

DAVID Y. IGE
GOVERNOR



LAUREL A. JOHNSTON
DIRECTOR
DEPT. COMM. NO. 317
KEN N. KITAMURA
DEPUTY DIRECTOR

EMPLOYEES' RETIREMENT SYSTEM
HAWAII EMPLOYER UNION HEALTH BENEFITS TRUST FUND
OFFICE OF THE PUBLIC DEFENDER

STATE OF HAWAII
DEPARTMENT OF BUDGET AND FINANCE
P.O. BOX 150
HONOLULU, HAWAII 96810-0150

ADMINISTRATIVE AND RESEARCH OFFICE
BUDGET, PROGRAM PLANNING AND
MANAGEMENT DIVISION
FINANCIAL ADMINISTRATION DIVISION
OFFICE OF FEDERAL AWARDS MANAGEMENT (OFAM)

December 28, 2018

The Honorable Ronald D. Kouchi
President and
Members of the Senate
Thirtieth State Legislature
State Capitol, Room 409
Honolulu, HI 96813

The Honorable Scott K. Saiki
Speaker and Members of the
House of Representatives
Thirtieth State Legislature
State Capitol, Room 431
Honolulu, HI 96813

Dear President Kouchi, Speaker Saiki, and Members of the Legislature:

For your information and consideration, I am transmitting a copy of the Actuarial Asset and Liability Stress Test 2018 report, as required by Act 85, Session Laws of Hawaii 2017. In accordance with Section 93-16, Hawaii Revised Statutes, a copy of this report has been transmitted to the Legislature Reference Bureau and the report may be viewed electronically at <http://ers.ehawaii.gov/resources/reports-to-legislature>.

Sincerely,

LAUREL A. JOHNSTON
Director of Finance

Enclosure

- c: Legislative Reference Bureau
- ec: Governor's Office: Gov.ReportsDistribution@hawaii.gov
Lieutenant Governor's Office: LtGov.ReportsDistribution@hawaii.gov
Legislative Auditor: auditors2@auditor.state.hi.us
Department of Budget and Finance: DBFLeg.DIR@hawaii.gov

December 27, 2018

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 2043. For purposes of this projection we have assumed that the employer contribution would decrease to the employer normal cost rate once full funding is achieved.
2. Stress Test Exhibits 2A and 2B are identical. 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.
3. Under the first part of the 3rd Stress Test (see Stress Test Exhibit 3A) the employer contribution rates would increase in the year following the current statutory increases to 25.25% of pay for All Other Employees and 46.00% of pay for Police and Firefighters, and would increase again the following fiscal year to 25.75% of pay for All Other Employees and 47.00% of pay for Police and Firefighters 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 36% 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 3.38% as of July 1, 2018.

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, 2018. 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, 2018 actuarial valuation. These assumptions are detailed in the actuarial valuation report dated January 2019. 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.

