



August 28, 2024

Hon. Cassie Brown  
Commissioner of Insurance  
Texas Department of Insurance  
1601 Congress Avenue  
Austin, TX 78701

via email: [ChiefClerk@tdi.texas.gov](mailto:ChiefClerk@tdi.texas.gov)

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Commissioner:

Following please find additional supporting information on the Texas Windstorm Insurance Association's 2024 annual rate filings (P-0123-05 and P-0123-06), as requested under Insurance Code § 2210.354 on August 23, 2024.

Responses have been included in line with the original request for clarity, with supporting exhibits attached as described.

Please let us know if you or your staff require any additional information or have further questions on this response.

Sincerely,

A handwritten signature in black ink, appearing to read "James Murphy", is positioned above the printed name.

James Murphy, FCAS, MAAA  
Chief Actuary, Vice President – Enterprise Analytics  
Texas Windstorm Insurance Association

### **TWIA Rating Rules Manual (Both Filings)**

1. The redlined rate manual shows changes to several rating factors, including territorial multipliers. Please provide the rate order calculation for each coverage and explain how the changes shown in the redlined manual amount to a uniform 10% increase.

The relevant pages from the TWIA Rating Manual are attached as Exhibit – Item 1R and Exhibit – Item 1C. These pages show the rate order calculation for residential and commercial policies and tie to the redlined manual amounts.

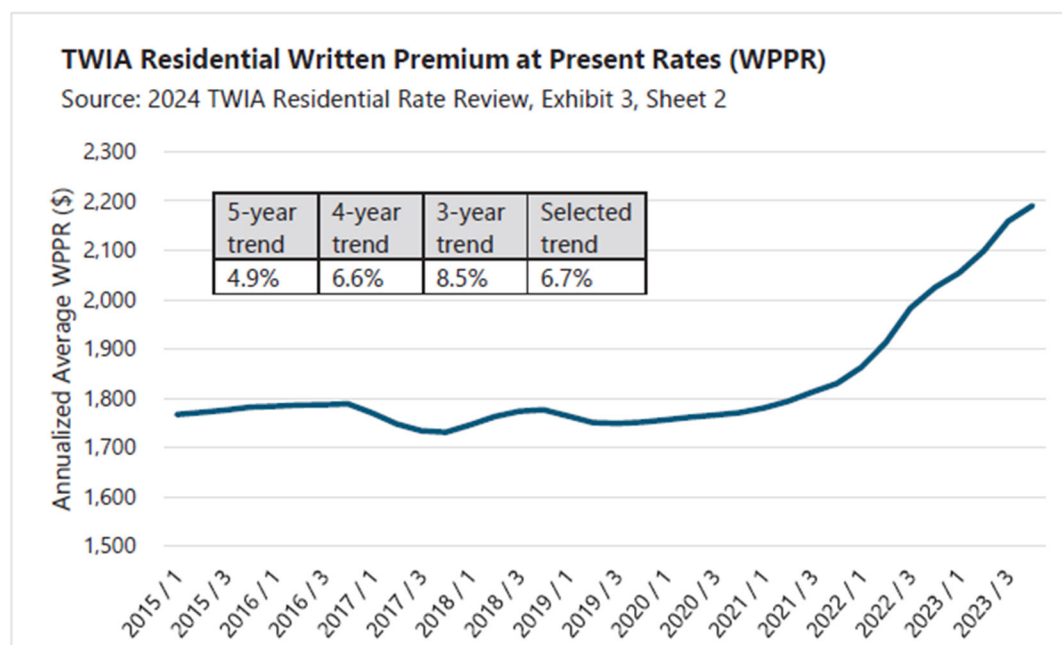
### **Loss Development Factors (Exhibit 2, Both Filings)**

2. The indication uses implied loss development factors derived from TWIA's paid and ultimate losses in Schedule P. Please provide a narrative and exhibit showing how the Schedule P ultimate losses were derived.

For consistency purposes, the same set of ultimate values were used for financial reporting and rate setting. Schedule P ultimate losses are based on the results of TWIA's internal reserve analysis as of December 31, 2023. Ultimate estimates for loss and loss adjustment expenses are selected for each accident quarter for residential and commercial business combined using paid and reported loss development methods. Hurricane losses are analyzed separately on an individual storm basis. The complete reserve analysis is included as Exhibit – Item 2. Individual loss triangles for residential and commercial business are included as Exhibit – Item 2R and Exhibit – 2C.

### **Premium Trend (Exhibit 3, Both Filings)**

3. TWIA's selected prospective premium trend of 6.7% for residential policies is the average of the 5-year, 4-year, and 3-year historical fitted trends for annualized average written premium at present rates through 2023. The chart below shows the data underlying these trends.



As shown in the chart, average written premium at present rates started to significantly increase in 2021. This increase is fully reflected in the 3-year trend but dampened in the 5-year and 4-year trends. If average premium continues to increase at the same (or higher) rate that it did starting in 2021, TWIA's use of 5- and 4-year trends to select the premium trend may understate prospective premium levels.

Additionally, since the experience period used to develop the selected premium trend ends in 2023, it doesn't reflect the impact of the 2024 Adjusted Building Cost (ABC) factor change, which will increase Coverage A limits by 12 to 13% for residential renewals effective on or after June 1, 2024 (unless the policyholder elects to reinstate the previous year's limit). This change could sustain or accelerate recent increases in average premium.

Please provide the indicated rate change for residential using an alternate premium trend selection that gives more weight to short-term trends and reflects the expected impact of the ABC factor change.

Weight was initially given to the 4-year and 5-year premium trend factors since the effect of inflation has stabilized within the past year – construction costs only increased by approximately 1% from June 2023 to June 2024 as documented in TWIA's recent statutory limits filing.

As for the ABC factors, it can be difficult to quantify the premium impact of the limit increase as it is not mandatory, and policyholders may opt out or select a different coverage amount. Policyholders actively matching the limits between their TWIA and underlying Homeowners policies will have most likely already increased limits to

match inflation and may not need any additional increases.

TWIA uses a two-year average change in construction costs to calculate the ABC factors. It is expected that the factors that will be implemented beginning in June 2025 will be approximately 4% based on current construction cost trends, reducing the impact on premium trend during the prospective rating period.

Please see a comparison of the indicated rate change using an alternative premium trend factor of 10.5%, which gives equal weight to short-term trends and the current ABC factors. Additional support is attached as Exhibit – Item 3.

Indicated Rate Change	Original	Revised
Residential	+38.0%	+36.0%

Because the selected loss trend factor lends weight to older years, a similar revision could be made to the loss trend factor. Setting the loss trend factor for the statewide Boeckh fitted trend, the coastal Boeckh fitted trend, and the modified CPI fitted trend factor to the 3-year trend factor results in an overall indication of 37% when combined with the revised premium trend factor.

4. TWIA’s selected prospective premium trend of 10.0% for commercial policies is lower than the average of the 5-year, 4-year, and 3-year historical fitted trends for annualized average written premium at present rates (WPPR) through 2023. The chart below shows the data underlying these trends.

Similar to residential policies, average premium for commercial policies has increased at a higher rate in recent years than in previous years. If average premium continues to increase at the rates seen in the 4- and 3-year trends, TWIA’s selection of 10.0% may understate prospective premium levels.

Please provide the indicated rate change for commercial using an alternate premium trend selection that gives more weight to short-term trends.

Weight was initially given to the 4-year and 5-year premium trend factors since the effect of inflation has stabilized within the past year, as noted above.

Please see a comparison of the indicated rate change using an alternative premium trend factor of 14.6%, which increases the weight given to short-term trends. The revised premium trend does not change the overall, rounded rate indication. Additional support is attached as Exhibit – Item 4.

Indicated Rate Change	Original	Revised
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Commercial	+45.0%	+45.0%
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### Modeled Hurricane Losses (Exhibit 7, Both Filings)

5. The hurricane models use TWIA exposures in-force as of 11/30/2023. What date or period do the construction, repair, and labor costs used in the models reflect?

Both the claims data and exposures used to calibrate the hurricane models are evaluated at the time of event. A damage ratio is determined from these two components (claims / exposure), which then informs the vulnerability curves used to calculate damage in the models. The models inherently rely on the underlying insured values being modeled as a proxy for construction, repair, and labor costs in estimating future losses. The date or period would be the same as the evaluation date of the exposures.

6. For each hurricane model, please provide the documentation TWIA relied upon with respect to Actuarial Standard of Practice No. 38 ("Catastrophe Modeling (for All Practice Areas)"), as described on page 1 of the residential and commercial rate review memos (pdf page 3).

Attached as Exhibit – Item 6, please find Aon’s ASOP 38 attestations for AIR TS V10, RMS V23, IF V17 and CoreLogic V23 models. Please note that the Impact Forecasting (IF) model version used for the TWIA rate filing is IF V18. Because this version has not yet been officially released, a formal ASOP 38 attestation is not yet available. TWIA staff relied on the attestation from the previous version and a review of current model results compared to results generated by previous model versions for reasonability.

### General Expenses (Exhibit 10, Both Filings)

7. TWIA’s General Expense ratio has been steadily decreasing.

	2021	2022	2023	Projected 2024
Direct Written Premium	395,112,773	518,299,032	653,043,231	815,861,000
General Expense	29,979,903	35,578,580	36,234,634	40,243,000
% of DWP	7.6%	6.9%	5.5%	4.9%

Source: 2024 TWIA Residential and Commercial Rate Review, Exhibit 10, Sheet 1

This trend indicates that increases in average premium have outpaced changes in General Expenses per exposure. Since average premium is expected to continue to

increase at a significant rate (see items #3-4 above and Exhibit 3), especially with the ABC factor change, the General Expense ratio may continue to fall going into the prospective period.

TWIA's selected General Expense provision of 5.2% is the average of the 2023 and projected 2024 ratios. Since these ratios were calculated using untrended premium, they may overstate prospective expense levels.

Please provide the indicated rate change for residential and commercial using an alternate General Expense provision that considers premium trend and, if material, expense trend.

Premium growth rates have slowed in 2024. Budgeted written premiums were used for ease of reference, however current projections estimate that calendar year 2024 direct written premium will be closer to \$750 million, which would result in an expense ratio of 5.4% at budgeted expense levels.

Regardless, please see a comparison of the indicated rate change using an alternative General Expense provision of 4.3% (assuming the current pace of the decreasing trend continues through 2025). Additional support is attached as Exhibit – Item 7R and Exhibit – Item 7C.

Indicated Rate Change	Original	Revised
Residential	+38.0%	+36.0%
Commercial	+45.0%	+44.0%

#### **Net Cost of Reinsurance (Exhibit 10, Both Filings)**

8. It's my understanding that premium ceded to TWIA's reinsurers is fully earned over the six-month hurricane risk period (i.e., June 1 to November 30), which would imply that TWIA's 2024 - 2025 reinsurance premium is earned between June 1, 2024 and November 30, 2024. This period ends before the rates in this filing will go into effect, if approved. How does TWIA consider this apparent mismatch in timing when determining the reinsurance expense to include in the indication?

From a timing perspective, all input variables were evaluated as of 11/30/23, including reinsurance premium, expected annual loss, and in-force TWIA premium as of that date. The indicated reinsurance expense percentage represents the actual reinsurance provision as of 11/30 and was used as a proxy for the prospective rating period. An alternative approach could have been to trend all

these input variables to the prospective period. If both the reinsurer and TWIA reflect a similar level of exposure growth in their pricing, the impact of this adjustment would be cancelled out.

In previous rate reviews, the alternative approach was used, but the premium was not adjusted to reflect future growth, potentially understating the reinsurance provision. This single methodological change accounted for an increase of +8.7% in the residential rate indication and +5.7% in the commercial rate indication.

9. Are there any provisions in TWIA's reinsurance contracts that adjust the premium up or down for changes in TWIA's exposures after the effective date of the contract? For example, if TWIA's exposures dropped 25 percent on July 1 (one month after the contract) is there an adjustment to the reinsurance premium? If the answer differs by reinsurance layer, please provide separate answers for each layer.

- a. If there is such a provision, please explain how the provision works. If the answer differs by reinsurance layer, please provide separate answers for each layer.

TWIA's traditional reinsurance contracts have a provision that adjusts the premium upward for any exposure growth beyond what was initially estimated. Actual exposures as of September 30, 2024, will be compared to initial estimates and the final contract premium will be adjusted proportionally. Based on current projections, this adjustment is expected to be approximately 2%. There is no corresponding provision for a reduction in premium for exposures less than initially estimated.

TWIA's catastrophe bond reinsurance contracts do not have a provision to adjust the premium for exposure changes, however there is a related provision to potentially reduce losses recoverable under the contract if exposure growth above initial estimates is in excess of a 10% allowance.

- b. If there is such a provision, how did TWIA consider this when determining the reinsurance expense to include in the indication?

No explicit adjustment for exposure growth is included in the indication. Please see our response to Item 8 for the role of exposure growth in this calculation.

10. Is the "2024 - 2025 Reinsurance Premium" amount in Sheet 2, line (1) the premium amount stated in the reinsurance contract? If it is not, please provide actuarial support for line (1). The support must begin with the premium stated in the contract

and show the step-by-step calculations TWIA used to arrive at line (1). Describe all material assumptions used.

The reinsurance premium amount shown in line (1) has been adjusted for ceding commissions, brokerage, and catastrophe bond issuance fees as follows:

Contractual Premiums	\$375,254,000
Exposure Adjustment	+ \$0
Brokerage Fee	+ \$2,000,000
Ceding Commission Adjustment	- \$12,510,626
Alamo Re 2024 Issuance Fees	+ \$5,566,794
Line (1) Reinsurance Premium	\$370,310,168

As noted above, no adjustment was made for increases in premium due to exposure growth.

11. Is the "2024 - 2025 Reinsurance Premium" amount in Sheet 2, line (1) net or gross of broker's discount? If gross, what is the amount of the broker's discount?

Net of brokers' discount. Please see our response to Item 10 above.

12. Is the "2024 - 2025 Reinsurance Premium" amount in Sheet 2, line (1) net or gross of ceding commission? If gross, what is the amount of the ceding commission?

Net of ceding commissions. Please see our response to Item 10 above.

### General (Both Filings)

13. In items #3, 4, and 7, we asked TWIA to calculate the indicated rate changes using alternate premium trend and General Expense selections. Please provide the indicated rate changes for residential and commercial if both of the alternate selections are used.

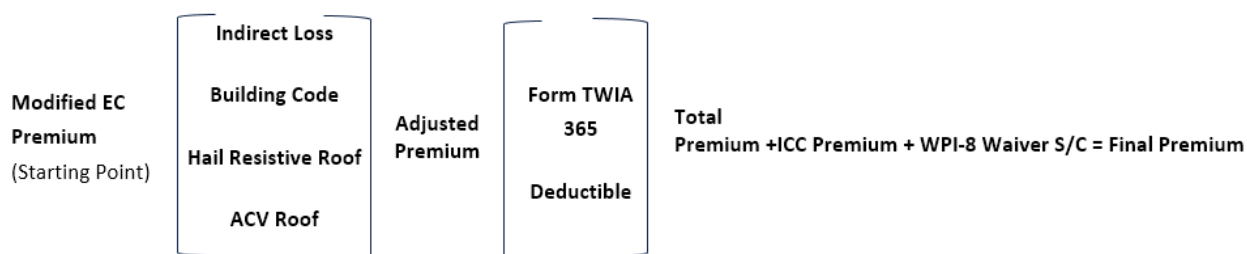
Please see the combined impact of the two adjustments made on the indicated rate change. Additional support is attached as Exhibit – Item 13R and Exhibit – Item 13C.

Indicated Rate Change	Original	Revised
Residential	+38.0%	+35.0%
Commercial	+45.0%	+43.0%



## B. Dwelling Premium Calculation Information

Premiums must be calculated separately for all items. Multiple adjustments may apply in the calculation of the premium. It is important that these adjustments be applied in the proper sequence to ensure that the premium is correct. The calculation diagram shown below and the following guidelines are provided to assist you in your calculation.



### CALCULATION STEPS:

**Step #1.** Calculate the Modified Extended Coverage Premium (hereinafter referred to as the Modified EC Premium) based on a 1% (\$100 minimum) deductible as follows:

- a) Multiply the base premium from [Dwelling/Farm & Ranch Dwelling – Building & Personal Property](#) by the appropriate territory multiplier from [Territorial Multipliers](#) and round to three decimal places, and then
- b) Multiply the result of step 1a by a flex factor of 1.3 and round to three decimal places.

**Step #2.** Calculate the Indirect Loss premium by applying the Indirect Loss factor from [Indirect Loss Endorsement and Percentages](#) of this manual to the premium calculated in step #1.

**Step #3.** Where applicable, apply the following adjustments independently to the Modified EC premium calculated in step #1:

- [Building Code Credit](#)
- [Hail Resistant Roof Credit](#)
- [Actual Cash Value Roof Credit](#)

Then add or subtract the results to the Indirect Loss premium calculated in step #2. This will result in the adjusted premium.

**Step #4.** Where applicable, apply the following adjustments independently to the Adjusted Premium calculated in step #3. Then add the results to the adjusted premium calculated in step #3 to equal the Total premium. If the coverages listed below do not apply, skip step #4. If this is done, the Total premium will be the same as the adjusted premium.

- [Replacement Cost Endorsement Form TWIA 365 surcharge](#)

- [Deductible Adjustment for a flat \\$100 or \\$250 flat](#)
- [Optional Large Deductible Percentage Chart](#)

**Step #5.** If coinsurance is being waived, apply the [First Loss Scale Formula](#) to the premium calculated in step #4 prior to rounding.

**Step #6.** If Increased Cost in Construction (ICC) coverage is being added calculate the ICC premium by multiplying the premium calculated in step 4 (or 5) times the appropriate ICC rate, then round to the nearest whole dollar. Refer to Residential [Increased Cost of Construction](#). If ICC is not being added, skip to step #8.

**Step #7.** Add the rounded ICC premium (step 6) to the premium determined in step 4 (or step 5 if coinsurance has been waived) to arrive at the Final premium.

**Step #8.** The premium from step 4, 5, or 7 to equal the total *premium* due TWIA.

**Step #9.** If the policy is being issued under the WPI-8 Waiver program, multiply the Final premium from step 4, 5, or 7 times 15% to calculate the WPI-8 Waiver surcharge, then round to the nearest whole dollar.

**Step #10.** Add the WPI-8 Waiver surcharge calculated in step #9 to the total premium from steps 4, 5, or 7 to arrive at the total premium due TWIA.

## Excess Area Surcharge

If any division of a building or any building of one division contains a ground floor area that equals 20,000 square feet or more, the rate shall be increased by 20%.

Division walls must be of masonry at least 8 inches thick and extend through roof. Openings need not be protected.

## Builder's Risk Coverage

- when insuring repairs, improvements, and/or additions, where the addition does not exceed 10% of the original grade floor area of the original structure, permanent building rate will apply in lieu of builder's risk rate.
- when you are insuring an addition, which exceeds 10% of the original grade floor area of the original structure, apply the appropriate builder's risk rate.

For rating purposes refer to [Rate Table A](#):

- **Dwelling:** Table 5 (Brick), 5A (Frame), or 5B (Brick Veneer)
- **Commercial:** Table 2 (FR or SFR), Table 8 (Brick), or Table 9 (Frame)
- A rating of FR or SFR requires a statement from a contractor or engineer certifying that the construction qualifies as FR or SFR and listing the criteria to support the designation.

## B. Commercial Premium Calculation Information

### Premium Calculation Information

Multiple adjustments may apply in the determination of a rate and/or the calculation of a premium. It is important that these debits and credits be applied in the proper sequence to ensure that the final premium is correct. The sequence in which to apply adjustments is listed below. Failure to follow these guidelines may result in the final premium being incorrect.

#### Calculation Factors:

Based on the coverage selected, multiple adjustments may apply to the base rate. All applicable debits/credits are listed below in the sequence which they should be applied. Commercial rates are truncated to 3 decimal places after each adjustment. (Refer to the "Rating information" section of this manual as indicated below for additional information).

**Adjustments<sup>1</sup>:**

Indirect Loss Adjustment  
Public Housing  
Excess Area Surcharge  
Deductible Adjustment  
Replacement Cost Endorsement Form 365  
(for commercially rated personal property)  
Value Exceeds Association Limit & First Loss Scale Formula  
(where coinsurance is being waived)  
Increased Cost in Construction (ICC) Form 432 Charge  
Business Income (BI) Form 17 Charge

**Refer to:**

Indirect Loss Endorsement  
[Public Housing Credit](#)  
[Excess Area Surcharge](#)  
[Commercial Deductibles](#)  
  
[Replacement Cost Endorsement](#)  
[Values in Excess of TWIA Limit](#)  
  
[Increase Cost in Construction](#)  
[Business Income Coverage](#)

**Commercial Rating Steps**

- **Step #1.** Determine the Annual Extended Coverage rate beginning at:
  - [Rate Table A](#) for:
    - Commercial Structures and Miscellaneous items
    - [Builder's Risk](#)
    - Commercially rated "Miscellaneous" Residential items
    - Business and Residential Personal Property in a commercially rated structure not classified as WR or SWR (Apply the [Apartment Contents Credit](#)).
  - [Rate Table B](#) for:
    - Condominium Association Structures
    - Townhouse Association Structures
  - [Rate Table C](#) for:
    - Business Personal Property
    - Residential Personal Property in a commercially rated structure classified as WR or SWR
  - [Farm & Ranch Barns and Miscellaneous Farm Property](#) for
    - Miscellaneous Farm property
    - Barns
    - Outbuildings used in conjunction with the Farm & Ranch
- **Step #2.** Multiply the rate derived in Step #1 by the amount of insurance per \$100.00 (or the replacement cost per \$100.00 where coinsurance is being waived)
- **Step #3.** Apply the Indirect Loss Adjustment Factor to the premium derived in Step #2.
- **Step #4.** If applicable apply the [Public Housing Credit](#) and/or the [Excess Area Surcharge](#)
- **Step #5.** Apply the [deductible adjustment](#) to the rate calculated in Step 3 (or 4).

