



December 31, 2020

Board of Trustees  
Employees' Retirement System of  
The State of Hawaii  
City Financial Tower  
201 Merchant St., Ste. 1400  
Honolulu, HI 96813-2980

**Re: Stress Test Annual Report**

Dear Members of the Board:

The purpose of this report is to provide the Employees' Retirement System of the State of Hawaii (ERS) with the information it must submit to the legislature as required by ACT – 85 (2017). Act – 85 (2017) requires that the actuary of the ERS perform an annual stress test as defined by the legislation and described below.

**Requirements of Annual Stress Test Report**

The annual stress test must address the following scenarios:

1. A 30-year projection of the ERS's assets, liabilities, pension debt, service costs, employee contributions, employer contributions, net amortization, benefit payments, payroll, and funded ratio assuming the current actuarial assumptions are met. See Stress Test Exhibit 1.
2. Two 30-year projections of the same items above assuming the actual investment performance in future years is 2% less than the assumed rate of return, but with two different contribution policies.
  - a. The first scenario shows the projected items assuming that the employer contribution rate in future years would increase if necessary to meet the current funding policy. In other words, if the funding period in a future year exceeds 30 years, the contribution rates would be adjusted to bring the funding period down to 30 years. See Stress Test Exhibit 2A.
  - b. The second scenario shows the projected items assuming no change in the current statutory contribution rates. See Stress Test Exhibit 2B.

3. Two 30-year projections of the same items above assuming the actual investment performance in the first year is a negative 20% followed by a 20-year period where investment performance is 2% less than the assumed rate of return, but with two different contribution policies.
  - a. The first scenario shows the projected items assuming that the employer contribution rate in future years would increase if necessary to meet the current funding policy. In other words, if the funding period in a future year exceeds 30 years, the contribution rates would be adjusted to bring the funding period down to 30 years. See Stress Test Exhibit 3A.
  - b. The second scenario shows the projected items assuming no change in the current statutory contribution rates. See Stress Test Exhibit 3B.
4. The estimated actuarial accrued liability, the total normal cost for each benefit tier, and the employer normal cost for each benefit tier under the current investment return assumption and using the 10-year average of the 30-year treasuries notes as of the valuation date. See Stress Test Exhibit 4.

### **Stress Test Summary Results**

The information required by the legislation is contained in the tables that follow this letter. The following is some brief commentary concerning the results themselves.

1. As shown in Stress Test Exhibit 1, the ERS is expected to be fully funded (100% funded ratio) in fiscal year ending 2046.
2. Stress Test Exhibits 2A and 2B are very similar. This is because the funding period at future valuation dates under both scenarios is never expected to exceed 30 years. The impact of the underperformance is a lengthening of the period of time until the plan is fully funded, but it is never expected to be more than 30 years from a future valuation date. Please note that while it is true that in aggregate the funding period would not exceed 30 years, if the Police and Firefighters were calculated independently, the funding period would exceed 30 years in a couple of years. A small increase in the Police and Firefighter rates is the difference between the two projections.
3. Under the first part of the 3<sup>rd</sup> Stress Test (see Stress Test Exhibit 3A) the employer contribution rates would ultimately increase to 26.25% of pay for All Other Employees and 50.25% of pay for Police and Firefighters in 2024 and remain at those levels for the foreseeable future. As shown in Stress Test Exhibit 3B (Employer Contributions remain at statutory rates) the funded ratio would decline below 35% but the trust is never exhausted. The funded ratio would begin to slowly climb once the 20-year period of 5% returns ends.
4. The 10-year average of the 30-year treasury notes is 3.05% as of July 1, 2020.



Based on the information reviewed for this report, the stress test shows that the System is sustainable in return environments much lower than currently assumed.

### Disclosures

The information contained in this report is based on the preliminary valuation results of the ERS as of June 30, 2020. While the actual valuation results may be slightly different, it is not expected that those changes will have any material impact on the information contained herein.