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		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-18	\$ 16,598	\$ 16,513	\$ 29,917	\$ 13,405	\$ 609	\$ 267	\$ 893	\$ 370	\$ 1,589	\$ 4,384	55.2%
30-Jun-19	\$ 17,208	\$ 17,208	\$ 30,983	\$ 13,774	\$ 622	\$ 281	\$ 1,060	\$ 220	\$ 1,573	\$ 4,495	55.5%
30-Jun-20	\$ 18,157	\$ 18,157	\$ 32,152	\$ 13,995	\$ 637	\$ 297	\$ 1,197	\$ 93	\$ 1,663	\$ 4,619	56.5%
30-Jun-21	\$ 19,238	\$ 19,238	\$ 33,325	\$ 14,088	\$ 653	\$ 313	\$ 1,231	\$ 65	\$ 1,755	\$ 4,750	57.7%
30-Jun-22	\$ 20,349	\$ 20,349	\$ 34,502	\$ 14,153	\$ 670	\$ 329	\$ 1,266	\$ 34	\$ 1,847	\$ 4,885	59.0%
30-Jun-23	\$ 21,494	\$ 21,494	\$ 35,681	\$ 14,187	\$ 687	\$ 346	\$ 1,302	\$ (1)	\$ 1,943	\$ 5,026	60.2%
30-Jun-24	\$ 22,675	\$ 22,675	\$ 36,861	\$ 14,185	\$ 705	\$ 364	\$ 1,339	\$ (40)	\$ 2,041	\$ 5,172	61.5%
30-Jun-25	\$ 23,894	\$ 23,894	\$ 38,040	\$ 14,146	\$ 723	\$ 381	\$ 1,379	\$ (82)	\$ 2,141	\$ 5,325	62.8%
30-Jun-26	\$ 25,153	\$ 25,153	\$ 39,216	\$ 14,063	\$ 742	\$ 400	\$ 1,420	\$ (130)	\$ 2,241	\$ 5,485	64.1%
30-Jun-27	\$ 26,458	\$ 26,458	\$ 40,391	\$ 13,933	\$ 762	\$ 419	\$ 1,463	\$ (184)	\$ 2,341	\$ 5,652	65.5%
30-Jun-28	\$ 27,816	\$ 27,816	\$ 41,566	\$ 13,749	\$ 783	\$ 439	\$ 1,509	\$ (242)	\$ 2,440	\$ 5,827	66.9%
30-Jun-29	\$ 29,233	\$ 29,233	\$ 42,740	\$ 13,508	\$ 806	\$ 459	\$ 1,556	\$ (306)	\$ 2,539	\$ 6,011	68.4%
30-Jun-30	\$ 30,716	\$ 30,716	\$ 43,918	\$ 13,202	\$ 829	\$ 481	\$ 1,606	\$ (377)	\$ 2,637	\$ 6,202	69.9%
30-Jun-31	\$ 32,273	\$ 32,273	\$ 45,098	\$ 12,825	\$ 853	\$ 502	\$ 1,657	\$ (454)	\$ 2,737	\$ 6,401	71.6%
30-Jun-32	\$ 33,912	\$ 33,912	\$ 46,283	\$ 12,371	\$ 878	\$ 525	\$ 1,711	\$ (539)	\$ 2,836	\$ 6,608	73.3%
