

JOSH GREEN, M.D.  
GOVERNOR



**DEPT. COMM. NO. 277**

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**  
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 19, 2022

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 2022 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 Legislative Reference Bureau and the report may be viewed electronically at <http://ers.ehawaii.gov/resources/reports-to-legislature>.

Sincerely,

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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Hawai'i State Public Library System: [ohsdoc@librarieshawaii.org](mailto:ohsdoc@librarieshawaii.org)



December 19, 2022

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, 2022.

**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 25.90% of pay for All Other Employees and 47.50% 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 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 2.71% as of July 1, 2022.

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, 2022. 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, 2022 actuarial valuation. These assumptions are detailed in the actuarial valuation report dated January 2022. 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.



Board of Trustees  
December 19, 2022  
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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  
(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-22	\$ 22,469	\$ 21,533	\$ 34,823	\$ 13,290	\$ 672	\$ 304	\$ 1,196	\$ 73	\$ 1,832	\$ 4,614	61.8%
30-Jun-23	\$ 22,680	\$ 22,680	\$ 36,043	\$ 13,363	\$ 685	\$ 319	\$ 1,225	\$ 47	\$ 1,934	\$ 4,726	62.9%
30-Jun-24	\$ 23,847	\$ 23,847	\$ 37,257	\$ 13,410	\$ 701	\$ 334	\$ 1,258	\$ 17	\$ 2,034	\$ 4,852	64.0%
30-Jun-25	\$ 25,042	\$ 25,042	\$ 38,469	\$ 13,427	\$ 717	\$ 350	\$ 1,291	\$ (16)	\$ 2,137	\$ 4,983	65.1%
30-Jun-26	\$ 26,264	\$ 26,264	\$ 39,675	\$ 13,412	\$ 734	\$ 366	\$ 1,326	\$ (53)	\$ 2,238	\$ 5,120	66.2%
30-Jun-27	\$ 27,519	\$ 27,519	\$ 40,879	\$ 13,359	\$ 752	\$ 383	\$ 1,363	\$ (93)	\$ 2,341	\$ 5,262	67.3%
30-Jun-28	\$ 28,810	\$ 28,810	\$ 42,077	\$ 13,267	\$ 770	\$ 400	\$ 1,400	\$ (137)	\$ 2,444	\$ 5,408	68.5%
30-Jun-29	\$ 30,141	\$ 30,141	\$ 43,271	\$ 13,131	\$ 788	\$ 418	\$ 1,439	\$ (186)	\$ 2,547	\$ 5,560	69.7%
30-Jun-30	\$ 31,516	\$ 31,516	\$ 44,462	\$ 12,945	\$ 808	\$ 435	\$ 1,480	\$ (239)	\$ 2,650	\$ 5,717	70.9%