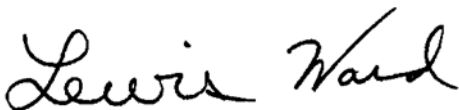
Except as noted, the data, financial information, and actuarial methods and assumptions are those used in the June 30, 2020 actuarial valuation. These assumptions are detailed in the actuarial valuation report dated January 2021. The results of the actuarial valuation and this "Stress Test" are dependent on the actuarial assumptions used. Actual results can and almost certainly will differ, as actual experience deviates from the assumptions. Even seemingly minor changes in the assumptions can materially change the liabilities, calculated contribution rates and funding periods. Based on the scope of this engagement, we have not performed analysis on the potential range of future measurements based on other factors. The actuarial calculations are intended to provide information for rational decision making.

This report was prepared using our proprietary valuation model and related software which in our professional judgment has the capability to provide results that are consistent with the purposes of the valuation. We performed tests to ensure that the model reasonably represents that which is intended to be modeled.

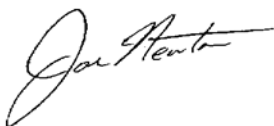
Joe Newton is a member of the American Academy of Actuaries and meets the Qualification Standards of the American Academy of Actuaries to render the actuarial opinions contained herein.

We look forward to discussing the results of this analysis with the Board.

Sincerely,



Lewis Ward  
Consultant



Joseph P. Newton  
Pension Market Leader and Actuary

Enclosures



## Hawaii Employees' Retirement System

### Stress Test Exhibit 1

(Dollar Amounts in \$ Millions)

