

JOSH GREEN, M.D.  
GOVERNOR

SYLVIA LUKE  
LIEUTENANT GOVERNOR

LUIS P. SALAVERIA  
DIRECTOR

SABRINA NASIR  
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**  
*Ka 'Oihana Mālama Mo'ohelu a Kālā*  
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

December 18, 2023

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

The Honorable Scott K. Saiki  
Speaker and Members of the  
House of Representatives  
Thirty Second 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 2023 report, as required by Act 85, Session Laws of Hawai'i 2017. In accordance with Section 93-16, Hawaii Revised Statutes, a copy of this report has been transmitted to the Legislative Reference Bureau and the report may be viewed electronically at <http://ers.ehawaii.gov/resources/reports-to-legislature>.

Sincerely,

/S/

LUIS P. SALAVERIA  
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)  
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Department of Budget and Finance: [DBFLeg.DIR@hawaii.gov](mailto:DBFLeg.DIR@hawaii.gov)



December 18, 2023

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. This stress test is based on the preliminary valuation results of ERS as of July 1, 2023.

**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, including a 7% return projected from the actuarial, or smoothed, value of assets. 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, starting from the market value of assets as of the valuation date, 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. **Important Note:** the Statutes governing the ERS contemplate that the employer contribution rates would be changed when the ERS is fully funded. However, because the statutes governing the stress test require the use of the same contribution pattern for Scenario's 1, 2B and 3B, we felt it would be inappropriate to change the contribution rates for Scenario #1 since the contribution rates would not change under the ERS statute in Scenarios 2B and 3B.
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. Note this is true in aggregate as well as for the All Other Employee group and the Police and Fire Employee group when determined separately.
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 26.00% of pay for All Other Employees and 49.00% 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 to approximately 32% 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 2.78% as of July 1, 2023.

Based on the information reviewed for this report, the stress test shows that the System is sustainable in the protracted low return environment of Scenario #2, but would require maintaining the current contribution patterns for a much longer period of time than is currently expected. While we believe the likelihood of Scenario #3 occurring is remote, if it did occur it would require an increase in the employer contribution rates under the current statutes and the higher rates would be required for many years.

### **Disclosures**

The information contained in this report is based on the preliminary valuation results of the ERS as of June 30, 2023. 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, 2023 actuarial valuation. These assumptions are detailed in the actuarial valuation report dated January 2024. 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.

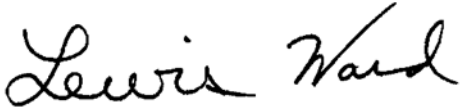
This report was prepared using our proprietary valuation model and related software which in our professional judgment has the capability to provide results that are consistent with the purposes of the valuation. We performed tests to ensure that the model reasonably represents that which is intended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

A handwritten signature in black ink that reads "Lewis Ward". The signature is fluid and cursive, with the first name "Lewis" and the last name "Ward" clearly distinguishable.

Lewis Ward  
Consultant

A handwritten signature in black ink that reads "Joe Newton". The signature is cursive and stylized, with the first name "Joe" and the last name "Newton" clearly distinguishable.