<sup>1</sup> There is no adjustment for the Replacement Cost Endorsement Form TWIA-164 or the Replacement Cost Endorsement Excluding Roof Endorsement Form 165

- **Step #6.** If [Personal Property Replacement Cost Form TWIA 365](#) has been selected, multiply the rate from Step #3 by 15% and add to the premium derived in Step #5.
- **Step #7.** If coinsurance has been waived, apply the 1<sup>st</sup> Loss Scale Formula to the premium calculated in Step #6 prior to rounding (refer to the [First Loss Scale Formula](#)). Round to the nearest whole dollar.
- **Step #8.** If Increased Cost in Construction (ICC) coverage is being added calculate the ICC premium by multiplying the premium calculated in step 5 (or 6 if replacement cost chosen, or 7 if coinsurance waived) times the appropriate [Increased Cost of Construction](#) rate, then round to the nearest whole dollar.
- **Step #9.** Calculate the BI premium by following the instructions on [Business Income Coverage Form TWIA 17](#). Round to the nearest whole dollar.
- **Step #10.** The total premium for this item is determined by adding the results of Steps 5 (or 6 or 7), 8, and 9. Round to the nearest whole dollar.



# Analysis of Losses and Loss Adjustment Expense Reserves

as of December 31, 2023

**Prepared by: Texas Windstorm Insurance Association**

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## Purpose

The Texas Windstorm Insurance Association (TWIA, or the Association) has conducted an actuarial review of TWIA's loss and loss adjustment expense reserves for its insurance program. This report documents the procedures, methods, assumptions, data and results of this analysis.

Each of these issues is estimated as of the December 31, 2023 accounting date based on data valued as of December 31, 2023. We continued to receive information and supplemental data through January 5, 2024; none of this additional information and data reflects activity between the valuation date of the data and the date it was provided.

The estimates in this report are actuarial central estimates which represent the expected value over the range of reasonably possible outcomes. As such these estimates are subject to variability. Actual results may differ substantially. This report and supporting work papers document the procedures and results of our analysis.



## Background

TWIA was established in 1971 by the Texas Legislature to provide wind and hail coverage to applicants unable to obtain insurance in the private market. The Legislature's action was a response to market constrictions along the Texas coast after several hurricanes.

TWIA is a residual insurer of last resort and as such is not a direct competitor in the private market. TWIA's primary purpose is to provide an adequate market for windstorm and hail insurance in certain designated portions of the seacoast territory of Texas. The seacoast territory includes 14 first-tier and 14 second-tier coastal counties. The designated catastrophe area is that portion of the seacoast territory where the Commissioner of Insurance has found that windstorm and hail insurance is not reasonably available. It currently includes the entire first tier and a portion of Harris County (second tier).

TWIA policies provide coverage for wind and hail losses only. No other perils are covered by TWIA policies.

TWIA establishes loss reserves in accordance with statutory accounting principles prescribed or permitted by the Department to cover its estimated liability for all losses and loss adjustment expenses with respect to reported and unreported claims incurred, net of reinsurance recoverables. Anticipated salvage and subrogation are not included in ultimate reserves.

## Executive summary

The following table summarizes a comparison of the indicated gross reserves to those carried by TWIA as of December 31, 2023:

<b><u>Gross</u></b>	<b><u>Actuarial indication</u></b>	<b><u>TWIA Carried</u></b>	<b><u>Difference</u></b>
Case Loss and LAE	\$16,248,844		
IBNR Loss and LAE	\$28,817,358		
Total	\$45,066,202	\$44,784,000	-\$282,202

A reasonable range around the IBNR estimate was estimated to be from \$32,904,428 to \$50,674,817 on a gross basis. TWIA carried gross reserves fall within that reasonable range.

The following table summarizes a comparison of the indicated net reserves to those carried by TWIA as of December 31, 2023:

<b><u>Net</u></b>	<b><u>Actuarial indication</u></b>	<b><u>TWIA Carried</u></b>	<b><u>Difference</u></b>
Case Loss and LAE	\$16,248,844		
IBNR Loss and LAE	\$28,817,358		
Total	\$45,066,202	\$44,784,260	-\$281,942

A reasonable range around the IBNR estimate was estimated to be from \$32,904,428 to \$50,674,817 on a net basis. TWIA carried net reserves fall within that reasonable range.

## Key findings

TWIA has finished its review of loss and loss adjustment expense reserves as of December 31, 2023. The total unpaid claim reserves as of December 31, 2023 are estimated to be approximately \$45.1 million. This represents a decrease of \$11.5 million since the September 30, 2023 review.

The following table illustrates the components of the unpaid loss and loss adjustment expense reserves and the ultimate loss and expense estimates compared to the prior quarter-end. All amounts are gross of reinsurance. 2012 - 2022 excludes Hurricanes Harvey.

Incurring but not reported (IBNR)	09/30/23	12/31/23	Change
2012 - 2022	5,225,183	4,597,439	-627,744
2023	19,246,216	14,943,340	-4,302,876

Harvey	13,951,752	9,276,580	-4,675,172
Total	38,423,151	28,817,358	-9,605,792

Total reserves including IBNR	09/30/23	12/31/23	Change
2012 - 2022	12,215,201	9,917,174	-2,298,027
2023	28,274,211	24,419,026	-3,855,184
Harvey	16,052,493	10,730,002	-5,322,491
Total	56,541,904	45,066,202	-11,475,702

Ultimate loss & loss adjustment expense	09/30/23	12/31/23	Change
2012 - 2022	647,489,529	646,020,361	-1,469,167
2023	90,723,389	101,195,171	10,471,782
Harvey	1,660,000,000	1,655,000,000	-5,000,000
Total	2,398,212,918	2,402,215,532	4,002,614

The analysis indicates a \$1.5 million decrease in ultimate loss and loss adjustment expenses for 2022 and prior years due to favorable loss and expense development.

The Association incurred \$101 million in loss & loss adjustment expense in accident year 2023 as of December 31, 2023. The majority of the 2023 claim activity was related to severe thunderstorms in Q1 and Q2, which includes \$18.0 million for the January 2023 Houston Tornado. The ultimate loss and loss adjustment expense estimates for Hurricane Harvey are reduced from \$1.660 billion to \$1.655 billion.

## Disclosures

### Qualifications of actuaries

Jim Murphy is the Chief Actuary with TWIA and is a Fellow of the Casualty Actuarial Society. He is also a member of the American Academy of Actuaries. As such and meets the Qualification Standards of the American Academy of Actuaries to render the actuarial opinion contained herein.

### Distribution and use

This report was prepared for internal use by the management of TWIA, the Board of Directors of TWIA, the auditors and the regulators. Use of this report for other than the stated purpose may not be proper and must be preceded by written authorization.

### Reliance on data

The following data and information used in this analysis were prepared by TWIA and are the responsibility of TWIA's management:

- TWIA losses and loss adjustment expenses
- TWIA monthly premium and loss and LAE rollforward exhibits

At the time of this analysis, some of the data was unaudited. The data was reviewed for reasonableness and consistency.

### Limitations

The projected ultimate liabilities and associated reserves for loss and LAE shown in this report are actuarial central estimates. As estimates, these values are subject to variability. The possibility of this variability arises from the fact that all factors affecting the ultimate liability for loss and LAE have not taken place and cannot be evaluated with absolute certainty.

The projection of liabilities is based on TWIA's historical experience with no anticipation of any extraordinary changes to the various factors that might impact the future cost of claims. However, methods used for estimating reserve requirements are believed to yield reasonable results based on current information. No guarantee, either expressed or implied, should be inferred that losses and loss adjustment expenses will develop as shown in this report.

### Methodology

Our actuarial analysis was divided into two major work steps:

- Non-hurricane loss estimation
- Hurricane loss estimation
- Unallocated loss and loss adjustment expense estimation

## **Non-hurricane loss and allocated loss adjustment expense estimation**

The first step of the analysis was to project paid and incurred loss and allocated loss adjustment expense (ALAE) to estimated ultimate values for each fiscal year through December 31, 2023. A large portion of the total cost of insurance claims that occur in each year is paid in subsequent years. This normal delay in payments creates a need to set aside funds each year to pay the future costs of already incurred claims. However, it is difficult to determine the exact amount of losses incurred during a year until sometime after the end of that year. One reason is that it is difficult to estimate ultimate costs for many claims when they are first reported. The claims adjuster makes estimates of the ultimate cost of individual claims based on the information available about each case. The unpaid amount estimated for an individual claim is called a "case reserve."

In most insurance programs, case reserves somewhat understate the ultimate cost of claims because the reserves are generally based only on the most currently available information about the circumstances surrounding each known claim. The result is that total estimated costs for claims incurred in a year are often revised upward over time. Though many claims settle for less than originally expected, decreases in estimated costs are more than offset by newly reported claims and by increases in case reserves for other claims about which new information emerges. This phenomenon of progressively revising reserves is called "loss development."

Loss development is a normal and expected part of most insurance programs. Even if it is substantial, loss development does not necessarily imply that claims are being administered improperly. For financial purposes, however, it is important to estimate the amount of future loss development to recognize the entire liability.

The application of several actuarial techniques is important in order to estimate the ultimate costs of claims. Each technique relies on a specific set of assumptions about the stability of the claims environment and thus provides additional insight into trends in claims costs. These methods will also give inapplicable results when the important assumptions on which they rely are violated. Thus, the methods applied act as checks and balances against each other, and, within reason, the more methods applied, the more likely it is that accurate loss estimates will be obtained.

Some methods may provide accurate results in some years and inaccurate results in others, depending on the situation in the local claims environment. Knowledge of the local environment and experience with the actuarial estimation methods is required to select the best results in each set of circumstances.

The actuarial methods used to estimate ultimate loss included the following:

- Paid loss development
- Reported loss development

Paid loss development assumes that the ratio of losses paid in one period to losses paid in an earlier period is approximately constant over time. For example, if, on average, paid losses at 24 months after the start of the year were 150% of losses at 12 months, loss development from 12 to 24 months is projected to be 50%. Similarly if losses at 36 months were 120% of losses at 24 months, then the combined loss development from 12 to 36 months is projected to be 80% ( $1.50 \times 1.20 = 1.80$ ). The process of estimating period-to-period development factors is normally continued until a level of maturity is reached at which point no additional movement is expected.

Reported loss development is similar to paid loss development but uses reported losses (paid loss plus case loss reserves) instead of paid losses.

Based on the expected losses and actual reported losses to date, ultimate losses were selected. Loss reserves were calculated as ultimate losses minus paid losses to date.

### **Hurricane loss and LAE estimation**

Hurricane losses are analyzed separately on an individual storm basis. Due to the unique nature of hurricanes and a lack of credible data, claims, legal, and management expert judgment for certain assumptions regarding the development of claims was considered in projecting the ultimate reported claims. Estimated ultimate claims were projected and used to calculate expected unreported claims. Due to lack of comparable data, provisions for reopened claims and adverse development on case reserves rely on the expert judgment of claims and actuarial staff. Similarly, a provision for unreported lawsuits and the average cost of litigated claims relies on the expert judgment of claims, legal, and actuarial.

### **Unallocated loss adjustment expense estimation**

Unallocated loss and loss adjustment expenses refer to the costs incurred by an insurance company in the process of investigating and settling claims, which are not directly allocated to specific claims. These costs include expenses like salaries of claims handling staff, overhead costs, and other administrative expenses.

In the "paid to paid ratio" method, ULAE reserve is estimated based on a historical relationship between paid ULAE and paid loss and allocated loss adjustment expenses. Historical data was evaluated to determine the ratio of ULAE paid to loss and allocated loss adjustment expenses paid over the last seven calendar years. This ratio is calculated by dividing the total ULAE paid by the total loss and allocated loss adjustment expenses paid.

To reflect the assumption that 50% of the ULAE is paid when the claim is opened and the other 50% of when it is closed, the ULAE reserve is set by applying the selected ratio of paid ULAE to paid loss and allocated loss adjustment expenses to the IBNR loss reserves, plus half of case reserves.

## Summary of exhibits

Exhibit I, Page 1 summarizes the gross and net loss and loss adjustment expense reserves. Case reserves and IBNR amounts are shown separately and combined into total unpaid amounts. Paid amounts are also included.

Exhibit I, Page 2 shows the total loss and loss adjustment expense IBNR amounts for accident years 2012 through 2023 and provides additional detail on major catastrophic events. All amounts on this and the following exhibits are gross of reinsurance. The allocation of IBNR between loss and LAE is based on historical ratios of paid loss and paid LAE.

Exhibit I, Page 3 shows the selection of the estimate of ultimate loss and LAE for Hurricanes Harvey, Ike, Dolly and Rita and the indicated loss and LAE IBNR amounts derived from the selected estimate. Provisions are made for unreported claims, additional development on closed claims, and adverse development on existing case reserves. A separate provision for additional litigation is also included. Hurricane Dolly and Rita are effectively fully developed and no additional IBNR provision is selected.

Exhibit I, Page 4 summarizes loss and ALAE amounts for accident years 2012 through 2023 by accident quarter and in total for each year. Hurricane Ike and Hurricane Harvey are excluded from this and all following exhibits. Paid, reported, case and IBNR reserve amounts are shown.

Exhibit II, Page 1 summarizes the paid and reported development methods used in the analysis and shows the selected ultimate amounts by accident quarter.

The paid development method is shown in detail on Exhibit III, Page 1 while the reported development method is shown in detail on Exhibit III, Page 2. Quarterly development factors are derived based on actual TWIA loss experience.

Exhibit IV, Pages 1 and 2 show TWIA loss data excluding and including hurricane experience, respectively. Loss data excluding hurricanes is extracted from the TWIA data warehouse. Loss data for hurricane data is from the accounting statements.

Exhibit V shows the reconciliation of actuarial data to Schedule P.

## Exhibit - Item 2

### Texas Windstorm Insurance Association

#### 2023 Q4 Reserve Analysis

##### Summary of Reserves

##### By Accident Year and Major Event

##### Gross and Net of Reinsurance

Exhibit I

Page 1

Accident Year	<u>Gross of Reinsurance</u>				<u>Loss Adjustment Expense Amounts</u>			
	<u>Loss Amounts</u>							
	Paid	Case	IBNR	Unpaid	Paid	Case	IBNR	Unpaid
	(1)	(1)	(2)		(1)	(1)	(2)	
2012	2,980,278	0	0	0	5,210,356	0	0	0
2013	70,883,387	0	0	0	14,708,869	0	0	0
2014	7,154,358	0	0	0	8,401,545	0	0	0
2015	139,125,158	199,830	135,906	335,736	37,259,460	124,565	58,245	182,810
2016	28,197,016	0	0	0	17,375,883	0	0	0
2017(Other)	23,517,219	2,500	5,311	7,811	10,604,351	10,177	2,276	12,453
2017(Harvey)	1,378,879,949	797,234	7,245,044	8,042,278	265,390,049	656,188	2,031,536	2,687,724
2018	12,114,002	100	10,126	10,226	7,030,489	24,068	4,340	28,408
2019	17,606,509	137,500	88,352	225,852	9,398,192	65,829	37,865	103,694
2020 (incl Hurr)	64,157,135	295,158	726,660	1,021,818	25,819,135	266,355	848,109	1,114,464
2021 (incl Hurr)	65,990,616	1,596,824	1,256,582	2,853,405	25,427,893	616,777	203,172	819,949
2022	26,747,220	1,571,327	854,347	2,425,674	16,394,113	408,725	366,149	774,874
2023	57,662,882	8,477,067	10,460,338	18,937,405	19,113,262	998,619	4,483,002	5,481,621
Total	1,895,015,732	13,077,540	20,782,665	33,860,205	462,133,598	3,171,303	8,034,694	11,205,997

Depopulated Claims								
Year	Paid	Case	IBNR	Unpaid	Paid	Case	IBNR	Unpaid
2016	17,985	0	0	0	11,350	0	0	0
2017	965,519	0	0	0	226,826	0	0	0
2018	50,620	0	0	0	19,843	0	0	0
2019	110,707	0	0	0	48,403	0	0	0
2020	109,142	0	0	0	13,331	0	0	0
2021	0	0	0	0	0	0	0	0
2022	0	0	0	0	0	0	0	0
2023	0	0	0	0	0	0	0	0
0								

Accident Year	<u>Net of Reinsurance</u>				<u>Loss Adjustment Expense Amounts</u>			
	<u>Loss Amounts</u>							
	Paid	Case	IBNR	Unpaid	Paid	Case	IBNR	Unpaid
2012	2,980,278	0	0	0	5,210,356	0	0	0
2013	70,883,387	0	0	0	14,708,869	0	0	0
2014	7,154,358	0	0	0	8,401,545	0	0	0
2015	139,125,158	199,830	135,906	335,736	37,259,460	124,565	58,245	182,810
2016	28,179,031	0	0	0	17,364,533	0	0	0
2017(Other)	22,551,700	2,500	5,311	7,811	10,377,525	10,177	2,276	12,453
2017(Harvey)	1,378,879,949	797,234	7,245,044	8,042,278	265,390,049	656,188	2,031,536	2,687,724
2018	12,063,383	100	10,126	10,226	7,010,646	24,068	4,340	28,408
2019	17,495,803	137,500	88,352	225,852	9,349,790	65,829	37,865	103,694
2020 (incl Hurr)	64,047,994	295,158	726,660	1,021,818	25,805,803	266,355	848,109	1,114,464
2021 (incl Hurr)	65,990,616	1,596,824	1,256,582	2,853,405	25,427,893	616,777	203,172	819,949
2022	26,747,220	1,571,327	854,347	2,425,674	16,394,113	408,725	366,149	774,874
2023	57,662,882	8,477,067	10,460,338	18,937,405	19,113,262	998,619	4,483,002	5,481,621
Total	1,893,761,759	13,077,540	20,782,665	33,860,205	461,813,845	3,171,303	8,034,694	11,205,997

##### Notes:

- (1) from Exhibit IV, Page 2
- (2) from Exhibit I, Page 2
- (7) from accounting loss rollforward file



## Exhibit - Item 2

### Texas Windstorm Insurance Association

#### 2023 Q4 Reserve Analysis

##### Summary of IBNR

##### By Accident Year and Major Event

##### Gross of Reinsurance

Exhibit I

Page 2

Accident Year	<u>Direct</u> Total IBNR	Loss IBNR	LAE IBNR	<u>Ceded</u> Total IBNR	Loss IBNR	LAE IBNR		Paid Loss / Paid LLAE
	(1)	(2)	(3)					(4)
2012	0	0	0					
2013	0	0	0					
2014	0	0	0					
2015	194,151	135,906	58,245				Prior	74.5%
2016	0	0	0	0	0	0	2017 and later	65.2%
2017(Non Harvey)	7,587	5,311	2,276	0	0	0	Selected	70.0%
2017(Harvey)	9,276,580	7,245,044	2,031,536	0	0	0		
2018	14,465	10,126	4,340	0	0	0		
2019	126,217	88,352	37,865	0	0	0		
2020 (incl Hurr)	1,574,769	726,660	848,109	0	0	0		
2021 (incl Hurr)	1,459,753	1,256,582	203,172	0	0	0		
2022	1,220,496	854,347	366,149	0	0	0		
2023	14,943,340	10,460,338	4,483,002	0	0	0		
Total	28,817,358	20,782,665	8,034,694	0	0	0		

#### Breakdown of Major Events

	<u>Ike</u>	<u>Dolly</u>	<u>Rita</u>	<u>Harvey</u>	<u>Hanna</u>	<u>Laura</u>	<u>Delta</u>	<u>Nicholas</u>
Total Payments	2,581,942,536	327,243,282	163,326,321	1,644,269,998	13,549,726	21,699,740	24,335,067	51,183,484
Case Reserves	0	0	79,230	1,453,422	87,579	190,390	153,342	1,684,031
Total IBNR	0	0	0	9,276,580	362,695	609,870	511,592	1,132,485
Loss IBNR	0	0	0	7,245,044	250,339	130,348	282,544	1,027,494
LAE IBNR	0	0	0	2,031,536	112,356	479,522	229,048	104,991
ULAE IBNR				378,506				
Total Ultimate Loss	2,581,942,536	327,243,282	163,405,551	1,655,000,000	14,000,000	22,500,000	25,000,000	54,000,000

#### Notes:

- (1) Exhibit I, Page 4 + Total IBNR for Hurricanes Ike and Harvey
- (2) = (1) \* (4) Selected
- (3) = (1) - (2)
- (4) Historical ratios of paid loss to paid LLAE

## Exhibit - Item 2

### Texas Windstorm Insurance Association

#### 2023 Q4 Reserve Analysis

Hurricane Ike, Harvey, Dolly and Rita, Hanna, Laura, Delta, Nicholas Ultimate Loss Estimate and Calculation of IBNR Reserves  
Gross of Reinsurance