30-Jun-31	\$ 32,941	\$ 32,941	\$ 45,648	\$ 12,707	\$ 828	\$ 454	\$ 1,522	\$ (298)	\$ 2,754	\$ 5,880	72.2%
30-Jun-32	\$ 34,420	\$ 34,420	\$ 46,829	\$ 12,409	\$ 848	\$ 473	\$ 1,565	\$ (362)	\$ 2,859	\$ 6,049	73.5%
30-Jun-33	\$ 35,958	\$ 35,958	\$ 48,006	\$ 12,048	\$ 870	\$ 493	\$ 1,610	\$ (432)	\$ 2,964	\$ 6,223	74.9%
30-Jun-34	\$ 37,562	\$ 37,562	\$ 49,177	\$ 11,616	\$ 892	\$ 513	\$ 1,657	\$ (509)	\$ 3,067	\$ 6,404	76.4%
30-Jun-35	\$ 39,239	\$ 39,239	\$ 50,347	\$ 11,108	\$ 915	\$ 534	\$ 1,705	\$ (592)	\$ 3,171	\$ 6,590	77.9%
30-Jun-36	\$ 40,997	\$ 40,997	\$ 51,513	\$ 10,516	\$ 939	\$ 556	\$ 1,755	\$ (683)	\$ 3,274	\$ 6,783	79.6%
30-Jun-37	\$ 42,846	\$ 42,846	\$ 52,679	\$ 9,834	\$ 964	\$ 577	\$ 1,807	\$ (781)	\$ 3,375	\$ 6,983	81.3%
30-Jun-38	\$ 44,795	\$ 44,795	\$ 53,848	\$ 9,053	\$ 990	\$ 600	\$ 1,861	\$ (888)	\$ 3,474	\$ 7,191	83.2%
30-Jun-39	\$ 46,855	\$ 46,855	\$ 55,021	\$ 8,166	\$ 1,017	\$ 623	\$ 1,917	\$ (1,003)	\$ 3,571	\$ 7,407	85.2%
30-Jun-40	\$ 49,041	\$ 49,041	\$ 56,205	\$ 7,163	\$ 1,046	\$ 646	\$ 1,975	\$ (1,128)	\$ 3,665	\$ 7,632	87.3%
30-Jun-41	\$ 51,367	\$ 51,367	\$ 57,402	\$ 6,036	\$ 1,075	\$ 671	\$ 2,035	\$ (1,264)	\$ 3,757	\$ 7,865	89.5%
30-Jun-42	\$ 53,846	\$ 53,846	\$ 58,618	\$ 4,772	\$ 1,106	\$ 696	\$ 2,098	\$ (1,411)	\$ 3,847	\$ 8,107	91.9%
30-Jun-43	\$ 56,496	\$ 56,496	\$ 59,857	\$ 3,361	\$ 1,139	\$ 720	\$ 2,163	\$ (1,569)	\$ 3,935	\$ 8,357	94.4%
30-Jun-44	\$ 59,331	\$ 59,331	\$ 61,124	\$ 1,793	\$ 1,172	\$ 745	\$ 2,230	\$ (1,740)	\$ 4,023	\$ 8,616	97.1%
30-Jun-45	\$ 62,369	\$ 62,369	\$ 62,423	\$ 54	\$ 1,207	\$ 771	\$ 2,299	\$ (1,923)	\$ 4,109	\$ 8,883	99.9%
30-Jun-46	\$ 65,627	\$ 65,627	\$ 63,758	\$ (1,869)	\$ 1,243	\$ 798	\$ 2,370	\$ (2,122)	\$ 4,194	\$ 9,159	102.9%
30-Jun-47	\$ 69,126	\$ 69,126	\$ 65,135	\$ (3,991)	\$ 1,281	\$ 825	\$ 2,444	\$ (2,336)	\$ 4,278	\$ 9,445	106.1%
30-Jun-48	\$ 72,886	\$ 72,886	\$ 66,560	\$ (6,326)	\$ 1,320	\$ 852	\$ 2,520	\$ (2,566)	\$ 4,363	\$ 9,740	109.5%
30-Jun-49	\$ 76,927	\$ 76,927	\$ 68,036	\$ (8,891)	\$ 1,360	\$ 880	\$ 2,599	\$ (2,814)	\$ 4,450	\$ 10,043	113.1%
30-Jun-50	\$ 81,271	\$ 81,271	\$ 69,567	\$ (11,704)	\$ 1,402	\$ 909	\$ 2,680	\$ (3,081)	\$ 4,539	\$ 10,355	116.8%
30-Jun-51	\$ 85,939	\$ 85,939	\$ 71,154	\$ (14,785)	\$ 1,445	\$ 938	\$ 2,763	\$ (3,369)	\$ 4,630	\$ 10,675	120.8%
30-Jun-52	\$ 90,955	\$ 90,955	\$ 72,802	\$ (18,153)	\$ 1,489	\$ 967	\$ 2,848	\$ (3,677)	\$ 4,725	\$ 11,005	124.9%



