Texas Windstorm Insurance Association

Estimated Aggregate Annual Losses

Based on Hurricane and Severe Thunderstorm Catastrophe Models:
RMS RiskLink
Verisk Touchstone
Impact Forecasting ELEMENTS
CoreLogic RQE

Exposures In-Force as of
11/30/2022 and 11/30/2023

Cautionary Language Regarding Catastrophe Model Loss Estimates

The following tables present hurricane and severe thunderstorm loss estimates prepared for the Association based on four leading industry models: RMS RiskLink, Verisk Touchstone, Impact Forecasting ELEMENTS, and CoreLogic RQE. Developing models to estimate losses resulting from catastrophes or other large-scale events is an inherently subjective and imprecise process, involving judgment about a variety of environmental, demographic, and regulatory factors. Such factors are inherently uncertain, and the Association does not model all the types of perils that may result in losses to the Association.

The assumptions and/or methodologies used in connection with the preparation of estimated losses derived by the Association may not constitute the exclusive set of reasonable assumptions, and the use of alternative assumptions and/or methodologies could yield results materially different from those generated or relied upon by the Association. Each model run is based on exposure information that will differ from the Association's actual exposure in the future based on future action the Association may take, including changes to existing policies and the writing of new business. Loss distribution models are not facts and should not be relied upon as such. Actual loss experience can materially differ from the modeled loss estimates used by the Association.

The Board of Directors considers the results of the models and other factors in connection with its decisions with respect to the purchase of reinsurance, including the amount of total limit sought. The Board also considers the results of the models in considering to its obligations under Chapter 2210.453 which require that the Association maintain total available loss funding in an amount not less than the probable maximum loss for the association for a catastrophe year with a probability of one in 100.

These models simulate thousands of hurricane and severe thunderstorm scenarios and apply the simulated hurricanes and severe thunderstorms to the Association's insured business to calculate the probability of aggregate losses for the entire year. The results below were generated using Association exposures as of November 30, 2022 and November 30, 2023. The loss estimates are used by the Association in the course of its business operations. The data and analysis provided by TWIA herein are provided "as is", without warranty of any kind whether express or implied.

This report includes information that is output from catastrophe models of Verisk Analytics, Inc. (Verisk), Risk Management Solutions, Inc. (RMS), Impact Forecasting, LLC (IF) and CoreLogic (CoreLogic). The information from these models is provided by Aon Benfield Inc. (Aon) under the terms of its license agreements with Verisk, RMS, IF, and CoreLogic. The results in this report from Verisk, RMS, IF, and CoreLogic are the products of the exposures modeled, the financial assumptions made concerning insurance terms such as deductibles and limits, and the risk models that project the dollars of damage that may be caused by defined catastrophe perils. Aon recommends that the results from these models in this report not be relied upon in isolation when making decisions that may affect the underwriting appetite, rate adequacy, or solvency of the company. The Verisk, RMS, IF, and CoreLogic models are based on scientific data, mathematical and empirical models, and the experience of engineering, geological, meteorological, and terrorism experts. Calibration of the models using actual loss experience is based on very sparse data, and material inaccuracies in these models are possible. The loss probabilities generated by the models are not predictive of future hurricanes, other windstorms, or earthquakes or other natural or man-made catastrophes, but provide estimates of the magnitude of losses that may occur in the event of such catastrophes. Aon makes no warranty about the accuracy of the Verisk, RMS, IF, and CoreLogic models and has made no attempt to independently verify them. Aon will not be liable for any loss or damage arising from or related to any use of, or decisions based upon, data developed using the models of Verisk, RMS, IF, and CoreLogic, including without limitation special, indirect, or consequential damages.

Definitions

Aggregate Loss Estimate: The most basic output of a catastrophe model is the estimate of losses for every simulated event. Losses presented on an aggregate basis include estimated total losses from all events in any given year. In contrast, an "occurrence basis" reflects the losses from the largest single event in any given year. The aggregate loss estimates do not include a provision for loss adjustment expenses. TWIA staff would recommend adding an amount equal to 15% of the estimated aggregate losses to represent the estimated loss adjustment expenses. Loss adjustment expenses represent costs associated with investigating and settling claims.