Exhibit I

Page 3

Estimated Ultimate Loss	Harvey	Ike	Hanna	Laura	Delta	Nicholas	Dolly	Rita	
Paid Losses and Allocated Loss Adjustment Expenses	1,530,988,790	2,454,391,642	13,549,726	21,699,740	24,335,067	51,183,484	327,243,282	163,326,321	
Loss and Allocated Loss Adjustment Expense Case Reserves	1,453,422	0	87,579	190,390	153,342	1,684,031	0	79,230	
Paid Unallocated Loss Adjustment Expenses	113,281,208	127,550,894					0	0	
Incurred But Not Reported Reserve	5,378,506	0	362,695	609,870	511,592	1,132,485	0	0	
Estimated Ultimate Loss & LAE from Hurricane	1,651,101,926	2,581,942,536	14,000,000	22,500,000	25,000,000	54,000,000	327,243,282	163,405,551	
Selected Ultimate Loss & LAE from Hurricane	1,655,000,000	2,581,942,536	14,000,000	22,500,000	25,000,000	54,000,000	327,243,282	163,405,551	
Selected Loss IBNR Reserve	7,245,044	0	250,339	130,348	282,544	1,027,494	0	0	
Selected LAE IBNR Reserve	2,031,536	0	112,356	479,522	229,048	104,991	0	0	
Selected Loss & LAE IBNR Reserve	9,276,580	0	362,695	609,870	511,592	1,132,485			
Calculation of IBNR Reserves									
(1) Unreported Claims									
Reported Claims	76,728	93,064					8,376		
Estimated Ultimate Claims	76,728	93,064					8,376		
Expected Claims	0	0					0		
Selected Average Claim Severity	50	26,373					39,069		
Estimated Total Loss and ALAE for Unreported Claims	0	0					0		
(2) Future Reopened Claims									
Expected Claims for Harvey	0	0					0		
Average Increase (average of Q1-Q4 of 2022)	2,500	7,912					11,721		
Estimated Total Loss and ALAE for Reopened Claims	0	0					0		
(3) Reserve Development on current case reserves	5,000,000	0					0		
(4) Demand Surge & Inflation	0								
Claim Development	5,000,000	0					0		
(4) Future Litigation Risk									
Reported Litigated Claims	1,289	0					0		
Estimated Ultimate Litigated Claims	1,289	0					0		
Expected Claims to be Litigated in the Future	0	0					0		
Average Claim Cost due to Litigation based on Legal Expert Inp	51,034	120,000					150,000		
Total	0	0					0		
(5) Total IBNR LALAE Reserve	5,000,000	0					0		
(6) Total IBNR ULAE Reserve	378,506	0	2,894	6,292	5,068	55,653	0		
Total IBNR Reserve	5,378,506	0	362,695	609,870	511,592	1,132,485	0		

Paid Loss / Paid LLAE	Ike	Dolly
2020 and Prior	87.8%	94.5%
2021	1.9%	75.0%
Selected	52.8%	70.0%

Paid ULAE/ Paid LALAE Harvey Recent 4 quarters	6.6%
Selected	6.6%

Notes: (1) ultimate claims projected based on Ike reporting pattern with adjustments to reflect new reporting patterns; average claim severity based on actuarial judgements  
(2) assumptions based on discussions with Claims Department and Senior Management  
(3) assumptions based on discussions with Claims Department and Senior Management  
(4) do not expect any further litigation expense for Ike, Harvey and Dolly  
(5) equal to sum of (1) - (4)

# Exhibit - Item 2

## Texas Windstorm Insurance Association

### 2023 Q4 Reserve Analysis

Summary of Analysis

Excluding Hurricane Rita, Dolly, Ike, and Harvey Experience

Gross of Reinsurance

Exhibit I

Page 4

Accident Quarter Ending	Loss & LAE Amounts (Excluding Paid ULAE)				Total Unpaid	Total Incurred
	Evaluated as of 12/31/23					
	Paid	Reported	Case	IBNR		
	(1)	(2)	(3)	(4)	(5)	(6)
12/31/12	3,663,893	3,663,893	0	0	0	3,663,893
3/31/13	5,839,522	5,839,522	0	0	0	5,839,522
6/30/13	69,179,182	69,179,182	0	0	0	69,179,182
9/30/13	3,930,675	3,930,675	0	0	0	3,930,675
12/31/13	1,370,989	1,370,989	0	0	0	1,370,989
3/31/14	1,643,793	1,643,793	0	0	0	1,643,793
6/30/14	5,762,498	5,762,498	0	0	0	5,762,498
9/30/14	1,936,766	1,936,766	0	0	0	1,936,766
12/31/14	3,029,563	3,029,563	0	0	0	3,029,563
3/31/15	2,839,826	2,839,826	0	0	0	2,839,826
6/30/15	146,326,876	146,651,271	324,396	194,151	518,547	146,845,422
9/30/15	4,344,122	4,344,122	0	0	0	4,344,122
12/31/15	13,710,525	13,710,525	0	0	0	13,710,525
3/31/16	12,832,005	12,832,005	0	0	0	12,832,005
6/30/16	19,805,899	19,805,899	0	0	0	19,805,899
9/30/16	1,997,199	1,997,199	0	0	0	1,997,199
12/31/16	2,031,723	2,031,723	0	0	0	2,031,723
3/31/17	13,527,575	13,527,575	0	0	0	13,527,575
6/30/17	9,268,183	9,268,183	0	0	0	9,268,183
9/30/17	5,102,625	5,102,625	0	0	0	5,102,625
12/31/17	1,965,187	1,977,863	12,677	7,587	20,264	1,985,450
3/31/18	2,699,782	2,723,950	24,168	14,465	38,633	2,738,415
6/30/18	7,614,310	7,614,310	0	0	0	7,614,310
9/30/18	2,077,373	2,077,373	0	0	0	2,077,373
12/31/18	3,723,516	3,723,516	0	0	0	3,723,516
3/31/19	2,881,050	3,046,879	165,829	99,248	265,077	3,146,127
6/30/19	11,864,866	11,894,866	30,000	17,955	47,955	11,912,821
9/30/19	7,268,906	7,276,406	7,500	6,415	13,915	7,282,821
12/31/19	1,721,648	1,721,648	0	2,599	2,599	1,724,247
3/31/20	1,351,271	1,351,271	0	3,110	3,110	1,354,381
6/30/20	12,667,282	12,761,826	94,544	56,585	151,129	12,818,411
9/30/20	2,725,151	2,725,746	595	9,932	10,527	2,735,678
12/31/20	3,583,177	3,618,240	35,063	20,985	56,048	3,639,225
3/31/21	10,830,329	10,950,126	119,797	71,699	191,496	11,021,825
6/30/21	8,044,487	8,212,683	168,196	100,666	268,862	8,313,349
9/30/21	4,834,000	4,901,427	67,427	50,675	118,102	4,952,102
12/31/21	5,503,391	5,677,540	174,149	104,228	278,377	5,781,768
3/31/22	8,092,092	8,532,590	440,498	263,638	704,136	8,796,228
6/30/22	12,986,140	13,607,988	621,848	372,176	994,024	13,980,164
9/30/22	4,873,475	5,382,075	508,600	304,397	812,997	5,686,472
12/31/22	5,605,927	6,015,033	409,107	280,285	689,392	6,295,318
3/31/23	30,930,084	33,748,940	2,818,856	4,712,405	7,531,261	38,461,345
6/30/23	31,331,078	36,280,049	4,948,971	6,981,294	11,930,265	43,261,343
9/30/23	2,855,898	4,028,253	1,172,356	1,511,877	2,684,233	5,540,130
12/31/23	943,033	1,478,537	535,504	1,737,764	2,273,268	3,216,301

#### Accident Year

2012	3,663,893	3,663,893	0	0	0	3,663,893
2013	80,320,368	80,320,368	0	0	0	80,320,368
2014	12,372,619	12,372,619	0	0	0	12,372,619
2015	167,221,348	167,545,744	324,396	194,151	518,547	167,739,895
2016	36,666,826	36,666,826	0	0	0	36,666,826
2017	29,863,570	29,876,246	12,677	7,587	20,264	29,883,833
2018	16,114,982	16,139,150	24,168	14,465	38,633	16,153,615
2019	23,736,470	23,939,799	203,329	126,217	329,546	24,066,016
2020	20,326,881	20,457,083	130,202	90,612	220,814	20,547,695
2021	29,212,206	29,741,776	529,570	327,268	856,838	30,069,044
2022	31,557,634	33,537,686	1,980,052	1,220,496	3,200,548	34,758,182
2023	66,060,092	75,535,779	9,475,686	14,943,340	24,419,026	90,479,119

Notes:

(1) Exhibit III, Page 1 (3)

(2) , (3)

(3) = (2) - (1)

(4) Exhibit II (7)

(5) = (3) + (4)

(6) = (1) + (5)

## Exhibit - Item 2

### Texas Windstorm Insurance Association

#### 2023 Q4 Reserve Analysis

Summary of Development Methods

Excluding Hurricane Rita, Dolly, Ike and Harvey, Laura, Hanna, Delta, Nicholas Experience

Gross of Reinsurance

Exhibit II

Page 1

Accident Quarter Ending	Loss & ALAE Amounts		Indicated Ultimate LALAE		Selected Ultimate LALAE	Indicated IBNR LALAE	Indicated IBNR LLAE
	Evaluated as of 12/31/23	by Development Method	Paid	Reported			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
12/31/12	3,663,893	3,663,893	3,663,893	3,663,893	3,663,893	0	0
03/31/13	5,839,522	5,839,522	5,839,522	5,839,522	5,839,522	0	0
06/30/13	69,179,182	69,179,182	69,179,182	69,179,182	69,179,182	0	0
09/30/13	3,930,675	3,930,675	3,930,675	3,930,675	3,930,675	0	0
12/31/13	1,370,989	1,370,989	1,370,989	1,370,989	1,370,989	0	0
03/31/14	1,643,793	1,643,793	1,643,793	1,643,793	1,643,793	0	0
06/30/14	5,762,498	5,762,498	5,762,498	5,762,498	5,762,498	0	0
09/30/14	1,936,766	1,936,766	1,936,766	1,936,766	1,936,766	0	0
12/31/14	3,029,563	3,029,563	3,029,563	3,029,563	3,029,563	0	0
03/31/15	2,839,826	2,839,826	2,839,826	2,839,826	2,839,826	0	0
06/30/15	146,326,876	146,651,271	146,326,876	146,651,271	146,651,271	0	194,151
09/30/15	4,344,122	4,344,122	4,344,122	4,344,122	4,344,122	0	0
12/31/15	13,710,525	13,710,525	13,710,525	13,710,525	13,710,525	0	0
03/31/16	12,832,005	12,832,005	12,832,005	12,832,005	12,832,005	0	0
06/30/16	19,805,899	19,805,899	19,805,899	19,805,899	19,805,899	0	0
09/30/16	1,997,199	1,997,199	1,997,199	1,997,199	1,997,199	0	0
12/31/16	2,031,723	2,031,723	2,031,723	2,031,723	2,031,723	0	0
03/31/17	13,527,575	13,527,575	13,527,575	13,527,575	13,527,575	0	0
06/30/17	9,268,183	9,268,183	9,268,183	9,268,183	9,268,183	0	0
09/30/17	5,102,625	5,102,625	5,102,625	5,102,625	5,102,625	0	0
12/31/17	1,965,187	1,977,863	1,965,187	1,977,863	1,977,863	0	7,587
03/31/18	2,699,782	2,723,950	2,700,052	2,723,950	2,723,950	0	14,465
06/30/18	7,614,310	7,614,310	7,615,833	7,614,310	7,614,310	0	0
09/30/18	2,077,373	2,077,373	2,077,789	2,076,542	2,077,373	0	0
12/31/18	3,723,516	3,723,516	3,724,633	3,721,282	3,723,516	0	0
03/31/19	2,881,050	3,046,879	2,882,491	3,044,137	3,046,879	0	99,248
06/30/19	11,864,866	11,894,866	11,874,361	11,881,787	11,894,866	0	17,955
09/30/19	7,268,906	7,276,406	7,279,088	7,269,132	7,278,015	1,609	6,415
12/31/19	1,721,648	1,721,648	1,725,266	1,719,927	1,723,819	2,171	2,599
03/31/20	1,351,271	1,351,271	1,355,601	1,349,920	1,353,869	2,598	3,110
06/30/20	12,667,282	12,761,826	12,716,764	12,710,822	12,761,826	0	56,585
09/30/20	2,725,151	2,725,746	2,739,079	2,713,494	2,733,746	8,000	9,932
12/31/20	3,583,177	3,618,240	3,606,892	3,598,375	3,618,240	0	20,985
03/31/21	10,830,329	10,950,126	10,936,897	10,887,830	10,950,126	0	71,699
06/30/21	8,044,487	8,212,683	8,152,075	8,149,628	8,212,683	0	100,666
09/30/21	4,834,000	4,901,427	4,915,796	4,873,523	4,910,048	8,621	50,675
12/31/21	5,503,391	5,677,540	5,618,900	5,636,750	5,677,540	0	104,228
03/31/22	8,092,092	8,532,590	8,303,245	8,445,874	8,532,590	0	263,638
06/30/22	12,986,140	13,607,988	13,411,609	13,476,425	13,607,988	0	372,176
09/30/22	4,873,475	5,382,075	5,096,060	5,346,031	5,382,075	0	304,397
12/31/22	5,605,927	6,015,033	5,964,549	6,064,372	6,044,637	29,603	280,285
03/31/23	30,930,084	33,748,940	34,389,640	35,897,182	36,276,358	2,527,419	4,712,405
06/30/23	31,331,078	36,280,049	37,448,147	41,097,717	39,637,889	3,357,840	6,981,294
09/30/23	2,855,898	4,028,253	3,925,505	5,156,382	4,705,131	676,877	1,511,877
12/31/23	943,033	1,478,537	2,398,011	2,838,911	2,662,551	1,184,014	1,737,764

		2017	2018	2019	2020	2021	2022	2023
(8)	Paid LALAE	29,863,570	16,114,982	23,736,470	79,911,413	80,395,690	31,557,634	66,060,092
(9)	Paid ULAE	4,258,001	3,029,510	3,268,231	10,064,857	11,022,820	11,583,700	10,716,052
(10)	ULAE Factor	1.166	1.232	1.160	1.144	1.159	1.580	1.194
(11)	Selected ULAE Loading	1.197						
(12)	Selected ULAE Factor for Case Reserves	0.5						

Notes:

(1) Exhibit III, Page 1 (3)  
(2) Exhibit III, Page 2 (3)

(4) Exhibit III, Page 2 (5)  
(5) Selected

(6) = (5) - (2)  
(7) = ((6) + [(2) - (1)] x (12)) x (11)

Exhibit III  
Page 1[illegible]

Notes:

(1) Exhibit IV, Page 1	(3) Exhibit IV, Page 1	(5) = (3) * (4)
(2) Average Age based on uniform earning assumption	(4) Selected	

## Page 2

[illegible]

Notes:

(1) Exhibit IV, Page 1	(3) Exhibit IV, Page 1	(5) Selected
(2) Average Age based on uniform earning assumption	(4) Selected	(5) = (3)

## Exhibit - Item 2

[illegible]

# Exhibit - Item 2

## Texas Windstorm Insurance Association

### 2023 Q4 Reserve Analysis

Aggregation of Data

Annual Loss Data Including Hurricanes Rita, Dolly, Ike, and Harvey

All Lines of Business

Exhibit IV

Page 2

Calendar / (1) Loss Data Excluding Hurricane Rita, Dolly, Ike and Harvey						(2) Hurricane Rita, Dolly, Ike, Harvey, Hanna, Laura, Delta, Nicholas Loss Data					
Accident	Paid Amounts			Case Reserves		Accident	Paid Amounts			Case Reserves	
Year	Loss	ALAE	ULAE	Loss	ALAE	Year	Loss	ALAE	ULAE	Loss	ALAE
2005 going to prior year row							148,606,726	14,719,595	0	0	79,230
2006							0	0	0	0	0
2007			2,159,225				0	0	0	0	0
2008			4,858,234				2,570,236,643	211,398,281	127,550,894	0	0
2009	0	0	297,772	0	0		0	0	0	0	0
2010	0	0	250,187	0	0		0	0	0	0	0
2011	0	0	1,998,530	0	0		0	0	0	0	0
2012	2,980,278	683,614	4,526,741	0	0		0	0	0	0	0
2013	70,883,387	9,436,981	5,271,888	0	0		0	0	0	0	0
2014	7,154,358	5,218,261	3,183,284	0	0		0	0	0	0	0
2015	139,125,158	28,096,190	9,163,270	199,830	124,565		0	0	0	0	0
2016	28,197,016	8,469,810	8,906,073	0	0		0	0	0	0	0
2017	23,517,219	6,346,350	4,258,001	2,500	10,177		1,378,879,949	152,108,841	113,281,208	797,234	656,188
2018	12,114,002	4,000,979	3,029,510	100	24,068		0	0	0	0	0
2019	17,606,509	6,129,961	3,268,231	137,500	65,829		0	0	0	0	0
2020	16,090,584	4,236,297	10,064,857	24,941	105,261		48,066,551	11,517,981	0	270,217	161,094
2021	22,938,335	6,273,872	11,022,820	316,599	212,971		43,052,282	8,131,202	0	1,280,224	403,807
2022	26,747,220	4,810,413	11,583,700	1,571,327	408,725		0	0	0	0	0
2023	57,662,882	8,397,211	10,716,052	8,477,067	998,619		0	0	0	0	0
Total	425,016,950	92,099,940	94,558,374	10,729,865	1,950,215		4,188,842,151	397,875,901	240,832,102	2,347,675	1,300,318

#### Calendar / Loss Data Including Hurricanes

Accident	Paid Amounts			Case Reserves	
Year	Loss	ALAE	ULAE	Loss	ALAE
2005 going	148,606,726	14,719,595		0	79,230
2006	0	0		0	0
2007	0	0	2,159,225	0	0
2008	2,570,236,643	211,398,281	132,409,128	0	0
2009	0	0	297,772	0	0
2010	0	0	250,187	0	0
2011	0	0	1,998,530	0	0
2012	2,980,278	683,614	4,526,741	0	0
2013	70,883,387	9,436,981	5,271,888	0	0
2014	7,154,358	5,218,261	3,183,284	0	0
2015	139,125,158	28,096,190	9,163,270	199,830	124,565
2016	28,197,016	8,469,810	8,906,073	0	0
2017	1,402,397,168	158,455,192	117,539,208	799,734	666,365
2018	12,114,002	4,000,979	3,029,510	100	24,068
2019	17,606,509	6,129,961	3,268,231	137,500	65,829
2020	64,157,135	15,754,278	10,064,857	295,158	266,355
2021	65,990,616	14,405,074	11,022,820	1,596,824	616,777
2022	26,747,220	4,810,413	11,583,700	1,571,327	408,725
2023	57,662,882	8,397,211	10,716,052	8,477,067	998,619
Total	4,613,859,101	489,975,840	335,390,476	13,077,540	3,250,533

Notes: (1) from Exhibit IV, Page 1; ULAE from accounting statements

(2) from accounting statements (Ike) and data warehouse (Rita, Dolly)



## Exhibit - Item 2

**Texas Windstorm Insurance Association**  
**2023 Q4 Reserve Analysis**  
Reconciliation of Actuarial Data to Schedule P  
All Lines of Business, All Forms Combined  
(000s)

Exhibit V

Calendar / <u>Schedule P - Part 1 - Summary</u>								
Accident	<u>Losses</u>				<u>Total Loss Expenses</u>			Total
Year	Paid	Case	IBNR	Incurred	Paid	Unpaid	Incurred	Incurred
	(Col 4)	(Col 13)	(Col 15)		(Col 6 + 8)	(Col 17+19+21)		(Col 26)
2014	7,871	0	0	7,871	6,928	0	6,928	14,799
2015	138,697	3	136	138,836	40,048	93	40,141	178,977
2016	28,422	0	0	28,422	15,387	0	15,387	43,809
2017	1,402,282	800	7,250	1,410,332	275,730	2,700	278,430	1,688,762
2018	12,097	0	10	12,107	6,774	28	6,802	18,909
2019	17,606	138	88	17,832	9,326	103	9,429	27,261
2020	64,031	285	727	65,043	28,953	1,094	30,047	95,090
2021	64,894	1,581	1,257	67,732	28,042	839	28,881	96,613
2022	27,771	1,599	854	30,224	11,577	784	12,361	42,585
2023	57,766	8,479	10,461	76,706	16,958	5,475	22,433	99,139
Total	1,821,437	12,885	20,783	1,855,105	439,723	11,116	450,839	2,305,944

Calendar / <u>Actuarial Data</u>								
Accident	<u>Losses</u>				<u>Total Loss Expenses</u>			Total
Year	Paid	Case	IBNR	Incurred	Paid	Unpaid	Incurred	Incurred
	(1)	(1)	(1)		(1)	(1)		
2014	7,154	0	0	7,154	8,402	0	8,402	15,556
2015	139,125	200	136	139,461	37,259	183	37,442	176,903
2016	28,197	0	0	28,197	17,376	0	17,376	45,573
2017	1,402,397	800	7,250	1,410,447	275,994	2,700	278,695	1,689,142
2018	12,114	0	10	12,124	7,030	28	7,059	19,183
2019	17,607	138	88	17,832	9,398	104	9,502	27,334
2020	64,157	295	727	65,179	25,819	1,114	26,934	92,113
2021	65,991	1,597	1,257	68,844	25,428	820	26,248	95,092
2022	26,747	1,571	854	29,173	16,394	775	17,169	46,342
2023	57,663	8,477	10,460	76,600	19,113	5,482	24,595	101,195
Total	1,821,152	13,078	20,783	1,855,012	442,214	11,206	453,420	2,308,433