Joseph P. Newton  
Pension Market Leader and Actuary

Enclosures

## Hawaii Employees Retirement System

### Stress Test Projections (Dollar Amounts in \$ Millions)

Valuation Date (1)	Market Value of Assets (2)	Actuarial Value of Assets (3)	Actuarial Accrued Liability (4)	Unfunded Actuarial Accrued Liability (5)	Normal Cost (6)	Projected Employee Contributions (7)	Projected Employer Contributions (8)	Net Amortization (9)	Benefit Payments (10)	Covered Payroll (11)	Funded Ratio (12)
30-Jun-23	\$ 22,425	\$ 22,515	\$ 36,225	\$ 13,710	\$ 698	\$ 322	\$ 1,244	\$ 61	\$ 1,918	\$ 4,805	62.2%
30-Jun-24	\$ 23,710	\$ 23,710	\$ 37,481	\$ 13,771	\$ 712	\$ 338	\$ 1,275	\$ 32	\$ 2,025	\$ 4,924	63.3%
30-Jun-25	\$ 24,926	\$ 24,926	\$ 38,729	\$ 13,803	\$ 729	\$ 354	\$ 1,310	\$ (1)	\$ 2,130	\$ 5,061	64.4%
30-Jun-26	\$ 26,171	\$ 26,171	\$ 39,973	\$ 13,802	\$ 746	\$ 371	\$ 1,346	\$ (38)	\$ 2,235	\$ 5,202	65.5%
30-Jun-27	\$ 27,448	\$ 27,448	\$ 41,212	\$ 13,764	\$ 764	\$ 388	\$ 1,383	\$ (78)	\$ 2,340	\$ 5,349	66.6%
30-Jun-28	\$ 28,762	\$ 28,762	\$ 42,448	\$ 13,687	\$ 783	\$ 405	\$ 1,422	\$ (122)	\$ 2,444	\$ 5,501	67.8%
30-Jun-29	\$ 30,116	\$ 30,116	\$ 43,682	\$ 13,565	\$ 803	\$ 424	\$ 1,462	\$ (171)	\$ 2,550	\$ 5,657	68.9%
30-Jun-30	\$ 31,517	\$ 31,517	\$ 44,912	\$ 13,394	\$ 823	\$ 442	\$ 1,504	\$ (224)	\$ 2,656	\$ 5,819	70.2%
30-Jun-31	\$ 32,968	\$ 32,968	\$ 46,138	\$ 13,171	\$ 843	\$ 462	\$ 1,547	\$ (283)	\$ 2,762	\$ 5,987	71.5%
30-Jun-32	\$ 34,473	\$ 34,473	\$ 47,361	\$ 12,888	\$ 865	\$ 481	\$ 1,592	\$ (347)	\$ 2,870	\$ 6,160	72.8%
30-Jun-33	\$ 36,039	\$ 36,039	\$ 48,580	\$ 12,541	\$ 887	\$ 501	\$ 1,638	\$ (417)	\$ 2,977	\$ 6,338	74.2%
30-Jun-34	\$ 37,671	\$ 37,671	\$ 49,795	\$ 12,124	\$ 910	\$ 522	\$ 1,686	\$ (494)	\$ 3,084	\$ 6,523	75.7%
30-Jun-35	\$ 39,377	\$ 39,377	\$ 51,009	\$ 11,631	\$ 934	\$ 544	\$ 1,735	\$ (577)	\$ 3,190	\$ 6,715	77.2%
30-Jun-36	\$ 41,166	\$ 41,166	\$ 52,220	\$ 11,054	\$ 958	\$ 565	\$ 1,786	\$ (667)	\$ 3,296	\$ 6,912	78.8%