30-Jun-33	\$ 35,641	\$ 35,641	\$ 47,473	\$ 11,833	\$ 904	\$ 548	\$ 1,767	\$ (631)	\$ 2,936	\$ 6,824	75.1%
30-Jun-34	\$ 37,468	\$ 37,468	\$ 48,670	\$ 11,201	\$ 931	\$ 572	\$ 1,825	\$ (732)	\$ 3,034	\$ 7,048	77.0%
30-Jun-35	\$ 39,407	\$ 39,407	\$ 49,876	\$ 10,469	\$ 959	\$ 597	\$ 1,885	\$ (843)	\$ 3,132	\$ 7,281	79.0%
30-Jun-36	\$ 41,467	\$ 41,467	\$ 51,093	\$ 9,626	\$ 988	\$ 622	\$ 1,948	\$ (962)	\$ 3,228	\$ 7,524	81.2%
30-Jun-37	\$ 43,662	\$ 43,662	\$ 52,325	\$ 8,664	\$ 1,019	\$ 649	\$ 2,013	\$ (1,093)	\$ 3,323	\$ 7,777	83.4%
30-Jun-38	\$ 46,006	\$ 46,006	\$ 53,577	\$ 7,571	\$ 1,051	\$ 675	\$ 2,082	\$ (1,235)	\$ 3,415	\$ 8,040	85.9%
30-Jun-39	\$ 48,517	\$ 48,517	\$ 54,853	\$ 6,336	\$ 1,084	\$ 704	\$ 2,153	\$ (1,389)	\$ 3,505	\$ 8,316	88.4%
30-Jun-40	\$ 51,212	\$ 51,212	\$ 56,159	\$ 4,947	\$ 1,120	\$ 732	\$ 2,227	\$ (1,556)	\$ 3,592	\$ 8,602	91.2%
30-Jun-41	\$ 54,111	\$ 54,111	\$ 57,501	\$ 3,390	\$ 1,156	\$ 761	\$ 2,304	\$ (1,738)	\$ 3,677	\$ 8,901	94.1%
30-Jun-42	\$ 57,233	\$ 57,233	\$ 58,886	\$ 1,653	\$ 1,194	\$ 791	\$ 2,385	\$ (1,934)	\$ 3,760	\$ 9,211	97.2%
30-Jun-43	\$ 60,602	\$ 60,602	\$ 60,321	\$ (281)	\$ 1,234	\$ 822	\$ 412	\$ (20)	\$ 3,840	\$ 9,533	100.5%
30-Jun-44	\$ 62,114	\$ 62,114	\$ 61,813	\$ (301)	\$ 1,275	\$ 854	\$ 422	\$ (21)	\$ 3,920	\$ 9,868	100.5%
30-Jun-45	\$ 63,691	\$ 63,691	\$ 63,369	\$ (322)	\$ 1,319	\$ 886	\$ 433	\$ (23)	\$ 4,000	\$ 10,215	100.5%
30-Jun-46	\$ 65,338	\$ 65,338	\$ 64,993	\$ (344)	\$ 1,363	\$ 919	\$ 444	\$ (24)	\$ 4,081	\$ 10,575	100.5%
30-Jun-47	\$ 67,062	\$ 67,062	\$ 66,694	\$ (368)	\$ 1,410	\$ 953	\$ 458	\$ (26)	\$ 4,161	\$ 10,949	100.6%
30-Jun-48	\$ 68,872	\$ 68,872	\$ 68,478	\$ (394)	\$ 1,459	\$ 987	\$ 471	\$ (28)	\$ 4,242	\$ 11,336	100.6%