Calendar / <u>Differences</u>								
Accident	<u>Losses</u>				<u>Total Loss Expenses</u>			Total
Year	Paid	Case	IBNR	Incurred	Paid	Unpaid	Incurred	Incurred
2014	-717	0	0	-717	1,474	0	1,474	757
2015	428	197	0	625	-2,789	90	-2,699	-2,074
2016	-225	0	0	-225	1,989	0	1,989	1,764
2017	115	0	0	115	264	0	265	380
2018	17	0	0	17	256	0	257	274
2019	1	-1	0	0	72	1	73	73
2020	126	10	0	136	-3,134	20	-3,113	-2,977
2021	1,097	16	0	1,112	-2,614	-19	-2,633	-1,521
2022	-1,024	-28	0	-1,051	4,817	-9	4,808	3,757
2023	-103	-2	-1	-106	2,155	7	2,162	2,056
Total	-285	193	0	-93	2,491	90	2,581	2,489

Notes:

(1) from Exhibit I page 1

## Exhibit - Item 2R

Texas Windstorm Insurance Association  
2023 Q4 Reserve Analysis  
Aggregation of Data  
Quarterly Loss Data Excluding Harvey, Dolly, Ike, Hanna, Laura, Delta, Nicholas  
Residential Policies (including Mobile Home)

#### Exhibit IV

[illegible]

## Exhibit - Item 2C

Texas Windstorm Insurance Association  
2023 Q4 Reserve Analysis  
Aggregation of Data  
Quarterly Loss Data Excluding Harvey, Dolly, Ike, Hanna, Laura, Delta, Nicholas  
Commercial Policies

[illegible]

Exhibit - Item 3  
**Texas Windstorm Insurance Association**  
**Residential Property - Wind & Hail**  
**Rate Level Review**  
Summary of Indicated Rate Change  
By Method for Projecting Hurricane Loss & LAE

Exhibit 1

Hurricane Projection Method	Indicated Loss & LAE Ratio		Fixed Expenses	Total	Permissible LLAE Ratio	2024
	Hurricane	Non-Hurricane				Indicated Rate Change
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Using Experience and Models	43.2%	12.7%	49.2%	105.1%	77.2%	+36.0%
Using Actual Industry Experience	38.2%	12.7%	49.2%	100.1%	77.2%	+30.0%
Verisk	55.4%	12.7%	49.2%	117.3%	77.2%	+52.0%
RMS	49.0%	12.7%	49.2%	110.9%	77.2%	+44.0%
Impact Forecasting	45.3%	12.7%	49.2%	107.2%	77.2%	+39.0%
CoreLogic RQE	42.6%	12.7%	49.2%	104.5%	77.2%	+35.0%
Average of All Models	48.1%	12.7%	49.2%	110.0%	77.2%	+42.5%

Notes:

- (2) Exhibit 5
- (3) Exhibit 2, Sheet 1
- (4) Exhibit 10, Sheet 1
- (5) = (2) + (3) + (4)
- (6) Exhibit 10, Sheet 1
- (7) = (5) / (6) - 1

# Exhibit - Item 3

## Texas Windstorm Insurance Association

### Residential Property - Wind & Hail

#### Rate Level Review

Projected Ultimate Non-Hurricane Loss & LAE Ratio

All Territory Weighted Average

Exhibit 2

Sheet 1

Territory	<u>2023 Written Premium</u>		Indicated Non-Hurricane Loss & LAE Ratio
	Amount	Share	
(1)	(2)	(3)	(4)
Tier 1 - Territory 8	183,156,184	35.0%	10.8%
Tier 1 - Territory 9	86,684,858	16.6%	6.3%
Tier 1 - Territory 10	246,412,664	47.1%	15.8%
Tier 2	6,678,115	1.3%	30.6%
Total / Average	522,931,821	100.0%	12.7%

#### Notes:

(2) TWIA data

(3) = (2) / (2) Total

(4) Exhibit 2, Sheet 2a - Sheet 2d

# Exhibit - Item 3

## Texas Windstorm Insurance Association Residential Property - Wind & Hail

### Rate Level Review

Projected Ultimate Non-Hurricane Loss & LAE Ratio  
Tier 1 -- Territory 8 (Galveston County)

Exhibit 2  
Sheet 2a

Accident Year Ending 9/30	Ultimate Non-Hurricane Loss	LAE Factor	Net Trend Factor	Projected Non-Hurricane Loss & LAE	Earned Premium at Current TWIA Rate Level	Indicated Non-Hurricane Loss & LAE Ratio
(1)	(2)	(3)	(4)	(5)	(6)	(7)
2014	520,624	0.290	1.039	697,798	141,396,555	0.5%
2015	17,456,712	0.290	1.026	23,104,657	143,824,430	16.1%
2016	10,988,633	0.290	1.030	14,600,597	140,103,503	10.4%
2017	2,721,261	0.290	0.995	3,492,875	133,016,924	2.6%
2018	2,556,928	0.290	0.983	3,242,364	121,376,251	2.7%
2019	4,884,869	0.290	0.954	6,011,613	114,641,201	5.2%
2020	5,651,316	0.290	0.965	7,035,041	113,445,809	6.2%
2021	25,649,071	0.290	0.914	30,241,794	117,940,724	25.6%
2022	12,074,652	0.290	0.880	13,707,145	129,461,860	10.6%
2023	33,728,902	0.290	0.929	40,421,053	159,933,055	25.3%
Total	116,232,968			142,554,937	1,315,140,312	10.8%

#### Notes:

- (2) Exhibit 2, Sheet 3b
- (3) Exhibit 4
- (4) Exhibit 2, Sheet 5
- (5) = (2) \* [1 + (3)] \* (4)
- (6) Exhibit 9, Sheet 1a
- (7) = (5) / (6)

# Exhibit - Item 3

## Texas Windstorm Insurance Association

### Residential Property - Wind & Hail

#### Rate Level Review

Projected Ultimate Non-Hurricane Loss & LAE Ratio

Tier 1 -- Territory 9 (Nueces County)

Exhibit 2

Sheet 2b

Accident Year Ending 9/30	Ultimate Non-Hurricane Loss	LAE Factor	Net Trend Factor	Projected Non-Hurricane Loss & LAE	Earned Premium at Current TWIA Rate Level	Indicated Non-Hurricane Loss & LAE Ratio
(1)	(2)	(3)	(4)	(5)	(6)	(7)
2014	1,618,066	0.290	1.039	2,168,710	78,255,381	2.8%
2015	9,468,390	0.290	1.026	12,531,793	81,529,229	15.4%
2016	9,533,582	0.290	1.030	12,667,270	80,522,915	15.7%
2017	7,674,191	0.290	0.995	9,850,208	76,211,725	12.9%
2018	1,116,311	0.290	0.983	1,415,560	68,808,541	2.1%
2019	840,804	0.290	0.954	1,034,744	62,864,123	1.6%
2020	483,920	0.290	0.965	602,408	60,369,447	1.0%
2021	788,242	0.290	0.914	929,385	59,850,735	1.6%
2022	1,209,235	0.290	0.880	1,372,724	62,591,785	2.2%
2023	1,566,684	0.290	0.929	1,877,530	76,445,090	2.5%
Total	34,299,425			44,450,332	707,448,971	6.3%

#### Notes:

(2) Exhibit 2, Sheet 3c

(3) Exhibit 4

(4) Exhibit 2, Sheet 5

(5) = (2) \* [1 + (3)] \* (4)

(6) Exhibit 9, Sheet 1b

(7) = (5) / (6)

# Exhibit - Item 3

## Texas Windstorm Insurance Association

### Residential Property - Wind & Hail

#### Rate Level Review

Projected Ultimate Non-Hurricane Loss & LAE Ratio

Tier 1 -- Territory 10 (Other Tier 1)

Exhibit 2

Sheet 2c

Accident Year Ending 9/30	Ultimate Non-Hurricane Loss	LAE Factor	Net Trend Factor	Projected Non-Hurricane Loss & LAE	Earned Premium at Current TWIA Rate Level	Indicated Non-Hurricane Loss & LAE Ratio
(1)	(2)	(3)	(4)	(5)	(6)	(7)
2014	2,847,173	0.290	1.039	3,816,094	233,107,124	1.6%
2015	86,534,172	0.290	1.026	114,531,438	237,999,667	48.1%
2016	12,170,939	0.290	1.030	16,171,527	227,183,607	7.1%
2017	21,918,178	0.290	0.995	28,133,077	207,881,527	13.5%
2018	6,779,148	0.290	0.983	8,596,434	179,645,974	4.8%
2019	10,208,022	0.290	0.954	12,562,604	159,579,121	7.9%
2020	22,040,186	0.290	0.965	27,436,726	148,714,964	18.4%
2021	30,328,898	0.290	0.914	35,759,590	147,041,832	24.3%
2022	13,200,665	0.290	0.880	14,985,395	157,257,092	9.5%
2023	32,660,717	0.290	0.929	39,140,930	211,507,410	18.5%
Total	238,688,098			301,133,815	1,909,918,318	15.8%

#### Notes:

(2) Exhibit 2, Sheet 3d

(3) Exhibit 4

(4) Exhibit 2, Sheet 5

(5) = (2) \* [1 + (3)] \* (4)

(6) Exhibit 9, Sheet 1c

(7) = (5) / (6)



# Exhibit - Item 3

## Texas Windstorm Insurance Association Residential Property - Wind & Hail

### Rate Level Review

Projected Ultimate Non-Hurricane Loss & LAE Ratio  
Tier 2 -- (Territories 1 and 11)

Exhibit 2  
Sheet 2d

Accident Year Ending 9/30	Ultimate Non-Hurricane Loss	LAE Factor	Net Trend Factor	Projected Non-Hurricane Loss & LAE	Earned Premium at Current TWIA Rate Level	Indicated Non-Hurricane Loss & LAE Ratio
(1)	(2)	(3)	(4)	(5)	(6)	(7)
2014	30,748	0.290	1.039	41,212	4,882,886	0.8%
2015	339,607	0.290	1.026	449,483	4,986,385	9.0%
2016	446,561	0.290	1.030	593,346	5,015,200	11.8%
2017	483,192	0.290	0.995	620,201	4,890,478	12.7%
2018	283,290	0.290	0.983	359,232	4,631,462	7.8%
2019	2,728,066	0.290	0.954	3,357,322	4,510,864	74.4%
2020	456,670	0.290	0.965	568,486	4,586,202	12.4%
2021	2,128,105	0.290	0.914	2,509,163	4,749,377	52.8%
2022	728,027	0.290	0.880	826,456	5,048,518	16.4%
2023	4,773,253	0.290	0.929	5,720,314	5,922,961	96.6%
Total	12,397,519			15,045,215	49,224,333	30.6%

#### Notes:

- (2) Exhibit 2, Sheet 3e
- (3) Exhibit 4
- (4) Exhibit 2, Sheet 5
- (5) = (2) \* [1 + (3)] \* (4)
- (6) Exhibit 9, Sheet 1d
- (7) = (5) / (6)

Exhibit - Item 3  
Texas Windstorm Insurance Association  
Residential Property - Wind & Hail  
Rate Level Review  
Calculation of Net Trend Factors

Exhibit 2  
Sheet 5

Year / Quarter	Average Written Premium At Present Rates		
(1)	(2)	(3) Current Average Earned Date	4/1/2023
2014 / 3	1,762.63	(4) Current Average Accident Date	4/1/2023
2015 / 3	1,778.86	(5) Prospective Average Earned / Accident Date	1/1/2026
2016 / 3	1,781.44	(6) Premium Trend Length	2.750
2017 / 3	1,738.90	(7) Loss Trend Length	2.750
2018 / 3	1,774.13	(8) Selected Premium Trend	10.5%
2019 / 3	1,771.01	(9) Selected Loss Trend	7.6%
2020 / 3	1,785.14		
2021 / 3	1,847.23		
2022 / 3	2,057.81		
2023 / 3	2,234.21		

Accident Year Ending 9/30	Current Premium Trend	Current Loss Trend	Prospective Premium Trend	Prospective Loss Trend	Net Trend Factor
(10)	(11)	(12)	(13)	(14)	(15)
2014	1.268	1.417	1.316	1.223	1.039
2015	1.256	1.387	1.316	1.223	1.026
2016	1.254	1.390	1.316	1.223	1.030
2017	1.285	1.376	1.316	1.223	0.995
2018	1.259	1.332	1.316	1.223	0.983
2019	1.262	1.295	1.316	1.223	0.954
2020	1.252	1.300	1.316	1.223	0.965
2021	1.209	1.189	1.316	1.223	0.914
2022	1.086	1.028	1.316	1.223	0.880
2023	1.000	1.000	1.316	1.223	0.929

Notes:

- (2) Average written premium per exposure at present rates from Exhibit 3, Sheet 2, Column (6)
- (3) Latest Year / Quarter Ending Date - 6 Months
- (4) Latest Accident Year Ending Date - 6 Months
- (5) Rate Effective Date + 12 Months
- (6) = (5) - (3)
- (7) = (5) - (4)
- (8) Exhibit 3, Sheet 2
- (9) Exhibit 3, Sheet 3a
- (11) = (2) Indexed to 2023 / 3
- (12) Exhibit 3, Sheet 3a
- (13) =  $[1 + (8)] ^ (6)$
- (14) =  $[1 + (9)] ^ (7)$
- (15) =  $[(12) * (14)] / [(11) * (13)]$

## Exhibit - Item 3

**Texas Windstorm Insurance Association**  
**Residential Property - Wind & Hail**
**Rate Level Review**

Premium Trend Analysis

TWIA Residential Written Premium at Present Rates (WPPR)

Exhibit 3  
Sheet 2

Year / Quarter	Exposure Written	Written Premium	On-Level Factors	Written Premium at Present Rates	Quarterly Average WPPR	Annualized Average WPPR	Exponential Fitted Trends			
							All-Year	5-Year	4-Year	3-Year
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
2014 / 2	79,155	111,616,003	1.255	140,128,872	1,770					
2014 / 3	89,874	128,096,479	1.237	158,414,687	1,763					
2014 / 4	60,646	86,711,448	1.221	105,885,837	1,746					
2015 / 1	57,651	85,327,979	1.210	103,236,560	1,791	1,767	1,691			
2015 / 2	82,158	122,581,230	1.196	146,575,670	1,784	1,771	1,698			
2015 / 3	84,402	127,421,809	1.178	150,139,314	1,779	1,776	1,706			
2015 / 4	57,308	87,342,988	1.163	101,596,837	1,773	1,782	1,713			
2016 / 1	54,113	84,557,230	1.153	97,461,471	1,801	1,783	1,721			
2016 / 2	79,991	125,845,764	1.139	143,345,209	1,792	1,786	1,728			
2016 / 3	77,932	123,784,247	1.122	138,831,226	1,781	1,787	1,736			
2016 / 4	51,030	81,959,449	1.108	90,806,567	1,779	1,788	1,743			
2017 / 1	50,991	79,037,984	1.103	87,139,377	1,709	1,770	1,751			
2017 / 2	73,614	114,547,681	1.103	126,288,818	1,716	1,747	1,759			
2017 / 3	68,864	108,614,623	1.103	119,747,622	1,739	1,734	1,766			
2017 / 4	45,960	73,697,340	1.103	81,251,317	1,768	1,731	1,774			
2018 / 1	44,101	71,679,332	1.098	78,682,660	1,784	1,746	1,782			
2018 / 2	63,851	104,163,394	1.085	112,994,275	1,770	1,763	1,790			
2018 / 3	61,408	101,951,681	1.069	108,946,054	1,774	1,774	1,798			
2018 / 4	40,418	68,300,637	1.055	72,071,158	1,783	1,777	1,805			
2019 / 1	39,758	65,036,872	1.050	68,288,716	1,718	1,764	1,813	1,670		
2019 / 2	60,805	99,948,528	1.050	104,945,954	1,726	1,750	1,821	1,691		
2019 / 3	57,547	97,063,357	1.050	101,916,525	1,771	1,749	1,829	1,711		
2019 / 4	38,375	65,697,652	1.050	68,982,535	1,798	1,751	1,837	1,732		
2020 / 1	38,302	63,498,682	1.050	66,673,616	1,741	1,756	1,845	1,753	1,691	
2020 / 2	59,374	98,472,763	1.050	103,396,401	1,741	1,761	1,854	1,774	1,718	
2020 / 3	57,963	98,544,861	1.050	103,472,104	1,785	1,765	1,862	1,796	1,745	
2020 / 4	37,911	65,820,531	1.050	69,111,558	1,823	1,770	1,870	1,817	1,773	
2021 / 1	39,057	66,582,420	1.050	69,911,541	1,790	1,780	1,878	1,840	1,801	1,746
2021 / 2	60,541	103,031,428	1.050	108,182,999	1,787	1,794	1,886	1,862	1,830	1,782
2021 / 3	59,878	105,341,091	1.050	110,608,146	1,847	1,813	1,895	1,884	1,859	1,819
2021 / 4	39,807	72,365,308	1.050	75,983,573	1,909	1,830	1,903	1,907	1,889	1,856
2022 / 1	40,733	76,134,863	1.045	79,562,723	1,953	1,863	1,911	1,930	1,919	1,895
2022 / 2	61,794	116,935,905	1.032	120,677,182	1,953	1,913	1,920	1,954	1,950	1,934
2022 / 3	79,530	161,132,745	1.016	163,657,432	2,058	1,983	1,928	1,978	1,981	1,974
2022 / 4	43,628	92,639,740	1.004	93,000,123	2,132	2,024	1,937	2,002	2,013	2,014
2023 / 1	46,661	98,545,683	1.000	98,545,683	2,112	2,055	1,945	2,026	2,045	2,056
2023 / 2	68,720	145,450,526	1.000	145,450,526	2,117	2,099	1,954	2,050	2,078	2,098
2023 / 3	83,884	187,414,809	1.000	187,414,809	2,234	2,159	1,962	2,075	2,111	2,142
2023 / 4	48,217	110,838,891	1.000	110,838,891	2,299	2,191	1,971	2,100	2,145	2,186
(14) Average Annual Change							1.8%	4.9%	6.6%	8.5%
(15) Correlation Coefficient							51.1%	84.7%	92.6%	98.1%
(16) Selected Premium Trend										10.5%

Notes: (2) Provided by TWIA. Exposures written on inception  
(3) Provided by TWIA. Premium written on inception  
(4) Cumulative effect of annual rate changes  
(5) = (3) \* (4)  
(6) = (5) / (2). WPPR = Written Premium at Present Rates  
(7) Four-quarter rolling average written premium  
(8) - (11) = (7) Fitted to an exponential distribution  
(14) Fitted average annual change  
(15) Evaluates the predictability of the fitted curve  
(16) Selected based on judgment, with equal weight given to 3-year, 4-year, and 5-year exponential fitted trends

# Exhibit - Item 4

## Texas Windstorm Insurance Association

### Commercial Property - Wind & Hail

#### Rate Level Review

Summary of Indicated Rate Change

By Method for Projecting Hurricane Loss & LAE

All Territories Combined

Exhibit 1

Hurricane Projection Method	Indicated Loss & LAE Ratio		Fixed Expenses	Total	Permissible LLAE Ratio	2024
	Hurricane	Non-Hurricane				Indicated Rate Change
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Using Experience and Models	51.8%	4.2%	55.6%	111.6%	77.2%	45.0%
Using Actual Industry Experience	48.4%	4.2%	55.6%	108.2%	77.2%	40.0%
Verisk	72.7%	4.2%	55.6%	132.5%	77.2%	72.0%
RMS	67.3%	4.2%	55.6%	127.1%	77.2%	65.0%
Impact Forecasting	32.1%	4.2%	55.6%	91.9%	77.2%	19.0%
CoreLogic RQE	48.2%	4.2%	55.6%	108.0%	77.2%	40.0%
Average of All Models	55.1%	4.2%	55.6%	114.9%	77.2%	48.9%

#### Notes:

(2) Exhibit 5

(3) Exhibit 2, Sheet 1

(4) Exhibit 10, Sheet 1

(5) = (2) + (3) + (4)

(6) Exhibit 10, Sheet 1

(7) = (5) / (6) - 1

# Exhibit - Item 4

## Texas Windstorm Insurance Association Commercial Property - Wind & Hail

### Rate Level Review

Projected Ultimate Non-Hurricane Loss & LAE Ratio  
All Territories Combined

Exhibit 2  
Sheet 1

Accident Year Ending 12/31	Ultimate Non-Hurricane Loss	LAE Factor	Net Trend Factor	Projected Non-Hurricane Loss & LAE	Earned Premium at Current Rate Level	Indicated Non-Hurricane Loss & LAE Ratio
(1)	(2)	(3)	(4)	(5)	(6)	(7)
2014	1,056,281	0.290	0.863	1,175,926	135,603,583	0.9%
2015	18,737,038	0.290	0.848	20,496,821	120,726,959	17.0%
2016	2,551,122	0.290	0.846	2,784,141	105,842,224	2.6%
2017	2,011,705	0.290	0.803	2,083,865	87,703,816	2.4%
2018	251,565	0.290	0.787	255,396	73,508,956	0.3%
2019	953,957	0.290	0.791	973,408	65,530,795	1.5%
2020	857,896	0.290	0.847	937,363	62,711,660	1.5%
2021	832,836	0.290	0.767	824,033	64,939,142	1.3%
2022	1,575,058	0.290	0.776	1,576,696	77,659,503	2.0%
2023	5,616,151	0.290	0.890	6,447,903	109,473,433	5.9%
Total	34,443,609			37,555,552	903,700,071	4.2%

