The average coverage for 2019, based on 2018 market shares and 2019 coverage selections, is projected to be 81.629%, compared to 73.483% for 2018 (an 11% increase).
  - b. The increase in the average FHCF coverage selection generates the 2019 FHCF layer of \$20.826 billion, compared to the 2018 layer of \$23.135 billion.
  - c. The projected loss retention for 2019 is \$7.422 billion compared to the 2018 retention of \$7.178 billion.
4. **Premium Change:** FHCF premium will increase by \$99 million (driven primarily by company coverage selection changes and the increase in the Loss Adjustment Expense allowance) from \$1.103 billion to \$1.202 billion based on the overall average rate change.

	<b>2019 Contract Year Modeled Per HB301</b>	<b>2019 Contract Year Modeled Approved 4/2/2019</b>	<b>2018 Contract Year Actual</b>	<b>2018 Contract Year Modeled Updated 6/13/2018</b>
<b>FHCF Coverage</b>				
Industry Retention	\$7.422 billion	\$7.422 billion	\$7.178 billion	\$7.255 billion
Limit	\$17 billion	\$17 billion	\$17 billion	\$17 billion
Average Coverage	81.629%	81.629%	73.483%	73.121%
FHCF Layer	\$20.826 billion	\$20.826 billion	\$23.135 billion	\$23.349 billion
FHCF Premium	\$1.202 billion	\$1.176 billion	\$1.103 billion	\$1.109 billion
Rate Change	-5.41%	-7.43%	-5.20%	-2.56%
Coverage Selection Change	11.08%	11.08%	-1.40%	-1.88%
Exposure Change	3.72%	3.72%	4.45%	2.83%
Premium Change	8.98%	6.66%	-2.36%	-1.70%
Overall Average Rate Change	5.07%	2.83%	-6.52%	-4.40%
Projected Payout Multiple	14.1434	14.4518	15.4136	15.3247
90% Retention Multiple	5.6005	5.7226	5.3135	5.3135
Exposure Base	\$2.360 trillion	\$2.360 trillion	\$2.275 trillion	\$2.238 trillion
Overall FHCF Rate/\$1,000 Exp.	0.5094	0.4985	0.4848	0.4956

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## Part I: The Ratemaking Process

### Overview

The rates in this report are developed for the limits and retentions, as specified by Section 215.555, Florida Statutes, as updated by HB301, for the Florida Hurricane Catastrophe Fund (FHCF) 2019 Contract Year. Paragon recommends an average 5.41% decrease in FHCF rates for the 2019 Contract Year based on a \$17.000 billion coverage limit and a \$7.422 billion per event retention, which drops to \$2.474 billion for the third largest and subsequent events (1/3 of \$7.422 billion). Companies that did not change their coverage selections will generally have rate decreases. After adjusting for changes in company coverage selections, the overall average FHCF rate change is projected to be an increase of 5.07%.

This rating formula will produce an estimated \$1.202 billion in total FHCF premium compared to \$1.103 billion in FHCF premium for the 2018 Contract Year. The increase in overall premium is projected to be 6.66% and is based on a rate decrease of 5.41%, an increase in coverage level of 11.1% and projected growth in exposure of 3.72%. After adjusting for the shift in company coverage selections towards 90%, as well as the increase in the Loss Adjustment Expense allowance, the overall average rate change is projected to be an increase of 5.07%. There is no change in the statutory mandated cash build up factor of 25% from 2018 to 2019. This premium estimate assumes the same reinsurance structure of \$1 billion excess of \$10.5 billion as 2018 with no change in ceded premium or losses. Exhibit XVII provides the methodology for adjusting 2019 rates for potential changes in reinsurance structure and contracted reinsurance premium should the actual FHCF reinsurance structure differ from the assumed structure used in this rating formula.

For 2019, FHCF coverage is a limit of \$17.000 billion excess of \$7.422 billion. There are two major factors affecting the FHCF layer of coverage for the 2019 Contract Year:

1. Pursuant to Section 215.555, Florida Statutes, the industry retention is equal to \$4.5 billion adjusted for the increase in reported exposure from 2004 through 2017. As exposures have grown 64.9% over this period, the modeled retention for 2019 is \$7.422 billion.
2. Pursuant to Section 215.555, Florida Statutes, the FHCF limit is equal to \$17.000 billion until there is sufficient estimated claims-paying capacity to fund \$17.000 billion of loss in subsequent Contract Years. As the State Board of Administration of Florida (SBA) has not made this determination, the FHCF limit for 2019 is \$17.000 billion.

The above changes will vary by deductible, construction, and territory. In 2017, we modified the methodology used in the previous ten years to develop territory relativities. To improve stability in ZIP Code rating groups, the new methodology will shift a ZIP Code to a different rating territory only if the indication is for a shift of two or more rating territories or if the indicated shift of one rating territory is consistent for three years. 2019 is the third year of this new methodology.

### Type of Business Allocation

The following table shows the components of the indicated premium changes by type of business.

