

DAVID Y. IGE  
GOVERNOR



WESLEY K. MACHIDA  
DIRECTOR

LAUREL A. JOHNSTON  
DEPUTY DIRECTOR

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

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

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

December 27, 2017

The Honorable Ronald D. Kouchi,  
President and  
Members of the Senate  
Twenty-Ninth State Legislature  
State Capitol, Room 409  
Honolulu, Hawaii 96813

The Honorable Scott K. Saiki,  
Speaker and Members of the  
House of Representatives  
Twenty-Ninth State Legislature  
State Capitol, Room 431  
Honolulu, Hawaii 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 2017 report, as required by Act 85, Session Laws of Hawaii 2017. In accordance with Section 93-16, Hawaii Revised Statutes, the report may be viewed electronically at <http://ers.ehawaii.gov/resources/report-to-legislature>.

Sincerely,

WESLEY K. MACHIDA  
Director of Finance

Enclosure

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



December 26, 2017

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.
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.
  - b. The second scenario shows the projected items assuming no change in the current statutory contribution rates.

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.
  - b. The second scenario shows the projected items assuming no change in the current statutory contribution rates.
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.

### **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 2044. 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 Stress Test 3A the employer contribution rates would increase in the year following the current statutory increases to 26% of pay for All Other Employees and 46.5% of pay for Police and Firefighters, and remain at those levels for the foreseeable future. Under Stress Test 3B (Employer Contributions remain at statutory rates) the funded ratio would decline below 40% 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 3.55% as of July 1, 2017.