#### Notes:

- (2) Exhibit 2, Sheet 2
- (3) Exhibit 4
- (4) = Exhibit 2, Sheet 4
- (5) = (2) \* [1 + (3)] \* (4)
- (6) Exhibit 9, Sheet 1
- (7) = (5) / (6)

Exhibit - Item 4  
**Texas Windstorm Insurance Association**  
**Commercial Property - Wind & Hail**  
**Rate Level Review**  
Calculation of Net Trend Factors

Exhibit 2  
Sheet 4

Year / Quarter	Average Written Premium At Present Rates		
(1)	(2)		
		(3) Current Average Earned Date	7/1/2023
2014 / 4	4,610.68	(4) Current Average Accident Date	7/1/2023
2015 / 4	4,595.35	(5) Prospective Average Earned / Accident Date	1/1/2026
2016 / 4	4,581.38	(6) Premium Trend Length	2.500
2017 / 4	4,426.00	(7) Loss Trend Length	2.500
2018 / 4	4,497.78	(8) Selected Premium Trend	14.6%
2019 / 4	4,601.77	(9) Selected Loss Trend	9.4%
2020 / 4	4,930.85		
2021 / 4	5,052.90		
2022 / 4	5,864.06		
2023 / 4	6,826.29		

Accident Year Ending 12/31	Current Premium Trend	Current Loss Trend	Prospective Premium Trend	Prospective Loss Trend	Net Trend Factor
(10)	(11)	(12)	(13)	(14)	(15)
2014	1.481	1.436	1.407	1.252	0.863
2015	1.485	1.415	1.407	1.252	0.848
2016	1.490	1.416	1.407	1.252	0.846
2017	1.542	1.392	1.407	1.252	0.803
2018	1.518	1.342	1.407	1.252	0.787
2019	1.483	1.318	1.407	1.252	0.791
2020	1.384	1.317	1.407	1.252	0.847
2021	1.351	1.165	1.407	1.252	0.767
2022	1.164	1.015	1.407	1.252	0.776
2023	1.000	1.000	1.407	1.252	0.890

Notes:

- (2) Average written premium per exposure at present rates from Exhibit 3, Sheet 1, Column (7)
- (3) Latest Year / Quarter Ending Date - 6 Months
- (4) Latest Accident Year Ending Date - 6 Months
- (5) Rate Effective Date + 12 Months
- (6) = (5) - (3)
- (7) = (5) - (4)
- (8) Exhibit 3, Sheet 1
- (9) Exhibit 3, Sheet 2a
- (11) = (2) Indexed to 2023 / 4
- (12) Exhibit 3, Sheet 2a
- (13) =  $[1 + (8)] ^ (6)$
- (14) =  $[1 + (9)] ^ (7)$
- (15) =  $[(12) * (14)] / [(11) * (13)]$

## Exhibit - Item 4

## Texas Windstorm Insurance Association

## Commercial Property - Wind &amp; Hail

## Rate Level Review

## Premium Trend Analysis

## TWIA Commercial Written Premium at Present Rates (WPPR)

Exhibit 3

Sheet 1

Year / Quarter	Exposure Written	Written Premium	On-Level Factors	Written Premium at Present Rates	Quarterly Average WPPR	Annualized Average WPPR	Exponential Fitted Trends			
							All-Year	5-Year	4-Year	3-Year
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
2014 / 2	8,964	35,219,745	1.256	44,251,073	4,937					
2014 / 3	8,292	29,887,118	1.237	36,962,324	4,458					
2014 / 4	6,088	21,627,063	1.222	26,418,431	4,339	4,611				
2015 / 1	6,464	24,808,373	1.209	29,989,092	4,639	4,617	4,176			
2015 / 2	7,870	33,339,199	1.195	39,846,309	5,063	4,639	4,214			
2015 / 3	7,657	28,055,666	1.177	33,012,506	4,311	4,604	4,253			
2015 / 4	4,802	17,430,504	1.163	20,275,304	4,222	4,595	4,292			
2016 / 1	5,512	22,487,925	1.151	25,890,562	4,697	4,606	4,331			
2016 / 2	6,522	28,623,450	1.138	32,569,345	4,994	4,562	4,371			
2016 / 3	6,507	25,417,054	1.120	28,466,060	4,375	4,592	4,411			
2016 / 4	4,047	14,955,154	1.107	16,558,181	4,091	4,581	4,452			
2017 / 1	4,263	17,482,209	1.103	19,274,135	4,521	4,539	4,493			
2017 / 2	5,717	25,224,489	1.103	27,809,999	4,864	4,486	4,534			
2017 / 3	5,172	19,050,031	1.103	21,002,659	4,061	4,409	4,576			
2017 / 4	3,489	13,077,837	1.103	14,418,315	4,133	4,426	4,618			
2018 / 1	3,663	15,807,970	1.096	17,331,059	4,731	4,465	4,660			
2018 / 2	5,108	22,862,777	1.084	24,773,451	4,850	4,447	4,703			
2018 / 3	4,612	17,927,115	1.066	19,118,289	4,145	4,483	4,746			
2018 / 4	3,109	12,284,401	1.055	12,954,588	4,167	4,498	4,790			
2019 / 1	2,933	14,759,154	1.050	15,497,112	5,284	4,590	4,834	4,262		
2019 / 2	4,431	20,959,587	1.050	22,007,566	4,967	4,612	4,878	4,353		
2019 / 3	3,993	14,943,999	1.050	15,691,199	3,930	4,573	4,923	4,447		
2019 / 4	2,966	12,109,737	1.050	12,715,224	4,287	4,602	4,969	4,543		
2020 / 1	2,719	14,566,185	1.050	15,294,494	5,625	4,657	5,014	4,640	4,408	
2020 / 2	3,982	18,776,705	1.050	19,715,540	4,951	4,642	5,060	4,740	4,527	
2020 / 3	3,970	15,951,658	1.050	16,749,241	4,219	4,728	5,107	4,842	4,650	
2020 / 4	2,710	13,543,203	1.050	14,220,363	5,247	4,931	5,154	4,946	4,775	
2021 / 1	2,521	12,672,604	1.050	13,306,234	5,278	4,854	5,201	5,052	4,904	4,656
2021 / 2	4,228	20,348,072	1.050	21,365,476	5,053	4,888	5,249	5,161	5,037	4,818
2021 / 3	3,892	16,793,147	1.050	17,632,804	4,531	4,983	5,297	5,271	5,173	4,985
2021 / 4	3,112	16,369,478	1.050	17,187,952	5,523	5,053	5,346	5,385	5,312	5,158
2022 / 1	2,725	15,396,927	1.044	16,079,017	5,901	5,178	5,395	5,500	5,456	5,338
2022 / 2	4,642	25,560,832	1.032	26,371,194	5,681	5,377	5,445	5,619	5,603	5,523
2022 / 3	5,337	29,199,819	1.015	29,644,617	5,555	5,645	5,495	5,739	5,755	5,715
2022 / 4	3,496	22,787,093	1.005	22,903,023	6,551	5,864	5,545	5,863	5,910	5,913
2023 / 1	3,273	22,499,113	1.000	22,499,113	6,874	6,056	5,596	5,989	6,070	6,118
2023 / 2	6,379	44,485,048	1.000	44,485,048	6,974	6,466	5,648	6,117	6,234	6,331
2023 / 3	6,029	38,901,087	1.000	38,901,087	6,452	6,716	5,700	6,249	6,402	6,551
2023 / 4	4,278	30,360,734	1.000	30,360,734	7,097	6,826	5,752	6,383	6,575	6,778
(14) Average Annual Change							3.7%	8.9%	11.3%	14.6%
(15) Correlation Coefficient							60.8%	87.9%	92.4%	96.8%
(16) Selected Premium Trend										14.6%

Notes: (2) Provided by TWIA. Exposures written on inception  
(3) Provided by TWIA. Premium written on inception  
(4) Factors to bring written premium to current rate level  
(5) = (3) \* (4)  
(6) = (5) / (2). WPPR = Written Premium at Present Rates  
(7) Four-quarter rolling average written premium  
(8) - (11) = (7) Fitted to an exponential distribution  
(14) Fitted average annual change  
(15) Evaluates the predictability of the fitted curve  
(16) Selected based on judgment, with weight given to 3-year, 4-year, and 5-year exponential fitted trends



# Statement of Compliance with Actuarial Standard of Practice 38

## Minchong Mao, FCAS, MAAA

### Background

Actuarial Standard of Practice 38 provides guidance to the actuary in using models that incorporate specialized knowledge outside the actuary's own area of expertise when developing an actuarial work product. When using such a model, the standard requires that the actuary perform five specific tasks, as described below using the numbering system of the standard. This document certifies that Minchong Mao, FCAS, MAAA, has performed these tasks for the catastrophe loss model(s) relied upon in the actuarial work product to which it is attached. It is intended that actuaries utilizing the actuarial work product in their insurance ratemaking efforts can rely on my model evaluation in accordance with Section 3.7 of the standard of practice. In July 2021, Actuarial Standards Board(ASB) adopted revision of ASOP No. 38. This document reflected the most current requirements in the 2021 revision.

### Model Versions Covered by this document

- AIR Hurricane model for the United States v18 utilized in Touchstone versions 2020 (TS V8), 2021 (TS V9), Version 2022 (TS V10) and later, released in 2021
- AIR Severe Thunderstorm Model for the United States implemented in Touchstone version 10 and later, released in 2022
- AIR Winter Storm Model for the United States v1.5 implemented in Touchstone version 5, 6, 7, 8, 9,10 and later
- AIR Wildfire Model for the United States v2 implemented in Touchstone version 6, 7, 8, 9,10 and later
- AIR Earthquake and Fire Following Model for the United States v10.1 implemented in Touchstone version 6, 7, 8, 9,10 and later. This version included Time Dependent Earthquake Hazard Adjustment.

### 3.2 Appropriate Reliance on Experts

*Catastrophe Models Developed by Experts—When selecting, using, reviewing, or evaluating a catastrophe model developed by experts, the actuary should take into account the following:*

- a. whether the individual or individuals who developed the catastrophe model are experts in the applicable field;*
- b. the extent to which the catastrophe model has been reviewed or validated by experts concerning aspects of the catastrophe model that could be material to the actuary's use of the catastrophe model;*  
*and*





*c. whether there are industry or regulatory standards that apply to the catastrophe model or to the testing or validation of the catastrophe model, and whether the catastrophe model has been certified as having met such standards.*

For those aspects of the model that are outside my area of expertise, I have relied on the list of experts provided by the modeler. Please see the modeler's ASOP 38 document and supporting documentation for additional information.

a. The individuals listed as employees of the modeler appear to be experts in their respective fields.

b. The modeler has provided documentation of reviews by outside experts. Many of these reviewers are well-recognized experts in their fields. I have reviewed the findings of the outside experts and found no significant differences of opinion with respect to the validity of the model.

c. Standards for catastrophe loss models have been promulgated by a few states. Most notably, the Florida Commission on Hurricane Loss Projection Methodology was created to review catastrophe loss models. The model(s) used in this work product, or derivatives thereof, have been certified by the Florida Commission on Hurricane Loss Projection Methodology.

### 3.3 Understanding of the Model

*The actuary should be familiar with the basic components of the catastrophe model and understand both the user input and the catastrophe model output, as discussed below.*

I have reviewed the modeler's ASOP 38 document and supporting documentation describing the model's components, input, and output, as well as other documentation, to comply with this requirement. In addition, I have specialized in actuarial applications of catastrophe model output since 2005.

*3.3.1 Catastrophe Model Components—The actuary should be familiar with the basic components of the catastrophe model and have an understanding of how such components interrelate within the catastrophe model. In addition, the actuary should identify which fields of expertise were used in developing or updating the catastrophe model and should make a reasonable effort to determine if the catastrophe model is based on generally accepted practices within the applicable fields of expertise. The actuary should also be familiar with how the catastrophe model was tested or validated and the level of independent expert review and testing.*

I am reasonably familiar with the basic components of the model and have a basic understanding of how such components interrelate within the model. I have identified the fields of expertise used in developing and updating the model and have determined that the model is based on generally accepted practices within the applicable fields of expertise. I am reasonably familiar with how the model was validated and have reviewed the documentation of reviews by outside experts.

*3.3.2 User Input—The actuary should take reasonable steps to confirm that the precision and accuracy of the user input are consistent with the intended purpose and should refer, as applicable, to ASOP No. 23, Data Quality, when selecting, using, or evaluating data used in the catastrophe model. Certain user input may be required to produce catastrophe model output for the specific application. User input can include assumptions or data. If the catastrophe model requires user input, the actuary should evaluate the reasonableness of the user input and should have an understanding of the relationship between the user input and catastrophe model output.*



I understand the user input required to produce model output, including the level of detail required to produce results that are consistent with insurance ratemaking and risk management applications.

*3.3.3 Catastrophe Model Output—The actuary should determine that the catastrophe model output is consistent with the intended purpose.*

I have determined that the model output is consistent with the insurance ratemaking applications for which it was used. We most often use event loss detail in our work, so we are always careful that our results balance to the model's prepared exhibits.

## 3.4 Appropriateness of the Model for the Intended Application

*The actuary should evaluate whether the catastrophe model is appropriate for the intended purpose and take into account the following:*

*3.4.1. Applicability of Historical Data—To the extent historical data are used in the development of the catastrophe model or the establishment of catastrophe model parameters, the actuary should take into account the adequacy of the historical data in representing the range of reasonably expected outcomes consistent with current knowledge about the phenomena being analyzed.*

*3.4.2. Developments in Relevant Fields—The actuary should make a reasonable effort to be aware of significant developments in relevant fields of expertise that are likely to materially affect the catastrophe model.*

The catastrophe model(s) we have relied upon were developed for purposes related to the management of risk. I have evaluated the model(s) in light of available alternatives and determined that the catastrophe loss model is the most appropriate method of estimating expected catastrophe loss distributions for insurance ratemaking.

Some additional considerations include the following:

3.4.1. Applicability of Historical Data: Historical data is relied upon extensively in the development and validation of catastrophe loss models. Smoothing procedures are applied in cases where reasonably foreseeable events are underrepresented in the historical data.

3.4.2. Developments in Relevant Fields: Catastrophe loss models are typically updated on an annual basis in order to incorporate the most current scientific research and information from recent catastrophe events.

I have made a reasonable effort to be aware of significant developments in the relevant fields of expertise. In particular, meteorological studies related to the current period of elevated hurricane activity are important in determining which of a model's frequency assumptions should be utilized in insurance ratemaking applications involving hurricane-exposed risk portfolios. Aon maintains a documentation library containing current research in the science of catastrophe perils.



### 3.5 Output Validation

*The actuary should validate that the output reasonably represents that which is being modeled. Depending on the intended purpose, output validation may include the following:*

- a. comparing output to those of an alternative model(s), where appropriate;*
- b. comparing the output produced by the catastrophe model with historical observations, if applicable;*
- c. comparing the consistency and reasonableness of relationships within the output; and*
- d. evaluating the reasonableness of changes in the output due to variations in the user input.*

a. Aon conducts extensive testing of each model that we license whenever a new model is released. Output from Model output is checked for reasonability against other models and for consistency with the modeler's representations as to changes incorporated in the current version. I have reviewed the results of these tests and found the model used in this analysis to provide reasonable output.

b. Catastrophes, by their nature, involve significant uncertainty in the amount of insured losses they produce. In light of this uncertainty, the model has been shown to produce reasonable estimates of losses incurred from historical events.

I have reviewed the modeler's ASOP 38 document and supporting documentation describing comparisons of model output to historical observations and found that the model produces reasonable estimates.

c. I have reviewed the relationships among output results and found them to be consistent and reasonable.

d. Aon conducts extensive testing of each model that we license with respect to the sensitivity of model output to variations in the user input and model assumptions. I have reviewed the results of these tests and obtained an understanding of the model's sensitivity.

### 3.6 Appropriate Use of the Model

*The actuary should evaluate the reasonableness of the catastrophe model output, considering the input and the intended purpose. The actuary should take into account the limitations of the catastrophe model and use professional judgment to determine whether it is appropriate to use the catastrophe model output. The actuary should also use professional judgment to determine whether any adjustments to the catastrophe model output are needed to meet the intended purpose. The actuary should disclose any such adjustments in accordance with section 4.1.*

In my professional judgment, it is appropriate to use the model results, without adjustment, for the purposes of the actuarial work product to which this document is attached.



### 3.7 Reliance on Another Actuary

*The actuary may rely on another actuary who has selected, used, reviewed, or evaluated the catastrophe model. However, the relying actuary should be reasonably satisfied that the other actuary is qualified to select, use, review, or evaluate the catastrophe model in accordance with applicable ASOPs, and the catastrophe model is appropriate for the intended purpose. The actuary should disclose the extent of any such reliance.*

Actuaries utilizing the actuarial work product to which this document is attached can rely on my complete evaluation of the model(s) used as described above. In doing so, they should document the extent of such reliance in their work.

### 3.8 Reliance on Data or Other Information Supplied by Others

*When relying on data or other information supplied by others, the actuary should refer to ASOP No. 23 and ASOP No. 41, Actuarial Communications, for guidance.*

We have discussed the treatment of exposure data in 3.3.2, we have reviewed the cat modelers' data quality and investigation procedures and can attest to their procedures being in compliance with ASOP No. 23, Data Quality. We have properly communicated ASOP reviews with internal and external stakeholders, we can attest that we are in compliance with ASOP No. 41.

### 3.9 Documentation

*The actuary should consider preparing and retaining documentation to support compliance with the requirements of section 3 and the disclosure requirements of section 4. If preparing documentation, the actuary should prepare such documentation in a form such that another actuary qualified in the same practice area could assess the reasonableness of the actuary's work and should document the steps taken to comply with this standard in light of proprietary aspects of the catastrophe model, if any. The degree of such documentation should be based on the professional judgment of the actuary and may vary with the complexity and purpose of the actuarial services. In addition, the actuary should refer to ASOP No. 41 for guidance related to the retention of file material other than that which is to be disclosed under section 4.*

We have retained documentation to support compliance with the requirements of section 3 and the disclosure requirements of section 4 in separate trade secret documents. The sensitivity testing to support section 3 involves detailed model results from several commercial vendors. Aon is required by our license agreements to protect modeling vendors' intellectual properties. The steps of Aon's ASOP 38 compliance work follow the ASOP 38 outline. I can attest that we are in compliance with ASOP No. 41.



Minchong Mao FCAS, MAAA

A handwritten signature in black ink, appearing to read "Minchong Mao".

May 2023



# Statement of Compliance with Actuarial Standard of Practice 38

## Minchong Mao, FCAS, MAAA

### Background

Actuarial Standard of Practice 38 provides guidance to the actuary in using models that incorporate specialized knowledge outside the actuary's own area of expertise when developing an actuarial work product. When using such a model, the standard requires that the actuary perform five specific tasks, as described below using the numbering system of the standard. This document certifies that Minchong Mao, FCAS, MAAA, has performed these tasks for the catastrophe loss model(s) relied upon in the actuarial work product to which it is attached. It is intended that actuaries utilizing the actuarial work product in their insurance ratemaking efforts can rely on my model evaluation in accordance with Section 3.7 of the standard of practice.

### Model Versions Covered by this document

- RMS North Atlantic Hurricane Model v23, released in 2023, implemented in RiskLink V23
- RMS North America Earthquake Model v17.0, released in 2017, implemented in RiskLink V17, V18, V18.1, V21, V23
- RMS Sever Convective Strom Model for the United States, released in 2014, implemented in RiskLink V17, V18, V18.1, V21, V23
- RMS Winter Storm Model for the United States, release in 2022, implemented in RiskLink V22, V23

### 3.2 Appropriate Reliance on Experts

*An actuary may rely on experts concerning those aspects of a model that are outside of the actuary's own area of expertise. The experts relied upon may either be the experts who provided the model or other experts.*

For those aspects of the model that are outside my area of expertise, I have relied on the list of experts provided by the modeler. Please see the modeler's ASOP 38 document and supporting documentation for additional information.

*In determining the appropriate level of reliance, the actuary should consider the following:*

*a. whether the individual or individuals upon whom the actuary is relying are experts in the applicable field;*

The individuals listed as employees of the modeler appear to be experts in their respective fields.

*b. the extent to which the model has been reviewed or opined on by experts in the applicable field, including any known significant differences of opinion among experts concerning aspects of the model that could be material to the actuary's use of the model; and*



The modeler has provided documentation of reviews by outside experts. Many of these reviewers are well-recognized experts in their fields. I have reviewed the findings of the outside experts and found no significant differences of opinion with respect to the validity of the model.