30-Jun-37	\$ 43,045	\$ 43,045	\$ 53,432	\$ 10,387	\$ 984	\$ 588	\$ 1,839	\$ (766)	\$ 3,400	\$ 7,117	80.6%
30-Jun-38	\$ 45,024	\$ 45,024	\$ 54,646	\$ 9,622	\$ 1,010	\$ 611	\$ 1,894	\$ (873)	\$ 3,502	\$ 7,329	82.4%
30-Jun-39	\$ 47,117	\$ 47,117	\$ 55,867	\$ 8,750	\$ 1,038	\$ 635	\$ 1,951	\$ (988)	\$ 3,602	\$ 7,551	84.3%
30-Jun-40	\$ 49,337	\$ 49,337	\$ 57,099	\$ 7,762	\$ 1,068	\$ 659	\$ 2,011	\$ (1,114)	\$ 3,698	\$ 7,782	86.4%
30-Jun-41	\$ 51,698	\$ 51,698	\$ 58,347	\$ 6,649	\$ 1,099	\$ 684	\$ 2,073	\$ (1,250)	\$ 3,793	\$ 8,022	88.6%
30-Jun-42	\$ 54,216	\$ 54,216	\$ 59,616	\$ 5,400	\$ 1,130	\$ 710	\$ 2,137	\$ (1,397)	\$ 3,885	\$ 8,270	90.9%
30-Jun-43	\$ 56,905	\$ 56,905	\$ 60,909	\$ 4,004	\$ 1,164	\$ 735	\$ 2,203	\$ (1,555)	\$ 3,976	\$ 8,528	93.4%
30-Jun-44	\$ 59,784	\$ 59,784	\$ 62,233	\$ 2,449	\$ 1,198	\$ 762	\$ 2,272	\$ (1,727)	\$ 4,066	\$ 8,794	96.1%
30-Jun-45	\$ 62,869	\$ 62,869	\$ 63,591	\$ 722	\$ 1,234	\$ 788	\$ 2,343	\$ (1,912)	\$ 4,155	\$ 9,070	98.9%
30-Jun-46	\$ 66,178	\$ 66,178	\$ 64,989	\$ (1,189)	\$ 1,272	\$ 815	\$ 2,417	\$ (2,111)	\$ 4,242	\$ 9,355	101.8%
30-Jun-47	\$ 69,732	\$ 69,732	\$ 66,432	\$ (3,299)	\$ 1,311	\$ 842	\$ 2,493	\$ (2,325)	\$ 4,328	\$ 9,650	105.0%
30-Jun-48	\$ 73,551	\$ 73,551	\$ 67,927	\$ (5,624)	\$ 1,352	\$ 871	\$ 2,572	\$ (2,557)	\$ 4,413	\$ 9,955	108.3%
30-Jun-49	\$ 77,661	\$ 77,661	\$ 69,480	\$ (8,180)	\$ 1,394	\$ 901	\$ 2,654	\$ (2,807)	\$ 4,500	\$ 10,270	111.8%
30-Jun-50	\$ 82,081	\$ 82,081	\$ 71,094	\$ (10,987)	\$ 1,438	\$ 930	\$ 2,737	\$ (3,075)	\$ 4,589	\$ 10,593	115.5%
30-Jun-51	\$ 86,835	\$ 86,835	\$ 72,773	\$ (14,062)	\$ 1,483	\$ 960	\$ 2,823	\$ (3,364)	\$ 4,680	\$ 10,927	119.3%
30-Jun-52	\$ 91,945	\$ 91,945	\$ 74,520	\$ (17,426)	\$ 1,529	\$ 992	\$ 2,912	\$ (3,676)	\$ 4,774	\$ 11,269	123.4%
30-Jun-53	\$ 97,439	\$ 97,439	\$ 76,338	\$ (21,101)	\$ 1,577	\$ 1,024	\$ 3,003	\$ (4,011)	\$ 4,872	\$ 11,622	127.6%