**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	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-22	\$ 22,469	\$ 21,533	\$ 34,823	\$ 13,290	\$ 672	\$ 304	\$ 1,196	\$ 73	\$ 1,832	\$ 4,614	61.8%	
30-Jun-23	23,235	22,958	36,043	13,085	685	319	1,225	27	1,934	4,726	63.7%	
30-Jun-24	23,981	24,104	37,257	13,154	701	334	1,258	(1)	2,034	4,852	64.7%	
30-Jun-25	24,710	25,154	38,469	13,315	717	350	1,291	(24)	2,137	4,983	65.4%	
30-Jun-26	25,420	26,092	39,675	13,583	734	366	1,326	(41)	2,238	5,120	65.8%	
30-Jun-27	26,113	26,907	40,879	13,972	752	383	1,363	(50)	2,341	5,262	65.8%	
30-Jun-28	26,790	27,623	42,077	14,454	770	400	1,400	(54)	2,444	5,408	65.6%	
30-Jun-29	27,450	28,314	43,271	14,958	788	418	1,439	(58)	2,547	5,560	65.4%	
30-Jun-30	28,095	28,984	44,462	15,478	808	435	1,480	(62)	2,650	5,717	65.2%	
30-Jun-31	28,726	29,636	45,648	16,012	828	454	1,522	(67)	2,754	5,880	64.9%	
30-Jun-32	29,343	30,275	46,829	16,555	848	473	1,565	(72)	2,859	6,049	64.6%	
30-Jun-33	29,947	30,899	48,006	17,106	870	493	1,610	(78)	2,964	6,223	64.4%	
30-Jun-34	30,540	31,512	49,177	17,665	892	513	1,657	(85)	3,067	6,404	64.1%	
30-Jun-35	31,125	32,116	50,347	18,230	915	534	1,705	(94)	3,171	6,590	63.8%	
30-Jun-36	31,702	32,713	51,513	18,801	939	556	1,755	(103)	3,274	6,783	63.5%	
30-Jun-37	32,276	33,305	52,679	19,374	964	577	1,807	(113)	3,375	6,983	63.2%	
30-Jun-38	32,849	33,898	53,848	19,950	990	600	1,861	(125)	3,474	7,191	63.0%	
30-Jun-39	33,427	34,494	55,021	20,527	1,017	623	1,917	(138)	3,571	7,407	62.7%	
30-Jun-40	34,015	35,101	56,205	21,103	1,046	646	1,975	(153)	3,665	7,632	62.5%	
30-Jun-41	34,619	35,724	57,402	21,678	1,075	671	2,035	(170)	3,757	7,865	62.2%	
30-Jun-42	35,245	36,370	58,618	22,248	1,106	696	2,098	(188)	3,847	8,107	62.0%	
30-Jun-43	35,898	37,044	59,857	22,813	1,139	720	2,163	(208)	3,935	8,357	61.9%	
30-Jun-44	36,585	37,751	61,124	23,373	1,172	745	2,230	(229)	4,023	8,616	61.8%	
30-Jun-45	37,309	38,498	62,423	23,925	1,207	771	2,299	(252)	4,109	8,883	61.7%	
30-Jun-46	38,078	39,290	63,758	24,468	1,243	798	2,370	(278)	4,194	9,159	61.6%	
30-Jun-47	38,897	40,134	65,135	25,002	1,281	825	2,444	(306)	4,278	9,445	61.6%	
30-Jun-48	39,773	41,036	66,560	25,524	1,320	852	2,520	(337)	4,363	9,740	61.7%	
30-Jun-49	40,712	42,003	68,036	26,033	1,360	880	2,599	(369)	4,450	10,043	61.7%	
30-Jun-50	41,716	43,037	69,567	26,529	1,402	909	2,680	(405)	4,539	10,355	61.9%	
30-Jun-51	42,791	44,144	71,154	27,010	1,445	938	2,763	(443)	4,630	10,675	62.0%	
30-Jun-52	43,940	45,328	72,802	27,474	1,489	967	2,848	(483)	4,725	11,005	62.3%	