Valuation Date	Market Value of Assets	Actuarial Value of Assets	Actuarial Accrued Liability	Unfunded		Normal Cost	Projected Employee Contributions	Projected Employer Contributions	Net Amortization	Benefit Payments	Covered Payroll	Funded Ratio
				Actuarial Accrued Liability	Actuarial Liability							
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	
30-Jun-20	\$ 17,160	\$ 18,028	\$ 32,673	\$ 14,645	\$ 654	\$ 296	\$ 1,204	\$ 150	\$ 1,651	\$ 4,630	55.2%	
30-Jun-21	\$ 19,116	\$ 19,116	\$ 33,912	\$ 14,796	\$ 668	\$ 312	\$ 1,234	\$ 127	\$ 1,749	\$ 4,747	56.4%	
30-Jun-22	\$ 20,227	\$ 20,227	\$ 35,150	\$ 14,923	\$ 684	\$ 328	\$ 1,268	\$ 101	\$ 1,846	\$ 4,878	57.5%	
30-Jun-23	\$ 21,366	\$ 21,366	\$ 36,391	\$ 15,024	\$ 700	\$ 344	\$ 1,303	\$ 72	\$ 1,947	\$ 5,014	58.7%	
30-Jun-24	\$ 22,534	\$ 22,534	\$ 37,631	\$ 15,097	\$ 717	\$ 361	\$ 1,339	\$ 40	\$ 2,048	\$ 5,155	59.9%	
30-Jun-25	\$ 23,733	\$ 23,733	\$ 38,870	\$ 15,137	\$ 735	\$ 379	\$ 1,377	\$ 4	\$ 2,152	\$ 5,302	61.1%	
30-Jun-26	\$ 24,964	\$ 24,964	\$ 40,105	\$ 15,141	\$ 753	\$ 397	\$ 1,416	\$ (36)	\$ 2,256	\$ 5,456	62.2%	
30-Jun-27	\$ 26,233	\$ 26,233	\$ 41,338	\$ 15,105	\$ 773	\$ 416	\$ 1,456	\$ (79)	\$ 2,362	\$ 5,616	63.5%	
30-Jun-28	\$ 27,541	\$ 27,541	\$ 42,567	\$ 15,026	\$ 793	\$ 435	\$ 1,499	\$ (129)	\$ 2,467	\$ 5,784	64.7%	
30-Jun-29	\$ 28,897	\$ 28,897	\$ 43,793	\$ 14,897	\$ 814	\$ 455	\$ 1,545	\$ (184)	\$ 2,572	\$ 5,960	66.0%	
30-Jun-30	\$ 30,305	\$ 30,305	\$ 45,018	\$ 14,713	\$ 836	\$ 475	\$ 1,592	\$ (244)	\$ 2,678	\$ 6,142	67.3%	
30-Jun-31	\$ 31,772	\$ 31,772	\$ 46,242	\$ 14,470	\$ 859	\$ 496	\$ 1,642	\$ (310)	\$ 2,783	\$ 6,334	68.7%	
30-Jun-32	\$ 33,306	\$ 33,306	\$ 47,465	\$ 14,160	\$ 883	\$ 518	\$ 1,693	\$ (384)	\$ 2,889	\$ 6,533	70.2%	
30-Jun-33	\$ 34,912	\$ 34,912	\$ 48,688	\$ 13,776	\$ 907	\$ 541	\$ 1,747	\$ (463)	\$ 2,995	\$ 6,740	71.7%	