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 July 1, 2017. 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 July 1, 2017 actuarial valuation. These assumptions are detailed in the actuarial valuation report dated January 2018. 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 Projections Item 1**  
(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-17	\$ 15,638	\$ 15,701	\$ 28,649	\$ 12,948	\$ 579	\$ 252	\$ 817	\$ 398	\$ 1,491	\$ 4,265	54.8%	
30-Jun-18	\$ 16,282	\$ 16,316	\$ 29,710	\$ 13,394	\$ 591	\$ 267	\$ 892	\$ 350	\$ 1,486	\$ 4,375	54.9%	
30-Jun-19	\$ 17,067	\$ 17,071	\$ 30,864	\$ 13,793	\$ 605	\$ 282	\$ 1,062	\$ 201	\$ 1,575	\$ 4,497	55.3%	
30-Jun-20	\$ 18,007	\$ 18,010	\$ 32,022	\$ 14,012	\$ 620	\$ 298	\$ 1,200	\$ 73	\$ 1,666	\$ 4,625	56.2%	
30-Jun-21	\$ 19,077	\$ 19,078	\$ 33,181	\$ 14,103	\$ 636	\$ 314	\$ 1,235	\$ 43	\$ 1,759	\$ 4,759	57.5%	
30-Jun-22	\$ 20,178	\$ 20,178	\$ 34,342	\$ 14,164	\$ 652	\$ 331	\$ 1,270	\$ 10	\$ 1,853	\$ 4,897	58.8%	
30-Jun-23	\$ 21,313	\$ 21,313	\$ 35,504	\$ 14,192	\$ 669	\$ 348	\$ 1,308	\$ (26)	\$ 1,949	\$ 5,042	60.0%	
30-Jun-24	\$ 22,483	\$ 22,483	\$ 36,666	\$ 14,184	\$ 687	\$ 366	\$ 1,346	\$ (67)	\$ 2,047	\$ 5,193	61.3%	
30-Jun-25	\$ 23,691	\$ 23,691	\$ 37,826	\$ 14,135	\$ 706	\$ 384	\$ 1,386	\$ (112)	\$ 2,146	\$ 5,350	62.6%	
30-Jun-26	\$ 24,942	\$ 24,942	\$ 38,985	\$ 14,043	\$ 725	\$ 403	\$ 1,429	\$ (162)	\$ 2,245	\$ 5,515	64.0%	
30-Jun-27	\$ 26,240	\$ 26,240	\$ 40,141	\$ 13,901	\$ 745	\$ 423	\$ 1,473	\$ (217)	\$ 2,344	\$ 5,688	65.4%	
30-Jun-28	\$ 27,592	\$ 27,592	\$ 41,297	\$ 13,705	\$ 766	\$ 443	\$ 1,519	\$ (277)	\$ 2,442	\$ 5,868	66.8%	
30-Jun-29	\$ 29,006	\$ 29,006	\$ 42,455	\$ 13,449	\$ 788	\$ 464	\$ 1,567	\$ (344)	\$ 2,539	\$ 6,056	68.3%	
30-Jun-30	\$ 30,488	\$ 30,488	\$ 43,615	\$ 13,127	\$ 811	\$ 485	\$ 1,617	\$ (417)	\$ 2,637	\$ 6,253	69.9%	
30-Jun-31	\$ 32,047	\$ 32,047	\$ 44,780	\$ 12,733	\$ 835	\$ 507	\$ 1,670	\$ (497)	\$ 2,734	\$ 6,457	71.6%	
30-Jun-32	\$ 33,691	\$ 33,691	\$ 45,951	\$ 12,260	\$ 860	\$ 530	\$ 1,724	\$ (584)	\$ 2,832	\$ 6,670	73.3%	
30-Jun-33	\$ 35,428	\$ 35,428	\$ 47,128	\$ 11,700	\$ 886	\$ 554	\$ 1,781	\$ (680)	\$ 2,929	\$ 6,891	75.2%	
30-Jun-34	\$ 37,269	\$ 37,269	\$ 48,314	\$ 11,045	\$ 913	\$ 579	\$ 1,840	\$ (784)	\$ 3,024	\$ 7,121	77.1%	
30-Jun-35	\$ 39,226	\$ 39,226	\$ 49,513	\$ 10,287	\$ 941	\$ 604	\$ 1,902	\$ (898)	\$ 3,119	\$ 7,361	79.2%	
30-Jun-36	\$ 41,311	\$ 41,311	\$ 50,726	\$ 9,415	\$ 971	\$ 630	\$ 1,966	\$ (1,022)	\$ 3,213	\$ 7,610	81.4%	
30-Jun-37	\$ 43,537	\$ 43,537	\$ 51,958	\$ 8,420	\$ 1,001	\$ 656	\$ 2,033	\$ (1,157)	\$ 3,304	\$ 7,869	83.8%	
30-Jun-38	\$ 45,921	\$ 45,921	\$ 53,212	\$ 7,292	\$ 1,033	\$ 684	\$ 2,103	\$ (1,304)	\$ 3,393	\$ 8,139	86.3%	
30-Jun-39	\$ 48,479	\$ 48,479	\$ 54,496	\$ 6,017	\$ 1,066	\$ 712	\$ 2,176	\$ (1,464)	\$ 3,480	\$ 8,421	89.0%	
30-Jun-40	\$ 51,229	\$ 51,229	\$ 55,813	\$ 4,584	\$ 1,101	\$ 741	\$ 2,252	\$ (1,637)	\$ 3,565	\$ 8,714	91.8%	
30-Jun-41	\$ 54,193	\$ 54,193	\$ 57,171	\$ 2,979	\$ 1,137	\$ 771	\$ 2,332	\$ (1,825)	\$ 3,647	\$ 9,019	94.8%	
30-Jun-42	\$ 57,390	\$ 57,390	\$ 58,577	\$ 1,187	\$ 1,175	\$ 801	\$ 2,414	\$ (2,028)	\$ 3,727	\$ 9,336	98.0%	
30-Jun-43	\$ 60,844	\$ 60,844	\$ 60,037	\$ (807)	\$ 1,214	\$ 833	\$ 753	\$ (441)	\$ 3,806	\$ 9,665	101.3%	
30-Jun-44	\$ 62,772	\$ 62,772	\$ 61,558	\$ (1,214)	\$ 1,255	\$ 865	\$ 406	\$ (101)	\$ 3,884	\$ 10,007	102.0%	
30-Jun-45	\$ 64,426	\$ 64,426	\$ 63,148	\$ (1,279)	\$ 1,298	\$ 898	\$ 420	\$ (111)	\$ 3,963	\$ 10,361	102.0%	
30-Jun-46	\$ 66,163	\$ 66,163	\$ 64,811	\$ (1,352)	\$ 1,342	\$ 931	\$ 435	\$ (120)	\$ 4,042	\$ 10,728	102.1%	
30-Jun-47	\$ 67,988	\$ 67,988	\$ 66,555	\$ (1,433)	\$ 1,388	\$ 966	\$ 451	\$ (130)	\$ 4,122	\$ 11,107	102.2%	