	A	B	C	D	E
Exh. 2 Sources	Line 48	Line 51	Line 55	Line 1.1	Line 58
Calculations			$((1+A)/(1+B))-1$		$((1+C)/(1+D))-1$
Type of Business	Premium Change	Exposure Change	Overall Avg. Rate Change	Company Selected Coverage Change	Avg. Rate Change Unadjusted For Coverage Change
Residential	9.51%	4.00%	5.30%	9.02%	-3.41%
Tenants	1.48%	4.00%	-2.42%	0.26%	-2.67%
Condos	6.55%	5.00%	1.47%	3.90%	-2.34%
Mobile Home	-1.19%	0.00%	-1.19%	0.76%	-1.94%
Commercial	11.54%	0.00%	11.54%	44.16%	-22.63%
<b>Total</b>	<b>8.98%</b>	<b>3.72%</b>	<b>5.07%</b>	<b>11.08%</b>	<b>-5.41%</b>

### Territory Changes

The 2019 recommended territories, like the 2018 FHCF territories, are based on analysis of losses in the FHCF coverage as modeled by AIR Worldwide Corporation (AIR), Corelogic-EQECAT (Corelogic), and Risk Management Solutions (RMS). The relationship between lowest rate and highest rate is approximately 1:37, similar to 2018. As was done last year, this ratio was adjusted to accurately reflect the indicated loss costs for territory 1. Indicated territory changes were tempered so that ZIP Codes would only shift one territory up or down if the indication was for a shift of two or more territories or if there has been an indicated one territory shift consistently for three years. With 2019 being the third year of the new methodology, 583 zip codes shifted down one territory, most due to 3-year indications of one territory shift.

### Premium Summary

We project premium, exposure, and retention changes as follows:

Exposure Growth (2018 to 2019)	3.72%
Retention	\$7.422 billion
Premium – 2018 (as of 10/29/18)	\$1.103 billion
Premium – 2019 (Projected) 3/19/2019	\$1.176 billion
Premium - 2019 (Projected) HB301	\$1.202 billion

### Use of Five Models Found Acceptable by the Florida Commission on Hurricane Loss Projection Methodology

For 2019, a weighting of five models found acceptable by the Florida Commission on Hurricane Loss Projection Methodology as of December 1, 2018 was used for aggregate results. The five models were AIR, Corelogic, RMS, Applied Research Associates (ARA), and the Florida Public Model (FPM). Model results were compared in detail to construct an industry distribution of losses by size. For the industry aggregate basis, consistent with the weighting methodology used in all years when the FHCF had five models, 5%, 20%, 50%, 20%, and 5% weights were applied to the models ranked from lowest to highest based on annual expected aggregate FHCF losses.

In 2019, all 5 models meet the 2015 standards. Four out of five models produced lower loss cost indications than in 2018 ratemaking, and therefore the 5-model weighted indication was lower.

For analysis of detailed allocation to type of business, territory, construction, and deductible, and for special coverage questions, three models (AIR, Corelogic, and RMS) were used for all types of business. Model results were compared in detail and 1/3 weight was given to each model for all types of business.

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## Summary of Changes to the 2019 Ratemaking Formula

The changes that occurred in the 2019 ratemaking formula include:

1. The 2018 average coverage selection was 73.483%. The projected 2019 average coverage is 81.629% based on March 1, 2019 selections and adjustments for rating mitigation factor changes. This change reduces the size of the 100% FHCF layer. While FHCF rates by coverage decrease by 7.43% compared to 2018 rates, the overall average FHCF rate increases by 2.83% due to the shift in coverage selections towards 90%. These were the rate changes prior to the legislative change in the loss adjustment expense allowance.
2. HB301 increased the loss adjustment expense allowance from 5% to 10% of FHCF covered losses. This change has a uniform 2.18% impact on rates, resulting in total rate changes by coverage down 5.41% compared to 2018 rates and an overall average FHCF rate increase of 5.07%.
3. The projected exposure trend increased from 2.83% in 2018 to 3.72% in 2019. The methodology for allocating trend was modified this year to recognize that most of the increase in exposure will be due to new construction. The change in distribution of exposure by age of home moderates the growth in modeled loss due to the projected increase in exposure.
4. The modeling for the 2019 per company retention limit adjustment is based on the average of the AIR and RMS models. The change in this adjustment factor this year produced a decrease in projected losses of \$4.1 million.
5. Expenses for 2013A and 2016A pre-event notes decreased from \$27.7 million in 2018 to \$26.1 million in 2019 due mainly to the maturation of \$550 million of 2016A notes.
6. Operating expenses are projected to increase by \$0.9 million from \$7.9 million in 2018 to \$8.8 million in 2019.
7. Estimated reinsurance premium and ceded losses were included in this year's rate indication presentation based on 2018 projected ceded premium and ceded losses for the \$1 billion excess of \$10.5 billion layer. A table to adjust premium, ceded losses, payout and retention multiples, and the indicated rate change is included in Exhibit XVII to accommodate any reinsurance purchase changes subsequent to the presentation of the 2019 Ratemaking Formula Report.

Details of the overall changes can be found in Exhibit II, which contains the following exhibits:

1. Summary of 2019 Rate Calculation;
2. Adjustment to Exposure Base and Summary of Rate Change;
3. Summary of Results; and
4. Historical Comparison of Exposures, Premiums, and Rates.

## Details of the Ratemaking Process

This ratemaking formula for the FHCF is based on Section 215.555, Florida Statutes. We have followed the same basic process used since 1995. Legislation enacted in 2005 (Chapter 2005-111, Laws of Florida, CS/SBN 1486) addressed retention in multiple-event seasons by creating a per event retention that applies to a participating insurer's two largest events and drops to 1/3 for all other events. This drop-down coverage has again been incorporated into the 2019 rates.

### A. Trend

For 2019 ratemaking, we reviewed construction data indices from Marshall & Swift and the actual exposures by coverage reported to the FHCF from 1995 to 2018. The Marshall & Swift construction indices for the Southeast were up 5.0% in 2018 compared to down 2.8% in 2017 as of October. Countrywide indices were up 4.5% compared to up 2.9% the prior year.

