



Texas Windstorm Insurance Association

Estimated Aggregate Annual Losses

**Based on RMS RiskLink and AIR Touchstone
Hurricane and Severe Thunderstorm Catastrophe Models
Exposure in Force as of
11/30/2019 and 11/30/2020**

Cautionary Language Regarding Catastrophe Model Loss Estimates

The following tables present hurricane and severe thunderstorm loss estimates prepared for the Association based on two leading industry models: AIR Touchstone and RMS RiskLink. 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, 2020 and November 30, 2019. 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.

The loss estimates were prepared for the Association based on certain accepted industry models of Air Worldwide Corporation and Risk Management Solutions. The modeled estimates were prepared for the Association from model output prepared by Guy Carpenter & Company LLC in connection with their provision of reinsurance brokerage services. The information contained herein reflects the professional judgment and analysis of the Association in respect to certain hurricane occurrence loss estimates derived from industry models. Neither Air Worldwide Corporation (AIR), Risk Management Solutions, Inc. (RMS), nor Guy Carpenter & Company LLC have reviewed, commented on, or approved this report or the information contained herein.

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 11/30/2019 and 11/30/2020
 All Peril (Hurricane & SCS) Gross Loss Estimates
 RMS RiskLink and AIR Touchstone
 \$'s in thousands, except where noted



Portfolio	Data as of:	Model
HUR & SCS	11/30/2019	RMS RiskLink 18.1 WS/CS ¹
	11/30/2020	RMS RiskLink 18.1 WS/CS ¹

HUR & SevThun	11/30/2019	AIR Touchstone 7.3 TC/Sev Thun ²
	11/30/2020	AIR Touchstone 7.3 TC/Sev Thun ²
	11/30/2020	AIR Touchstone 8.0 TC/Sev Thun ²

Portfolio	TWIA Portfolio as of:		Percent Change
	11/30/2019	11/30/2020	
TIV (000's)	\$66,715,956	\$66,315,306	-0.6%
Limits (000's)	\$61,298,338	\$60,729,663	-0.9%
Risk Count (#)	201,719	196,129	-2.8%

Return Period	Annual Exceedance Probability (AEP)	RMS RiskLink 18.1 WS/CS ³		AIR Touchstone 8.0 TC/Sev Thun ³	
		VaR (PML) - All Peril Near Term (Stochastic)		VaR (PML) - All Peril Near Term (WSST)	
1,000	0.10%	\$8,940,650	\$10,647,472		
500	0.20%	6,546,753	9,211,558		
250	0.40%	4,498,963	6,683,291		
100	1.00%	2,714,659	4,295,784		
50	2.00%	1,676,726	2,456,126		
25	4.00%	938,039	1,264,603		
20	5.00%	760,826	1,011,749		
10	10.00%	343,235	398,322		
5	20.00%	\$88,692	\$115,453		
Age Annual Loss (AAL)		\$163,926	\$216,142		
StdDv		\$662,604	\$853,125		

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 11/30/2019 or 11/30/2020), 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 11/30/2019 or 11/30/2020), with demand surge impact, excluding storm surge
- (3) Updated occupancy type and additional secondary modifier data was included in the exposure data as of 11/30/2020 used to develop the model output.



Texas Windstorm Insurance Association
Exposure in Force as of 11/30/2019 and 11/30/2020
All Peril (Hurricane & SCS) Gross Loss Estimates
RMS RiskLink
\$'s in thousands, except where noted

Portfolio	Model
HUR & SCS	RMS RiskLink 18.1 WS/CS ¹
	RMS RiskLink 18.1 WS/CS ¹

Portfolio	TWIA Portfolio as of:		Percent Change
	11/30/2019	11/30/2020	
TIV (000's)	\$66,715,956	\$66,315,306	-0.6%
Limits (000's)	\$61,298,338	\$60,729,663	-0.9%
Risk Count (#)	201,719	196,129	-2.8%