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 (1)	Market Value of Assets (2)	Actuarial Value of Assets (3)	Actuarial Accrued Liability (4)	Unfunded		Projected Employee Contributions (7)	Projected Employer Contributions (8)	Net Amortization (9)	Benefit Payments (10)	Covered Payroll (11)	Funded Ratio (12)
				Actuarial Accrued Liability (5)	Normal Cost (6)						
30-Jun-18	\$ 16,598	\$ 16,513	\$ 29,917	\$ 13,405	\$ 609	\$ 267	\$ 893	\$ 370	\$ 1,589	\$ 4,384	55.2%
30-Jun-19	16,972	17,149	30,983	13,833	622	281	1,060	224	1,573	4,495	55.4%
30-Jun-20	17,568	17,918	32,152	14,234	637	297	1,197	110	1,663	4,619	55.7%
30-Jun-21	18,257	18,691	33,325	14,634	653	313	1,231	103	1,755	4,750	56.1%
30-Jun-22	18,937	19,405	34,502	15,097	670	329	1,266	100	1,847	4,885	56.2%
30-Jun-23	19,607	20,097	35,681	15,584	687	346	1,302	97	1,943	5,026	56.3%
30-Jun-24	20,267	20,775	36,861	16,086	705	364	1,339	93	2,041	5,172	56.4%
30-Jun-25	20,915	21,532	38,040	16,508	723	381	1,379	83	2,141	5,325	56.6%
30-Jun-26	21,551	22,219	39,216	16,997	742	400	1,420	75	2,241	5,485	56.7%
30-Jun-27	22,178	22,871	40,391	17,520	762	419	1,463	67	2,341	5,652	56.6%
30-Jun-28	22,797	23,514	41,566	18,051	783	439	1,509	60	2,440	5,827	56.6%
30-Jun-29	23,412	24,149	42,740	18,591	806	459	1,556	50	2,539	6,011	56.5%
30-Jun-30	24,024	24,782	43,918	19,135	829	481	1,606	39	2,637	6,202	56.4%
30-Jun-31	24,638	25,417	45,098	19,682	853	502	1,657	26	2,737	6,401	56.4%
30-Jun-32	25,256	26,055	46,283	20,229	878	525	1,711	11	2,836	6,608	56.3%
30-Jun-33	25,879	26,698	47,473	20,775	904	548	1,767	(5)	2,936	6,824	56.2%
30-Jun-34	26,512	27,352	48,670	21,318	931	572	1,825	(24)	3,034	7,048	56.2%
30-Jun-35	27,160	28,020	49,876	21,856	959	597	1,885	(46)	3,132	7,281	56.2%
30-Jun-36	27,826	28,707	51,093	22,386	988	622	1,948	(69)	3,228	7,524	56.2%
30-Jun-37	28,516	29,419	52,325	22,906	1,019	649	2,013	(96)	3,323	7,777	56.2%
30-Jun-38	29,237	30,162	53,577	23,415	1,051	675	2,082	(126)	3,415	8,040	56.3%
30-Jun-39	29,996	30,944	54,853	23,909	1,084	704	2,153	(159)	3,505	8,316	56.4%
30-Jun-40	30,801	31,774	56,159	24,385	1,120	732	2,227	(196)	3,592	8,602	56.6%
30-Jun-41	31,661	32,660	57,501	24,841	1,156	761	2,304	(236)	3,677	8,901	56.8%
30-Jun-42	32,586	33,612	58,886	25,274	1,194	791	2,385	(280)	3,760	9,211	57.1%
30-Jun-43	33,584	34,640	60,321	25,681	1,234	822	2,468	(329)	3,840	9,533	57.4%
30-Jun-44	34,665	35,753	61,813	26,061	1,275	854	2,555	(382)	3,920	9,868	57.8%
30-Jun-45	35,838	36,960	63,369	26,408	1,319	886	2,645	(439)	4,000	10,215	58.3%
30-Jun-46	37,111	38,271	64,993	26,722	1,363	919	2,738	(502)	4,081	10,575	58.9%
30-Jun-47	38,495	39,695	66,694	26,999	1,410	953	2,835	(569)	4,161	10,949	59.5%
30-Jun-48	39,998	41,242	68,478	27,236	1,459	987	2,935	(642)	4,242	11,336	60.2%