Our selection of exposure and risk count trends for 2019 was based predominantly on the last three years of historical FHCF data. The table below displays the last five years of annual growth in exposure and risks. In making selections, the FHCF trend data was benchmarked against the indications generated from the Marshall & Swift construction indices.

Historical FHCF exposure and risk counts can be found in Exhibit III. Note that the trended exposure data in Exhibit III is based on exposure reported to the FHCF as of 10/29/2018. This data was used in the catastrophe modeling process.

For 2019, the exposure trending process was refined to focus on new construction. For residential, tenants, and condominium unit owners, trends in unit counts were mainly applied to newer construction (year built 2012 and subsequent) and older year built counts were assumed to have minimal to negative trends. Exposure trends were also mainly allocated to newer construction (year built 2012 and subsequent), with trend levels closer to inflation changes for older construction. Using this approach, the overall trended FHCF exposures better reflect the improvement in damageability levels due to new construction.

**Annual Growth in Exposure and Risk Counts Reported  
by FHCF Participating Insurers as of 10/29/2018**

	Residential		Tenants		Condominiums		Mobile Homes		Commercial	
	Exposure	Risk Count	Exposure	Risk Count	Exposure	Risk Count	Exposure	Risk Count	Exposure	Risk Count
2013-2014	1.6%	0.3%	7.3%	12.0%	2.1%	0.8%	-3.7%	-1.0%	-4.3%	-5.1%
2014-2015	2.1%	0.0%	1.3%	12.2%	2.0%	0.8%	-5.8%	-7.9%	-9.8%	-7.2%
2015-2016	3.9%	1.3%	12.0%	10.3%	5.1%	3.2%	0.6%	-1.8%	-6.5%	-6.5%
2016-2017	2.8%	0.8%	9.1%	12.0%	3.9%	1.4%	1.4%	-1.1%	-3.8%	-4.5%
2017-2018	4.6%	1.7%	2.8%	-4.2%	5.9%	2.3%	2.5%	-0.5%	2.2%	0.3%
Selected	4.0%	1.0%	4.0%	4.0%	5.0%	2.0%	0.0%	0.0%	0.0%	0.0%

### B. Insurance Industry Aggregate Retention for Ratemaking Purposes (Exhibit IV)

For development of this premium formula, it is necessary to assume a projected aggregate insurance industry retention to estimate losses in the aggregate layer of coverage.

Section 215.555, Florida Statutes, specifies the calculation of the retention multiple for each participating insurer. The numerator of the retention multiple is \$4.5 billion adjusted by the percentage growth in FHCF covered exposure from 2004 to the Contract Year two years prior to the current year. The historical exposure for 2017 was \$2,178.2 billion (as of 10/29/2018) as compared to \$1,320.6 billion in 2004. The percent adjustment is 64.9%, so the numerator of the retention multiple is \$7.422 billion (rounded to the nearest million).

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The denominator of the retention multiple is the projected total FHCF reimbursement premium assuming all participating insurers have selected the 90% coverage option. Retention multiples by coverage % are displayed below.

Coverage %	90%	75%	45%
Retention Multiple	5.6005	6.7206	11.2010

Each participating insurer's provisional retention is the retention multiple (adjusted for coverage selection) times its provisional premium. An insurer's actual retention is the retention multiple times its actual premium.

Based on the above calculation, the retention multiple numerator of \$7.422 billion is used as the insurance industry aggregate retention for simulating losses in the aggregate layer of coverage. This value is equivalent to the sum of retentions for all insurers.

Since 2003, 100% of all FHCF premiums are calculated based on the premium formula rates applied to individual company exposures. This is called Section I premium. Section II premium refers to a premium calculated from exposure under covered policies that would require individual ratemaking, with each policy risk modeled and rated individually by company. There is currently no Section II exposure and therefore no Section II premium. The Section I insurance industry aggregate retention is \$7.422 billion (based on 100% of projected premium) and the Section II aggregate retention is \$0 (based on 0% of projected premium.)

**C. Industry Excess Layer (Exhibit IV)**

Under Section 215.555(4)(c)1, Florida Statutes, "The contract shall also provide that the obligation of the board with respect to all contracts covering a particular contract year shall not exceed the actual claims-paying capacity of the fund up to a limit of \$17 billion for that contract year, unless the board determines that there is sufficient estimated claims-paying capacity to provide \$17 billion of capacity for the current contract year and an additional \$17 billion of capacity for subsequent contract years."

As the board has made no such determination regarding capacity in excess of \$17 billion, the limit for the 2019 Contract Year is \$17 billion. This \$17 billion represents the total capacity at selected coverage levels for loss and loss adjustment expense. Loss adjustment expense is statutorily set at 5% of losses recoverable from the FHCF. Participating insurers report only losses and do not report loss adjustment expenses.

The loss and loss expense limit of \$17 billion is first divided by 1.10 to produce a loss only limit of \$15,454,545,455. This limit is then split between Sections I and II based on trended actual premium at current selected coverage levels. We view this as the best indicator of expected losses in the layer. Based on this split, 100% of the \$15,454,545,455 limit is in Section I. This value is the Section I loss only limit.

The next step is to gross up the limit for coverage level. The 2018 average coverage level is 73.483%, which produced the actual 2018 100% loss limit of \$22,032,878,037. Final 2019 company coverage selections as of March 1, 2019 produced an average coverage level of 81.629% based on 2018 company market shares and rating group definitions. The 2018 market shares were then adjusted to 2019 rating group definitions, resulting in a projected 2019 coverage level of 81.629%.

