MINUTES OF THE SPECIAL BOARD MEETING OF THE
BOARD OF TRUSTEES OF THE EMPLOYEES' RETIREMENT SYSTEM (ERS)

TUESDAY, JULY 16, WEDNESDAY, JULY 17, AND THURSDAY, JULY 18, 2013

THE RITZ-CARLTON, KAPALUA; BALLROOMS SALON 1, 2, 3, AND 4
ONE RITZ-CARLTON DRIVE, KAPALUA, MAUI, HAWAII 96761

ROLL CALL FOR JULY 16, 2013	Trustees present:	Mr. Emmit Kane, Chair Ms. Jackie Ferguson-Miyamoto Ms. Pilialoha Lee Loy Mr. Colbert Matsumoto Mr. Jerome Rauckhorst Mr. Wayne Yamasaki Mr. Kalbert Young
	Trustee excused:	Mr. Vincent Barfield, Vice Chair
	Attorneys present:	Mr. Brian Aburano, Deputy Attorney General Ms. Diane Kishimoto, Deputy Attorney General
	Staff present:	Mr. Wesley Machida, Executive Director Ms. Kanoe Margol, Assistant Administrator Mr. Vijoy Chattergy, Chief Investment Officer Ms. Donna Curry, Program Specialist Ms. Jaime Hirata, Recording Secretary Ms. Raechele Joyo, Secretary Ms. Wanda Kugiya, Secretary
	Guests present:	See Attachment A.
QUORUM/CALL TO ORDER		A quorum being present, Mr. Emmit Kane, Chair of the Board of Trustees of the Employees' Retirement System (the Board), called the special meeting to order at 9:08 a.m.

ENTER EXECUTIVE SESSION

On a motion made by Trustee Lee Loy, seconded by Trustee Ferguson-Miyamoto, and unanimously carried, the Board entered into executive session:

- Pursuant to HRS § 92-5(a)(8), to consider and, if appropriate, to make a decision regarding the sale of property from the LaSalle Investment Management, Inc. core real estate portfolio;

- Pursuant to HRS § 92-5(a)(8), to consider a status report from Courtland Partners, Ltd. on the Core Separate Account Transition;

- Pursuant to HRS § 92-5(a)(8), to consider a status report from Heitman Capital Management on the Ka'anapali Golf Courses and issues arising from a site inspection of the Royal Ka'anapali Golf Courses; appropriate action;

- Pursuant to HRS § 92-5(a)(8), to consider a status report from Courtland Partners, Ltd. on BlackSand Capital; appropriate action;

- To approve the May 14, 2013 executive session minutes;

- Pursuant to HRS § 92-5(a)(4) and (8), to consult with the Board's attorneys on questions and issues pertaining to, and to consider staff's preliminary recommendations relating to, trustee elections;

- Pursuant to HRS § 92-5(a)(8), to consider a report from Hamilton Lane Advisors, LLC regarding private equity strategic plan; appropriate action; and

- Pursuant to HRS § 92-5(a)(8), to consider the Actuary's and Investment Consultant's preliminary projections and estimates regarding future pension liabilities.

EXECUTIVE SESSION TO
CONSIDER AND, IF APPROPRIATE,
TO MAKE A DECISION
REGARDING THE SALE OF
PROPERTY FROM THE LASALLE
INVESTMENT MANAGEMENT, INC.
CORE REAL ESTATE PORTFOLIO

EXECUTIVE SESSION TO
CONSIDER A STATUS REPORT
FROM COURTLAND PARTNERS,
LTD. ON THE CORE SEPARATE
ACCOUNT TRANSITION

EXECUTIVE SESSION TO
CONSIDER A STATUS REPORT
FROM HEITMAN CAPITAL
MANAGEMENT ON THE
KA'ANAPALI GOLF COURSES AND
ISSUES ARISING FROM A SITE
INSPECTION OF THE ROYAL
KA'ANAPALI GOLF COURSES

RECESS

Chair Kane called a recess at 10:48 a.m.

RECONVENE

A quorum being present, Chair Kane reconvened the meeting at 11:02 a.m.