*c. whether there are standards that apply to the model or to the testing or validation of the model, and whether the model has been certified as having met such standards.*

Standards for catastrophe loss models have been promulgated by a few states. Most notably, the Florida Commission on Hurricane Loss Projection Methodology was created to review catastrophe loss models. The model(s) used in this work product, or derivatives thereof, have been certified by the Florida Commission on Hurricane Loss Projection Methodology.

### 3.3 Understanding of the Model

*The actuary should be reasonably familiar with the basic components of the model and understand both the user input and the model output, as discussed below.*

I have reviewed the modeler's ASOP 38 document and supporting documentation describing the model's components, input, and output, as well as other documentation, to comply with this requirement. In addition, I have specialized in actuarial applications of catastrophe model output since 2005.

*3.3.1 Model Components—The actuary should be reasonably familiar with the basic components of the model and have a basic understanding of how such components interrelate within the model. In addition, the actuary should identify which fields of expertise were used in developing or updating the model, and should make a reasonable effort to determine if the model is based on generally accepted practices within the applicable fields of expertise. The actuary should also be reasonably familiar with how the model was tested or validated and the level of independent expert review and testing.*

I am reasonably familiar with the basic components of the model and have a basic understanding of how such components interrelate within the model. I have identified the fields of expertise used in developing and updating the model and have determined that the model is based on generally accepted practices within the applicable fields of expertise. I am reasonably familiar with how the model was validated and have reviewed the documentation of reviews by outside experts.

*3.3.2 User Input—Certain user input may be required to produce model output for the specific application. The actuary should understand the user input that is required to produce the model output. This understanding includes the level of detail required in the user input to produce results that are consistent with the intended use of the model.*

I understand the user input required to produce model output, including the level of detail required to produce results that are consistent with insurance ratemaking and risk management applications.

*3.3.3 Model Output—The actuary should determine that the model output is consistent with the actuary's intended use of the model.*

I have determined that the model output is consistent with the insurance ratemaking applications for which it was used. We most often use event loss detail in our work, so we are always careful that our results balance to the model's prepared exhibits.



### 3.4 Appropriateness of the Model for the Intended Application

*The actuary should evaluate whether the model is appropriate for the particular actuarial analysis, and consider limitations of the model, modifications to the model, and the assumptions needed in order to apply the model output.*

The catastrophe model(s) we have relied upon were developed for purposes related to the management of risk. I have evaluated the model(s) in light of available alternatives and determined that the catastrophe loss model is the most appropriate method of estimating expected catastrophe loss distributions for insurance ratemaking.

*Some additional considerations include the following:*

*a. Applicability of Historical Data—To the extent historical data are used in the development of the model or the establishment of model parameters, the actuary should consider the adequacy of the historical data in representing the range of reasonably expected outcomes consistent with current knowledge about the phenomena being analyzed.*

Historical data is relied upon extensively in the development and validation of catastrophe loss models. Smoothing procedures are applied in cases where reasonably foreseeable events are underrepresented in the historical data.

*b. Developments in Relevant Fields—The actuary should make a reasonable effort to be aware of significant developments in relevant fields of expertise. The actuary should evaluate whether such developments are likely to materially affect the current actuarial analysis.*

Catastrophe loss models are typically updated on an annual basis in order to incorporate the most current scientific research and information from recent catastrophe events.

I have made a reasonable effort to be aware of significant developments in the relevant fields of expertise. In particular, meteorological studies related to the current period of elevated hurricane activity are important in determining which of a model's frequency assumptions should be utilized in insurance ratemaking applications involving hurricane-exposed risk portfolios. Aon maintains a documentation library containing current research in the science of catastrophe perils.

### 3.5 Appropriate Validation

*The actuary should evaluate the user input and the reasonableness of the model output, as discussed below.*

*3.5.1 User Input—With respect to the quality and availability of the user input data to be used in the model, the actuary should refer to ASOP No. 23, Data Quality.*

The model input data for this analysis was supplied by the client. The data was reviewed for reasonableness in accordance with ASOP 23.

*3.5.2 Model Output—In view of the intended use of the model, the actuary should examine the model output for reasonableness, considering factors such as the following:*

*a. the results derived from alternate models or methods, where available and appropriate;*





In addition, Aon conducts extensive testing of each model that we license whenever a new model is released. Output from Model output is checked for reasonability against other models and for consistency with the modeler's representations as to changes incorporated in the current version. I have reviewed the results of these tests and found the model used in this analysis to provide reasonable output.

*b. how historical observations, if applicable, compare to results produced by the model;*

Catastrophes, by their nature, involve significant uncertainty in the amount of insured losses they produce. In light of this uncertainty, the model has been shown to produce reasonable estimates of losses incurred from historical events.

I have reviewed the modeler's ASOP 38 document and supporting documentation describing comparisons of model output to historical observations and found that the model produces reasonable estimates.

*c. the consistency and reasonableness of relationships among various output results; and*

I have reviewed the relationships among output results and found them to be consistent and reasonable.

*d. the sensitivity of the model output to variations in the user input and model assumptions.*

Aon conducts extensive testing of each model that we license with respect to the sensitivity of model output to variations in the user input and model assumptions. I have reviewed the results of these tests and obtained an understanding of the model's sensitivity.

## 3.6 Appropriate Use of the Model

*Having completed the analysis described in sections 3.2–3.5 above, the actuary should use his or her professional judgment to determine whether it is appropriate to use the model results, subject to any appropriate adjustments. The actuary should disclose any such adjustments in accordance with section 4.3.*

In my professional judgment, it is appropriate to use the model results, without adjustment, for the purposes of the actuarial work product to which this document is attached.

## 3.7 Reliance on Model Evaluation by Another Actuary

*The actuary may rely on another actuary who has, for a particular model, conducted some or all of the evaluations and processes described in this standard. However, the relying actuary should be satisfied that the other actuary's evaluation was performed in accordance with this standard and is appropriate for the intended application. The actuary should document the extent of such reliance in accordance with section 4.1.*

Actuaries utilizing the actuarial work product to which this document is attached can rely on my complete evaluation of the model(s) used as described above. In doing so, they should document the extent of such reliance in their work.



Minchong Mao FCAS, MAAA

*Minchong Mao*

Dec.1 2023



# Statement of Compliance with Actuarial Standard of Practice 38

## Minchong Mao, FCAS, MAAA

### Background

Actuarial Standard of Practice 38 provides guidance to the actuary in using models that incorporate specialized knowledge outside the actuary's own area of expertise when developing an actuarial work product. When using such a model, the standard requires that the actuary perform five specific tasks, as described below using the numbering system of the standard. This document certifies that Minchong Mao, FCAS, MAAA, has performed these tasks for the catastrophe loss model(s) relied upon in the actuarial work product to which it is attached. It is intended that actuaries utilizing the actuarial work product in their insurance ratemaking efforts can rely on my model evaluation in accordance with Section 3.7 of the standard of practice. In July 2021, Actuarial Standards Board(ASB) adopted revision of ASOP No. 38. This document reflected the most current requirements in the 2021 revision.

### Model Versions Covered by this document

- CoreLogic Hurricane model for the United States implemented in RQE V23. RQE V23 was released in 2023
- CoreLogic Severe Thunderstorm Model for the United States implemented in RQE V15, 16,17,18, 19, 21,23.
- CoreLogic Winter Storm Model for the United States implemented in RQE V15, 16,17,18,19, 21, 23
- CoreLogic Earthquake and Fire Following Model for the United States implemented in RQE V15, 16,17,18, 19, 21, 23.

### 3.2 Appropriate Reliance on Experts

*Catastrophe Models Developed by Experts—When selecting, using, reviewing, or evaluating a catastrophe model developed by experts, the actuary should take into account the following:*

- a. whether the individual or individuals who developed the catastrophe model are experts in the applicable field;*
- b. the extent to which the catastrophe model has been reviewed or validated by experts concerning aspects of the catastrophe model that could be material to the actuary's use of the catastrophe model; and*
- c. whether there are industry or regulatory standards that apply to the catastrophe model or to the testing or validation of the catastrophe model, and whether the catastrophe model has been certified as having met such standards.*



For those aspects of the model that are outside my area of expertise, I have relied on the list of experts provided by the modeler. Please see the modeler's ASOP 38 document and supporting documentation for additional information.

- a. The individuals listed as employees of the modeler appear to be experts in their respective fields.
- b. The modeler has provided documentation of reviews by outside experts. Many of these reviewers are well-recognized experts in their fields. I have reviewed the findings of the outside experts and found no significant differences of opinion with respect to the validity of the model.
- c. Standards for catastrophe loss models have been promulgated by a few states. Most notably, the Florida Commission on Hurricane Loss Projection Methodology was created to review catastrophe loss models. The model(s) used in this work product, or derivatives thereof, have been certified by the Florida Commission on Hurricane Loss Projection Methodology.

### 3.3 Understanding of the Model

*The actuary should be familiar with the basic components of the catastrophe model and understand both the user input and the catastrophe model output, as discussed below.*

I have reviewed the modeler's ASOP 38 document and supporting documentation describing the model's components, input, and output, as well as other documentation, to comply with this requirement. In addition, I have specialized in actuarial applications of catastrophe model output since 2005.

*3.3.1 Catastrophe Model Components—The actuary should be familiar with the basic components of the catastrophe model and have an understanding of how such components interrelate within the catastrophe model. In addition, the actuary should identify which fields of expertise were used in developing or updating the catastrophe model and should make a reasonable effort to determine if the catastrophe model is based on generally accepted practices within the applicable fields of expertise. The actuary should also be familiar with how the catastrophe model was tested or validated and the level of independent expert review and testing.*

I am reasonably familiar with the basic components of the model and have a basic understanding of how such components interrelate within the model. I have identified the fields of expertise used in developing and updating the model and have determined that the model is based on generally accepted practices within the applicable fields of expertise. I am reasonably familiar with how the model was validated and have reviewed the documentation of reviews by outside experts.

*3.3.2 User Input—The actuary should take reasonable steps to confirm that the precision and accuracy of the user input are consistent with the intended purpose and should refer, as applicable, to ASOP No. 23, Data Quality, when selecting, using, or evaluating data used in the catastrophe model. Certain user input may be required to produce catastrophe model output for the specific application. User input can include assumptions or data. If the catastrophe model requires user input, the actuary should evaluate the reasonableness of the user input and should have an understanding of the relationship between the user input and catastrophe model output.*

I understand the user input required to produce model output, including the level of detail required to produce results that are consistent with insurance ratemaking and risk management applications.



*3.3.3 Catastrophe Model Output—The actuary should determine that the catastrophe model output is consistent with the intended purpose.*

I have determined that the model output is consistent with the insurance ratemaking applications for which it was used. We most often use event loss detail in our work, so we are always careful that our results balance to the model's prepared exhibits.

## 3.4 Appropriateness of the Model for the Intended Application

*The actuary should evaluate whether the catastrophe model is appropriate for the intended purpose and take into account the following:*

*3.4.1. Applicability of Historical Data—To the extent historical data are used in the development of the catastrophe model or the establishment of catastrophe model parameters, the actuary should take into account the adequacy of the historical data in representing the range of reasonably expected outcomes consistent with current knowledge about the phenomena being analyzed.*

*3.4.2. Developments in Relevant Fields—The actuary should make a reasonable effort to be aware of significant developments in relevant fields of expertise that are likely to materially affect the catastrophe model.*

The catastrophe model(s) we have relied upon were developed for purposes related to the management of risk. I have evaluated the model(s) in light of available alternatives and determined that the catastrophe loss model is the most appropriate method of estimating expected catastrophe loss distributions for insurance ratemaking.

Some additional considerations include the following:

3.4.1. Applicability of Historical Data: Historical data is relied upon extensively in the development and validation of catastrophe loss models. Smoothing procedures are applied in cases where reasonably foreseeable events are underrepresented in the historical data.

3.4.2. Developments in Relevant Fields: Catastrophe loss models are typically updated on an annual basis in order to incorporate the most current scientific research and information from recent catastrophe events.

I have made a reasonable effort to be aware of significant developments in the relevant fields of expertise. In particular, meteorological studies related to the current period of elevated hurricane activity are important in determining which of a model's frequency assumptions should be utilized in insurance ratemaking applications involving hurricane-exposed risk portfolios. Aon maintains a documentation library containing current research in the science of catastrophe perils.

## 3.5 Output Validation

*The actuary should validate that the output reasonably represents that which is being modeled. Depending on the intended purpose, output validation may include the following:*



- a. comparing output to those of an alternative model(s), where appropriate;*
- b. comparing the output produced by the catastrophe model with historical observations, if applicable;*
- c. comparing the consistency and reasonableness of relationships within the output; and*
- d. evaluating the reasonableness of changes in the output due to variations in the user input.*

a. Aon conducts extensive testing of each model that we license whenever a new model is released. Output from Model output is checked for reasonability against other models and for consistency with the modeler's representations as to changes incorporated in the current version. I have reviewed the results of these tests and found the model used in this analysis to provide reasonable output.

b. Catastrophes, by their nature, involve significant uncertainty in the amount of insured losses they produce. In light of this uncertainty, the model has been shown to produce reasonable estimates of losses incurred from historical events.

I have reviewed the modeler's ASOP 38 document and supporting documentation describing comparisons of model output to historical observations and found that the model produces reasonable estimates.

c. I have reviewed the relationships among output results and found them to be consistent and reasonable.

d. Aon conducts extensive testing of each model that we license with respect to the sensitivity of model output to variations in the user input and model assumptions. I have reviewed the results of these tests and obtained an understanding of the model's sensitivity.

### 3.6 Appropriate Use of the Model

*The actuary should evaluate the reasonableness of the catastrophe model output, considering the input and the intended purpose. The actuary should take into account the limitations of the catastrophe model and use professional judgment to determine whether it is appropriate to use the catastrophe model output. The actuary should also use professional judgment to determine whether any adjustments to the catastrophe model output are needed to meet the intended purpose. The actuary should disclose any such adjustments in accordance with section 4.1.*

In my professional judgment, it is appropriate to use the model results, without adjustment, for the purposes of the actuarial work product to which this document is attached.

### 3.7 Reliance on Another Actuary

*The actuary may rely on another actuary who has selected, used, reviewed, or evaluated the catastrophe model. However, the relying actuary should be reasonably satisfied that the other actuary is qualified to select, use, review, or evaluate the catastrophe model in accordance with applicable ASOPs, and the*



*catastrophe model is appropriate for the intended purpose. The actuary should disclose the extent of any such reliance.*

Actuaries utilizing the actuarial work product to which this document is attached can rely on my complete evaluation of the model(s) used as described above. In doing so, they should document the extent of such reliance in their work.

Minchong Mao FCAS, MAAA

A handwritten signature in black ink, appearing to read "Minchong Mao".

Dec. 1 2023



# Statement of Compliance with Actuarial Standard of Practice 38

## Minchong Mao, FCAS, MAAA

### Background

Actuarial Standard of Practice 38 provides guidance to the actuary in using models that incorporate specialized knowledge outside the actuary's own area of expertise when developing an actuarial work product. When using such a model, the standard requires that the actuary perform five specific tasks, as described below using the numbering system of the standard. This document certifies that Minchong Mao, FCAS, MAAA, has performed these tasks for the catastrophe loss model(s) relied upon in the actuarial work product to which it is attached. It is intended that actuaries utilizing the actuarial work product in their insurance ratemaking efforts can rely on my model evaluation in accordance with Section 3.7 of the standard of practice. In July 2021, Actuarial Standards Board(ASB) adopted revision of ASOP No. 38. This document reflected the most current requirements in the 2021 revision.

### Model Versions Covered by this document

- Impact Forecasting Atlantic Tropical Cyclone Model released in 2023, implemented in Element V17

### 3.2 Appropriate Reliance on Experts

*Catastrophe Models Developed by Experts—When selecting, using, reviewing, or evaluating a catastrophe model developed by experts, the actuary should take into account the following:*

- a. whether the individual or individuals who developed the catastrophe model are experts in the applicable field;*
- b. the extent to which the catastrophe model has been reviewed or validated by experts concerning aspects of the catastrophe model that could be material to the actuary's use of the catastrophe model; and*
- c. whether there are industry or regulatory standards that apply to the catastrophe model or to the testing or validation of the catastrophe model, and whether the catastrophe model has been certified as having met such standards.*

For those aspects of the model that are outside my area of expertise, I have relied on the list of experts provided by the modeler. Please see the modeler's ASOP 38 document and supporting documentation for additional information.

- a. The individuals listed as employees of the modeler appear to be experts in their respective fields.
- b. The modeler has provided documentation of reviews by outside experts. Many of these reviewers are well-recognized experts in their fields. I have reviewed the findings of the outside experts and found no significant differences of opinion with respect to the validity of the model.
- c. Standards for catastrophe loss models have been promulgated by a few states. Most notably, the Florida Commission on Hurricane Loss Projection Methodology was created to review catastrophe loss





models. The model(s) used in this work product, or derivatives thereof, have been certified by the Florida Commission on Hurricane Loss Projection Methodology.

### 3.3 Understanding of the Model

*The actuary should be familiar with the basic components of the catastrophe model and understand both the user input and the catastrophe model output, as discussed below.*

I have reviewed the modeler's ASOP 38 document and supporting documentation describing the model's components, input, and output, as well as other documentation, to comply with this requirement. In addition, I have specialized in actuarial applications of catastrophe model output since 2005.

*3.3.1 Catastrophe Model Components—The actuary should be familiar with the basic components of the catastrophe model and have an understanding of how such components interrelate within the catastrophe model. In addition, the actuary should identify which fields of expertise were used in developing or updating the catastrophe model and should make a reasonable effort to determine if the catastrophe model is based on generally accepted practices within the applicable fields of expertise. The actuary should also be familiar with how the catastrophe model was tested or validated and the level of independent expert review and testing.*

I am reasonably familiar with the basic components of the model and have a basic understanding of how such components interrelate within the model. I have identified the fields of expertise used in developing and updating the model and have determined that the model is based on generally accepted practices within the applicable fields of expertise. I am reasonably familiar with how the model was validated and have reviewed the documentation of reviews by outside experts.

*3.3.2 User Input—The actuary should take reasonable steps to confirm that the precision and accuracy of the user input are consistent with the intended purpose and should refer, as applicable, to ASOP No. 23, Data Quality, when selecting, using, or evaluating data used in the catastrophe model. Certain user input may be required to produce catastrophe model output for the specific application. User input can include assumptions or data. If the catastrophe model requires user input, the actuary should evaluate the reasonableness of the user input and should have an understanding of the relationship between the user input and catastrophe model output.*

I understand the user input required to produce model output, including the level of detail required to produce results that are consistent with insurance ratemaking and risk management applications.

*3.3.3 Catastrophe Model Output—The actuary should determine that the catastrophe model output is consistent with the intended purpose.*

I have determined that the model output is consistent with the insurance ratemaking applications for which it was used. We most often use event loss detail in our work, so we are always careful that our results balance to the model's prepared exhibits.



## 3.4 Appropriateness of the Model for the Intended Application

*The actuary should evaluate whether the catastrophe model is appropriate for the intended purpose and take into account the following:*

*3.4.1. Applicability of Historical Data—To the extent historical data are used in the development of the catastrophe model or the establishment of catastrophe model parameters, the actuary should take into account the adequacy of the historical data in representing the range of reasonably expected outcomes consistent with current knowledge about the phenomena being analyzed.*

*3.4.2. Developments in Relevant Fields—The actuary should make a reasonable effort to be aware of significant developments in relevant fields of expertise that are likely to materially affect the catastrophe model.*

The catastrophe model(s) we have relied upon were developed for purposes related to the management of risk. I have evaluated the model(s) in light of available alternatives and determined that the catastrophe loss model is the most appropriate method of estimating expected catastrophe loss distributions for insurance ratemaking.

Some additional considerations include the following:

3.4.1. Applicability of Historical Data: Historical data is relied upon extensively in the development and validation of catastrophe loss models. Smoothing procedures are applied in cases where reasonably foreseeable events are underrepresented in the historical data.

3.4.2. Developments in Relevant Fields: Catastrophe loss models are typically updated on an annual basis in order to incorporate the most current scientific research and information from recent catastrophe events.

I have made a reasonable effort to be aware of significant developments in the relevant fields of expertise. In particular, meteorological studies related to the current period of elevated hurricane activity are important in determining which of a model's frequency assumptions should be utilized in insurance ratemaking applications involving hurricane-exposed risk portfolios. Aon maintains a documentation library containing current research in the science of catastrophe perils.

## 3.5 Output Validation

*The actuary should validate that the output reasonably represents that which is being modeled. Depending on the intended purpose, output validation may include the following:*

- a. comparing output to those of an alternative model(s), where appropriate;*
- b. comparing the output produced by the catastrophe model with historical observations, if applicable;*
- c. comparing the consistency and reasonableness of relationships within the output; and*



*d. evaluating the reasonableness of changes in the output due to variations in the user input.*

a. Aon conducts extensive testing of each model that we license whenever a new model is released. Output from Model output is checked for reasonability against other models and for consistency with the modeler's representations as to changes incorporated in the current version. I have reviewed the results of these tests and found the model used in this analysis to provide reasonable output.

b. Catastrophes, by their nature, involve significant uncertainty in the amount of insured losses they produce. In light of this uncertainty, the model has been shown to produce reasonable estimates of losses incurred from historical events.