## Hawaii Employees Retirement System

Stress Test Projections Item 2 - 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	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-17	\$ 15,638	\$ 15,701	\$ 28,649	\$ 12,948	\$ 579	\$ 252	\$ 817	\$ 398	\$ 1,491	\$ 4,265	54.8%	
30-Jun-18	15,973	16,239	29,710	13,471	591	267	892	355	1,486	4,375	54.7%	
30-Jun-19	16,421	16,829	30,864	14,035	605	282	1,062	218	1,575	4,497	54.5%	
30-Jun-20	16,990	17,501	32,022	14,520	620	298	1,200	108	1,666	4,625	54.7%	
30-Jun-21	17,651	18,192	33,181	14,989	636	314	1,235	105	1,759	4,759	54.8%	
30-Jun-22	18,301	18,868	34,342	15,474	652	331	1,270	102	1,853	4,897	54.9%	
30-Jun-23	18,940	19,530	35,504	15,974	669	348	1,308	98	1,949	5,042	55.0%	
30-Jun-24	19,568	20,180	36,666	16,486	687	366	1,346	94	2,047	5,193	55.0%	
30-Jun-25	20,185	20,818	37,826	17,009	706	384	1,386	89	2,146	5,350	55.0%	
30-Jun-26	20,791	21,444	38,985	17,541	725	403	1,429	83	2,245	5,515	55.0%	
30-Jun-27	21,387	22,060	40,141	18,082	745	423	1,473	76	2,344	5,688	55.0%	
30-Jun-28	21,976	22,668	41,297	18,629	766	443	1,519	68	2,442	5,868	54.9%	
30-Jun-29	22,561	23,273	42,455	19,182	788	464	1,567	58	2,539	6,056	54.8%	
30-Jun-30	23,146	23,877	43,615	19,738	811	485	1,617	46	2,637	6,253	54.7%	
30-Jun-31	23,734	24,484	44,780	20,296	835	507	1,670	33	2,734	6,457	54.7%	
30-Jun-32	24,327	25,097	45,951	20,854	860	530	1,724	17	2,832	6,670	54.6%	
30-Jun-33	24,928	25,717	47,128	21,411	886	554	1,781	(0)	2,929	6,891	54.6%	
30-Jun-34	25,542	26,350	48,314	21,964	913	579	1,840	(20)	3,024	7,121	54.5%	
30-Jun-35	26,173	27,002	49,513	22,511	941	604	1,902	(43)	3,119	7,361	54.5%	
30-Jun-36	26,827	27,676	50,726	23,050	971	630	1,966	(68)	3,213	7,610	54.6%	
30-Jun-37	27,509	28,379	51,958	23,578	1,001	656	2,033	(96)	3,304	7,869	54.6%	
30-Jun-38	28,227	29,119	53,212	24,094	1,033	684	2,103	(128)	3,393	8,139	54.7%	
30-Jun-39	28,987	29,903	54,496	24,593	1,066	712	2,176	(163)	3,480	8,421	54.9%	
30-Jun-40	29,800	30,740	55,813	25,073	1,101	741	2,252	(203)	3,565	8,714	55.1%	
30-Jun-41	30,673	31,639	57,171	25,532	1,137	771	2,332	(246)	3,647	9,019	55.3%	
30-Jun-42	31,616	32,610	58,577	25,967	1,175	801	2,414	(293)	3,727	9,336	55.7%	
30-Jun-43	32,639	33,664	60,037	26,373	1,214	833	2,500	(345)	3,806	9,665	56.1%	
30-Jun-44	33,751	34,808	61,558	26,750	1,255	865	2,588	(401)	3,884	10,007	56.5%	
30-Jun-45	34,961	36,054	63,148	27,094	1,298	898	2,681	(462)	3,963	10,361	57.1%	
30-Jun-46	36,278	37,409	64,811	27,403	1,342	931	2,776	(528)	4,042	10,728	57.7%	
30-Jun-47	37,710	38,883	66,555	27,673	1,388	966	2,874	(599)	4,122	11,107	58.4%	