EXECUTIVE SESSION TO
CONSIDER A STATUS REPORT
FROM COURTLAND PARTNERS,
LTD. ON BLACKSAND CAPITAL

APPROVAL OF EXECUTIVE
SESSION MINUTES
- MAY 14, 2013

EXECUTIVE SESSION TO CONSULT
WITH THE BOARD'S ATTORNEYS
ON QUESTIONS AND ISSUES
PERTAINING TO, AND TO
CONSIDER STAFF'S PRELIMINARY
RECOMMENDATIONS RELATING
TO TRUSTEE ELECTIONS

(Mr. Humphrey and Mr. Moore left the meeting.)

EXECUTIVE SESSION TO
CONSIDER A REPORT FROM
HAMILTON LANE ADVISORS, LLC
REGARDING PRIVATE EQUITY
STRATEGIC PLAN

RECESS

Chair Kane called a recess at 12:33 p.m.

RECONVENE

A quorum being present, Chair Kane reconvened the meeting at 1:42 p.m.

EXECUTIVE SESSION TO
CONSIDER THE ACTUARY'S AND
INVESTMENT CONSULTANT'S
PRELIMINARY PROJECTIONS AND
ESTIMATES REGARDING FUTURE
PENSION LIABILITIES

EXIT EXECUTIVE SESSION

On a motion made by Trustee Lee Loy, seconded by Trustee Ferguson-Miyamoto, and unanimously carried, the Board exited executive session.

NEW ACTUARIAL OPTION FACTORS FOR EMPLOYEES WHO BECOME ERS MEMBERS AFTER JUNE 30, 2012 (ACT 163, SLH 2011)

Mr. Joe Newton of Gabriel Roeder Smith & Company (GRS), the ERS's actuary consultant, and Mr. Wesley Machida, ERS's Executive Director (Executive Director) presented the new actuarial option factor tables prepared by GRS to be used to calculate retirement pension benefits for employees who become ERS members after June 30, 2012. These are the ERS members who are subject to the provisions of Act 163, SLH 2011. The factors reflect the same 7.75% investment return assumption rate and updated mortality tables used in the updated option factor tables adopted by the Board in January 2013 for employees who became ERS members prior to July 1, 2012.

(Trustee Young left the meeting.)

On a motion made by Trustee Lee Loy, seconded by Trustee Ferguson-Miyamoto, and unanimously carried, the Board approved the actuarial option factor tables for ERS members with membership dates after June 30, 2012, that are attached to these minutes as Tables 1, 2, 3, 4, and 6, and incorporated by reference (Attachment C).

There being no further discussion, Mr. Newton left the meeting.

ENTER EXECUTIVE SESSION

On a motion made by Trustee Lee Loy, seconded by Trustee Ferguson-Miyamoto, and unanimously carried, the Board entered executive session :

- Pursuant to HRS § 92-5(a)(4) and (8), to consult with the Board's attorneys on questions and issues pertaining to the Board's powers, duties, privileges, immunities and liabilities relating to interactions and meetings with third-parties; and

- Pursuant to HRS § 92-5(a)(8), to consider and, if appropriate, to make a decision regarding the draft of the internal audit report by KMH LLP.

(Trustee Young returned to the meeting.)

EXECUTIVE SESSION TO CONSULT WITH THE BOARD'S ATTORNEYS ON QUESTIONS AND ISSUES PRETAINING TO THE BOARD'S POWERS, DUTIES, PRIVILEGES, IMMUNITIES AND LIABILITIES RELATING TO INTERACTIONS AND MEETINGS WITH THIRD-PARTIES

EXECUTIVE SESSION TO
CONSIDER AND, IF APPROPRIATE,
TO MAKE A DECISION
REGARDING THE DRAFT OF THE
INTERNAL AUDIT REPORT BY
KMH LLP

EXIT EXECUTIVE SESSION

On a motion made by Trustee Lee Loy, seconded by Trustee Ferguson-Miyamoto, and unanimously carried, the Board exited from executive session.