I have reviewed the modeler's ASOP 38 document and supporting documentation describing comparisons of model output to historical observations and found that the model produces reasonable estimates.

c. I have reviewed the relationships among output results and found them to be consistent and reasonable.

d. Aon conducts extensive testing of each model that we license with respect to the sensitivity of model output to variations in the user input and model assumptions. I have reviewed the results of these tests and obtained an understanding of the model's sensitivity.

### 3.6 Appropriate Use of the Model

*The actuary should evaluate the reasonableness of the catastrophe model output, considering the input and the intended purpose. The actuary should take into account the limitations of the catastrophe model and use professional judgment to determine whether it is appropriate to use the catastrophe model output. The actuary should also use professional judgment to determine whether any adjustments to the catastrophe model output are needed to meet the intended purpose. The actuary should disclose any such adjustments in accordance with section 4.1.*

In my professional judgment, it is appropriate to use the model results, without adjustment, for the purposes of the actuarial work product to which this document is attached.

### 3.7 Reliance on Another Actuary

*The actuary may rely on another actuary who has selected, used, reviewed, or evaluated the catastrophe model. However, the relying actuary should be reasonably satisfied that the other actuary is qualified to select, use, review, or evaluate the catastrophe model in accordance with applicable ASOPs, and the catastrophe model is appropriate for the intended purpose. The actuary should disclose the extent of any such reliance.*

Actuaries utilizing the actuarial work product to which this document is attached can rely on my complete evaluation of the model(s) used as described above. In doing so, they should document the extent of such reliance in their work.



### 3.8 Reliance on Data or Other Information Supplied by Others

*When relying on data or other information supplied by others, the actuary should refer to ASOP No. 23 and ASOP No. 41, Actuarial Communications, for guidance.*

We have discussed the treatment of exposure data in 3.3.2, we have reviewed the cat modelers' data quality and investigation procedures and can attest to their procedures being in compliance with ASOP No. 23, Data Quality. We have properly communicated ASOP reviews with internal and external stakeholders, we can attest that we are in compliance with ASOP No. 41.

### 3.9 Documentation

*The actuary should consider preparing and retaining documentation to support compliance with the requirements of section 3 and the disclosure requirements of section 4. If preparing documentation, the actuary should prepare such documentation in a form such that another actuary qualified in the same practice area could assess the reasonableness of the actuary's work and should document the steps taken to comply with this standard in light of proprietary aspects of the catastrophe model, if any.*

*The degree of such documentation should be based on the professional judgment of the actuary and may vary with the complexity and purpose of the actuarial services. In addition, the actuary should refer to ASOP No. 41 for guidance related to the retention of file material other than that which is to be disclosed under section 4.*

We have retained documentation to support compliance with the requirements of section 3 and the disclosure requirements of section 4 in separate trade secret documents. The sensitivity testing to support section 3 involves detailed model results from several commercial vendors. Aon is required by our license agreements to protect modeling vendors' intellectual properties. The steps of Aon's ASOP 38 compliance work follow the ASOP 38 outline. I can attest that we are in compliance with ASOP No. 41.

Minchong Mao FCAS, MAAA

A handwritten signature in black ink, appearing to read "Minchong Mao".

June 2024

Exhibit - Item 7R  
**Texas Windstorm Insurance Association**  
**Residential Property - Wind & Hail**  
**Rate Level Review**  
Summary of Indicated Rate Change  
By Method for Projecting Hurricane Loss & LAE

Exhibit 1

Hurricane Projection Method	Indicated Loss & LAE Ratio			Fixed Expenses	Total	Permissible LLAE Ratio	2024
	Hurricane	Non-Hurricane					Indicated Rate Change
(1)	(2)	(3)		(4)	(5)	(6)	(7)
Using Experience and Models	43.2%	13.9%		48.3%	105.4%	<b>77.2%</b>	<b>+36.0%</b>
Using Actual Industry Experience	38.2%	13.9%		48.3%	100.4%	<b>77.2%</b>	<b>+30.0%</b>
Verisk	55.4%	13.9%		48.3%	117.6%	<b>77.2%</b>	<b>+52.0%</b>
RMS	49.0%	13.9%		48.3%	111.2%	<b>77.2%</b>	<b>+44.0%</b>
Impact Forecasting	45.3%	13.9%		48.3%	107.5%	<b>77.2%</b>	<b>+39.0%</b>
CoreLogic RQE	42.6%	13.9%		48.3%	104.8%	<b>77.2%</b>	<b>+36.0%</b>
Average of All Models	48.1%	13.9%		48.3%	110.3%	<b>77.2%</b>	<b>+42.9%</b>

Notes:

- (2) Exhibit 5
- (3) Exhibit 2, Sheet 1
- (4) Exhibit 10, Sheet 1
- (5) = (2) + (3) + (4)
- (6) Exhibit 10, Sheet 1
- (7) = (5) / (6) - 1

# Exhibit - Item 7R

Texas Windstorm Insurance Association

Residential Property - Wind & Hail

Rate Level Review

Expenses and Variable Permissible Loss & LAE Ratios

Exhibit 10

Sheet 1

Expense Category	2021	2022	2023	Projected 2024	Selected
(1) Direct Written Premium	395,112,773	518,299,032	653,043,231	815,861,000	
(2) Direct Earned Premium	378,504,197	443,490,204	589,353,024	743,860,000	
(3) Commission					
\$ Amount	63,161,029	82,854,389	104,392,398	130,538,000	
% of DWP	16.0%	16.0%	16.0%	16.0%	16.0%
(4) Other Acquisition					
\$ Amount	0	0	0	0	
% of DWP	0.0%	0.0%	0.0%	0.0%	0.0%
(5) General Expense					
Unadjusted \$ Amount	29,979,903	35,578,580	36,234,634	40,243,000	
Adjustments					
Contribution to Statutory Fund	0	0	0	0	
Adjusted \$ Amount	29,979,903	35,578,580	36,234,634	40,243,000	
% of DWP	7.6%	6.9%	5.5%	4.9%	4.3%
(6) Taxes, Licenses & Fees					
\$ Amount	7,364,210	9,499,183	11,379,394	14,889,000	
% of DWP	1.9%	1.8%	1.7%	1.8%	1.8%
(7) Reinsurance Expense					44.0%
(8) Outstanding Class 1 Public Security Repayment					0.0%
(9) Total Fixed Expenses					48.3%
(10) Total Variable Expenses					17.8%
(11) CRTF Contribution & UW Contingency & Uncertainty					5.0%
(12) Permissible Loss, LAE and Fixed Expense Ratio					77.2%

## Notes:

(1) - (6) From TWIA's Statutory Annual Statements and Insurance Expense Exhibits. 2024 figures are projected

(7) Exhibit 10, Sheet 2

(8) Outstanding principal paid off in 2023

(9) = (5) + (7) + (8)

(10) = (3) + (4) + (6)

(11) CRTF contribution selected judgmentally

(12) = 100% - (10) - (11)

# Exhibit - Item 7C

## Texas Windstorm Insurance Association

### Commercial Property - Wind & Hail

#### Rate Level Review

Summary of Indicated Rate Change

By Method for Projecting Hurricane Loss & LAE

All Territories Combined

Exhibit 1

Hurricane Projection Method	Indicated Loss & LAE Ratio		Fixed Expenses	Total	Permissible LLAE Ratio	2024
	Hurricane	Non-Hurricane				Indicated Rate Change
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Using Experience and Models	51.8%	4.6%	54.7%	111.1%	<b>77.2%</b>	<b>44.0%</b>
Using Actual Industry Experience	48.4%	4.6%	54.7%	107.7%	<b>77.2%</b>	<b>40.0%</b>
Verisk	72.7%	4.6%	54.7%	132.0%	<b>77.2%</b>	<b>71.0%</b>
RMS	67.3%	4.6%	54.7%	126.6%	<b>77.2%</b>	<b>64.0%</b>
Impact Forecasting	32.1%	4.6%	54.7%	91.4%	<b>77.2%</b>	<b>18.0%</b>
CoreLogic RQE	48.2%	4.6%	54.7%	107.5%	<b>77.2%</b>	<b>39.0%</b>
Average of All Models	55.1%	4.6%	54.7%	114.4%	<b>77.2%</b>	<b>48.2%</b>

#### Notes:

(2) Exhibit 5

(3) Exhibit 2, Sheet 1

(4) Exhibit 10, Sheet 1

(5) = (2) + (3) + (4)

(6) Exhibit 10, Sheet 1

(7) = (5) / (6) - 1

Exhibit - Item 7C  
Texas Windstorm Insurance Association  
Commercial Property - Wind & Hail  
Rate Level Review  
Expenses and Permissible Loss & LAE Ratios

Exhibit 10  
Sheet 1

Expense Category	2021	2022	2023	Projected 2024	Selected
(1) Direct Written Premium	395,112,773	518,299,032	653,043,231	815,861,000	
(2) Direct Earned Premium	378,504,197	443,490,204	589,353,024	743,860,000	
(3) Commission					
\$ Amount	63,161,029	82,854,389	104,392,398	130,538,000	
% of DWP	16.0%	16.0%	16.0%	16.0%	16.0%
(4) Other Acquisition					
\$ Amount	\$0	\$0	\$0	\$0	
% of DWP	0.0%	0.0%	0.0%	0.0%	0.0%
(5) General Expense					
Unadjusted \$ Amount	29,979,903	35,578,580	36,234,634	40,243,000	
Adjustments					
Contribution to Statutory Fund	0	0	0	0	
Adjusted \$ Amount	29,979,903	35,578,580	36,234,634	40,243,000	
% of DWP	7.6%	6.9%	5.5%	4.9%	4.3%
(6) Taxes, Licenses & Fees					
\$ Amount	7,364,210	9,499,183	11,379,394	14,889,000	
% of DWP	1.9%	1.8%	1.7%	1.8%	1.8%
(7) Reinsurance Expense					50.4%
(8) Outstanding Class 1 Public Security Repayment					0.0%
(9) Total Fixed Expenses					54.7%
(10) Total Variable Expenses					17.8%
(11) CRTF Contribution & UW Contingency & Uncertainty					5.0%
(12) Permissible Loss, LAE, and Fixed Expense Ratio					77.2%

Notes:

- (1) - (6) From TWIA's Statutory Annual Statements and Insurance Expense Exhibits. 2024 figures are projected
- (7) Exhibit 10, Sheet 2
- (8) Outstanding principal paid off in 2023
- (9) = (5) + (7) + (8)
- (10) = (3) + (4) + (6)
- (11) CRTF contribution selected judgmentally
- (12) = 100% - (10) - (11)



Exhibit - Item 13R  
**Texas Windstorm Insurance Association**  
**Residential Property - Wind & Hail**  
**Rate Level Review**  
Summary of Indicated Rate Change  
By Method for Projecting Hurricane Loss & LAE

Exhibit 1

Hurricane Projection Method	Indicated Loss & LAE Ratio		Fixed Expenses	Total	Permissible LLAE Ratio	2024
	Hurricane	Non-Hurricane				Indicated Rate Change
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Using Experience and Models	43.2%	12.7%	48.3%	104.2%	77.2%	+35.0%
Using Actual Industry Experience	38.2%	12.7%	48.3%	99.2%	77.2%	+29.0%
Verisk	55.4%	12.7%	48.3%	116.4%	77.2%	+51.0%
RMS	49.0%	12.7%	48.3%	110.0%	77.2%	+42.0%
Impact Forecasting	45.3%	12.7%	48.3%	106.3%	77.2%	+38.0%
CoreLogic RQE	42.6%	12.7%	48.3%	103.6%	77.2%	+34.0%
Average of All Models	48.1%	12.7%	48.3%	109.1%	77.2%	+41.3%

Notes:

- (2) Exhibit 5
- (3) Exhibit 2, Sheet 1
- (4) Exhibit 10, Sheet 1
- (5) = (2) + (3) + (4)
- (6) Exhibit 10, Sheet 1
- (7) = (5) / (6) - 1

# Exhibit - Item 13R

## Texas Windstorm Insurance Association

### Residential Property - Wind & Hail

#### Rate Level Review

Projected Ultimate Non-Hurricane Loss & LAE Ratio

All Territory Weighted Average

Exhibit 2  
Sheet 1

Territory	<u>2023 Written Premium</u>		Indicated Non-Hurricane Loss & LAE Ratio
	Amount	Share	
(1)	(2)	(3)	(4)
Tier 1 - Territory 8	183,156,184	35.0%	10.8%
Tier 1 - Territory 9	86,684,858	16.6%	6.3%
Tier 1 - Territory 10	246,412,664	47.1%	15.8%
Tier 2	6,678,115	1.3%	30.6%
Total / Average	522,931,821	100.0%	12.7%

#### Notes:

(2) TWIA data

(3) = (2) / (2) Total

(4) Exhibit 2, Sheet 2a - Sheet 2d

# Exhibit - Item 13R

## Texas Windstorm Insurance Association

### Residential Property - Wind & Hail

#### Rate Level Review

Projected Ultimate Non-Hurricane Loss & LAE Ratio

Tier 1 -- Territory 8 (Galveston County)

Exhibit 2

Sheet 2a

Accident Year Ending 9/30	Ultimate Non-Hurricane Loss	LAE Factor	Net Trend Factor	Projected Non-Hurricane Loss & LAE	Earned Premium at Current TWIA Rate Level	Indicated Non-Hurricane Loss & LAE Ratio
(1)	(2)	(3)	(4)	(5)	(6)	(7)
2014	520,624	0.290	1.039	697,798	141,396,555	0.5%
2015	17,456,712	0.290	1.026	23,104,657	143,824,430	16.1%
2016	10,988,633	0.290	1.030	14,600,597	140,103,503	10.4%
2017	2,721,261	0.290	0.995	3,492,875	133,016,924	2.6%
2018	2,556,928	0.290	0.983	3,242,364	121,376,251	2.7%
2019	4,884,869	0.290	0.954	6,011,613	114,641,201	5.2%
2020	5,651,316	0.290	0.965	7,035,041	113,445,809	6.2%
2021	25,649,071	0.290	0.914	30,241,794	117,940,724	25.6%
2022	12,074,652	0.290	0.880	13,707,145	129,461,860	10.6%
2023	33,728,902	0.290	0.929	40,421,053	159,933,055	25.3%
Total	116,232,968			142,554,937	1,315,140,312	10.8%

#### Notes:

(2) Exhibit 2, Sheet 3b

(3) Exhibit 4

(4) Exhibit 2, Sheet 5

(5) = (2) \* [1 + (3)] \* (4)

(6) Exhibit 9, Sheet 1a

(7) = (5) / (6)

Exhibit - Item 13R

Texas Windstorm Insurance Association

Residential Property - Wind & Hail

Rate Level Review

Projected Ultimate Non-Hurricane Loss & LAE Ratio

Tier 1 -- Territory 9 (Nueces County)

Exhibit 2  
Sheet 2b

Accident Year Ending 9/30	Ultimate Non-Hurricane Loss	LAE Factor	Net Trend Factor	Projected Non-Hurricane Loss & LAE	Earned Premium at Current TWIA Rate Level	Indicated Non-Hurricane Loss & LAE Ratio
(1)	(2)	(3)	(4)	(5)	(6)	(7)
2014	1,618,066	0.290	1.039	2,168,710	78,255,381	2.8%
2015	9,468,390	0.290	1.026	12,531,793	81,529,229	15.4%
2016	9,533,582	0.290	1.030	12,667,270	80,522,915	15.7%
2017	7,674,191	0.290	0.995	9,850,208	76,211,725	12.9%
2018	1,116,311	0.290	0.983	1,415,560	68,808,541	2.1%
2019	840,804	0.290	0.954	1,034,744	62,864,123	1.6%
2020	483,920	0.290	0.965	602,408	60,369,447	1.0%
2021	788,242	0.290	0.914	929,385	59,850,735	1.6%
2022	1,209,235	0.290	0.880	1,372,724	62,591,785	2.2%
2023	1,566,684	0.290	0.929	1,877,530	76,445,090	2.5%
Total	34,299,425			44,450,332	707,448,971	6.3%

Notes:

- (2) Exhibit 2, Sheet 3c
- (3) Exhibit 4
- (4) Exhibit 2, Sheet 5
- (5) = (2) \* [1 + (3)] \* (4)
- (6) Exhibit 9, Sheet 1b
- (7) = (5) / (6)

# Exhibit - Item 13R

## Texas Windstorm Insurance Association

### Residential Property - Wind & Hail

#### Rate Level Review

Projected Ultimate Non-Hurricane Loss & LAE Ratio

Tier 1 -- Territory 10 (Other Tier 1)

Exhibit 2

Sheet 2c

Accident Year Ending 9/30	Ultimate Non-Hurricane Loss	LAE Factor	Net Trend Factor	Projected Non-Hurricane Loss & LAE	Earned Premium at Current TWIA Rate Level	Indicated Non-Hurricane Loss & LAE Ratio
(1)	(2)	(3)	(4)	(5)	(6)	(7)
2014	2,847,173	0.290	1.039	3,816,094	233,107,124	1.6%
2015	86,534,172	0.290	1.026	114,531,438	237,999,667	48.1%
2016	12,170,939	0.290	1.030	16,171,527	227,183,607	7.1%
2017	21,918,178	0.290	0.995	28,133,077	207,881,527	13.5%
2018	6,779,148	0.290	0.983	8,596,434	179,645,974	4.8%
2019	10,208,022	0.290	0.954	12,562,604	159,579,121	7.9%
2020	22,040,186	0.290	0.965	27,436,726	148,714,964	18.4%
2021	30,328,898	0.290	0.914	35,759,590	147,041,832	24.3%
2022	13,200,665	0.290	0.880	14,985,395	157,257,092	9.5%
2023	32,660,717	0.290	0.929	39,140,930	211,507,410	18.5%
Total	238,688,098			301,133,815	1,909,918,318	15.8%

#### Notes:

(2) Exhibit 2, Sheet 3d

(3) Exhibit 4

(4) Exhibit 2, Sheet 5

(5) = (2) \* [1 + (3)] \* (4)

(6) Exhibit 9, Sheet 1c

(7) = (5) / (6)

# Exhibit - Item 13R

## Texas Windstorm Insurance Association Residential Property - Wind & Hail

### Rate Level Review

Projected Ultimate Non-Hurricane Loss & LAE Ratio  
Tier 2 -- (Territories 1 and 11)

Exhibit 2  
Sheet 2d

Accident Year Ending 9/30	Ultimate Non-Hurricane Loss	LAE Factor	Net Trend Factor	Projected Non-Hurricane Loss & LAE	Earned Premium at Current TWIA Rate Level	Indicated Non-Hurricane Loss & LAE Ratio
(1)	(2)	(3)	(4)	(5)	(6)	(7)
2014	30,748	0.290	1.039	41,212	4,882,886	0.8%
2015	339,607	0.290	1.026	449,483	4,986,385	9.0%
2016	446,561	0.290	1.030	593,346	5,015,200	11.8%
2017	483,192	0.290	0.995	620,201	4,890,478	12.7%
2018	283,290	0.290	0.983	359,232	4,631,462	7.8%
2019	2,728,066	0.290	0.954	3,357,322	4,510,864	74.4%
2020	456,670	0.290	0.965	568,486	4,586,202	12.4%
2021	2,128,105	0.290	0.914	2,509,163	4,749,377	52.8%
2022	728,027	0.290	0.880	826,456	5,048,518	16.4%
2023	4,773,253	0.290	0.929	5,720,314	5,922,961	96.6%
Total	12,397,519			15,045,215	49,224,333	30.6%

#### Notes:

- (2) Exhibit 2, Sheet 3e
- (3) Exhibit 4
- (4) Exhibit 2, Sheet 5
- (5) = (2) \* [1 + (3)] \* (4)
- (6) Exhibit 9, Sheet 1d
- (7) = (5) / (6)

Exhibit - Item 13R  
Texas Windstorm Insurance Association  
Residential Property - Wind & Hail  
Rate Level Review  
Calculation of Net Trend Factors

Exhibit 2  
Sheet 5

Year / Quarter	Average Written Premium At Present Rates		
(1)	(2)	(3) Current Average Earned Date	4/1/2023
2014 / 3	1,762.63	(4) Current Average Accident Date	4/1/2023
2015 / 3	1,778.86	(5) Prospective Average Earned / Accident Date	1/1/2026
2016 / 3	1,781.44	(6) Premium Trend Length	2.750
2017 / 3	1,738.90	(7) Loss Trend Length	2.750
2018 / 3	1,774.13	(8) Selected Premium Trend	10.5%
2019 / 3	1,771.01	(9) Selected Loss Trend	7.6%
2020 / 3	1,785.14		
2021 / 3	1,847.23		
2022 / 3	2,057.81		
2023 / 3	2,234.21		

Accident Year Ending 9/30	Current Premium Trend	Current Loss Trend	Prospective Premium Trend	Prospective Loss Trend	Net Trend Factor
(10)	(11)	(12)	(13)	(14)	(15)
2014	1.268	1.417	1.316	1.223	1.039
2015	1.256	1.387	1.316	1.223	1.026
2016	1.254	1.390	1.316	1.223	1.030
2017	1.285	1.376	1.316	1.223	0.995
2018	1.259	1.332	1.316	1.223	0.983
2019	1.262	1.295	1.316	1.223	0.954
2020	1.252	1.300	1.316	1.223	0.965
2021	1.209	1.189	1.316	1.223	0.914
2022	1.086	1.028	1.316	1.223	0.880
2023	1.000	1.000	1.316	1.223	0.929

