Texas Windstorm Insurance Association

Estimated Aggregate Annual Losses

Based on RMS RiskLink, AIR Touchstone, Impact Forecasting ELEMENTS, and CoreLogic Solutions Hurricane and Severe Thunderstorm Catastrophe Models

Exposure in Force as of 11/30/2020 and 11/30/2021

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, AIR Touchstone, Impact Forecasting and CoreLogic. 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 limits 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, 2021 and November 30, 2020. 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 AIR Worldwide Corporation (AIR), Risk Management Solutions, Inc. (RMS), Impact Forecasting, LLC (IF) and CoreLogic Solutions (CoreLogic). The information from the models is provided by Aon Benfield Inc. (Aon) under the terms of its license agreements with AIR, RMS, IF, and CoreLogic. The results in this report from AIR and RMS 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 AIR, 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 AIR, 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 AIR, 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 after 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
Exposure in Force as of 11/30/2020 and 11/30/2021
All Perils (Hurricane and Severe Convective Storm)
Gross Loss Estimate
RMS RiskLink, AIR Touchstone, Impact Forecasting
ELEMENTS & CoreLogic RQE
$ in thousands except where noted

Portfolio	Data as of:	Model
HUR & SCS	11/30/2020	RMS RiskLink 18.1 WS/CS[1]
	11/30/2021	RMS RiskLink 21.0 WS/CS[1]
HUR & SevThun	11/30/2020	AIR Touchstone 8.0 TC/Sev Thun[2]
	11/30/2021	AIR Touchstone 9.0 TC/Sev Thun[2]
HUR & SCS	11/30/2021	Impact Forecasting v15.0 TC/SCS[3]
HUR & SCS	11/30/2021	CoreLogic RQE v21.0 HU/SCS[4]

	TWIA Portfolio as of:		
Portfolio	11/30/2020	11/30/2021	**Percent Change**
TIV (000's)	$66,315,306	$70,833,471	6.8%
Limits (000's)	$60,729,663	$65,223,102	7.4%
Risk Count (#)	196,129	202,136	3.1%

		RMS RiskLink 21.0 WS/CS	**AIR Touchstone 9.0 TC/Sev Thun**	**Impact Forecasting v15.0 TC/SCS**	**CoreLogic RQE v21.0 HU/SCS**
Return Period	**Annual Exceedance Probability (AEP)**	VaR (PML) - All Peril Near-Term (Stochastic)	VaR (PML) - All Peril Near-Term (WarmSST)	VaR (PML) - All Peril Near-Term (Stochastic)	VaR (PML) - All Peril Near-Term (Stochastic)
1,000	0.10%	9,953,453	11,392,503	8,009,176	8,980,694
500	0.20%	7,373,971	9,900,714	6,927,277	7,201,099
250	0.40%	5,095,189	7,106,758	5,511,968	5,557,921
100	1.00%	3,091,511	4,540,357	3,600,976	3,502,033
50	2.00%	1,932,224	2,612,538	2,353,044	2,124,729
25	4.00%	1,093,593	1,342,320	1,406,008	1,089,907
20	5.00%	891,317	1,076,983	1,121,452	853,712
Average Annual Loss (AAL)		191,165	230,179	220,164	182,402
StdDv		748,456	908,601	725,480	709,454

Footnotes:

*(1) Aggregate annual expected loss by return period based on the indicated **RMS** windstorm and convective storm model version and exposure data (as of 11/30/2020 or 11/30/2021), with loss amplification impact, excluding storm surge*

*(2) Aggregate annual expected loss by return period based on the indicated **AIR** tropical cyclone and severe thunderstorm model version and TWIA exposure data (as of 11/30/2020 or 11/30/2021), with demand surge impact, excluding storm*

*(3) Aggregate annual expected loss by return period based on the indicated **Impact Forecasting** tropical cyclone and convective storm model version and exposure data (as of 11/30/2021), with demand surge impact, excluding storm surge*

*(4) Aggregate annual expected loss by return period based on the indicated **CoreLogic** hurricane and convective storm model version and exposure data (as of 11/30/2021), with demand surge impact, excluding storm surge*

Texas Windstorm Insurance Association
Exposure in Force as of 11/30/2020 and 11/30/2021
All Perils (Hurricane and Severe Convective Storm)
Gross Loss Estimate
RMS RiskLink
$'s in thousands, except where noted