Finally, the FHCF limit is grossed up for the 2019 projected average coverage level of 81.629% to get the 100% loss limit of \$18,932,706,772. The top end of the loss only layer is then an estimated projected aggregate retention of \$7,422,000,000 for ratemaking purposes plus this limit, which equals \$26,354,706,772.

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In summary, for Section I and II loss only modeling purposes we use the following layer:

81.629% of \$18,932,706,772 xs \$7,422,000,000

For publication purposes, the Sections I and II loss and loss adjustment expense layer is:

81.629% of \$20,825,977,449 xs \$7,422,000,000

The simulations produced by the modelers are for producing manual rates per \$1,000 of exposure under covered policies. The rates resulting from such simulations are referred to as Section I rates.

**D. Industry Detail Exposure Data**

Actual 2018 industry FHCF exposures for buildings, contents, and appurtenant structures were summarized by:

1. Type of Business (residential, tenants, condominium unit owners, mobile home, commercial habitational);
2. ZIP Code;
3. Construction/Tie-Down Type; and
4. Deductible.

For modeling, we used data as of 6/30/2018 as reported through 10/29/2018 by 163 of 163 companies reporting FHCF Section I exposure for the 2018 year. This data was trended one year as described in Section A. Exhibit III contains trended control totals of the FHCF exposures used in the modeling process.

**E. Modeling Assumption and Data Changes: Combining Five Models - AIR, Corelogic, RMS, ARA & FPM**

**Table of Models Used to Calculate Overall Industry Losses**

Model	2006-2007	2008-2019
AIR	X	X
ARA	X	X
Corelogic	X	X
RMS	X	X
FPM		X

The table above lists the models that were used to calculate the overall FHCF losses by year. Only models that had been found acceptable by the Florida Commission on Hurricane Loss Projection Methodology as of December 1 of the prior year were used in that year's ratemaking session.

In 2019, all 5 models meet the 2015 standards. Four out of five models produced lower loss cost indications than in 2018 ratemaking, and therefore the 5-model weighted indication was lower.

All five of the modelers produce a distribution of industry-wide losses based on trended reported exposures by type of business, deductible, construction, and ZIP Code. The AIR model produces a listing of losses for 50,000 simulated years while the FPM model losses are based on 58,000 simulated years. The ARA model produced a listing of losses for 250,000 simulated years. The other models produce a listing of losses by size with assigned annual frequencies. Since 2008, demand surge has been modeled directly by each of the accepted modelers. Adjustments to these loss distributions are described in the next section.

Exposure data for invalid ZIP Codes was provided to the modelers who then modeled such exposure at the county level. Less than 0.01% of total reported exposure comes from invalid ZIP Codes, which are either ZIP Codes that are located outside of the state of Florida or are ZIP Codes that the U.S. Postal Service does not recognize or has decommissioned. In the latter case, the FHCF continues to produce rates for such codes for several years in order to give companies time to update their data.

Paragon used the results from each modeler to produce industry-wide gross (that is, net of policy deductibles and after application of policy limits) annual expected losses by type of business and to produce industry-wide FHCF excess losses for all coverages combined. Data from the modelers was combined by giving weights of 5%, 20%, 50%, 20%, and 5% to the model results from lowest to highest. A weighted loss distribution is included in Exhibit V.

The FHCF weighted loss curve in Exhibit V is developed solely for estimating excess hurricane losses within the FHCF layer. Estimates of losses above the FHCF layer were not taken into consideration in developing the curve. Shifts in modeler weights within the FHCF loss layer may have an amplified impact on loss estimates above the FHCF layer.

Although it is not used for ratemaking purposes, we have included an additional loss distribution based on uniform modeler weights (20% / 20% / 20% / 20% / 20%) in Exhibit V. Over time this curve may show greater stability for losses above the FHCF layer. As stated in our disclaimer in Part III herein, we recommend that any party using this report have its own actuary review this report to ensure that the party understands the assumptions and uncertainties inherent in our estimates.

**Table of Models Used for Classifications**

Model	2006-2008	2009-2012	2013-2019
AIR	X	X	X
Corelogic	X	X	X
RMS	X	X	X
FPM		X	

Three of the modelers ran our 2018 Contract Year trended exposures through their models and provided more detailed outputs (i.e., losses by ZIP Code, construction, and deductible codes for each type of business) that were used to update the class plan relativities. We used a straight average of the indicated loss costs for each rating cell as a basis in order to populate our class plan with rates. Details of the allocation of rates to type of business, deductible, construction, and territory are described in Part III.

Exhibit V contains tables and graphs of modeled loss severity distributions:

1. Gross Loss per Event;
2. Excess Retention Aggregate;
3. Single Event FHCF Liabilities; and
4. FHCF Layer Aggregate.

**F. Losses in the Layer at Coverage Percent**

The limit for the 2019 Contract Year is \$17 billion. Because the size of the excess layer is dependent on the average coverage selections of all the FHCF participating insurers, losses must be modeled after coverage selection. Coverage percentage varies by type of business, so modeled losses need to also reflect this variation. As a result, we start with the allocation to type of business and apply the coverage percentages to the layered loss (a method used consistently since 2001). We calculate the overall rates and premiums at the different coverage percentages at the end of the calculations.

Excess losses are allocated to type of business based on their adjusted gross losses. The allocations are adjusted so that no type of business has an overall rate change exceeding 15% in any one year, prior to legislated rate changes. This allocation appears in line 9 of the summary in Exhibit II. See Exhibit VI for additional details.