Return Period	A	B	C	B vs. A	C vs. B	C vs. A
	VaR (PML) - All Peril Near Term (Stochastic) ¹			Percent Change		
	11/19 Exposures Baseline (Renewal) RMS v18.1 ²	11/20 Exposures Baseline RMS v18.1 ³	11/20 Exposures Occ & SecMod Upd RMS v18.1 ⁴	11/19 v18.1 Base to 11/20 v18.1 Base	11/20 v18.1 Base to 11/20 v18.1 Upd	11/19 v18.1 Base to 11/20 v18.1 Upd
Annual Exceedance Probability (AEP) in thousands						
1,000	\$9,460,278	\$9,705,451	\$8,940,650	2.6%	-7.9%	-5.5%
500	6,934,944	7,114,944	6,546,753	2.6%	-8.0%	-5.6%
250	4,778,706	4,895,102	4,498,963	2.4%	-8.1%	-5.9%
100	2,890,027	2,947,364	2,714,659	2.0%	-7.9%	-6.1%
50	1,785,048	1,816,862	1,676,726	1.8%	-7.7%	-6.1%
25	1,000,043	1,014,748	938,039	1.5%	-7.6%	-6.2%
20	810,968	821,952	760,826	1.4%	-7.4%	-6.2%
10	365,087	368,639	343,235	1.0%	-6.9%	-6.0%
5	\$92,225	\$92,456	\$88,692	0.2%	-4.1%	-3.8%
AAL	\$173,834	\$176,584	\$163,926	1.6%	-7.2%	-5.7%
StdDv	\$701,145	\$717,741	\$662,604	2.4%	-7.7%	-5.5%

Return Period	A	B	C	B vs. A	C vs. B	C vs. A
	VaR (PML) - All Peril Long Term (Historical)			Percent Change		
	11/19 Exposures Baseline (Renewal) RMS v18.1 ²	11/20 Exposures Baseline RMS v18.1 ³	11/20 Exposures Occ & SecMod Upd RMS v18.1 ⁴	11/19 v18.1 Base to 11/20 v18.1 Base	11/20 v18.1 Base to 11/20 v18.1 Upd	11/19 v18.1 Base to 11/20 v18.1 Upd
Annual Exceedance Probability (AEP)						
1,000	\$9,402,705	\$9,646,899	\$8,883,952	2.6%	-7.9%	-5.5%
500	6,929,946	7,109,624	6,542,508	2.6%	-8.0%	-5.6%
250	4,797,062	4,914,299	4,516,959	2.4%	-8.1%	-5.8%
100	2,913,279	2,971,223	2,736,982	2.0%	-7.9%	-6.1%
50	1,806,633	1,839,026	1,697,601	1.8%	-7.7%	-6.0%
25	1,014,999	1,030,050	952,559	1.5%	-7.5%	-6.2%
20	823,638	834,903	773,119	1.4%	-7.4%	-6.1%
10	371,980	375,710	349,975	1.0%	-6.8%	-5.9%
5	\$95,209	\$95,474	\$91,575	0.3%	-4.1%	-3.8%
AAL	\$175,801	\$178,595	\$165,800	1.6%	-7.2%	-5.7%
StdDv	\$700,511	\$717,088	\$661,796	2.4%	-7.7%	-5.5%

Footnotes:

- (1) Aggregate annual expected loss by return period based on indicated RMS windstorm and convective storm model version and exposure data (as of 11/30/2019 or 11/30/2020), with loss amplification impact, excluding storm surge impact, using either near term or long term ("historical") event frequency as noted.
- (2) RMS Risklink v18.1 model output using 11/30/2019 exposure data without updated occupancy type and secondary modifier data. This model output was used by the TWIA Board in the determination of the 1:100 PML for the 2020 reinsurance placement.
- (3) RMS Risklink v18.1 model output using 11/30/2020 exposure data without updated occupancy type and secondary modifier data
- (4) RMS Risklink v18.1 model output using 11/30/2020 exposure data with updated occupancy type and secondary modifier data

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 All Peril (Hurricane & Sev Thunderstorm) Gross Loss Estimates
 AIR Touchstone
 \$'s in thousands, except where noted



Portfolio	Model
HUR & SevThun 11/30/2019	AIR Touchstone 7.3 TC/Sev Thun
11/30/2020	AIR Touchstone 7.3 TC/Sev Thun
11/30/2020	AIR Touchstone 8.0 TC/Sev Thun

Portfolio	TWIA Portfolio as of:		Percent Change
	11/30/2019	11/30/2020	
TIV (000's)	66,715,956,466	66,315,306,315	-0.6%
Limits (000's)	61,298,338,492	60,729,663,104	-0.9%
Risk Count (#)	201,719	196,129	-2.8%