## 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	Market Value of Assets	Actuarial Value of Assets	Actuarial Accrued Liability	Unfunded Actuarial Accrued Liability	Normal Cost	Projected Employee Contributions	Projected Employer Contributions	Net Amortization	Benefit Payments	Covered Payroll	Funded Ratio
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
30-Jun-23	\$ 22,425	\$ 22,515	\$ 36,225	\$ 13,710	\$ 698	\$ 322	\$ 1,244	\$ 61	\$ 1,918	\$ 4,805	62.2%
30-Jun-24	23,170	23,568	37,481	13,914	712	338	1,275	42	2,025	4,924	62.9%
30-Jun-25	23,888	24,509	38,729	14,220	729	354	1,310	28	2,130	5,061	63.3%
30-Jun-26	24,587	25,331	39,973	14,642	746	371	1,346	21	2,235	5,202	63.4%
30-Jun-27	25,268	26,051	41,212	15,161	764	388	1,383	20	2,340	5,349	63.2%
30-Jun-28	25,929	26,743	42,448	15,705	783	405	1,422	19	2,444	5,501	63.0%
30-Jun-29	26,573	27,412	43,682	16,269	803	424	1,462	18	2,550	5,657	62.8%
30-Jun-30	27,202	28,062	44,912	16,849	823	442	1,504	18	2,656	5,819	62.5%
30-Jun-31	27,813	28,695	46,138	17,443	843	462	1,547	16	2,762	5,987	62.2%
30-Jun-32	28,410	29,312	47,361	18,050	865	481	1,592	14	2,870	6,160	61.9%
30-Jun-33	28,991	29,912	48,580	18,668	887	501	1,638	12	2,977	6,338	61.6%
30-Jun-34	29,558	30,499	49,795	19,296	910	522	1,686	8	3,084	6,523	61.2%
30-Jun-35	30,114	31,074	51,009	19,934	934	544	1,735	4	3,190	6,715	60.9%
30-Jun-36	30,662	31,640	52,220	20,581	958	565	1,786	(1)	3,296	6,912	60.6%
30-Jun-37	31,202	32,198	53,432	21,234	984	588	1,839	(6)	3,400	7,117	60.3%
30-Jun-38	31,738	32,752	54,646	21,895	1,010	611	1,894	(14)	3,502	7,329	59.9%
30-Jun-39	32,276	33,308	55,867	22,559	1,038	635	1,951	(22)	3,602	7,551	59.6%
30-Jun-40	32,822	33,871	57,099	23,228	1,068	659	2,011	(31)	3,698	7,782	59.3%
30-Jun-41	33,381	34,448	58,347	23,899	1,099	684	2,073	(43)	3,793	8,022	59.0%
30-Jun-42	33,960	35,045	59,616	24,570	1,130	710	2,137	(55)	3,885	8,270	58.8%
30-Jun-43	34,563	35,667	60,909	25,242	1,164	735	2,203	(69)	3,976	8,528	58.6%
30-Jun-44	35,197	36,321	62,233	25,912	1,198	762	2,272	(85)	4,066	8,794	58.4%
30-Jun-45	35,868	37,012	63,591	26,579	1,234	788	2,343	(102)	4,155	9,070	58.2%
30-Jun-46	36,580	37,746	64,989	27,243	1,272	815	2,417	(120)	4,242	9,355	58.1%
30-Jun-47	37,341	38,529	66,432	27,903	1,311	842	2,493	(141)	4,328	9,650	58.0%
30-Jun-48	38,157	39,370	67,927	28,558	1,352	871	2,572	(164)	4,413	9,955	58.0%
30-Jun-49	39,035	40,274	69,480	29,206	1,394	901	2,654	(190)	4,500	10,270	58.0%
30-Jun-50	39,981	41,248	71,094	29,846	1,438	930	2,737	(217)	4,589	10,593	58.0%
30-Jun-51	40,997	42,295	72,773	30,478	1,483	960	2,823	(247)	4,680	10,927	58.1%
30-Jun-52	42,089	43,419	74,520	31,101	1,529	992	2,912	(279)	4,774	11,269	58.3%
30-Jun-53	43,260	44,625	76,338	31,713	1,577	1,024	3,003	(314)	4,872	11,622	58.5%