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## G. Adjustments to Modeled Losses

- **Law and Ordinance Coverage**
- **Aggregate Wind Deductible Adjustment**

These adjustments are similar to the adjustments made in the 2018 ratemaking formula.

The projected industry retention was applied to the adjusted modeled losses to estimate the FHCF excess losses. Details on the Law and Ordinance adjustments discussed here are presented in Exhibit VII. The overall increase in modeled gross losses due to these adjustments is 4.29%, compared to an increase of 4.28% in 2018.

### **Law and Ordinance Coverage**

Law and ordinance coverage provides extra limit for Coverage A (building) in the case where additional rebuilding costs are incurred in order to comply with local laws and ordinances.

We again recommend the FHCF continue to use the factor of 4.86% of residential modeled losses. We assume most companies charge approximately 3% of premium for law and ordinance coverage. We assume approximately 45% of the losses that would generate law and ordinance losses would be FHCF hurricane losses and 25% of the base premium is FHCF premium, so  $3\% \times (45\%/25\%) = 5.4\%$ . We also assume that only 90% of all residential policies will have this coverage in place at the time of a hurricane loss. Then the loading to FHCF residential modeled losses would be  $5.4\% \times 90\% = 4.86\%$ . See Exhibit VII for additional details.

### **Aggregate Wind Deductible Adjustment**

Under Section 627.701, Florida Statutes, residential property insurance policies issued on or after May 1, 2005 must have hurricane deductibles that apply on an annual, rather than a per-event, basis. Insurers may apply the "other perils" deductible or any amount remaining from the hurricane deductible, whichever is greater, to a loss for a second hurricane and each subsequent hurricane that year.

The loss events were adjusted to account for this change in loss exposure. Adjustment factors by type of business were developed. Exhibit VII details the derivation of these factors. The take-up ratio only impacts the commercial type of business as only these policyholders have the option of having an annual hurricane deductible. The adjusted load was then weighted with the adjusted load from 2018 giving 33% weight and 67% weight to 2019. The selected adjustment factor is the rounded value of the weighted load after the "take-up" modification.

## H. Adjustments for Per Company Limits and Retentions

In this year's ratemaking report Paragon has updated the adjustment to expected losses for individual company limits, retentions and coverage based on information from an analysis based on detailed loss projections run by Paragon from the RMS and AIR model runs used for 2019 ratemaking. The average of the results from the two separate analyses is -.4595%. Weighting this result against the prior adjustment factor of 0.2987% (2/3 current indication, 1/3 prior selection), we recommend a factor of -0.2068%. To summarize the approach, using the same exposure inputs and assumptions used by AIR and RMS, Paragon generated files of simulated Florida statewide gross hurricane losses. Average gross losses were first adjusted by type of business for AIR and RMS to match the average gross loss generated by the five models used in FHCF ratemaking. Each simulated gross loss was then allocated to ZIP Code and type of business. Next, FHCF market shares were applied by ZIP Code and company (based on 2018 FHCF premium) to allocate each simulated gross loss to all the FHCF companies. Simulated gross losses for each individual company were then summed and applied the companies' projected retention, limit, and coverage percentage (based on 2018 FHCF premium market shares and 2019 selected coverages) to generate company FHCF losses. These were summed by simulated event to get FHCF total loss by event. Paragon summed losses by simulated year applying aggregate limits and impact of retention drop downs. Separately for the AIR and RMS runs, the average annual FHCF loss based individual company losses was compared to the average annual FHCF loss based on industry total losses, retention, limit and coverage percentage.

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The average of the resulting adjustment factors was -0.4595% indicating, on an average basis, the two approaches generate almost identical results.

Using this more detailed approach, we also observe that there is significant variability between industry gross losses and FHCF layer losses. This variability cannot be determined when using industry gross losses, limits, and retentions to calculate FHCF layered losses. One observation is that the return time for the FHCF to exhaust its total capacity is longer than the value based on industry gross losses. Another observation is that due to increased market share of a single FHCF participating insurer in specific parts of the state, losses in areas where that insurer has very limited market share cannot generate full capacity FHCF layer losses. On the other hand, in parts of the state where one member company has significant market share, that company's retention becomes the effective retention for the industry on storm tracks in that area.

The current and prior special analyses indications can be found in Exhibit VIII.

The shape of the exceedance curves presented in Exhibits V and VIII are different, but the overall expected values of the FHCF loss layers are very similar. The Exhibit VIII curve is the more appropriate curve to use for analysis of interval FHCF losses within the FHCF layer because it more realistically recognizes the impact of company exposure distributions, retentions, and limits. Therefore, Exhibit VIII is used for analysis of expected FHCF losses offset by potential risk transfer options in section P below.

**I. Other Post-Model Adjustments: (5%)**

There are a few coverages that may appear on some FHCF covered policies that are not explicitly modeled in the FHCF's requested simulation. These coverages include guaranteed replacement cost, inflation guard, and reimbursable amounts paid as fees on behalf of or inuring to the benefit of a policyholder. We do not believe there is sufficient FHCF exposure from these coverages to justify additional administrative reporting and modeling at this time, but we do believe it is appropriate to load for these coverages in the post model adjustment.

Consistent with prior years, we recommend judgmentally increasing the modeled excess loss costs by 5% for all types of business to account for these coverages and other factors that are not directly included in the modeled loss results.