**Hawaii Employees Retirement System**  
**Stress Test Projections Item 2 - Actual Returns are 5% (2% Less than Assumed)**  
**Scenario B - Contribution Rates Kept at Current Statutor Rates**  
(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	Normal Cost							
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	
30-Jun-17	\$ 15,638	\$ 15,701	\$ 28,649	\$ 12,948	\$ 579	\$ 252	\$ 817	\$ 398	\$ 1,491	\$ 4,265	54.8%	
30-Jun-18	15,973	16,239	29,710	13,471	591	267	892	355	1,486	4,375	54.7%	
30-Jun-19	16,421	16,829	30,864	14,035	605	282	1,062	218	1,575	4,497	54.5%	
30-Jun-20	16,990	17,501	32,022	14,520	620	298	1,200	108	1,666	4,625	54.7%	
30-Jun-21	17,651	18,192	33,181	14,989	636	314	1,235	105	1,759	4,759	54.8%	
30-Jun-22	18,301	18,868	34,342	15,474	652	331	1,270	102	1,853	4,897	54.9%	
30-Jun-23	18,940	19,530	35,504	15,974	669	348	1,308	98	1,949	5,042	55.0%	
30-Jun-24	19,568	20,180	36,666	16,486	687	366	1,346	94	2,047	5,193	55.0%	
30-Jun-25	20,185	20,818	37,826	17,009	706	384	1,386	89	2,146	5,350	55.0%	
30-Jun-26	20,791	21,444	38,985	17,541	725	403	1,429	83	2,245	5,515	55.0%	
30-Jun-27	21,387	22,060	40,141	18,082	745	423	1,473	76	2,344	5,688	55.0%	
30-Jun-28	21,976	22,668	41,297	18,629	766	443	1,519	68	2,442	5,868	54.9%	
30-Jun-29	22,561	23,273	42,455	19,182	788	464	1,567	58	2,539	6,056	54.8%	
30-Jun-30	23,146	23,877	43,615	19,738	811	485	1,617	46	2,637	6,253	54.7%	
30-Jun-31	23,734	24,484	44,780	20,296	835	507	1,670	33	2,734	6,457	54.7%	
30-Jun-32	24,327	25,097	45,951	20,854	860	530	1,724	17	2,832	6,670	54.6%	
30-Jun-33	24,928	25,717	47,128	21,411	886	554	1,781	(0)	2,929	6,891	54.6%	
30-Jun-34	25,542	26,350	48,314	21,964	913	579	1,840	(20)	3,024	7,121	54.5%	
30-Jun-35	26,173	27,002	49,513	22,511	941	604	1,902	(43)	3,119	7,361	54.5%	
30-Jun-36	26,827	27,676	50,726	23,050	971	630	1,966	(68)	3,213	7,610	54.6%	
30-Jun-37	27,509	28,379	51,958	23,578	1,001	656	2,033	(96)	3,304	7,869	54.6%	
30-Jun-38	28,227	29,119	53,212	24,094	1,033	684	2,103	(128)	3,393	8,139	54.7%	
30-Jun-39	28,987	29,903	54,496	24,593	1,066	712	2,176	(163)	3,480	8,421	54.9%	
30-Jun-40	29,800	30,740	55,813	25,073	1,101	741	2,252	(203)	3,565	8,714	55.1%	
30-Jun-41	30,673	31,639	57,171	25,532	1,137	771	2,332	(246)	3,647	9,019	55.3%	
30-Jun-42	31,616	32,610	58,577	25,967	1,175	801	2,414	(293)	3,727	9,336	55.7%	
30-Jun-43	32,639	33,664	60,037	26,373	1,214	833	2,500	(345)	3,806	9,665	56.1%	
30-Jun-44	33,751	34,808	61,558	26,750	1,255	865	2,588	(401)	3,884	10,007	56.5%	
30-Jun-45	34,961	36,054	63,148	27,094	1,298	898	2,681	(462)	3,963	10,361	57.1%	
30-Jun-46	36,278	37,409	64,811	27,403	1,342	931	2,776	(528)	4,042	10,728	57.7%	
30-Jun-47	37,710	38,883	66,555	27,673	1,388	966	2,874	(599)	4,122	11,107	58.4%	