Return Period	A	B	C	D	B vs. A	C vs. B	D vs. C	D vs. A
	VaR (PML) - All Peril Near Term (WSST) ¹				Percent Change			
	11/19 Exposures Baseline (Renewal) AIR v7.3	11/20 Exposures Baseline AIR v7.3 ²	11/20 Exposures Occ & SecMod Upd AIR v7.3 ³	11/20 Exposures Occ & SecMod Upd AIR v8.0 ⁴	11/19 v7.3 Base to 11/20 v7.3 Base	11/20 v7.3 Base to 11/20 v7.3 Upd	11/20 v7.3 Upd to 11/20 v8.0 Upd	11/19 v7.3 Base to 11/20 v8.0 Upd
Annual Exceedance Probability (AEP)								
1,000	\$10,751,243	\$11,127,600	\$10,569,446	\$10,647,472	3.5%	-5.0%	0.7%	-1.0%
500	9,405,375	9,595,530	9,145,057	9,211,558	2.0%	-4.7%	0.7%	-2.1%
250	6,755,921	6,975,213	6,609,722	6,683,291	3.2%	-5.2%	1.1%	-1.1%
100	4,376,081	4,507,437	4,205,959	4,295,784	3.0%	-6.7%	2.1%	-1.8%
50	2,518,026	2,605,099	2,421,628	2,456,126	3.5%	-7.0%	1.4%	-2.5%
25	1,310,463	1,339,738	1,238,660	1,264,603	2.2%	-7.5%	2.1%	-3.5%
20	1,055,868	1,070,595	995,124	1,011,749	1.4%	-7.0%	1.7%	-4.2%
10	413,850	419,401	392,646	398,322	1.3%	-6.4%	1.4%	-3.8%
5	\$120,642	\$120,904	\$115,443	\$115,453	0.2%	-4.5%	0.0%	-4.3%
AAL	\$223,308	\$227,580	\$213,474	\$216,142	1.9%	-6.2%	1.3%	-3.2%
StdDv	\$870,578	\$893,557	\$843,397	\$853,125	2.6%	-5.6%	1.2%	-2.0%

Return Period	A	B	C	D	B vs. A	C vs. B	D vs. C	D vs. A
	VaR (PML) - All Peril Long Term (Standard) ¹				Percent Change			
	11/19 Exposures Baseline (Renewal) AIR v7.3 ²	11/20 Exposures Baseline AIR v7.3 ³	11/20 Exposures Occ & SecMod Upd AIR v7.3 ⁴	11/20 Exposures Occ & SecMod Upd AIR v8.0 ⁴	11/19 v7.3 Base to 11/20 v7.3 Base	11/20 v7.3 Base to 11/20 v7.3 Upd	11/20 v7.3 Upd to 11/20 v8.0 Upd	11/19 v7.3 Base to 11/20 v8.0 Upd
Annual Exceedance Probability (AEP)								
1,000	10,751,243	11,127,600	10,569,446	10,647,472	3.5%	-5.0%	0.7%	-1.0%
500	9,304,603	9,577,744	9,103,162	9,206,582	2.9%	-5.0%	1.1%	-1.1%
250	6,431,821	6,658,695	6,217,974	6,325,378	3.5%	-6.6%	1.7%	-1.7%
100	4,108,849	4,136,121	3,916,424	3,975,788	0.7%	-5.3%	1.5%	-3.2%
50	2,382,456	2,442,765	2,273,768	2,311,143	2.5%	-6.9%	1.6%	-3.0%
25	1,229,242	1,256,242	1,163,448	1,184,232	2.2%	-7.4%	1.8%	-3.7%
20	970,579	978,668	916,162	930,192	0.8%	-6.4%	1.5%	-4.2%
10	377,966	383,802	362,676	365,849	1.5%	-5.5%	0.9%	-3.2%
5	112,372	112,979	106,303	106,303	0.5%	-5.9%	0.0%	-5.4%
AAL	209,583	213,514	200,262	202,732	1.9%	-6.2%	1.2%	-3.3%
StdDv	837,960	859,728	811,618	820,810	2.6%	-5.6%	1.1%	-2.0%

Footnotes:

- (1) Aggregate annual expected loss by return period based on indicated AIR tropical cyclone and severe thunderstorm model version and TWIA exposure data (as of 11/30/2019 or 11/30/2020), with demand surge impact, excluding storm surge impact, using either near term or long term event frequency as noted.
- (2) AIR Touchstone v7.3 model output using 11/30/2019 exposure data without updated occupancy type and secondary modifier data. This model output was used by the TWIA Board in the determination of the 1:100 PML for the 2020 reinsurance placement.
- (3) AIR Touchstone v7.3 model output using 11/30/2020 exposure data without updated occupancy type and secondary modifier data.
- (4) AIR Touchstone v7.3 model output using 11/30/2020 exposure data with updated occupancy type and secondary modifier data.