**J. Investment Income Credit – Eliminated in 2012**

Since 2012, the FHCF has not used investment income in current year rates. Exhibit IX contains the following tables:

1. FHCF rate of return history;
2. Graph of Interest Rate Assumption; and
3. FHCF Financial Statement Investment Income.

There are three reasons that the use of an investment income credit in FHCF ratemaking is not appropriate and has been discontinued at this time.

First, the FHCF investment credit is based on anticipated future long term retained investment income. The amount of anticipated future investment income assumes the FHCF would maintain a stable structure in perpetuity. Since the FHCF's inception, Florida statutes have been revised and FHCF coverage layers have changed resulting in lower return times and less investment income than originally projected in prior contract year ratemaking.

Second, during periods of sharp interest rate drops such as after 2000 and 2008 the FHCF will need rate increases due to reductions in the investment credit. These rate increases reduce FHCF long term rate stability.

Third, when investment income is used for providing a credit to current year rates, the same investment income cannot be used for mitigation funds appropriated by the legislature. During the

years when an investment income credit was used, the premium formula required a matrix to adjust final rates to cover the potential FHCF for FHCF mitigation appropriations which were usually not finalized until the end of the legislative session after the premium formula had been approved. This approach also causes potential instability in FHCF rates. During years when no investment credit is included in the premium formula, the investment income can be used for mitigation appropriation without impacting FHCF rates.

For the three reasons above, we have discontinued the use of the investment credit in the FHCF ratemaking formula.

**K. Operating Expenses and Mitigation Funding**

Operating expenses of \$8,796,525 are based on an estimate of 2019 fiscal year operating expenses provided by the SBA. This value is an increase of \$864,248 from the 2018 Contract Year projected expense of \$7,932,277.

Per section J, the estimated mitigation funding target underlying the rates is set at zero since no investment income will be used to reduce 2019 rates. Pursuant to Section 215.555, Florida Statutes, the minimum appropriation is \$10 million, and the maximum appropriation is 35% of the prior fiscal year's investment income. In 2018, the Florida legislature appropriated \$13.5 million for mitigation. For the 2019-2020 FHCF contract year, the calculated maximum amount subject to mitigation appropriation will be 35% of \$201,443,000 which equals \$70,505,050. Appropriation of mitigation funding will not affect the FHCF rates in 2019.

**L. Pre-Event Notes Expense**

This year's estimate of \$26.1 million is the sum of the projected cost estimates for 2013A and 2016A pre-event notes. This estimate includes the net carrying cost and a judgmental loading for potential asset loss during the Contract Year. The 2019 carrying cost estimates are provided by the FHCF's Financial Advisor, Raymond James & Associates. Raymond James' cost estimate is the projected difference between the interest payments to note holders and the investment income on the note proceeds during the 2019 Contract Year (see Exhibit X).

A 0.3% judgmental loading (based on historical FHCF information) is added to the carrying cost for potential asset loss during the Contract Year. The sum of this loading is \$5.1 million. The loading for the 2013A notes is \$3.0 million (0.3% of \$1.00 billion). \$500 million of the 2013A notes came due on 7/1/2018 so the value of the 2013A notes will be \$1 billion for the entire 12 months of the 2019 contract year. \$550 million of the 2016A notes will come due on 07/1/2019 so the remaining value of the 2016A notes will be \$650 million for the last 11 months of the 2019 contract year. The loading for the 2016A notes is \$2.1 million (0.3% of \$0.7 billion).

Should the SBA authorize additional expenditure for pre-event notes during the 2019 Contract Year, the rates, retention multiples, and payout multiple should be modified using the factors provided in Exhibit XI.

**M. Premium Credits (Windstorm Mitigation Construction Credits)**

We are using the same approach to windstorm mitigation construction factors as we used in the 2018 Ratemaking Formula Report, including the incorporation of factors for the following mitigation features recognized since 2012:

<i>Type of Business</i>	<i>Year Built</i>	<i>Structure Opening Protection</i>	<i>Roof Shape</i>
<i>Commercial Residential</i>	X	X	X
<i>Residential</i>	X	X	X
<i>Mobile Home</i>			
<i>Tenants</i>	X	X	X
<i>Condominium Owners</i>	X	X	X

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The proposed rate factors associated with each variable are shown in Exhibit XIV. We propose that these be applied to calculate the final rate for any covered policy subject to the following:

- Year built, structure opening protection, and roof shape factors be applied multiplicatively;
- The combined factor for any risk will not be capped;
- Every risk will be evaluated for its rating factor; and
- A final factor will be applied by type of business so that the indicated premium levels for each type of business are achieved.

Exhibit XII includes:

1. Calculation of actual 2018 premium credits/surcharges;
2. 2018 distribution of credits/surcharges; and
3. 2018 distribution of exposure and counts by rating region and type of business.

**N. Section II (Excess) Adjustment**

We included \$0 of Section II premium, based on the fact that there was no Section II exposure reported in 2018. Section II premium covers policies that require individual rating procedures. These exposures would be modeled and rated individually by company.

**O. Adjustment for Updated Exposures**

In the past, we have included an adjustment for change in premiums and exposures between November of the prior year and February of the current year. This change does not affect rate changes but should improve the accuracy of projected premium. For this year, there was no material change to FHCF exposure, so an adjustment was not included.

**P. Risk Transfer Options**

The rates presented in this report include a loading for the cost of risk transfer for a ceded layer of \$1 billion excess of \$10.5 billion, the same as the reinsurance structure used in the 2018 FHCF premium formula. The ceded premium is set equal to the 2018 initial premium of \$63.0 million and projected ceded losses of \$28.2 million.