## Hawaii Employees Retirement System

Stress Test Projections Item 3 - 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		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-17	\$ 15,638	\$ 15,701	\$ 28,649	\$ 12,948	\$ 579	\$ 252	\$ 817	\$ 398	\$ 1,491	\$ 4,265	54.8%
30-Jun-18	12,120	15,276	29,710	14,435	591	267	892	422	1,486	4,375	51.4%
30-Jun-19	12,376	14,803	30,864	16,061	605	282	1,062	360	1,575	4,497	48.0%
30-Jun-20	12,742	14,325	32,022	17,697	620	298	1,200	330	1,666	4,625	44.7%
30-Jun-21	13,191	13,786	33,181	19,395	636	314	1,349	295	1,759	4,759	41.5%
30-Jun-22	13,735	14,249	34,342	20,093	652	331	1,388	304	1,853	4,897	41.5%
30-Jun-23	14,266	14,741	35,504	20,763	669	348	1,428	308	1,949	5,042	41.5%
30-Jun-24	14,785	15,253	36,666	21,413	687	366	1,471	310	2,047	5,193	41.6%
30-Jun-25	15,290	15,770	37,826	22,056	706	384	1,515	310	2,146	5,350	41.7%
30-Jun-26	15,782	16,277	38,985	22,708	725	403	1,561	308	2,245	5,515	41.8%
30-Jun-27	16,263	16,773	40,141	23,368	745	423	1,609	305	2,344	5,688	41.8%
30-Jun-28	16,735	17,261	41,297	24,036	766	443	1,659	301	2,442	5,868	41.8%
30-Jun-29	17,202	17,744	42,455	24,711	788	464	1,712	295	2,539	6,056	41.8%
30-Jun-30	17,667	18,224	43,615	25,391	811	485	1,766	288	2,637	6,253	41.8%
30-Jun-31	18,133	18,706	44,780	26,074	835	507	1,824	278	2,734	6,457	41.8%
30-Jun-32	18,604	19,192	45,951	26,759	860	530	1,883	266	2,832	6,670	41.8%
30-Jun-33	19,082	19,685	47,128	27,443	886	554	1,945	252	2,929	6,891	41.8%
30-Jun-34	19,571	20,190	48,314	28,124	913	579	2,010	236	3,024	7,121	41.8%
30-Jun-35	20,078	20,712	49,513	28,800	941	604	2,077	217	3,119	7,361	41.8%
30-Jun-36	20,606	21,257	50,726	29,469	971	630	2,147	194	3,213	7,610	41.9%
30-Jun-37	21,163	21,831	51,958	30,127	1,001	656	2,220	169	3,304	7,869	42.0%
30-Jun-38	21,755	22,441	53,212	30,772	1,033	684	2,297	139	3,393	8,139	42.2%
30-Jun-39	22,821	23,203	54,496	31,292	1,066	712	2,376	98	3,480	8,421	42.6%
30-Jun-40	23,983	24,143	55,813	31,670	1,101	741	2,460	45	3,565	8,714	43.3%
30-Jun-41	25,254	25,287	57,171	31,884	1,137	771	2,546	(23)	3,647	9,019	44.2%
30-Jun-42	26,648	26,662	58,577	31,915	1,175	801	2,637	(107)	3,727	9,336	45.5%
30-Jun-43	28,180	28,185	60,037	31,852	1,214	833	2,730	(200)	3,806	9,665	46.9%
30-Jun-44	29,866	29,867	61,558	31,691	1,255	865	2,827	(302)	3,884	10,007	48.5%
30-Jun-45	31,721	31,721	63,148	31,426	1,298	898	2,928	(415)	3,963	10,361	50.2%
30-Jun-46	33,762	33,762	64,811	31,050	1,342	931	3,032	(538)	4,042	10,728	52.1%
30-Jun-47	36,004	36,004	66,555	30,551	1,388	966	3,139	(672)	4,122	11,107	54.1%