30-Jun-34	\$ 36,600	\$ 36,600	\$ 49,913	\$ 13,313	\$ 934	\$ 564	\$ 1,803	\$ (551)	\$ 3,098	\$ 6,957	73.3%	
30-Jun-35	\$ 38,380	\$ 38,380	\$ 51,142	\$ 12,763	\$ 961	\$ 588	\$ 1,862	\$ (647)	\$ 3,203	\$ 7,182	75.0%	
30-Jun-36	\$ 40,261	\$ 40,261	\$ 52,377	\$ 12,116	\$ 989	\$ 613	\$ 1,922	\$ (751)	\$ 3,305	\$ 7,416	76.9%	
30-Jun-37	\$ 42,256	\$ 42,256	\$ 53,621	\$ 11,366	\$ 1,019	\$ 638	\$ 1,986	\$ (865)	\$ 3,405	\$ 7,660	78.8%	
30-Jun-38	\$ 44,377	\$ 44,377	\$ 54,878	\$ 10,502	\$ 1,050	\$ 664	\$ 2,052	\$ (988)	\$ 3,503	\$ 7,915	80.9%	
30-Jun-39	\$ 46,639	\$ 46,639	\$ 56,153	\$ 9,514	\$ 1,083	\$ 691	\$ 2,121	\$ (1,123)	\$ 3,599	\$ 8,182	83.1%	
30-Jun-40	\$ 49,060	\$ 49,060	\$ 57,452	\$ 8,391	\$ 1,117	\$ 719	\$ 2,193	\$ (1,269)	\$ 3,691	\$ 8,460	85.4%	
30-Jun-41	\$ 51,658	\$ 51,658	\$ 58,780	\$ 7,122	\$ 1,153	\$ 748	\$ 2,268	\$ (1,429)	\$ 3,782	\$ 8,751	87.9%	
30-Jun-42	\$ 54,450	\$ 54,450	\$ 60,144	\$ 5,694	\$ 1,191	\$ 778	\$ 2,347	\$ (1,602)	\$ 3,870	\$ 9,053	90.5%	
30-Jun-43	\$ 57,457	\$ 57,457	\$ 61,550	\$ 4,093	\$ 1,230	\$ 807	\$ 2,428	\$ (1,788)	\$ 3,956	\$ 9,367	93.4%	
30-Jun-44	\$ 60,700	\$ 60,700	\$ 63,005	\$ 2,305	\$ 1,271	\$ 838	\$ 2,513	\$ (1,991)	\$ 4,041	\$ 9,693	96.3%	
30-Jun-45	\$ 64,200	\$ 64,200	\$ 64,515	\$ 315	\$ 1,314	\$ 870	\$ 2,601	\$ (2,209)	\$ 4,125	\$ 10,032	99.5%	
30-Jun-46	\$ 67,980	\$ 67,980	\$ 66,087	\$ (1,894)	\$ 1,358	\$ 902	\$ 2,692	\$ (2,445)	\$ 4,210	\$ 10,383	102.9%	
30-Jun-47	\$ 72,064	\$ 72,064	\$ 67,725	\$ (4,339)	\$ 1,404	\$ 936	\$ 2,786	\$ (2,702)	\$ 4,293	\$ 10,748	106.4%	
30-Jun-48	\$ 76,479	\$ 76,479	\$ 69,439	\$ (7,040)	\$ 1,452	\$ 970	\$ 2,884	\$ (2,978)	\$ 4,378	\$ 11,127	110.1%	
30-Jun-49	\$ 81,250	\$ 81,250	\$ 71,233	\$ (10,017)	\$ 1,502	\$ 1,006	\$ 2,986	\$ (3,276)	\$ 4,465	\$ 11,518	114.1%	
30-Jun-50	\$ 86,406	\$ 86,406	\$ 73,113	\$ (13,292)	\$ 1,554	\$ 1,042	\$ 3,091	\$ (3,598)	\$ 4,556	\$ 11,924	118.2%	