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)	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 Accrued Liability (5)								
30-Jun-18	\$ 16,598	\$ 16,513	\$ 29,917	\$ 13,405	\$ 609	\$ 267	\$ 893	\$ 370	\$ 1,589	\$ 4,384	55.2%	
30-Jun-19	16,972	17,149	30,983	13,833	622	281	1,060	224	1,573	4,495	55.4%	
30-Jun-20	17,568	17,918	32,152	14,234	637	297	1,197	110	1,663	4,619	55.7%	
30-Jun-21	18,257	18,691	33,325	14,634	653	313	1,231	103	1,755	4,750	56.1%	
30-Jun-22	18,937	19,405	34,502	15,097	670	329	1,266	100	1,847	4,885	56.2%	
30-Jun-23	19,607	20,097	35,681	15,584	687	346	1,302	97	1,943	5,026	56.3%	
30-Jun-24	20,267	20,775	36,861	16,086	705	364	1,339	93	2,041	5,172	56.4%	
30-Jun-25	20,915	21,532	38,040	16,508	723	381	1,379	83	2,141	5,325	56.6%	
30-Jun-26	21,551	22,219	39,216	16,997	742	400	1,420	75	2,241	5,485	56.7%	
30-Jun-27	22,178	22,871	40,391	17,520	762	419	1,463	67	2,341	5,652	56.6%	
30-Jun-28	22,797	23,514	41,566	18,051	783	439	1,509	60	2,440	5,827	56.6%	
30-Jun-29	23,412	24,149	42,740	18,591	806	459	1,556	50	2,539	6,011	56.5%	
30-Jun-30	24,024	24,782	43,918	19,135	829	481	1,606	39	2,637	6,202	56.4%	
30-Jun-31	24,638	25,417	45,098	19,682	853	502	1,657	26	2,737	6,401	56.4%	
30-Jun-32	25,256	26,055	46,283	20,229	878	525	1,711	11	2,836	6,608	56.3%	
30-Jun-33	25,879	26,698	47,473	20,775	904	548	1,767	(5)	2,936	6,824	56.2%	
30-Jun-34	26,512	27,352	48,670	21,318	931	572	1,825	(24)	3,034	7,048	56.2%	
30-Jun-35	27,160	28,020	49,876	21,856	959	597	1,885	(46)	3,132	7,281	56.2%	
30-Jun-36	27,826	28,707	51,093	22,386	988	622	1,948	(69)	3,228	7,524	56.2%	
30-Jun-37	28,516	29,419	52,325	22,906	1,019	649	2,013	(96)	3,323	7,777	56.2%	
30-Jun-38	29,237	30,162	53,577	23,415	1,051	675	2,082	(126)	3,415	8,040	56.3%	
30-Jun-39	29,996	30,944	54,853	23,909	1,084	704	2,153	(159)	3,505	8,316	56.4%	
30-Jun-40	30,801	31,774	56,159	24,385	1,120	732	2,227	(196)	3,592	8,602	56.6%	
30-Jun-41	31,661	32,660	57,501	24,841	1,156	761	2,304	(236)	3,677	8,901	56.8%	
30-Jun-42	32,586	33,612	58,886	25,274	1,194	791	2,385	(280)	3,760	9,211	57.1%	
30-Jun-43	33,584	34,640	60,321	25,681	1,234	822	2,468	(329)	3,840	9,533	57.4%	
30-Jun-44	34,665	35,753	61,813	26,061	1,275	854	2,555	(382)	3,920	9,868	57.8%	
30-Jun-45	35,838	36,960	63,369	26,408	1,319	886	2,645	(439)	4,000	10,215	58.3%	
30-Jun-46	37,111	38,271	64,993	26,722	1,363	919	2,738	(502)	4,081	10,575	58.9%	
30-Jun-47	38,495	39,695	66,694	26,999	1,410	953	2,835	(569)	4,161	10,949	59.5%	
30-Jun-48	39,998	41,242	68,478	27,236	1,459	987	2,935	(642)	4,242	11,336	60.2%	