Aggregate Exceedance Probability: Aggregate exceedance probability represents the probability of the total losses from all events in any given year meeting or exceeding a given threshold.

Average Annual Loss (AAL): The AAL is the expected value of losses to be experienced in any given year. It is equal to the sum of all simulated event losses multiplied by the probability of each of those events. Average annual losses are also calculated by dividing the total losses for all simulated storms by the number of simulated years in the computer simulation.

Demand Surge: Demand surge estimates the degree to which losses are escalated by a combination of economic, social, and operational conditions that follow a given event. Demand surge accounts for three separate mechanisms of escalation arising from (1) increase in the costs of building materials and labor costs as demand exceeds supply, (2) cost inflation due to the difficulties in fully adjusting claims following a catastrophic event, and (3) under certain extreme scenarios, coverage and loss expansion due to a complex collection of factors such as containment failures, evacuation effects, and systemic economic downturns in selected urban areas.

Gross Basis: Gross basis refers to the total losses before any recoveries from reinsurance or other funding mechanisms.

Near Term vs. Long Term (Historical) Event Set: Hurricanes in the Atlantic basin are known to follow multidecadal periods of heightened or diminished activity in terms of frequency of events, intensity, and landfall frequency. To account for these frequency changes, catastrophe model vendors provide alternative event catalogs or rates set alongside the long-term mean. Near-term or medium-term rates represent the five-year, medium-term outlook of North Atlantic hurricane activity. Long-term rates represent the event rates that are consistent with the long-term historical average.

Return Period: The return period is simply the inverse of the exceedance probability. For example, a 1% exceedance probability is equal to a 100-year return period. The return period term can be misleading by implying a period of time that would be expected to pass between events of that magnitude, when in reality they are representative of the probability of meeting or exceeding that level of loss in any given year.

Risk Count: Risk count refers to the number of individual structures insured. Some policies may cover more than one structure.

Storm Surge: Storm surge refers to the damage caused by rising ocean water levels along coastlines affected by a hurricane that can cause widespread flooding. Losses from storm surge and other forms of flooding are not covered by TWIA policies.

Texas Windstorm Insurance Association
Catastrophe Model Output Summary
Model Versions and Exposure Summary
Exposures In-Force as of 11/30/2022 and 11/30/2023

Model	Data as of:	Portfolio
RMS RiskLink v21.0 WS/CS	11/30/2022	HUR & SCS
RMS RiskLink v23.0 WS/CS	11/30/2023	HUR & SCS

Model	Data as of:	Portfolio
Verisk Touchstone 9.0 TC/Sev Thun	11/30/2022	HUR & SevThun
Verisk Touchstone 10.0 TC/Sev Thun	11/30/2023	HUR & SevThun

Model	Data as of:	Portfolio
Impact Forecasting v15.0 TC/SCS	11/30/2022	HUR & SCS
Impact Forecasting v18.0 TC/SCS	11/30/2023	HUR & SCS

Model	Data as of:	Portfolio
CoreLogic RQE v21.0 HU/SCS	11/30/2022	HUR & SCS
CoreLogic RQE v23.0 HU/SCS	11/30/2023	HUR & SCS

TWIA Exposures as of:	11/30/2022	11/30/2023	Percent Change
Total Insured Values (000s)	$89,935,082	$113,543,081	26.3%
Total Insured Limits (000s)	$82,865,490	$104,780,130	26.4%
Risk Count (#)	231,121	256,479	11.0%

Texas Windstorm Insurance Association
Catastrophe Model Output Summary
All Perils (Hurricane and Severe Convective Storm) Gross Loss Estimates
RMS RiskLink, Verisk Touchstone, Impact Forecasting ELEMENTS, and CoreLogic RQE
Exposures In-Force as of 11/30/2023