**Hawaii Employees' Retirement System**  
**Stress Test Exhibit 2A - Actual Returns are 5% (2% Less than Assumed)**  
**Scenario A - Contribution Rates Adjusted if Necessary to Keep Future Valuations' Funding Periods at 30 Years or Less**  
(Dollar Amounts in \$ Millions)

Valuation Date	Market Value of Assets	Actuarial Value of Assets	Actuarial Accrued Liability	Unfunded		Projected Employee Contributions	Projected Employer Contributions	Net Amortization	Benefit Payments	Covered Payroll	Funded Ratio
				Actuarial Accrued Liability	Normal Cost						
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
30-Jun-20	\$ 17,160	\$ 18,028	\$ 32,673	\$ 14,645	\$ 654	\$ 296	\$ 1,204	\$ 150	\$ 1,651	\$ 4,630	55.2%
30-Jun-21	17,846	18,716	33,912	15,196	668	312	1,235	155	1,749	4,747	55.2%
30-Jun-22	18,514	19,295	35,150	15,855	684	328	1,268	166	1,846	4,878	54.9%
30-Jun-23	19,166	19,791	36,391	16,599	700	344	1,306	179	1,947	5,014	54.4%
30-Jun-24	19,803	20,436	37,631	17,195	717	361	1,342	184	2,048	5,155	54.3%
30-Jun-25	20,421	21,066	38,870	17,803	735	379	1,380	187	2,152	5,302	54.2%
30-Jun-26	21,020	21,682	40,105	18,423	753	397	1,419	190	2,256	5,456	54.1%
30-Jun-27	21,600	22,281	41,338	19,057	773	416	1,460	193	2,362	5,616	53.9%
30-Jun-28	22,161	22,861	42,567	19,706	793	435	1,504	194	2,467	5,784	53.7%
30-Jun-29	22,707	23,425	43,793	20,368	814	455	1,550	193	2,572	5,960	53.5%
30-Jun-30	23,240	23,976	45,018	21,042	836	475	1,598	193	2,678	6,142	53.3%
30-Jun-31	23,760	24,514	46,242	21,728	859	496	1,649	191	2,783	6,334	53.0%
30-Jun-32	24,271	25,042	47,465	22,423	883	518	1,701	187	2,889	6,533	52.8%
30-Jun-33	24,775	25,562	48,688	23,126	907	541	1,756	182	2,995	6,740	52.5%
30-Jun-34	25,273	26,077	49,913	23,836	934	564	1,812	176	3,098	6,957	52.2%
30-Jun-35	25,772	26,593	51,142	24,550	961	588	1,871	168	3,203	7,182	52.0%
30-Jun-36	26,273	27,110	52,377	25,267	989	613	1,933	159	3,305	7,416	51.8%
30-Jun-37	26,782	27,635	53,621	25,986	1,019	638	1,997	147	3,405	7,660	51.5%
30-Jun-38	27,304	28,174	54,878	26,705	1,050	664	2,064	134	3,503	7,915	51.3%
30-Jun-39	27,846	28,733	56,153	27,421	1,083	691	2,134	117	3,599	8,182	51.2%
30-Jun-40	28,416	29,321	57,452	28,131	1,117	719	2,208	97	3,691	8,460	51.0%
30-Jun-41	29,583	30,086	58,780	28,694	1,153	748	2,284	65	3,782	8,751	51.2%
30-Jun-42	30,847	31,057	60,144	29,087	1,191	778	2,364	19	3,870	9,053	51.6%
30-Jun-43	32,219	32,263	61,550	29,287	1,230	807	2,446	(43)	3,956	9,367	52.4%
30-Jun-44	33,714	33,732	63,005	29,273	1,271	838	2,532	(123)	4,041	9,693	53.5%
30-Jun-45	35,345	35,351	64,515	29,164	1,314	870	2,621	(211)	4,125	10,032	54.8%
30-Jun-46	37,126	37,128	66,087	28,958	1,358	902	2,714	(309)	4,210	10,383	56.2%
30-Jun-47	39,073	39,074	67,725	28,651	1,404	936	2,809	(416)	4,293	10,748	57.7%
30-Jun-48	41,203	41,203	69,439	28,236	1,452	970	2,909	(534)	4,378	11,127	59.3%
30-Jun-49	43,530	43,530	71,233	27,703	1,502	1,006	3,012	(662)	4,465	11,518	61.1%
30-Jun-50	46,072	46,072	73,113	27,041	1,554	1,042	3,118	(802)	4,556	11,924	63.0%