The final FHCF 2019 risk transfer structure and cost has not been determined at the time of this report presentation. Should the FHCF enter into a risk transfer arrangement, the cost shall be determined based on the actual ceded layer selected and contracted initial reinsurance premium. The 2019 FHCF premium rates and factors would be adjusted accordingly, by the formula specified in Exhibit XVII.

The estimates for FHCF loss credits are based on the average of 2019 AIR and RMS data distributions in Exhibit VIII. Exhibit XVII is based on the same loss severity distribution and displays probability of exceedance for specific FHCF layers with the adjustments to the FHCF loss layer level prior to fixed expenses. These values are used to illustrate a range of potential risk transfer structures and costs in Exhibit XVII. The details of the formula calculation, along with potential revised factors, are provided in Exhibit XVII.

The Net Risk Transfer Cost Premium in Exhibit XVII and the Estimated Additional Annual Cost of Pre-Event Notes in Exhibit XI are additive in their impact on FHCF premium and rates. Retention and Projected Payout Multiples can be adjusted with interpolation based on the sum of the combined impact on FHCF premiums.

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## Part II: Allocation of Premium

Within a type of business, premium is allocated to territory, construction, and deductible based on a set of relativities. This is the same process that has been used since the creation of the 2001 rates. In all cases, the relativities recommended for 2019 have been adjusted so that none of them has changed by more than 15%. In 2019, the allocation process for territories was changed as described below. There were no other significant changes in the allocation process for 2019. Following is an overview of the FHCF rating classifications and the entire allocation process.

### Overview of the Rating Classifications

#### 1. Type of Business

The actuarially indicated FHCF premium is allocated first among the five types of business: commercial, residential, mobile home, tenants, and condominium unit owners. This allocation is based on the hurricane catastrophe modeling. For each modeled event, the proportion of FHCF layer losses allocated to each type of business is identical to the allocation of gross losses from that event. This process incorporates the varying weighted average coverage selection of each type of business. This approach produces indicated allocations, which are then adjusted so that no type of business has an indicated rate change of more than 15%. Actual allocations can be found in Exhibit VI.

#### 2. Territorial Definitions

Since 2001, the FHCF revises rating territories using information from three hurricane models: AIR, Corelogic, and RMS. Territory definitions are based on excess layer loss costs, as they are indicative of what insurers might recover from the FHCF. Actual changes to territories are tempered each year to minimize the magnitude of rate changes. For 2019, indicated territories have been recalculated for each ZIP Code using the latest data from these models.

In order to increase rating stability, the FHCF territory tempering method was changed in 2017. Review of past FHCF rating history shows that there have been many years when there were large numbers of ZIP Codes shifting one territory in a year and then shifting back one territory the following year (see Exhibit XVIII). Starting in 2017 a ZIP Code is shifted by one territory to a new territory only if the indication is for a shift of two or more territories or a shift of one territory has been consistent for three years. 2019 being the third year of the new methodology, 583 zip codes shifted down one territory, most due to 3-year indications of one territory shift.

#### 3. Construction

In 2018, FHCF data was collected for four residential, seven commercial, and three mobile home construction types. Tenants and condominium unit owners exposures have the same construction classes as commercial. The mobile home codes relate to the extent of their tie downs and their compliance with Federal Housing and Urban Development building codes that went into effect in July 1994.

#### 4. Deductibles

The rates proposed are for the same sets of deductibles as for 2018. Relativities for each deductible vary by type of business. As with construction relativities, changes in deductible relativities were limited to changing no more than 15%.

### General Overview of the Rate Allocation Process

#### Construction Classes

Relativities between the most common construction within a type of business and the other construction types were calculated using AIR, Corelogic, and RMS generated ZIP Code level loss costs. The indicated relativities were selected, except that they were limited to changing from the 2018 relativities by no more than 15%.

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Rates for unknown construction are calculated using the same method as other construction types, not to exceed the highest rate for all known constructions in the same type of business.

### **Rating Region (Territory) Definition**

To begin the process this year, we identified the 1,457 ZIP Codes for which rates would be produced. These are the currently valid U.S. Postal Service ZIP Codes in Florida, plus some recently deactivated ZIP Codes for which we continue to produce rates. We identified 928 of the ZIP Codes that had at least \$30 million of total exposure. The remaining 529 ZIP Codes were mapped to these 928 ZIP Codes by location. Most of these 529 ZIP Codes were exclusively post office boxes. They inherited their territory from the territory of the ZIP Code to which they were mapped. The purpose of this step was to avoid trying to assign ZIP Codes to territories if they had very little exposure. When a ZIP Code has no frame exposure, for example, the models produce a 0.00 loss cost. To avoid these problems and to increase the reliability of the modeled losses, this mapping technique was employed.

In order to define territories, residential base deductible ZIP Code level loss costs to the FHCF layer were used. The excess loss costs from three models (AIR, Corelogic, and RMS) were averaged and then weighted by the amount of construction in the three classes: frame, masonry, and masonry veneer. Together, these constructions account for over 99% of residential exposure. The result was a weighted average loss cost for each ZIP Code.

The ZIP Codes were ranked by weighted average loss cost and partitioned into 25 territories, or rating regions. We set the relativities between rating regions ahead of time, and then fit the ZIP Codes to these values. This enabled a more consistent spread of values between the highest and lowest rates. In keeping with past rates, the ratio of the rates in the highest and lowest regions was set at 35:1. Subject to these guidelines, statistical methods were used to maximize the differences between regions and minimize the variation within a region. This same procedure was performed for this year's rates. Subsequently, we judgmentally adjusted the territory 1 loss cost down to better reflect actual indications for territory 1. This adjustment had the effect of changing the ratio to approximately 37:1.