Return Period	Annual Exceedence Probability (AEP)	VaR (PML) - All Peril Near-Term (Stochastic)			
		RMS RiskLink v23.0 WS/CS (1)	Verisk Touchstone 10.0 TC/Sev Thun (2)	Impact Forecasting v18.0 TC/SCS (3)	CoreLogic RQE v23.0 HU/SCS (4)
1,000	0.10%	17,201,252,941	17,441,833,092	13,534,947,461	13,749,226,216
500	0.20%	13,149,931,111	15,283,631,528	10,922,549,088	11,137,047,072
250	0.40%	9,243,022,175	11,276,842,942	8,077,320,248	8,641,026,638
100	1.00%	5,534,943,379	7,061,919,745	4,916,396,087	5,497,154,818
50	2.00%	3,408,918,791	4,148,837,536	3,043,660,601	3,300,797,569
25	4.00%	1,932,051,895	2,221,541,081	1,721,196,520	1,777,002,824
20	5.00%	1,572,596,645	1,784,917,575	1,360,891,348	1,422,239,705
Annual avg (AAL)		333,773,888	382,485,448	279,340,159	295,772,361
Std dev		1,293,564,601	1,413,851,563	1,120,655,663	1,104,167,929

Return Period	Annual Exceedence Probability (AEP)	VaR (PML) - All Peril Long-Term (Historical)			
		RMS RiskLink v23.0 WS/CS (1)	Verisk Touchstone 10.0 TC/Sev Thun (2)	Impact Forecasting v18.0 TC/SCS (3)	CoreLogic RQE v23.0 HU/SCS (4)
1,000	0.10%	16,843,155,144	17,441,833,092	13,285,191,807	13,046,378,301
500	0.20%	12,800,996,654	15,122,923,345	10,425,852,613	10,491,241,320
250	0.40%	8,940,160,695	10,366,072,568	7,719,636,546	7,998,463,964
100	1.00%	5,331,030,216	6,690,067,070	4,580,814,760	5,023,391,036
50	2.00%	3,257,197,754	3,910,142,236	2,872,717,144	2,972,362,459
25	4.00%	1,830,384,798	2,062,449,141	1,584,056,544	1,601,018,409
20	5.00%	1,480,797,189	1,656,478,449	1,246,200,373	1,257,850,675
Annual avg (AAL)		313,789,003	360,030,563	259,490,169	265,343,901
Std dev		1,259,153,323	1,362,680,184	1,073,404,617	1,026,565,511

Aggregate annual expected loss by return period based on TWIA exposure data as of 11/30/2023 and
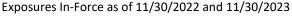
(1) the indicated RMS windstorm and convective storm model version with loss amplification impact, excluding storm surge;

(2) the indicated Verisk tropical cyclone and severe thunderstorm model version with demand surge impact, excluding storm surge;

(3) the indicated IF tropical cyclone and convective storm model version with demand surge impact, excluding storm surge; or

(4) the indicated RQE hurricane and convective storm model version with demand surge impact, excluding storm surge

Texas Windstorm Insurance Association
Catastrophe Model Output Summary
All Perils (Hurricane and Severe Convective Storm) Gross Loss Estimates
RMS RiskLink
Exposures In-Force as of 11/30/2022 and 11/30/2023

Return Period	AEP - All Perils Near-Term (Stochastic)		
	A	*B*	*B vs A*
	11/30/22 Exposures	11/30/23 Exposures	11/30/22 v21 to 11/30/23 v23
	RMS v21	RMS v23	Exposure Change
1,000	12,813,682,470	17,201,252,941	34.2%
500	9,480,519,490	13,149,931,111	38.7%
250	6,519,244,900	9,243,022,175	41.8%
100	3,944,438,166	5,534,943,379	40.3%
50	2,447,703,737	3,408,918,791	39.3%
25	1,376,792,507	1,932,051,895	40.3%
20	1,118,655,863	1,572,596,645	40.6%
Annual avg (AAL)	241,056,627	333,773,888	38.5%
Std dev	958,128,615	1,293,564,601	35.0%