**Hawaii Employees' Retirement System**  
 Stress Test Exhibit 2B - Actual Returns are 5% (2% Less than Assumed)  
 Scenario B - Contribution Rates Kept at Current Statutory Rates  
 (Dollar Amounts in \$ Millions)

Valuation Date (1)	Market Value of Assets (2)	Actuarial Value of Assets (3)	Unfunded			Projected Employee Contributions (7)	Projected Employer Contributions (8)	Net Amortization (9)	Benefit Payments (10)	Covered Payroll (11)	Funded Ratio (12)
			Actuarial Accrued Liability (4)	Actuarial Accrued Liability (5)	Normal Cost (6)						
30-Jun-20	\$ 17,160	\$ 18,028	\$ 32,673	\$ 14,645	\$ 654	\$ 296	\$ 1,204	\$ 150	\$ 1,651	\$ 4,630	55.2%
30-Jun-21	17,846	18,716	33,912	15,196	668	312	1,234	155	1,749	4,747	55.2%
30-Jun-22	18,514	19,295	35,150	15,856	684	328	1,268	167	1,846	4,878	54.9%
30-Jun-23	19,165	19,790	36,391	16,601	700	344	1,303	182	1,947	5,014	54.4%
30-Jun-24	19,798	20,431	37,631	17,199	717	361	1,339	187	2,048	5,155	54.3%
30-Jun-25	20,413	21,058	38,870	17,811	735	379	1,377	191	2,152	5,302	54.2%
30-Jun-26	21,009	21,670	40,105	18,435	753	397	1,416	194	2,256	5,456	54.0%
30-Jun-27	21,585	22,265	41,338	19,073	773	416	1,456	198	2,362	5,616	53.9%
30-Jun-28	22,141	22,840	42,567	19,727	793	435	1,499	200	2,467	5,784	53.7%
30-Jun-29	22,681	23,398	43,793	20,395	814	455	1,545	201	2,572	5,960	53.4%
30-Jun-30	23,207	23,942	45,018	21,076	836	475	1,592	201	2,678	6,142	53.2%
30-Jun-31	23,719	24,472	46,242	21,770	859	496	1,642	201	2,783	6,334	52.9%
30-Jun-32	24,221	24,991	47,465	22,475	883	518	1,693	198	2,889	6,533	52.7%
30-Jun-33	24,714	25,500	48,688	23,188	907	541	1,747	195	2,995	6,740	52.4%
30-Jun-34	25,201	26,003	49,913	23,910	934	564	1,803	190	3,098	6,957	52.1%
30-Jun-35	25,687	26,505	51,142	24,637	961	588	1,862	184	3,203	7,182	51.8%
30-Jun-36	26,174	27,008	52,377	25,369	989	613	1,922	177	3,305	7,416	51.6%
30-Jun-37	26,667	27,517	53,621	26,104	1,019	638	1,986	167	3,405	7,660	51.3%
30-Jun-38	27,171	28,038	54,878	26,841	1,050	664	2,052	156	3,503	7,915	51.1%
30-Jun-39	27,694	28,577	56,153	27,576	1,083	691	2,121	141	3,599	8,182	50.9%
30-Jun-40	28,244	29,143	57,452	28,309	1,117	719	2,193	125	3,691	8,460	50.7%
30-Jun-41	29,383	29,883	58,780	28,897	1,153	748	2,268	95	3,782	8,751	50.8%
30-Jun-42	30,617	30,826	60,144	29,318	1,191	778	2,347	52	3,870	9,053	51.3%
30-Jun-43	31,956	32,000	61,550	29,550	1,230	807	2,428	(6)	3,956	9,367	52.0%
30-Jun-44	33,413	33,432	63,005	29,574	1,271	838	2,513	(82)	4,041	9,693	53.1%
30-Jun-45	35,003	35,010	64,515	29,506	1,314	870	2,601	(166)	4,125	10,032	54.3%
30-Jun-46	36,739	36,741	66,087	29,345	1,358	902	2,692	(259)	4,210	10,383	55.6%
30-Jun-47	38,636	38,637	67,725	29,088	1,404	936	2,786	(362)	4,293	10,748	57.0%
30-Jun-48	40,711	40,711	69,439	28,727	1,452	970	2,884	(474)	4,378	11,127	58.6%
30-Jun-49	42,979	42,979	71,233	28,254	1,502	1,006	2,986	(597)	4,465	11,518	60.3%
30-Jun-50	45,455	45,455	73,113	27,658	1,554	1,042	3,091	(731)	4,556	11,924	62.2%