Portfolio		Model
HUR & SCS	11/30/2020	RMS RiskLink 18.1 WS/CS[1]
	11/30/2021	RMS RiskLink 21.0 WS/CS[1]

	TWIA Portfolio as of:		
Portfolio	11/30/2020	11/30/2021	**Percent Change**
TIV (000's)	66,315,306	70,833,471	6.8%
Limits (000's)	60,729,663	65,223,102	7.4%
Risk Count (#)	196,129	202,136	3.1%

	A	*B*	*C*	*B vs. A*	*C vs. B*	*C vs. A*
	VaR (PML) - All Peril Near Term (Stochastic)[1]				**Percent Change**	
Return Period	11/30/2020 Exposures Occ & 2nd Mod Upd RMS v18.1[4]	11/30/2021 Exposures RMS v18.1[3]	11/30/2021 Exposures RMS v21.0[2]	11/30/2021 v18.1 to 11/30/2020 v18.1 Exposure Change	11/30/2021 v21 to 11/30/2021 v18.1 Model Change	11/30/2021 v21 to 11/30/2020 v18.1 Total Change
Annual Exceedance Probability (AEP) in thousands						
1,000	8,940,650	9,933,639	9,953,453	11.1%	0.2%	11.3%
500	6,546,753	7,240,125	7,373,971	10.6%	1.8%	12.6%
250	4,498,963	4,955,252	5,095,189	10.1%	2.8%	13.3%
100	**2,714,659**	**2,977,645**	**3,091,511**	**9.7%**	**3.8%**	**13.9%**
50	1,676,726	1,833,381	1,932,224	9.3%	5.4%	15.2%
25	938,039	1,020,921	1,093,593	8.8%	7.1%	16.6%
20	760,826	826,613	891,317	8.6%	7.8%	17.2%
AAL	163,926	179,202	191,165	9.3%	6.7%	16.6%
StdDv	662,604	735,831	748,456	11.1%	1.7%	13.0%

	A	*B*	*C*	*B vs. A*	*C vs. B*	*C vs. A*
	VaR (PML) - All Peril Long Term (Historical)				**Percent Change**	
Return Period	11/30/2020 Exposures Occ & 2nd Mod Upd RMS v18.1[4]	11/30/2021 Exposures RMS v18.1[3]	11/30/2021 Exposures RMS v21.0[2]	11/30/2021 v18.1 to 11/30/2020 v18.1 Exposure Change	11/30/2021 v21 to 11/30/2021 v18.1 Model Change	11/30/2021 v21 to 11/30/2020 v18.1 Total Change
Annual Exceedance Probability (AEP)						
1,000	8,883,952	9,867,780	9,921,846	11.1%	0.5%	11.7%
500	6,542,508	7,235,040	7,341,019	10.6%	1.5%	12.2%
250	4,516,959	4,975,303	5,062,190	10.1%	1.7%	12.1%
100	**2,736,982**	**3,002,038**	**3,071,456**	**9.7%**	**2.3%**	**12.2%**
50	1,697,601	1,855,939	1,912,084	9.3%	3.0%	12.6%
25	952,559	1,036,528	1,071,835	8.8%	3.4%	12.5%
20	773,119	839,885	869,196	8.6%	3.5%	12.4%
AAL	165,800	181,247	185,688	9.3%	2.5%	12.0%
StdDv	661,796	734,560	743,772	11.0%	1.3%	12.4%

Footnotes:

(1) Aggregate annual expected loss by return period based on indicated RMS windstorm and convective storm model version and exposure data (as of 11/30/2020 or 11/30/2021), with loss amplification impact, excluding storm surge impact, using either near term (stochastic) or long term (historical) event frequency as noted

(2) RMS Risklink v21 model output using 11/30/2021 exposure data. This model output was used by the TWIA Board in the determination of the 1:100 PML for the 2022 reinsurance placement

(3) RMS Risklink v18.1 model output using 11/30/2021 exposure data

(4) RMS Risklink v18.1 model output using 11/30/2020 exposure data with updated occupancy type and secondary modifier data