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	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-22	\$ 22,469	\$ 21,533	\$ 34,823	\$ 13,290	\$ 672	\$ 304	\$ 1,196	\$ 73	\$ 1,832	\$ 4,614	61.8%	
30-Jun-23	23,235	22,958	36,043	13,085	685	319	1,225	27	1,934	4,726	63.7%	
30-Jun-24	23,981	24,104	37,257	13,154	701	334	1,258	(1)	2,034	4,852	64.7%	
30-Jun-25	24,710	25,154	38,469	13,315	717	350	1,291	(24)	2,137	4,983	65.4%	
30-Jun-26	25,420	26,092	39,675	13,583	734	366	1,326	(41)	2,238	5,120	65.8%	
30-Jun-27	26,113	26,907	40,879	13,972	752	383	1,363	(50)	2,341	5,262	65.8%	
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30-Jun-29	27,450	28,314	43,271	14,958	788	418	1,439	(58)	2,547	5,560	65.4%	
30-Jun-30	28,095	28,984	44,462	15,478	808	435	1,480	(62)	2,650	5,717	65.2%	
30-Jun-31	28,726	29,636	45,648	16,012	828	454	1,522	(67)	2,754	5,880	64.9%	
30-Jun-32	29,343	30,275	46,829	16,555	848	473	1,565	(72)	2,859	6,049	64.6%	
30-Jun-33	29,947	30,899	48,006	17,106	870	493	1,610	(78)	2,964	6,223	64.4%	
30-Jun-34	30,540	31,512	49,177	17,665	892	513	1,657	(85)	3,067	6,404	64.1%	
30-Jun-35	31,125	32,116	50,347	18,230	915	534	1,705	(94)	3,171	6,590	63.8%	
30-Jun-36	31,702	32,713	51,513	18,801	939	556	1,755	(103)	3,274	6,783	63.5%	
30-Jun-37	32,276	33,305	52,679	19,374	964	577	1,807	(113)	3,375	6,983	63.2%	
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30-Jun-39	33,427	34,494	55,021	20,527	1,017	623	1,917	(138)	3,571	7,407	62.7%	
30-Jun-40	34,015	35,101	56,205	21,103	1,046	646	1,975	(153)	3,665	7,632	62.5%	
30-Jun-41	34,619	35,724	57,402	21,678	1,075	671	2,035	(170)	3,757	7,865	62.2%	
30-Jun-42	35,245	36,370	58,618	22,248	1,106	696	2,098	(188)	3,847	8,107	62.0%	
30-Jun-43	35,898	37,044	59,857	22,813	1,139	720	2,163	(208)	3,935	8,357	61.9%	
30-Jun-44	36,585	37,751	61,124	23,373	1,172	745	2,230	(229)	4,023	8,616	61.8%	
30-Jun-45	37,309	38,498	62,423	23,925	1,207	771	2,299	(252)	4,109	8,883	61.7%	
30-Jun-46	38,078	39,290	63,758	24,468	1,243	798	2,370	(278)	4,194	9,159	61.6%	
30-Jun-47	38,897	40,134	65,135	25,002	1,281	825	2,444	(306)	4,278	9,445	61.6%	
30-Jun-48	39,773	41,036	66,560	25,524	1,320	852	2,520	(337)	4,363	9,740	61.7%	
30-Jun-49	40,712	42,003	68,036	26,033	1,360	880	2,599	(369)	4,450	10,043	61.7%	
30-Jun-50	41,716	43,037	69,567	26,529	1,402	909	2,680	(405)	4,539	10,355	61.9%	
30-Jun-51	42,791	44,144	71,154	27,010	1,445	938	2,763	(443)	4,630	10,675	62.0%	
30-Jun-52	43,940	45,328	72,802	27,474	1,489	967	2,848	(483)	4,725	11,005	62.3%	