## Hawaii Employees' Retirement System

Stress Test Exhibit 3A - Negative 20% Return Followed by 20-Year Period with 5% Returns

Scenario A - Contribution Rates Adjusted if Necessary to Keep Future Valuations' Funding Periods at 30 Years or Less

(Dollar Amounts in \$ Millions)

Valuation Date (1)	Market Value of Assets (2)	Actuarial Value of Assets (3)	Actuarial Accrued Liability (4)	Unfunded		Normal Cost (6)	Projected Employee Contributions (7)	Projected Employer Contributions (8)	Net Amortization (9)	Benefit Payments (10)	Covered Payroll (11)	Funded Ratio (12)
				Actuarial Liability (5)	Normal Cost (6)							
30-Jun-20	\$ 17,160	\$ 18,028	\$ 32,673	\$ 14,645	\$ 654	\$ 296	\$ 1,204	\$ 150	\$ 1,651	\$ 4,630	55.2%	
30-Jun-21	13,577	17,649	33,912	16,263	668	312	1,288	174	1,749	4,747	52.0%	
30-Jun-22	14,087	17,106	35,150	18,044	684	328	1,331	254	1,846	4,878	48.7%	
30-Jun-23	14,582	16,396	36,391	19,995	700	344	1,434	285	1,947	5,014	45.1%	
30-Jun-24	15,120	15,817	37,631	21,814	717	361	1,497	346	2,048	5,155	42.0%	
30-Jun-25	15,664	16,257	38,870	22,613	735	379	1,540	358	2,152	5,302	41.8%	
30-Jun-26	16,189	16,731	40,105	23,374	753	397	1,583	367	2,256	5,456	41.7%	
30-Jun-27	16,696	17,228	41,338	24,110	773	416	1,629	372	2,362	5,616	41.7%	
30-Jun-28	17,184	17,728	42,567	24,839	793	435	1,676	375	2,467	5,784	41.6%	
30-Jun-29	17,658	18,215	43,793	25,578	814	455	1,726	376	2,572	5,960	41.6%	
30-Jun-30	18,118	18,690	45,018	26,328	836	475	1,778	377	2,678	6,142	41.5%	
30-Jun-31	18,567	19,154	46,242	27,088	859	496	1,832	376	2,783	6,334	41.4%	
30-Jun-32	19,006	19,608	47,465	27,857	883	518	1,889	373	2,889	6,533	41.3%	
30-Jun-33	19,439	20,055	48,688	28,633	907	541	1,948	369	2,995	6,740	41.2%	
30-Jun-34	19,868	20,498	49,913	29,415	934	564	2,010	362	3,098	6,957	41.1%	
30-Jun-35	20,299	20,943	51,142	30,199	961	588	2,074	354	3,203	7,182	41.0%	
30-Jun-36	20,734	21,392	52,377	30,985	989	613	2,141	344	3,305	7,416	40.8%	
30-Jun-37	21,178	21,851	53,621	31,770	1,019	638	2,211	331	3,405	7,660	40.8%	
30-Jun-38	21,640	22,327	54,878	32,551	1,050	664	2,285	315	3,503	7,915	40.7%	
30-Jun-39	22,125	22,827	56,153	33,326	1,083	691	2,362	295	3,599	8,182	40.7%	
30-Jun-40	22,642	23,361	57,452	34,091	1,117	719	2,443	271	3,691	8,460	40.7%	
30-Jun-41	23,649	24,048	58,780	34,732	1,153	748	2,527	236	3,782	8,751	40.9%	
30-Jun-42	24,748	24,916	60,144	35,228	1,191	778	2,615	188	3,870	9,053	41.4%	
30-Jun-43	25,955	25,990	61,550	35,560	1,230	807	2,707	126	3,956	9,367	42.2%	
30-Jun-44	27,281	27,296	63,005	35,709	1,271	838	2,802	48	4,041	9,693	43.3%	
30-Jun-45	28,742	28,747	64,515	35,769	1,314	870	2,901	(38)	4,125	10,032	44.6%	
30-Jun-46	30,351	30,352	66,087	35,735	1,358	902	3,003	(134)	4,210	10,383	45.9%	
30-Jun-47	32,123	32,123	67,725	35,602	1,404	936	3,109	(240)	4,293	10,748	47.4%	
30-Jun-48	34,076	34,076	69,439	35,363	1,452	970	3,219	(356)	4,378	11,127	49.1%	
30-Jun-49	36,226	36,226	71,233	35,007	1,502	1,006	3,333	(483)	4,465	11,518	50.9%	
30-Jun-50	38,589	38,590	73,113	34,524	1,554	1,042	3,451	(623)	4,556	11,924	52.8%	



**Hawaii Employees' Retirement System**  
**Stress Test Exhibit 3B - Negative 20% Return Followed by 20-Year Period with 5% Returns**  
**Scenario B - Contribution Rates Kept at Current Statutory Rates**  
(Dollar Amounts in \$ Millions)