Notes:

- (2) Average written premium per exposure at present rates from Exhibit 3, Sheet 2, Column (6)
- (3) Latest Year / Quarter Ending Date - 6 Months
- (4) Latest Accident Year Ending Date - 6 Months
- (5) Rate Effective Date + 12 Months
- (6) = (5) - (3)
- (7) = (5) - (4)
- (8) Exhibit 3, Sheet 2
- (9) Exhibit 3, Sheet 3a
- (11) = (2) Indexed to 2023 / 3
- (12) Exhibit 3, Sheet 3a
- (13) =  $[1 + (8)] ^ (6)$
- (14) =  $[1 + (9)] ^ (7)$
- (15) =  $[(12) * (14)] / [(11) * (13)]$

Exhibit - Item 13R

**Texas Windstorm Insurance Association**  
**Residential Property - Wind & Hail**  
**Rate Level Review**

Exhibit 3  
Sheet 2

Premium Trend Analysis

TWIA Residential Written Premium at Present Rates (WPPR)

Year / Quarter	Exposure Written	Written Premium	On-Level Factors	Written Premium at Present Rates	Quarterly Average WPPR	Annualized Average WPPR	Exponential Fitted Trends			
							All-Year	5-Year	4-Year	3-Year
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
2014 / 2	79,155	111,616,003	1.255	140,128,872	1,770					
2014 / 3	89,874	128,096,479	1.237	158,414,687	1,763					
2014 / 4	60,646	86,711,448	1.221	105,885,837	1,746					
2015 / 1	57,651	85,327,979	1.210	103,236,560	1,791	1,767	1,691			
2015 / 2	82,158	122,581,230	1.196	146,575,670	1,784	1,771	1,698			
2015 / 3	84,402	127,421,809	1.178	150,139,314	1,779	1,776	1,706			
2015 / 4	57,308	87,342,988	1.163	101,596,837	1,773	1,782	1,713			
2016 / 1	54,113	84,557,230	1.153	97,461,471	1,801	1,783	1,721			
2016 / 2	79,991	125,845,764	1.139	143,345,209	1,792	1,786	1,728			
2016 / 3	77,932	123,784,247	1.122	138,831,226	1,781	1,787	1,736			
2016 / 4	51,030	81,959,449	1.108	90,806,567	1,779	1,788	1,743			
2017 / 1	50,991	79,037,984	1.103	87,139,377	1,709	1,770	1,751			
2017 / 2	73,614	114,547,681	1.103	126,288,818	1,716	1,747	1,759			
2017 / 3	68,864	108,614,623	1.103	119,747,622	1,739	1,734	1,766			
2017 / 4	45,960	73,697,340	1.103	81,251,317	1,768	1,731	1,774			
2018 / 1	44,101	71,679,332	1.098	78,682,660	1,784	1,746	1,782			
2018 / 2	63,851	104,163,394	1.085	112,994,275	1,770	1,763	1,790			
2018 / 3	61,408	101,951,681	1.069	108,946,054	1,774	1,774	1,798			
2018 / 4	40,418	68,300,637	1.055	72,071,158	1,783	1,777	1,805			
2019 / 1	39,758	65,036,872	1.050	68,288,716	1,718	1,764	1,813	1,670		
2019 / 2	60,805	99,948,528	1.050	104,945,954	1,726	1,750	1,821	1,691		
2019 / 3	57,547	97,063,357	1.050	101,916,525	1,771	1,749	1,829	1,711		
2019 / 4	38,375	65,697,652	1.050	68,982,535	1,798	1,751	1,837	1,732		
2020 / 1	38,302	63,498,682	1.050	66,673,616	1,741	1,756	1,845	1,753	1,691	
2020 / 2	59,374	98,472,763	1.050	103,396,401	1,741	1,761	1,854	1,774	1,718	
2020 / 3	57,963	98,544,861	1.050	103,472,104	1,785	1,765	1,862	1,796	1,745	
2020 / 4	37,911	65,820,531	1.050	69,111,558	1,823	1,770	1,870	1,817	1,773	
2021 / 1	39,057	66,582,420	1.050	69,911,541	1,790	1,780	1,878	1,840	1,801	1,746
2021 / 2	60,541	103,031,428	1.050	108,182,999	1,787	1,794	1,886	1,862	1,830	1,782
2021 / 3	59,878	105,341,091	1.050	110,608,146	1,847	1,813	1,895	1,884	1,859	1,819
2021 / 4	39,807	72,365,308	1.050	75,983,573	1,909	1,830	1,903	1,907	1,889	1,856
2022 / 1	40,733	76,134,863	1.045	79,562,723	1,953	1,863	1,911	1,930	1,919	1,895
2022 / 2	61,794	116,935,905	1.032	120,677,182	1,953	1,913	1,920	1,954	1,950	1,934
2022 / 3	79,530	161,132,745	1.016	163,657,432	2,058	1,983	1,928	1,978	1,981	1,974
2022 / 4	43,628	92,639,740	1.004	93,000,123	2,132	2,024	1,937	2,002	2,013	2,014
2023 / 1	46,661	98,545,683	1.000	98,545,683	2,112	2,055	1,945	2,026	2,045	2,056
2023 / 2	68,720	145,450,526	1.000	145,450,526	2,117	2,099	1,954	2,050	2,078	2,098
2023 / 3	83,884	187,414,809	1.000	187,414,809	2,234	2,159	1,962	2,075	2,111	2,142
2023 / 4	48,217	110,838,891	1.000	110,838,891	2,299	2,191	1,971	2,100	2,145	2,186
(14) Average Annual Change							1.8%	4.9%	6.6%	8.5%
(15) Correlation Coefficient							51.1%	84.7%	92.6%	98.1%
(16) Selected Premium Trend										10.5%

Notes: (2) Provided by TWIA. Exposures written on inception  
(3) Provided by TWIA. Premium written on inception  
(4) Cumulative effect of annual rate changes  
(5) = (3) \* (4)  
(6) = (5) / (2). WPPR = Written Premium at Present Rates  
(7) Four-quarter rolling average written premium  
(8) - (11) = (7) Fitted to an exponential distribution  
(14) Fitted average annual change  
(15) Evaluates the predictability of the fitted curve  
(16) Selected based on judgment, with equal weight given to 3-year, 4-year, and 5-year exponential fitted trends



## Exhibit - Item 13R

**Texas Windstorm Insurance Association**  
**Residential Property - Wind & Hail**  
**Rate Level Review**

Expenses and Variable Permissible Loss &amp; LAE Ratios

Exhibit 10  
Sheet 1

Expense Category	2021	2022	2023	Projected 2024	Selected
(1) Direct Written Premium	395,112,773	518,299,032	653,043,231	815,861,000	
(2) Direct Earned Premium	378,504,197	443,490,204	589,353,024	743,860,000	
(3) Commission					
\$ Amount	63,161,029	82,854,389	104,392,398	130,538,000	
% of DWP	16.0%	16.0%	16.0%	16.0%	16.0%
(4) Other Acquisition					
\$ Amount	0	0	0	0	
% of DWP	0.0%	0.0%	0.0%	0.0%	0.0%
(5) General Expense					
Unadjusted \$ Amount	29,979,903	35,578,580	36,234,634	40,243,000	
Adjustments					
Contribution to Statutory Fund	0	0	0	0	
Adjusted \$ Amount	29,979,903	35,578,580	36,234,634	40,243,000	
% of DWP	7.6%	6.9%	5.5%	4.9%	4.3%
(6) Taxes, Licenses & Fees					
\$ Amount	7,364,210	9,499,183	11,379,394	14,889,000	
% of DWP	1.9%	1.8%	1.7%	1.8%	1.8%
(7) Reinsurance Expense					44.0%
(8) Outstanding Class 1 Public Security Repayment					0.0%
(9) Total Fixed Expenses					48.3%
(10) Total Variable Expenses					17.8%
(11) CRTF Contribution & UW Contingency & Uncertainty					5.0%
(12) Permissible Loss, LAE and Fixed Expense Ratio					77.2%

## Notes:

- (1) - (6) From TWIA's Statutory Annual Statements and Insurance Expense Exhibits. 2024 figures are projected  
(7) Exhibit 10, Sheet 2  
(8) Outstanding principal paid off in 2023  
(9) = (5) + (7) + (8)  
(10) = (3) + (4) + (6)  
(11) CRTF contribution selected judgmentally  
(12) = 100% - (10) - (11)

Exhibit - Item 13C

**Texas Windstorm Insurance Association**

**Commercial Property - Wind & Hail**

**Rate Level Review**

Summary of Indicated Rate Change

By Method for Projecting Hurricane Loss & LAE

All Territories Combined

Exhibit 1

Hurricane Projection Method	Indicated Loss & LAE Ratio		Fixed Expenses	Total	Permissible LLAE Ratio	2024
	Hurricane	Non-Hurricane				Indicated Rate Change
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Using Experience and Models	51.8%	4.2%	54.7%	110.7%	77.2%	43.0%
Using Actual Industry Experience	48.4%	4.2%	54.7%	107.3%	77.2%	39.0%
Verisk	72.7%	4.2%	54.7%	131.6%	77.2%	70.0%
RMS	67.3%	4.2%	54.7%	126.2%	77.2%	63.0%
Impact Forecasting	32.1%	4.2%	54.7%	91.0%	77.2%	18.0%
CoreLogic RQE	48.2%	4.2%	54.7%	107.1%	77.2%	39.0%
Average of All Models	55.1%	4.2%	54.7%	114.0%	77.2%	47.7%

Notes:

(2) Exhibit 5

(3) Exhibit 2, Sheet 1

(4) Exhibit 10, Sheet 1

(5) = (2) + (3) + (4)

(6) Exhibit 10, Sheet 1

(7) = (5) / (6) - 1

# Exhibit - Item 13C

## Texas Windstorm Insurance Association Commercial Property - Wind & Hail

### Rate Level Review

Projected Ultimate Non-Hurricane Loss & LAE Ratio  
All Territories Combined

Exhibit 2  
Sheet 1

Accident Year Ending 12/31	Ultimate Non-Hurricane Loss	LAE Factor	Net Trend Factor	Projected Non-Hurricane Loss & LAE	Earned Premium at Current Rate Level	Indicated Non-Hurricane Loss & LAE Ratio
(1)	(2)	(3)	(4)	(5)	(6)	(7)
2014	1,056,281	0.290	0.863	1,175,926	135,603,583	0.9%
2015	18,737,038	0.290	0.848	20,496,821	120,726,959	17.0%
2016	2,551,122	0.290	0.846	2,784,141	105,842,224	2.6%
2017	2,011,705	0.290	0.803	2,083,865	87,703,816	2.4%
2018	251,565	0.290	0.787	255,396	73,508,956	0.3%
2019	953,957	0.290	0.791	973,408	65,530,795	1.5%
2020	857,896	0.290	0.847	937,363	62,711,660	1.5%
2021	832,836	0.290	0.767	824,033	64,939,142	1.3%
2022	1,575,058	0.290	0.776	1,576,696	77,659,503	2.0%
2023	5,616,151	0.290	0.890	6,447,903	109,473,433	5.9%
Total	34,443,609			37,555,552	903,700,071	4.2%

#### Notes:

- (2) Exhibit 2, Sheet 2
- (3) Exhibit 4
- (4) = Exhibit 2, Sheet 4
- (5) = (2) \* [1 + (3)] \* (4)
- (6) Exhibit 9, Sheet 1
- (7) = (5) / (6)

Exhibit - Item 13C  
Texas Windstorm Insurance Association  
Commercial Property - Wind & Hail  
Rate Level Review  
Calculation of Net Trend Factors

Exhibit 2  
Sheet 4

Year / Quarter	Average Written Premium At Present Rates		
(1)	(2)		
		(3) Current Average Earned Date	7/1/2023
2014 / 4	4,610.68	(4) Current Average Accident Date	7/1/2023
2015 / 4	4,595.35	(5) Prospective Average Earned / Accident Date	1/1/2026
2016 / 4	4,581.38	(6) Premium Trend Length	2.500
2017 / 4	4,426.00	(7) Loss Trend Length	2.500
2018 / 4	4,497.78	(8) Selected Premium Trend	14.6%
2019 / 4	4,601.77	(9) Selected Loss Trend	9.4%
2020 / 4	4,930.85		
2021 / 4	5,052.90		
2022 / 4	5,864.06		
2023 / 4	6,826.29		

Accident Year Ending 12/31	Current Premium Trend	Current Loss Trend	Prospective Premium Trend	Prospective Loss Trend	Net Trend Factor
(10)	(11)	(12)	(13)	(14)	(15)
2014	1.481	1.436	1.407	1.252	0.863
2015	1.485	1.415	1.407	1.252	0.848
2016	1.490	1.416	1.407	1.252	0.846
2017	1.542	1.392	1.407	1.252	0.803
2018	1.518	1.342	1.407	1.252	0.787
2019	1.483	1.318	1.407	1.252	0.791
2020	1.384	1.317	1.407	1.252	0.847
2021	1.351	1.165	1.407	1.252	0.767
2022	1.164	1.015	1.407	1.252	0.776
2023	1.000	1.000	1.407	1.252	0.890

Notes:

- (2) Average written premium per exposure at present rates from Exhibit 3, Sheet 1, Column (7)
- (3) Latest Year / Quarter Ending Date - 6 Months
- (4) Latest Accident Year Ending Date - 6 Months
- (5) Rate Effective Date + 12 Months
- (6) = (5) - (3)
- (7) = (5) - (4)
- (8) Exhibit 3, Sheet 1
- (9) Exhibit 3, Sheet 2a
- (11) = (2) Indexed to 2023 / 4
- (12) Exhibit 3, Sheet 2a
- (13) =  $[1 + (8)] ^ (6)$
- (14) =  $[1 + (9)] ^ (7)$
- (15) =  $[(12) * (14)] / [(11) * (13)]$

Exhibit - Item 13C  
**Texas Windstorm Insurance Association**  
**Commercial Property - Wind & Hail**  
**Rate Level Review**  
Premium Trend Analysis  
TWIA Commercial Written Premium at Present Rates (WPPR)

Exhibit 3  
Sheet 1

Year / Quarter	Exposure Written	Written Premium	On-Level Factors	Written Premium at Present Rates	Quarterly Average WPPR	Annualized Average WPPR	Exponential Fitted Trends			
							All-Year	5-Year	4-Year	3-Year
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
2014 / 2	8,964	35,219,745	1.256	44,251,073	4,937					
2014 / 3	8,292	29,887,118	1.237	36,962,324	4,458					
2014 / 4	6,088	21,627,063	1.222	26,418,431	4,339	4,611				
2015 / 1	6,464	24,808,373	1.209	29,989,092	4,639	4,617	4,176			
2015 / 2	7,870	33,339,199	1.195	39,846,309	5,063	4,639	4,214			
2015 / 3	7,657	28,055,666	1.177	33,012,506	4,311	4,604	4,253			
2015 / 4	4,802	17,430,504	1.163	20,275,304	4,222	4,595	4,292			
2016 / 1	5,512	22,487,925	1.151	25,890,562	4,697	4,606	4,331			
2016 / 2	6,522	28,623,450	1.138	32,569,345	4,994	4,562	4,371			
2016 / 3	6,507	25,417,054	1.120	28,466,060	4,375	4,592	4,411			
2016 / 4	4,047	14,955,154	1.107	16,558,181	4,091	4,581	4,452			
2017 / 1	4,263	17,482,209	1.103	19,274,135	4,521	4,539	4,493			
2017 / 2	5,717	25,224,489	1.103	27,809,999	4,864	4,486	4,534			
2017 / 3	5,172	19,050,031	1.103	21,002,659	4,061	4,409	4,576			
2017 / 4	3,489	13,077,837	1.103	14,418,315	4,133	4,426	4,618			
2018 / 1	3,663	15,807,970	1.096	17,331,059	4,731	4,465	4,660			
2018 / 2	5,108	22,862,777	1.084	24,773,451	4,850	4,447	4,703			
2018 / 3	4,612	17,927,115	1.066	19,118,289	4,145	4,483	4,746			
2018 / 4	3,109	12,284,401	1.055	12,954,588	4,167	4,498	4,790			
2019 / 1	2,933	14,759,154	1.050	15,497,112	5,284	4,590	4,834	4,262		
2019 / 2	4,431	20,959,587	1.050	22,007,566	4,967	4,612	4,878	4,353		
2019 / 3	3,993	14,943,999	1.050	15,691,199	3,930	4,573	4,923	4,447		
2019 / 4	2,966	12,109,737	1.050	12,715,224	4,287	4,602	4,969	4,543		
2020 / 1	2,719	14,566,185	1.050	15,294,494	5,625	4,657	5,014	4,640	4,408	
2020 / 2	3,982	18,776,705	1.050	19,715,540	4,951	4,642	5,060	4,740	4,527	
2020 / 3	3,970	15,951,658	1.050	16,749,241	4,219	4,728	5,107	4,842	4,650	
2020 / 4	2,710	13,543,203	1.050	14,220,363	5,247	4,931	5,154	4,946	4,775	
2021 / 1	2,521	12,672,604	1.050	13,306,234	5,278	4,854	5,201	5,052	4,904	4,656
2021 / 2	4,228	20,348,072	1.050	21,365,476	5,053	4,888	5,249	5,161	5,037	4,818
2021 / 3	3,892	16,793,147	1.050	17,632,804	4,531	4,983	5,297	5,271	5,173	4,985
2021 / 4	3,112	16,369,478	1.050	17,187,952	5,523	5,053	5,346	5,385	5,312	5,158
2022 / 1	2,725	15,396,927	1.044	16,079,017	5,901	5,178	5,395	5,500	5,456	5,338
2022 / 2	4,642	25,560,832	1.032	26,371,194	5,681	5,377	5,445	5,619	5,603	5,523
2022 / 3	5,337	29,199,819	1.015	29,644,617	5,555	5,645	5,495	5,739	5,755	5,715
2022 / 4	3,496	22,787,093	1.005	22,903,023	6,551	5,864	5,545	5,863	5,910	5,913
2023 / 1	3,273	22,499,113	1.000	22,499,113	6,874	6,056	5,596	5,989	6,070	6,118
2023 / 2	6,379	44,485,048	1.000	44,485,048	6,974	6,466	5,648	6,117	6,234	6,331
2023 / 3	6,029	38,901,087	1.000	38,901,087	6,452	6,716	5,700	6,249	6,402	6,551
2023 / 4	4,278	30,360,734	1.000	30,360,734	7,097	6,826	5,752	6,383	6,575	6,778
(14) Average Annual Change							3.7%	8.9%	11.3%	14.6%
(15) Correlation Coefficient							60.8%	87.9%	92.4%	96.8%
(16) Selected Premium Trend										14.6%

Notes: (2) Provided by TWIA. Exposures written on inception  
(3) Provided by TWIA. Premium written on inception  
(4) Factors to bring written premium to current rate level  
(5) = (3) \* (4)  
(6) = (5) / (2). WPPR = Written Premium at Present Rates  
(7) Four-quarter rolling average written premium  
(8) - (11) = (7) Fitted to an exponential distribution  
(14) Fitted average annual change  
(15) Evaluates the predictability of the fitted curve  
(16) Selected based on judgment, with weight given to 3-year, 4-year, and 5-year exponential fitted trends

Exhibit - Item 13C  
Texas Windstorm Insurance Association  
Commercial Property - Wind & Hail  
Rate Level Review  
Expenses and Permissible Loss & LAE Ratios

Exhibit 10  
Sheet 1

Expense Category	2021	2022	2023	Projected 2024	Selected
(1) Direct Written Premium	395,112,773	518,299,032	653,043,231	815,861,000	
(2) Direct Earned Premium	378,504,197	443,490,204	589,353,024	743,860,000	
(3) Commission					
\$ Amount	63,161,029	82,854,389	104,392,398	130,538,000	
% of DWP	16.0%	16.0%	16.0%	16.0%	16.0%
(4) Other Acquisition					
\$ Amount	\$0	\$0	\$0	\$0	
% of DWP	0.0%	0.0%	0.0%	0.0%	0.0%
(5) General Expense					
Unadjusted \$ Amount	29,979,903	35,578,580	36,234,634	40,243,000	
Adjustments					
Contribution to Statutory Fund	0	0	0	0	
Adjusted \$ Amount	29,979,903	35,578,580	36,234,634	40,243,000	
% of DWP	7.6%	6.9%	5.5%	4.9%	4.3%
(6) Taxes, Licenses & Fees					
\$ Amount	7,364,210	9,499,183	11,379,394	14,889,000	
% of DWP	1.9%	1.8%	1.7%	1.8%	1.8%
(7) Reinsurance Expense					50.4%
(8) Outstanding Class 1 Public Security Repayment					0.0%
(9) Total Fixed Expenses					54.7%
(10) Total Variable Expenses					17.8%
(11) CRTF Contribution & UW Contingency & Uncertainty					5.0%
(12) Permissible Loss, LAE, and Fixed Expense Ratio					77.2%

Notes:

- (1) - (6) From TWIA's Statutory Annual Statements and Insurance Expense Exhibits. 2024 figures are projected
- (7) Exhibit 10, Sheet 2
- (8) Outstanding principal paid off in 2023
- (9) = (5) + (7) + (8)
- (10) = (3) + (4) + (6)
- (11) CRTF contribution selected judgmentally
- (12) = 100% - (10) - (11)