**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	Market Value of Assets	Actuarial Value of Assets	Actuarial Accrued Liability	Unfunded Actuarial Accrued Liability	Normal Cost	Projected Employee Contributions	Projected Employer Contributions	Net Amortization	Benefit Payments	Covered Payroll	Funded Ratio
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
30-Jun-23	\$ 22,425	\$ 22,515	\$ 36,225	\$ 13,710	\$ 698	\$ 322	\$ 1,244	\$ 61	\$ 1,918	\$ 4,805	62.2%
30-Jun-24	23,170	23,568	37,481	13,914	712	338	1,275	42	2,025	4,924	62.9%
30-Jun-25	23,888	24,509	38,729	14,220	729	354	1,310	28	2,130	5,061	63.3%
30-Jun-26	24,587	25,331	39,973	14,642	746	371	1,346	21	2,235	5,202	63.4%
30-Jun-27	25,268	26,051	41,212	15,161	764	388	1,383	20	2,340	5,349	63.2%
30-Jun-28	25,929	26,743	42,448	15,705	783	405	1,422	19	2,444	5,501	63.0%
30-Jun-29	26,573	27,412	43,682	16,269	803	424	1,462	18	2,550	5,657	62.8%
30-Jun-30	27,202	28,062	44,912	16,849	823	442	1,504	18	2,656	5,819	62.5%
30-Jun-31	27,813	28,695	46,138	17,443	843	462	1,547	16	2,762	5,987	62.2%
30-Jun-32	28,410	29,312	47,361	18,050	865	481	1,592	14	2,870	6,160	61.9%
30-Jun-33	28,991	29,912	48,580	18,668	887	501	1,638	12	2,977	6,338	61.6%
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30-Jun-39	32,276	33,308	55,867	22,559	1,038	635	1,951	(22)	3,602	7,551	59.6%
30-Jun-40	32,822	33,871	57,099	23,228	1,068	659	2,011	(31)	3,698	7,782	59.3%
30-Jun-41	33,381	34,448	58,347	23,899	1,099	684	2,073	(43)	3,793	8,022	59.0%
30-Jun-42	33,960	35,045	59,616	24,570	1,130	710	2,137	(55)	3,885	8,270	58.8%
30-Jun-43	34,563	35,667	60,909	25,242	1,164	735	2,203	(69)	3,976	8,528	58.6%
30-Jun-44	35,197	36,321	62,233	25,912	1,198	762	2,272	(85)	4,066	8,794	58.4%
30-Jun-45	35,868	37,012	63,591	26,579	1,234	788	2,343	(102)	4,155	9,070	58.2%
30-Jun-46	36,580	37,746	64,989	27,243	1,272	815	2,417	(120)	4,242	9,355	58.1%
30-Jun-47	37,341	38,529	66,432	27,903	1,311	842	2,493	(141)	4,328	9,650	58.0%
30-Jun-48	38,157	39,370	67,927	28,558	1,352	871	2,572	(164)	4,413	9,955	58.0%
30-Jun-49	39,035	40,274	69,480	29,206	1,394	901	2,654	(190)	4,500	10,270	58.0%
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30-Jun-51	40,997	42,295	72,773	30,478	1,483	960	2,823	(247)	4,680	10,927	58.1%
30-Jun-52	42,089	43,419	74,520	31,101	1,529	992	2,912	(279)	4,774	11,269	58.3%
30-Jun-53	43,260	44,625	76,338	31,713	1,577	1,024	3,003	(314)	4,872	11,622	58.5%