We tempered the change in territory from 2018 to 2019 by limiting the territory movement to no more than one from its 2018 territory assignment and only if there is an indication of a movement of two or more territories. This change has been made in 2019 to increase stability of territory definitions.

The proposed (tempered) territories, or rating groups, are presented in Exhibit XIII. Exhibit XV shows exposure and counts by territory. Exhibit XIX displays the proposed territories as maps.

### **Production of Rates**

The total FHCF losses have been allocated to five types of business (Exhibit VI). Within each, construction and deductible relativities have been calculated. In this process, ZIP Code level modeled loss costs were combined using a straight average. Relativities between territories were determined in the territorial definition process.

An overall premium adjustment factor was calculated for each type of business, so that the modeled exposure, when rated using 90% coverage rates, produced the desired total premium for each type of business. In this last step, the premium required was adjusted to the 90% coverage level.

Rates for 75% and 45% coverage level were calculated as 75/90ths and 45/90ths, respectively, of the 90% coverage rates.

The proposed rates produced for the base set of deductibles are found in Exhibit XIV.

Exhibit XV shows exposure and counts by territory.

Exhibit XVI compares rate changes for Residential Masonry (2% Deductible) by rating region across the state before application of windstorm mitigation credits.

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The rates that are published in these exhibits are base rates. To calculate the final rate for an insured risk, one must take into consideration the relativities applicable for the three construction characteristics:

Preliminary factor = (year built factor) x (roof shape factor) x (opening protection factor)

2019 mitigation factors do not have a cap. Prior to 2014 the preliminary factor was tempered by minimum and maximum caps. In 2014 we removed the cap of plus or minus 30% to unlimited due to increased credibility in reported company data.

Actual factor = Preliminary Factor.

A small on balance factor is applied so that the final rates will produce the indicated FHCF reimbursement premium levels by type of business.

Final rate = (Base rate) x (actual factor) x (on balance factor).

All rate factors for the windstorm mitigation construction rating classifications and the on balance factor are shown in Exhibit XIV.

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## Part III: Limitations

### Scope

This report was prepared for the use of the State Board of Administration of Florida (SBA) for the sole purpose of developing a formula for determining the actuarially indicated premium to be paid by individual companies for the Florida Hurricane Catastrophe Fund (FHCF) for the 2019 Contract Year as specified by Section 215.555, Florida Statutes. The formula must be approved by unanimous vote of the SBA Trustees and they may, at any time, revise the formula pursuant to the procedure provided in Section 215.555(5)(b), Florida Statutes.

The rates in this report are developed for the limits and retentions specified by Section 215.555, Florida Statutes, for the 2019 Contract Year. No adjustments have been made to reflect availability of FHCF financial capacity during and subsequent to the 2019 Contract Year.

Actual coverage provided by the FHCF for the 2019 Contract Year is subject to modification due to legislative, judicial, or regulatory actions. Except where explicitly noted, such modifications are not considered in this report.

### Data Sources

In developing the 2019 FHCF ratemaking formula, we have relied on the following data from various sources:

1. FHCF 2018 Contract Year exposure data as of 10/29/2018 as reported by 163 FHCF companies and compiled by Paragon. This data has not been fully audited yet and could be subject to variability in terms of amounts and classifications of exposure data.
2. Historical FHCF exposure data from prior years, subject to audit by FHCF auditors and compiled by Paragon.
3. Projections of 2019 season hurricane losses prepared by AIR, ARA, Corelogic, FPM, and RMS for use in determining overall expected industry losses. All loss projections are based on catastrophe models that have been accepted by the Florida Commission on Hurricane Loss Projection Methodology as of December 1, 2018.
4. Allocations of projected 2019 season hurricane losses prepared by AIR, Corelogic, and RMS for use in developing various rating classifications.
5. Special analyses of mitigation rating factors prepared by AIR, ARA, Corelogic and RMS.
6. Special analyses of projected hurricane losses by county by ARA, Corelogic and RMS.
7. Special analyses of projected hurricane losses by ZIP Code by Paragon using AIR and RMS models.
8. Historical FHCF investment returns as reported by the SBA.
9. Industry residential construction cost trends for Florida and the United States as developed by Marshall & Swift.
10. Estimates of projected FHCF operating expenses by FHCF staff.
11. Estimates of projected net expenses for 2013A and 2016A Pre-Event Notes by Raymond James and Associates.

We have not audited or verified the sources of the data and information. If the underlying data or information is inaccurate or incomplete, the results of our formula report may be impacted.

### Variability of Results

Ratemaking is the projection of future losses and expenses and their relationship to future exposures. The projected rates contained in the attached report represent our best professional judgment. In property catastrophe reinsurance, actual losses are likely to vary from expected losses. The degree of variation could be substantial and could be in either direction from estimates. There is also significant potential for future variability in projections of expenses and exposures.

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### **Distribution and Use**

This report was prepared for the use of the SBA for the sole purpose of developing a formula for determining the actuarially indicated premium to be paid by individual companies for the FHCF for the 2019 Contract Year as specified by Section 215.555, Florida Statutes. The data, assumptions, methodology, and results in this report may not be appropriate for other than the intended use. We recommend that any party using this report have its own actuary review this report to ensure that the party understands the assumptions and uncertainties inherent in our estimates.

A copy of this report will be available on the web site of the FHCF.