Return Period	AEP - All Perils Long-Term (Historical)		
	A	*B*	*B vs A*
	11/30/22 Exposures	11/30/23 Exposures	11/30/22 v21 to 11/30/23 v23
	RMS v21	RMS v23	Exposure Change
1,000	12,774,698,163	16,843,155,144	31.8%
500	9,436,184,161	12,800,996,654	35.7%
250	6,478,745,993	8,940,160,695	38.0%
100	3,920,262,070	5,331,030,216	36.0%
50	2,423,213,213	3,257,197,754	34.4%
25	1,350,106,649	1,830,384,798	35.6%
20	1,091,320,901	1,480,797,189	35.7%
Annual avg (AAL)	234,273,833	313,789,003	33.9%
Std dev	952,147,185	1,259,153,323	32.2%

Aggregate annual expected loss by return period based on indicated RMS windstorm and convective storm model version and exposure data (as of 11/30/2022 or 11/30/2023), with loss amplification impact, excluding storm surge impact, using either near term (stochastic) or long term (historical) event frequency as noted

A RMS Risklink v21 model output using 11/30/2022 exposure data
B RMS Risklink v23 model output using 11/30/2023 exposure data
   This model output was used by the TWIA Board in the determination of the 1:100 PML for the 2024 hurricane season

Texas Windstorm Insurance Association
Catastrophe Model Output Summary
All Perils (Hurricane and Severe Convective Storm) Gross Loss Estimates
Verisk Touchstone
Exposures In-Force as of 11/30/2022 and 11/30/2023

	AEP - All Perils (Warm Sea Surface Temperature)		
	A	*B*	*B vs A*
	11/30/22	11/30/23	11/30/22 v9
	Exposures	Exposures	to 11/30/23 v10
Return Period	Verisk v9	Verisk v10	Exposure Change
1,000	13,905,877,832	17,441,833,092	25.4%
500	12,293,941,408	15,283,631,528	24.3%
250	8,859,243,149	11,276,842,942	27.3%
100	5,614,995,609	7,061,919,745	25.8%
50	3,248,243,821	4,148,837,536	27.7%
25	1,691,358,898	2,221,541,081	31.3%
20	1,377,498,694	1,784,917,575	29.6%
Annual avg (AAL)	290,123,439	382,485,448	31.8%
Std dev	1,123,210,761	1,413,851,563	25.9%

	AEP - All Perils (Standard)		
	A	*B*	*B vs A*
	11/30/22	11/30/23	11/30/22 v9
	Exposures	Exposures	to 11/30/23 v10
Return Period	Verisk v9	Verisk v10	Exposure Change
1,000	13,905,877,832	17,441,833,092	25.4%
500	12,010,763,032	15,122,923,345	25.9%
250	8,196,615,316	10,366,072,568	26.5%
100	5,199,959,981	6,690,067,070	28.7%
50	3,062,974,078	3,910,142,236	27.7%
25	1,605,215,705	2,062,449,141	28.5%
20	1,260,308,230	1,656,478,449	31.4%
Annual avg (AAL)	272,370,329	360,030,563	32.2%
Std dev	1,081,553,325	1,362,680,184	26.0%

Aggregate annual expected loss by return period based on indicated Verisk tropical cyclone and severe thunderstorm model version and exposure data (as of 11/30/2022 or 11/30/2023), with demand surge impact, excluding storm surge impact, using either warm sea surface temperature (near term) or standard (long term) event frequency as noted

A Verisk Touchstone v9 model output using 11/30/2022 exposure data
B Verisk Touchstone v10 model output using 11/30/2023 exposure data
   This model output was used by the TWIA Board in the determination of the 1:100 PML for the 2024 hurricane season

Texas Windstorm Insurance Association
Catastrophe Model Output Summary
All Perils (Hurricane and Severe Convective Storm) Gross Loss Estimates
Impact Forecasting ELEMENTS
Exposures In-Force as of 11/30/2022 and 11/30/2023

	AEP - All Perils Near-Term (Stochastic)		
	A	*B*	*B vs A*
	11/30/22	11/30/23	11/30/22 v15
	Exposures	Exposures	to 11/30/23 v18
Return Period	IF v15	IF v18	Exposure Change
1,000	9,605,169,617	13,534,947,461	40.9%
500	8,249,969,367	10,922,549,088	32.4%
250	6,599,340,758	8,077,320,248	22.4%
100	4,318,721,108	4,916,396,087	13.8%
50	2,808,672,089	3,043,660,601	8.4%
25	1,683,770,183	1,721,196,520	2.2%
20	1,345,386,422	1,360,891,348	1.2%
Annual avg (AAL)	263,124,582	279,340,159	6.2%
Std dev	866,473,415	1,120,655,663	29.3%