## 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	Unfunded			Normal Cost	Projected Employee Contributions	Projected Employer Contributions	Net Amortization	Benefit Payments	Covered Payroll	Funded Ratio
			Actuarial Accrued Liability	Actuarial Liability	Actuarial Liability							
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	
30-Jun-22	\$ 22,469	\$ 21,533	\$ 34,823	\$ 13,290	\$ 672	\$ 304	\$ 1,196	\$ 73	\$ 1,832	\$ 4,614	61.8%	
30-Jun-23	17,662	21,425	36,043	14,618	685	319	1,225	134	1,934	4,726	59.4%	
30-Jun-24	18,129	21,097	37,257	16,160	701	334	1,258	209	2,034	4,852	56.6%	
30-Jun-25	18,565	20,550	38,469	17,919	717	350	1,327	261	2,137	4,983	53.4%	
30-Jun-26	19,004	19,819	39,675	19,856	734	366	1,439	282	2,238	5,120	50.0%	
30-Jun-27	19,493	20,212	40,879	20,667	752	383	1,480	297	2,341	5,262	49.4%	
30-Jun-28	19,959	20,628	42,077	21,449	770	400	1,527	305	2,444	5,408	49.0%	
30-Jun-29	20,408	21,064	43,271	22,208	788	418	1,573	311	2,547	5,560	48.7%	
30-Jun-30	20,838	21,503	44,462	22,958	808	435	1,617	320	2,650	5,717	48.4%	
30-Jun-31	21,247	21,924	45,648	23,724	828	454	1,663	327	2,754	5,880	48.0%	
30-Jun-32	21,635	22,325	46,829	24,504	848	473	1,711	334	2,859	6,049	47.7%	
30-Jun-33	22,004	22,706	48,006	25,299	870	493	1,760	340	2,964	6,223	47.3%	
30-Jun-34	22,353	23,068	49,177	26,110	892	513	1,811	346	3,067	6,404	46.9%	
30-Jun-35	22,686	23,412	50,347	26,934	915	534	1,864	352	3,171	6,590	46.5%	
30-Jun-36	23,004	23,742	51,513	27,772	939	556	1,919	356	3,274	6,783	46.1%	
30-Jun-37	23,310	24,058	52,679	28,621	964	577	1,975	360	3,375	6,983	45.7%	
30-Jun-38	23,608	24,366	53,848	29,481	990	600	2,034	363	3,474	7,191	45.3%	
30-Jun-39	23,901	24,669	55,021	30,352	1,017	623	2,095	365	3,571	7,407	44.8%	
30-Jun-40	24,196	24,974	56,205	31,231	1,046	646	2,159	366	3,665	7,632	44.4%	
30-Jun-41	24,497	25,285	57,402	32,117	1,075	671	2,225	365	3,757	7,865	44.0%	
30-Jun-42	24,811	25,609	58,618	33,010	1,106	696	2,293	364	3,847	8,107	43.7%	
30-Jun-43	25,143	25,950	59,857	33,907	1,139	720	2,364	361	3,935	8,357	43.4%	
30-Jun-44	25,992	26,440	61,124	34,684	1,172	745	2,437	348	4,023	8,616	43.3%	
30-Jun-45	26,910	27,098	62,423	35,325	1,207	771	2,513	324	4,109	8,883	43.4%	
30-Jun-46	27,908	27,947	63,758	35,811	1,243	798	2,591	287	4,194	9,159	43.8%	
30-Jun-47	28,994	29,011	65,135	36,125	1,281	825	2,672	237	4,278	9,445	44.5%	
30-Jun-48	30,180	30,186	66,560	36,374	1,320	852	2,755	180	4,363	9,740	45.4%	
30-Jun-49	31,475	31,477	68,036	36,559	1,360	880	2,841	118	4,450	10,043	46.3%	
30-Jun-50	32,888	32,888	69,567	36,678	1,402	909	2,929	48	4,539	10,355	47.3%	
30-Jun-51	34,427	34,427	71,154	36,727	1,445	938	3,020	(29)	4,630	10,675	48.4%	
30-Jun-52	36,103	36,103	72,802	36,699	1,489	967	3,113	(111)	4,725	11,005	49.6%	