Valuation Date	Market Value of Assets	Actuarial Value of Assets	Unfunded			Normal Cost	Projected Employee Contributions	Projected Employer Contributions	Net Amortization	Benefit Payments	Covered Payroll	Funded Ratio
			Actuarial Accrued Liability	Actuarial Accrued Liability	Actuarial Accrued Liability							
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	
30-Jun-20	\$ 17,160	\$ 18,028	\$ 32,673	\$ 14,645	\$ 654	\$ 296	\$ 1,204	\$ 150	\$ 1,651	\$ 4,630	55.2%	
30-Jun-21	13,577	17,649	33,912	16,263	668	312	1,234	230	1,749	4,747	52.0%	
30-Jun-22	14,031	17,051	35,150	18,100	684	328	1,268	324	1,846	4,878	48.5%	
30-Jun-23	14,458	16,270	36,391	20,120	700	344	1,303	429	1,947	5,014	44.7%	
30-Jun-24	14,856	15,549	37,631	22,081	717	361	1,339	529	2,048	5,155	41.3%	
30-Jun-25	15,224	15,810	38,870	23,060	735	379	1,377	558	2,152	5,302	40.7%	
30-Jun-26	15,560	16,090	40,105	24,015	753	397	1,416	585	2,256	5,456	40.1%	
30-Jun-27	15,864	16,378	41,338	24,960	773	416	1,456	610	2,362	5,616	39.6%	
30-Jun-28	16,134	16,652	42,567	25,915	793	435	1,499	633	2,467	5,784	39.1%	
30-Jun-29	16,374	16,899	43,793	26,895	814	455	1,545	656	2,572	5,960	38.6%	
30-Jun-30	16,584	17,116	45,018	27,902	836	475	1,592	679	2,678	6,142	38.0%	
30-Jun-31	16,765	17,305	46,242	28,937	859	496	1,642	702	2,783	6,334	37.4%	
30-Jun-32	16,920	17,465	47,465	30,000	883	518	1,693	725	2,889	6,533	36.8%	
30-Jun-33	17,048	17,599	48,688	31,090	907	541	1,747	749	2,995	6,740	36.1%	
30-Jun-34	17,151	17,707	49,913	32,206	934	564	1,803	771	3,098	6,957	35.5%	
30-Jun-35	17,235	17,794	51,142	33,349	961	588	1,862	794	3,203	7,182	34.8%	
30-Jun-36	17,299	17,861	52,377	34,516	989	613	1,922	817	3,305	7,416	34.1%	
30-Jun-37	17,348	17,912	53,621	35,709	1,019	638	1,986	839	3,405	7,660	33.4%	
30-Jun-38	17,387	17,953	54,878	36,925	1,050	664	2,052	862	3,503	7,915	32.7%	
30-Jun-39	17,420	17,988	56,153	38,165	1,083	691	2,121	882	3,599	8,182	32.0%	
30-Jun-40	17,456	18,025	57,452	39,427	1,117	719	2,193	903	3,691	8,460	31.4%	
30-Jun-41	17,841	18,155	58,780	40,625	1,153	748	2,268	916	3,782	8,751	30.9%	
30-Jun-42	18,266	18,397	60,144	41,747	1,191	778	2,347	922	3,870	9,053	30.6%	
30-Jun-43	18,740	18,768	61,550	42,782	1,230	807	2,428	920	3,956	9,367	30.5%	
30-Jun-44	19,273	19,284	63,005	43,721	1,271	838	2,513	909	4,041	9,693	30.6%	
30-Jun-45	19,873	19,877	64,515	44,638	1,314	870	2,601	894	4,125	10,032	30.8%	
30-Jun-46	20,550	20,551	66,087	45,536	1,358	902	2,692	875	4,210	10,383	31.1%	
30-Jun-47	21,314	21,314	67,725	46,411	1,404	936	2,786	851	4,293	10,748	31.5%	
30-Jun-48	22,176	22,176	69,439	47,263	1,452	970	2,884	824	4,378	11,127	31.9%	
30-Jun-49	23,146	23,146	71,233	48,087	1,502	1,006	2,986	792	4,465	11,518	32.5%	
30-Jun-50	24,234	24,234	73,113	48,879	1,554	1,042	3,091	754	4,556	11,924	33.1%	





Hawaii Employees' Retirement System  
 Stress Test Exhibit 4 - Comparison of Cost Items at Current Investment Return Assumption  
 (7.0%)

All Other Employees

	Valuation Assumptions		10-Year Average of 30-Year Treasuries	
	Hired Prior to July 1, 2012	Hired After June 30, 2012	Hired Prior to July 1, 2012	Hired After June 30, 2012
Membership Tier				
Actuarial Accrued Liability	\$25,527	\$727	\$43,597	\$1,914
Total Normal Cost %	12.20%	11.86%	36.45%	30.96%
Employer Normal Cost %	7.80%	3.81%	32.04%	22.91%

Police and Fire Employees

	Valuation Assumptions		10-Year Average of 30-Year Treasuries	
	Hired Prior to July 1, 2012	Hired After June 30, 2012	Hired Prior to July 1, 2012	Hired After June 30, 2012
Membership Tier				
Actuarial Accrued Liability	\$6,321	\$98	\$11,145	\$260
Total Normal Cost %	27.12%	21.64%	78.31%	61.09%
Employer Normal Cost %	14.92%	7.44%	66.11%	46.89%

Dollar Amounts are in \$ Millions