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 Accrued Liability (5)								
30-Jun-18	\$ 16,598	\$ 16,513	\$ 29,917	\$ 13,405	\$ 609	\$ 267	\$ 893	\$ 370	\$ 1,589	\$ 4,384	55.2%	
30-Jun-19	12,881	16,127	30,983	14,856	622	281	1,060	296	1,573	4,495	52.0%	
30-Jun-20	13,271	15,256	32,152	16,896	637	297	1,197	296	1,663	4,619	47.4%	
30-Jun-21	13,746	14,635	33,325	18,691	653	313	1,310	305	1,755	4,750	43.9%	
30-Jun-22	14,282	14,730	34,502	19,772	670	329	1,374	315	1,847	4,885	42.7%	
30-Jun-23	14,831	15,231	35,681	20,450	687	346	1,414	322	1,943	5,026	42.7%	
30-Jun-24	15,367	15,758	36,861	21,102	705	364	1,454	325	2,041	5,172	42.8%	
30-Jun-25	15,888	16,357	38,040	21,682	723	381	1,497	323	2,141	5,325	43.0%	
30-Jun-26	16,393	16,901	39,216	22,315	742	400	1,542	321	2,241	5,485	43.1%	
30-Jun-27	16,887	17,414	40,391	22,977	762	419	1,589	320	2,341	5,652	43.1%	
30-Jun-28	17,371	17,916	41,566	23,649	783	439	1,638	317	2,440	5,827	43.1%	
30-Jun-29	17,846	18,408	42,740	24,332	806	459	1,690	314	2,539	6,011	43.1%	
30-Jun-30	18,317	18,895	43,918	25,022	829	481	1,743	308	2,637	6,202	43.0%	
30-Jun-31	18,787	19,381	45,098	25,718	853	502	1,799	301	2,737	6,401	43.0%	
30-Jun-32	19,258	19,867	46,283	26,416	878	525	1,858	293	2,836	6,608	42.9%	
30-Jun-33	19,732	20,357	47,473	27,117	904	548	1,918	282	2,936	6,824	42.9%	
30-Jun-34	20,213	20,853	48,670	27,817	931	572	1,981	269	3,034	7,048	42.8%	
30-Jun-35	20,706	21,362	49,876	28,514	959	597	2,047	253	3,132	7,281	42.8%	
30-Jun-36	21,216	21,887	51,093	29,206	988	622	2,115	235	3,228	7,524	42.8%	
30-Jun-37	21,747	22,435	52,325	29,891	1,019	649	2,186	214	3,323	7,777	42.9%	
30-Jun-38	22,306	23,011	53,577	30,566	1,051	675	2,260	190	3,415	8,040	43.0%	
30-Jun-39	22,901	23,625	54,853	31,228	1,084	704	2,338	162	3,505	8,316	43.1%	
30-Jun-40	23,994	24,397	56,159	31,762	1,120	732	2,418	123	3,592	8,602	43.4%	
30-Jun-41	25,186	25,355	57,501	32,146	1,156	761	2,502	71	3,677	8,901	44.1%	
30-Jun-42	26,488	26,524	58,886	32,362	1,194	791	2,589	4	3,760	9,211	45.0%	
30-Jun-43	27,917	27,932	60,321	32,390	1,234	822	2,680	(78)	3,840	9,533	46.3%	
30-Jun-44	29,486	29,491	61,813	32,322	1,275	854	2,774	(171)	3,920	9,868	47.7%	
30-Jun-45	31,212	31,213	63,369	32,156	1,319	886	2,872	(272)	4,000	10,215	49.3%	
30-Jun-46	33,108	33,109	64,993	31,885	1,363	919	2,973	(383)	4,081	10,575	50.9%	
30-Jun-47	35,192	35,192	66,694	31,502	1,410	953	3,078	(505)	4,161	10,949	52.8%	
30-Jun-48	37,481	37,481	68,478	30,997	1,459	987	3,187	(639)	4,242	11,336	54.7%	