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-22	\$ 22,469	\$ 21,533	\$ 34,823	\$ 13,290	\$ 672	\$ 304	\$ 1,196	\$ 73	\$ 1,832	\$ 4,614	61.8%	
30-Jun-23	17,662	21,425	36,043	14,618	685	319	1,225	134	1,934	4,726	59.4%	
30-Jun-24	18,129	21,097	37,257	16,160	701	334	1,258	209	2,034	4,852	56.6%	
30-Jun-25	18,565	20,550	38,469	17,919	717	350	1,291	298	2,137	4,983	53.4%	
30-Jun-26	18,967	19,782	39,675	19,893	734	366	1,326	401	2,238	5,120	49.9%	
30-Jun-27	19,338	20,056	40,879	20,823	752	383	1,363	430	2,341	5,262	49.1%	
30-Jun-28	19,676	20,341	42,077	21,736	770	400	1,400	456	2,444	5,408	48.3%	
30-Jun-29	19,981	20,629	43,271	22,643	788	418	1,439	480	2,547	5,560	47.7%	
30-Jun-30	20,252	20,905	44,462	23,557	808	435	1,480	504	2,650	5,717	47.0%	
30-Jun-31	20,491	21,151	45,648	24,497	828	454	1,522	527	2,754	5,880	46.3%	
30-Jun-32	20,697	21,364	46,829	25,466	848	473	1,565	552	2,859	6,049	45.6%	
30-Jun-33	20,868	21,542	48,006	26,463	870	493	1,610	577	2,964	6,223	44.9%	
30-Jun-34	21,007	21,687	49,177	27,490	892	513	1,657	602	3,067	6,404	44.1%	
30-Jun-35	21,115	21,800	50,347	28,547	915	534	1,705	629	3,171	6,590	43.3%	
30-Jun-36	21,192	21,881	51,513	29,633	939	556	1,755	655	3,274	6,783	42.5%	
30-Jun-37	21,240	21,932	52,679	30,748	964	577	1,807	683	3,375	6,983	41.6%	
30-Jun-38	21,262	21,955	53,848	31,892	990	600	1,861	711	3,474	7,191	40.8%	
30-Jun-39	21,260	21,955	55,021	33,066	1,017	623	1,917	740	3,571	7,407	39.9%	
30-Jun-40	21,240	21,935	56,205	34,270	1,046	646	1,975	769	3,665	7,632	39.0%	
30-Jun-41	21,205	21,900	57,402	35,502	1,075	671	2,035	798	3,757	7,865	38.2%	
30-Jun-42	21,160	21,854	58,618	36,764	1,106	696	2,098	828	3,847	8,107	37.3%	
30-Jun-43	21,109	21,802	59,857	38,055	1,139	720	2,163	859	3,935	8,357	36.4%	
30-Jun-44	21,468	21,850	61,124	39,274	1,172	745	2,230	884	4,023	8,616	35.7%	
30-Jun-45	21,855	22,015	62,423	40,408	1,207	771	2,299	901	4,109	8,883	35.3%	
30-Jun-46	22,277	22,311	63,758	41,447	1,243	798	2,370	910	4,194	9,159	35.0%	
30-Jun-47	22,741	22,755	65,135	42,380	1,281	825	2,444	910	4,278	9,445	34.9%	
30-Jun-48	23,254	23,259	66,560	43,301	1,320	852	2,520	908	4,363	9,740	34.9%	
30-Jun-49	23,822	23,823	68,036	44,213	1,360	880	2,599	904	4,450	10,043	35.0%	
30-Jun-50	24,448	24,448	69,567	45,118	1,402	909	2,680	896	4,539	10,355	35.1%	
30-Jun-51	25,139	25,139	71,154	46,015	1,445	938	2,763	888	4,630	10,675	35.3%	
30-Jun-52	25,898	25,898	72,802	46,904	1,489	967	2,848	877	4,725	11,005	35.6%	



## 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 (2.71%)

#### 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	\$26,661	\$1,323	\$47,094	\$3,377
Total Normal Cost %	12.78%	12.23%	42.10%	34.77%
Employer Normal Cost %	8.30%	4.16%	37.63%	26.70%

#### 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	\$6,662	\$178	\$12,154	\$477
Total Normal Cost %	28.59%	22.46%	88.99%	68.08%
Employer Normal Cost %	16.39%	8.26%	76.79%	53.88%

Dollar Amounts are in \$ Millions