## 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	Market Value of Assets	Actuarial Value of Assets	Actuarial Accrued Liability	Unfunded Actuarial Accrued Liability	Normal Cost	Projected Employee Contributions	Projected Employer Contributions	Net Amortization	Benefit Payments	Covered Payroll	Funded Ratio
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
30-Jun-23	\$ 22,425	\$ 22,515	\$ 36,225	\$ 13,710	\$ 698	\$ 322	\$ 1,244	\$ 61	\$ 1,918	\$ 4,805	62.2%
30-Jun-24	17,609	22,177	37,481	15,304	712	338	1,275	139	2,025	4,924	59.2%
30-Jun-25	18,050	21,586	38,729	17,143	729	354	1,310	233	2,130	5,061	55.7%
30-Jun-26	18,457	20,747	39,973	19,226	746	371	1,438	246	2,235	5,202	51.9%
30-Jun-27	18,925	19,788	41,212	21,424	764	388	1,520	317	2,340	5,349	48.0%
30-Jun-28	19,409	20,149	42,448	22,300	783	405	1,562	336	2,444	5,501	47.5%
30-Jun-29	19,871	20,546	43,682	23,135	803	424	1,612	344	2,550	5,657	47.0%
30-Jun-30	20,318	20,974	44,912	23,938	823	442	1,658	354	2,656	5,819	46.7%
30-Jun-31	20,744	21,407	46,138	24,731	843	462	1,705	362	2,762	5,987	46.4%
30-Jun-32	21,149	21,824	47,361	25,538	865	481	1,755	369	2,870	6,160	46.1%
30-Jun-33	21,535	22,221	48,580	26,359	887	501	1,805	376	2,977	6,338	45.7%
30-Jun-34	21,901	22,601	49,795	27,194	910	522	1,858	383	3,084	6,523	45.4%
30-Jun-35	22,252	22,963	51,009	28,045	934	544	1,913	388	3,190	6,715	45.0%
30-Jun-36	22,588	23,312	52,220	28,909	958	565	1,969	393	3,296	6,912	44.6%
30-Jun-37	22,912	23,647	53,432	29,786	984	588	2,027	397	3,400	7,117	44.3%
30-Jun-38	23,227	23,973	54,646	30,674	1,010	611	2,088	400	3,502	7,329	43.9%
30-Jun-39	23,539	24,295	55,867	31,573	1,038	635	2,151	402	3,602	7,551	43.5%
30-Jun-40	23,853	24,619	57,099	32,480	1,068	659	2,217	403	3,698	7,782	43.1%
30-Jun-41	24,175	24,951	58,347	33,396	1,099	684	2,285	402	3,793	8,022	42.8%
30-Jun-42	24,511	25,298	59,616	34,318	1,130	710	2,356	401	3,885	8,270	42.4%
30-Jun-43	24,867	25,664	60,909	35,245	1,164	735	2,429	398	3,976	8,528	42.1%
30-Jun-44	25,247	26,057	62,233	36,176	1,198	762	2,505	393	4,066	8,794	41.9%
30-Jun-45	26,156	26,605	63,591	36,986	1,234	788	2,584	378	4,155	9,070	41.8%
30-Jun-46	27,144	27,332	64,989	37,657	1,272	815	2,665	352	4,242	9,355	42.1%
30-Jun-47	28,221	28,261	66,432	38,171	1,311	842	2,749	313	4,328	9,650	42.5%
30-Jun-48	29,400	29,416	67,927	38,511	1,352	871	2,836	260	4,413	9,955	43.3%
30-Jun-49	30,691	30,697	69,480	38,783	1,394	901	2,926	199	4,500	10,270	44.2%
30-Jun-50	32,105	32,107	71,094	38,987	1,438	930	3,018	133	4,589	10,593	45.2%
30-Jun-51	33,651	33,652	72,773	39,121	1,483	960	3,113	59	4,680	10,927	46.2%
30-Jun-52	35,339	35,339	74,520	39,181	1,529	992	3,210	(22)	4,774	11,269	47.4%
30-Jun-53	37,179	37,179	76,338	39,159	1,577	1,024	3,311	(112)	4,872	11,622	48.7%