Texas Windstorm Insurance Association
Exposure in Force as of 11/30/2020 and 11/30/2021
All Perils (Hurricane and Severe Convective Storm) Gross Loss Estimate
AIR Touchstone
$'s in thousands, except where noted

Portfolio		Model
HUR & SCS	11/30/2020	AIR Touchstone 8.0 TC/Sev Thun[1]
	11/30/2021	AIR Touchstone 9.0 TC/Sev Thun[1]

Portfolio	TWIA Portfolio as of:		Percent Change
	11/30/2020	11/30/2021	
TIV (000's)	66,315,306	70,833,471	6.8%
Limits (000's)	60,729,663	65,223,102	7.4%
Risk Count (#)	196,129	202,136	3.1%

	A	*B*	*C*	*B vs. A*	*C vs. B*	*C vs. A*
	VaR (PML) - All Peril Near Term (WSST)				Percent Change	
Return Period	11/30/2020 Exposures Occ & 2nd Mod Upd AIR v8[4]	11/30/2021 Exposures AIR v8[3]	11/30/2021 Exposures AIR v9[2]	11/30/2021 v8 to 11/30/2020 v8 Exposure Change	11/30/2021 v9 to 11/30/2021 v8 Model Change	11/30/2021 v9 to 11/30/2020 v8 Total Change
Annual Exceedance Probability (AEP) in thousands						
1,000	10,647,472	11,438,324	11,392,503	7.4%	-0.4%	7.0%
500	9,211,558	9,939,184	9,900,714	7.9%	-0.4%	7.5%
250	6,683,291	7,156,983	7,106,758	7.1%	-0.7%	6.3%
100	**4,295,784**	**4,546,271**	**4,540,357**	**5.8%**	**-0.1%**	**5.7%**
50	2,456,126	2,622,748	2,612,538	6.8%	-0.4%	6.4%
25	1,264,603	1,346,228	1,342,320	6.5%	-0.3%	6.1%
20	1,011,749	1,078,428	1,076,983	6.6%	-0.1%	6.4%
AAL	216,142	230,643	230,179	6.7%	-0.2%	6.5%
StdDv	853,125	911,019	908,601	6.8%	-0.3%	6.5%

	A	*B*	*C*	*B vs. A*	*C vs. B*	*C vs. A*
	VaR (PML) - All Peril Long Term (Standard)				Percent Change	
Return Period	11/30/2020 Exposures Occ & 2nd Mod Upd AIR v8[4]	11/30/2021 Exposures AIR v8[3]	11/30/2021 Exposures AIR v9[2]	11/30/2021 v8 to 11/30/2020 v8 Exposure Change	11/30/2021 v9 to 11/30/2021 v8 Model Change	11/30/2021 v9 to 11/30/2020 v8 Total Change
Annual Exceedance Probability (AEP)						
1,000	10,647,472	11,438,324	11,392,503	7.4%	-0.4%	7.0%
500	9,206,582	9,737,477	9,701,719	5.8%	-0.4%	5.4%
250	6,325,378	6,787,477	6,760,599	7.3%	-0.4%	6.9%
100	**3,975,788**	**4,221,803**	**4,218,062**	**6.2%**	**-0.1%**	**6.1%**
50	2,311,143	2,480,413	2,476,806	7.3%	-0.1%	7.2%
25	1,184,232	1,268,891	1,267,729	7.1%	-0.1%	7.1%
20	930,192	976,165	974,337	4.9%	-0.2%	4.7%
AAL	202,732	216,346	215,923	6.7%	-0.2%	6.5%
StdDv	820,810	876,526	874,246	6.8%	-0.3%	6.5%

Footnotes:

(1) Aggregate annual expected loss by return period based on indicated AIR tropical cyclone and severe thunderstorm model version and exposure data (as of 11/30/2020 or 11/30/2021), with demand surge impact, excluding storm surge impact, using either warm sea surface temperature (near term) or standard (long term) event frequency as noted

(2) AIR Touchstone v9 model output using 11/30/2021 exposure data. This model output was used by the TWIA Board in the determination of the 1:100 PML for the 2022 reinsurance placement

(3) AIR Touchstone v8 model output using 11/30/2021 exposure data

(4) AIR Touchstone v8 model output using 11/30/2020 exposure data with updated occupancy type and secondary modifier data