**Hawaii Employees Retirement System**  
**Stress Test Projections Item 3 - Negative 20% Return Followed by 20-year Period with 5% Returns**  
**Scenario B - Contribution Rates Kept at Current Statutor Rates**  
(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-17	\$ 15,638	\$ 15,701	\$ 28,649	\$ 12,948	\$ 579	\$ 252	\$ 817	\$ 398	\$ 1,491	\$ 4,265	54.8%
30-Jun-18	12,120	15,276	29,710	14,435	591	267	892	422	1,486	4,375	51.4%
30-Jun-19	12,376	14,803	30,864	16,061	605	282	1,062	360	1,575	4,497	48.0%
30-Jun-20	12,742	14,325	32,022	17,697	620	298	1,200	330	1,666	4,625	44.7%
30-Jun-21	13,191	13,786	33,181	19,395	636	314	1,235	413	1,759	4,759	41.5%
30-Jun-22	13,618	14,131	34,342	20,211	652	331	1,270	433	1,853	4,897	41.1%
30-Jun-23	14,023	14,495	35,504	21,009	669	348	1,308	451	1,949	5,042	40.8%
30-Jun-24	14,406	14,867	36,666	21,799	687	366	1,346	466	2,047	5,193	40.5%
30-Jun-25	14,764	15,233	37,826	22,593	706	384	1,386	480	2,146	5,350	40.3%
30-Jun-26	15,099	15,578	38,985	23,407	725	403	1,429	494	2,245	5,515	40.0%
30-Jun-27	15,410	15,900	40,141	24,241	745	423	1,473	507	2,344	5,688	39.6%
30-Jun-28	15,700	16,200	41,297	25,097	766	443	1,519	520	2,442	5,868	39.2%
30-Jun-29	15,972	16,482	42,455	25,973	788	464	1,567	533	2,539	6,056	38.8%
30-Jun-30	16,227	16,746	43,615	26,869	811	485	1,617	545	2,637	6,253	38.4%
30-Jun-31	16,469	16,997	44,780	27,783	835	507	1,670	557	2,734	6,457	38.0%
30-Jun-32	16,699	17,235	45,951	28,716	860	530	1,724	568	2,832	6,670	37.5%
30-Jun-33	16,919	17,462	47,128	29,666	886	554	1,781	578	2,929	6,891	37.1%
30-Jun-34	17,132	17,682	48,314	30,632	913	579	1,840	587	3,024	7,121	36.6%
30-Jun-35	17,343	17,901	49,513	31,612	941	604	1,902	595	3,119	7,361	36.2%
30-Jun-36	17,555	18,120	50,726	32,606	971	630	1,966	601	3,213	7,610	35.7%
30-Jun-37	17,773	18,345	51,958	33,612	1,001	656	2,033	606	3,304	7,869	35.3%
30-Jun-38	18,004	18,583	53,212	34,629	1,033	684	2,103	610	3,393	8,139	34.9%
30-Jun-39	18,608	18,929	54,496	35,567	1,066	712	2,176	605	3,480	8,421	34.7%
30-Jun-40	19,267	19,402	55,813	36,411	1,101	741	2,252	591	3,565	8,714	34.8%
30-Jun-41	19,994	20,022	57,171	37,149	1,137	771	2,332	567	3,647	9,019	35.0%
30-Jun-42	20,797	20,809	58,577	37,768	1,175	801	2,414	533	3,727	9,336	35.5%
30-Jun-43	21,690	21,694	60,037	38,343	1,214	833	2,500	493	3,806	9,665	36.1%
30-Jun-44	22,683	22,684	61,558	38,874	1,255	865	2,588	447	3,884	10,007	36.8%
30-Jun-45	23,789	23,789	63,148	39,359	1,298	898	2,681	396	3,963	10,361	37.7%
30-Jun-46	25,019	25,019	64,811	39,793	1,342	931	2,776	339	4,042	10,728	38.6%
30-Jun-47	26,384	26,384	66,555	40,171	1,388	966	2,874	276	4,122	11,107	39.6%

## Hawaii Employees Retirement System

### Stress Test Item 4 - Comparison of Cost Items at Current Investment Return Assumption (7.0%) and 10-Year Average of 30-Year Treasuries (3.55%)

#### All Other Employees

Membership Tier	<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>
Actuarial Accrued Liability	\$23,028	\$284	\$36,750	\$666
Total Normal Cost %	12.47%	12.09%	31.12%	27.18%
Employer Normal Cost %	8.00%	4.90%	26.65%	19.99%

#### Police and Fire Employees

Membership Tier	<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>
Actuarial Accrued Liability	\$5,301	\$35	\$8,697	\$85
Total Normal Cost %	26.15%	21.12%	65.28%	51.41%
Employer Normal Cost %	13.95%	6.92%	53.08%	37.21%

Dollar Amounts are in \$ Millions