	AEP - All Perils Long-Term (Historical)		
	A	*B*	*B vs A*
	11/30/22	11/30/23	11/30/22 v15
	Exposures	Exposures	to 11/30/23 v18
Return Period	IF v15	IF v18	Exposure Change
1,000	9,453,539,887	13,285,191,807	40.5%
500	7,935,044,262	10,425,852,613	31.4%
250	6,391,889,201	7,719,636,546	20.8%
100	4,170,936,990	4,580,814,760	9.8%
50	2,669,934,577	2,872,717,144	7.6%
25	1,546,638,386	1,584,056,544	2.4%
20	1,223,104,899	1,246,200,373	1.9%
Annual avg (AAL)	242,019,897	259,490,169	7.2%
Std dev	835,627,138	1,073,404,617	28.5%

Aggregate annual expected loss by return period based on indicated Impact Forecasting windstorm and convective
storm model version and exposure data (as of 11/30/2022 or 11/30/2023), with loss amplification impact,
excluding storm surge impact, using either near term (stochastic) or long term (historical) event frequency as noted

A Impact Forecasting ELEMENTS v15 model output using 11/30/2022 exposure data
B Impact Forecasting ELEMENTS v18 model output using 11/30/2023 exposure data
   This model output was not used by the TWIA Board in the determination of the 1:100 PML for the 2024 hurricane season

Texas Windstorm Insurance Association
Catastrophe Model Output Summary
All Perils (Hurricane and Severe Convective Storm) Gross Loss Estimates
CoreLogic RQE
Exposures In-Force as of 11/30/2022 and 11/30/2023

Return Period	AEP - All Perils Near-Term (Stochastic)		
	A	*B*	*B vs A*
	11/30/22	11/30/23	11/30/22 v21
	Exposures	Exposures	to 11/30/23 v23
	RQE v21	RQE v23	Exposure Change
1,000	10,305,639,424	13,749,226,216	33.4%
500	8,286,888,960	11,137,047,072	34.4%
250	6,427,227,648	8,641,026,638	34.4%
100	4,102,111,488	5,497,154,818	34.0%
50	2,470,216,960	3,300,797,569	33.6%
25	1,285,246,976	1,777,002,824	38.3%
20	1,006,832,832	1,422,239,705	41.3%
Annual avg (AAL)	216,629,360	295,772,361	36.5%
Std dev	821,560,896	1,104,167,929	34.4%

Return Period	AEP - All Perils Long-Term (Historical)		
	A	*B*	*B vs A*
	11/30/22	11/30/23	11/30/22 v21
	Exposures	Exposures	to 11/30/23 v23
	RQE v21	RQE v23	Exposure Change
1,000	9,605,532,672	13,046,378,301	35.8%
500	7,751,426,560	10,491,241,320	35.3%
250	5,926,180,864	7,998,463,964	35.0%
100	3,619,483,392	5,023,391,036	38.8%
50	2,182,423,552	2,972,362,459	36.2%
25	1,128,550,784	1,601,018,409	41.9%
20	877,177,088	1,257,850,675	43.4%
Annual avg (AAL)	192,861,360	265,343,901	37.6%
Std dev	754,420,416	1,026,565,511	36.1%

Aggregate annual expected loss by return period based on indicated RQE windstorm and convective storm
model version and exposure data (as of 11/30/2022 or 11/30/2023), with loss amplification impact, excluding
storm surge impact, using either near term (stochastic) or long term (historical) event frequency as noted

A CoreLogic RQE v21 model output using 11/30/2022 exposure data
B CoreLogic RQE v23 model output using 11/30/2023 exposure data
    This model output was not used by the TWIA Board in the determination of the 1:100 PML for the 2024 hurricane season