**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	Market Value of Assets	Actuarial Value of Assets	Actuarial Accrued Liability	Unfunded Actuarial Accrued Liability	Normal Cost	Projected Employee Contributions	Projected Employer Contributions	Net Amortization	Benefit Payments	Covered Payroll	Funded Ratio
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
30-Jun-23	\$ 22,425	\$ 22,515	\$ 36,225	\$ 13,710	\$ 698	\$ 322	\$ 1,244	\$ 61	\$ 1,918	\$ 4,805	62.2%
30-Jun-24	17,609	22,177	37,481	15,304	712	338	1,275	139	2,025	4,924	59.2%
30-Jun-25	18,050	21,586	38,729	17,143	729	354	1,310	233	2,130	5,061	55.7%
30-Jun-26	18,457	20,747	39,973	19,226	746	371	1,346	342	2,235	5,202	51.9%
30-Jun-27	18,831	19,693	41,212	21,520	764	388	1,383	465	2,340	5,349	47.8%
30-Jun-28	19,170	19,907	42,448	22,542	783	405	1,422	498	2,444	5,501	46.9%
30-Jun-29	19,477	20,145	43,682	23,537	803	424	1,462	527	2,550	5,657	46.1%
30-Jun-30	19,750	20,394	44,912	24,517	823	442	1,504	554	2,656	5,819	45.4%
30-Jun-31	19,989	20,636	46,138	25,503	843	462	1,547	580	2,762	5,987	44.7%
30-Jun-32	20,195	20,846	47,361	26,515	865	481	1,592	607	2,870	6,160	44.0%
30-Jun-33	20,365	21,023	48,580	27,557	887	501	1,638	634	2,977	6,338	43.3%
30-Jun-34	20,501	21,164	49,795	28,631	910	522	1,686	662	3,084	6,523	42.5%
30-Jun-35	20,604	21,273	51,009	29,736	934	544	1,735	690	3,190	6,715	41.7%
30-Jun-36	20,676	21,348	52,220	30,872	958	565	1,786	720	3,296	6,912	40.9%
30-Jun-37	20,717	21,392	53,432	32,041	984	588	1,839	750	3,400	7,117	40.0%
30-Jun-38	20,729	21,405	54,646	33,241	1,010	611	1,894	781	3,502	7,329	39.2%
30-Jun-39	20,717	21,394	55,867	34,473	1,038	635	1,951	812	3,602	7,551	38.3%
30-Jun-40	20,684	21,362	57,099	35,737	1,068	659	2,011	844	3,698	7,782	37.4%
30-Jun-41	20,637	21,313	58,347	37,034	1,099	684	2,073	877	3,793	8,022	36.5%
30-Jun-42	20,578	21,253	59,616	38,362	1,130	710	2,137	910	3,885	8,270	35.7%
30-Jun-43	20,513	21,186	60,909	39,723	1,164	735	2,203	945	3,976	8,528	34.8%
30-Jun-44	20,444	21,116	62,233	41,117	1,198	762	2,272	980	4,066	8,794	33.9%
30-Jun-45	20,775	21,146	63,591	42,445	1,234	788	2,343	1,009	4,155	9,070	33.3%
30-Jun-46	21,138	21,293	64,989	43,696	1,272	815	2,417	1,031	4,242	9,355	32.8%
30-Jun-47	21,539	21,571	66,432	44,861	1,311	842	2,493	1,046	4,328	9,650	32.5%
30-Jun-48	21,985	21,999	67,927	45,929	1,352	871	2,572	1,052	4,413	9,955	32.4%
30-Jun-49	22,485	22,489	69,480	46,991	1,394	901	2,654	1,055	4,500	10,270	32.4%
30-Jun-50	23,042	23,044	71,094	48,050	1,438	930	2,737	1,057	4,589	10,593	32.4%
30-Jun-51	23,663	23,664	72,773	49,109	1,483	960	2,823	1,057	4,680	10,927	32.5%
30-Jun-52	24,352	24,352	74,520	50,167	1,529	992	2,912	1,056	4,774	11,269	32.7%
30-Jun-53	25,115	25,115	76,338	51,224	1,577	1,024	3,003	1,051	4,872	11,622	32.9%



## Hawaii Employees' Retirement System

### Stress Test Exhibit 4 - Comparison of Cost Items at Current Investment Return Assumption (7.0%) and 10-Year Average of 30-Year Treasuries (2.78%)

#### 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	\$27,434	\$1,631	\$47,729	\$3,994
Total Normal Cost %	12.78%	12.24%	41.54%	34.22%
Employer Normal Cost %	8.28%	4.16%	37.05%	26.15%

#### 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	\$6,938	\$222	\$12,442	\$578
Total Normal Cost %	28.60%	22.46%	87.22%	66.93%
Employer Normal Cost %	16.40%	8.26%	75.02%	52.73%

Dollar Amounts are in \$ Millions