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 (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 Accrued Liability (5)	Normal Cost (6)							
30-Jun-18	\$ 16,598	\$ 16,513	\$ 29,917	\$ 13,405	\$ 609	\$ 267	\$ 893	\$ 370	\$ 1,589	\$ 4,384	55.2%	
30-Jun-19	12,881	16,127	30,983	14,856	622	281	1,060	296	1,573	4,495	52.0%	
30-Jun-20	13,271	15,256	32,152	16,896	637	297	1,197	296	1,663	4,619	47.4%	
30-Jun-21	13,746	14,635	33,325	18,691	653	313	1,231	387	1,755	4,750	43.9%	
30-Jun-22	14,200	14,648	34,502	19,854	670	329	1,266	433	1,847	4,885	42.5%	
30-Jun-23	14,634	15,032	35,681	20,649	687	346	1,302	451	1,943	5,026	42.1%	
30-Jun-24	15,045	15,432	36,861	21,429	705	364	1,339	467	2,041	5,172	41.9%	
30-Jun-25	15,432	15,893	38,040	22,147	723	381	1,379	478	2,141	5,325	41.8%	
30-Jun-26	15,794	16,288	39,216	22,928	742	400	1,420	490	2,241	5,485	41.5%	
30-Jun-27	16,133	16,642	40,391	23,749	762	419	1,463	503	2,341	5,652	41.2%	
30-Jun-28	16,450	16,972	41,566	24,593	783	439	1,509	517	2,440	5,827	40.8%	
30-Jun-29	16,747	17,280	42,740	25,460	806	459	1,556	531	2,539	6,011	40.4%	
30-Jun-30	17,026	17,570	43,918	26,348	829	481	1,606	544	2,637	6,202	40.0%	
30-Jun-31	17,290	17,844	45,098	27,255	853	502	1,657	556	2,737	6,401	39.6%	
30-Jun-32	17,541	18,103	46,283	28,180	878	525	1,711	568	2,836	6,608	39.1%	
30-Jun-33	17,778	18,349	47,473	29,124	904	548	1,767	579	2,936	6,824	38.7%	
30-Jun-34	18,006	18,585	48,670	30,085	931	572	1,825	589	3,034	7,048	38.2%	
30-Jun-35	18,228	18,815	49,876	31,061	959	597	1,885	599	3,132	7,281	37.7%	
30-Jun-36	18,448	19,042	51,093	32,051	988	622	1,948	607	3,228	7,524	37.3%	
30-Jun-37	18,669	19,270	52,325	33,055	1,019	649	2,013	614	3,323	7,777	36.8%	
30-Jun-38	18,898	19,506	53,577	34,071	1,051	675	2,082	620	3,415	8,040	36.4%	
30-Jun-39	19,140	19,755	54,853	35,098	1,084	704	2,153	624	3,505	8,316	36.0%	
30-Jun-40	19,778	20,120	56,159	36,039	1,120	732	2,227	620	3,592	8,602	35.8%	
30-Jun-41	20,477	20,619	57,501	36,882	1,156	761	2,304	607	3,677	8,901	35.9%	
30-Jun-42	21,245	21,275	58,886	37,611	1,194	791	2,385	583	3,760	9,211	36.1%	
30-Jun-43	22,095	22,107	60,321	38,214	1,234	822	2,468	548	3,840	9,533	36.6%	
30-Jun-44	23,038	23,042	61,813	38,772	1,275	854	2,555	508	3,920	9,868	37.3%	
30-Jun-45	24,085	24,086	63,369	39,283	1,319	886	2,645	462	4,000	10,215	38.0%	
30-Jun-46	25,247	25,248	64,993	39,746	1,363	919	2,738	410	4,081	10,575	38.8%	
30-Jun-47	26,538	26,538	66,694	40,156	1,410	953	2,835	352	4,161	10,949	39.8%	
30-Jun-48	27,970	27,970	68,478	40,508	1,459	987	2,935	287	4,242	11,336	40.8%	

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

All Other Employees

	<u>Valuation Assumptions</u>		<u>10-Year Average of 30-Year Treasuries</u>	
	<u>Hired Prior to July 1, 2012</u>	<u>Hired After June 30, 2012</u>	<u>Hired Prior to July 1, 2012</u>	<u>Hired After June 30, 2012</u>
Membership Tier				
Actuarial Accrued Liability	\$23,825	\$454	\$39,033	\$1,046
Total Normal Cost %	12.47%	12.12%	32.85%	28.45%
Employer Normal Cost %	8.63%	2.96%	29.20%	18.75%

Police and Fire Employees

	<u>Valuation Assumptions</u>		<u>10-Year Average of 30-Year Treasuries</u>	
	<u>Hired Prior to July 1, 2012</u>	<u>Hired After June 30, 2012</u>	<u>Hired Prior to July 1, 2012</u>	<u>Hired After June 30, 2012</u>
Membership Tier				
Actuarial Accrued Liability	\$5,585	\$53	\$9,389	\$129
Total Normal Cost %	26.18%	21.12%	68.60%	53.99%
Employer Normal Cost %	13.98%	6.92%	56.40%	39.79%

Dollar Amounts are in \$ Millions