APPROVAL OF BOARD MEETING
MINUTES – MAY 14, 2013

On a motion made by Trustee Lee Loy, seconded by Trustee Ferguson-Miyamoto, and unanimously carried, the Board approved the minutes of the May 14, 2013 Board meeting.

(Chair Kane left the meeting. Trustee Lee Loy assumed the duties of Chair of the meeting.)

CHANGE IN TITLE OF THE ASSISTANT ADMINISTRATOR TO DEPUTY EXECUTIVE DIRECTOR

The Executive Director reported that, effective July 1, 2013, the title of the ERS Administrator was changed by statute to Executive Director. Because of this change, the Executive Director requested that the Board change the title of the ERS Assistant Administrator to Deputy Executive Director. The title change for the Assistant Administrator requires approval from the Director of Finance and the Director of Human Resource Development.

AUTHORIZATION FOR THE EXECUTION OF CONTRACTS AND OTHER LEGAL DOCUMENTS ON BEHALF OF THE ERS

The Executive Director presented to the Board for the Board's consideration a resolution relating to the authority for the execution of contracts and other legal documents on behalf of the ERS.

On a motion made by Trustee Ferguson-Miyamoto, seconded by Trustee Lee Loy, and unanimously carried, the Board authorized changing the title of the ERS's Assistant Administrator to Deputy Executive Director and adopted the following:

RESOLUTION

RESOLVED, That any two of the following; namely,

(1) Executive Director of the Employees' Retirement System of the State of Hawaii, or
(2) Deputy Executive Director in the absence of the Executive Director, or
(3) Director of Finance of the State of Hawaii in the absence of the Executive Director and the Deputy Executive Director, and
(4) Chairperson of the Board of Trustees, or
(5) Vice-Chairperson in the absence of the Chairperson, or
(6) Any member of the Board of Trustees in the absence of the Chairperson and Vice-Chairperson,

are hereby authorized to sign and execute for and on behalf of the Employees' Retirement System of the State of Hawaii all contracts, agreements and other instruments and legal documents, the signing and execution of which is necessary and proper for the conduct of the business of said System, and which is pursuant to and in conformity with action taken by the Board of Trustees of said System with respect to the subject matter of such document, agreement or instrument of the execution thereof.

All such documents which have been executed by the Secretary or Administrator of the Employees' Retirement System or Assistant Secretary or Assistant Administrator of the Employees' Retirement System, are not invalidated, impaired, or jeopardized by this resolution.

All such documents which have been executed by the Executive Director prior to the adoption of this resolution are ratified and confirmed.

(Chair Kane returned to the meeting.)

INVESTMENT MANAGER ORGANIZATIONAL CHANGES

Mr. Vijoy Chattergy, the ERS's Chief Investment Officer (CIO), provided an update on the organizational changes of the ERS's investment managers:

- Credit Suisse Securities (USA) LLC (CSTM) and J.P. Morgan have exited the transition management business; J.P. Morgan was selected as one of the firms to provide transition management services for the next three to five years. There is no impact to the operation of the transition management pool or to the management of the ERS Portfolio.

- Mercator Asset Management, L.P. (Mercator) announced that Cindy A. New will assume partnership status at Mercator effective July 1, 2013; no impact to the management of ERS assets is expected.

- Western Asset Management Company (WAMCO) announced that Joseph Carieri will leave the firm; Chris Orndorff will continue to serve as the primary portfolio managers of the ERS account; no impact on investment performance is expected.

INVESTMENT OFFICE ACTIVITIES

The CIO reported on the status of Investment Office activities for July 2013. Highlights included:

- Abbott Capital Management, LLC closed on commitments and strategies to CVC Capital Partners VI and Sentinel Capital Partners.

- Hamilton Lane Advisors, LLC (Hamilton Lane) providing ongoing review of the ERS's private equity program.

- BlackRock, Inc. (BlackRock) requested additional tools to manage costs and improve performance. Pension Consulting Alliance, Inc. (PCA), ERS's general investment consultant, and ERS staff are in the process of reviewing the tools and will inform the Board of any recommendations at a future Board meeting.

- CIO informed Bradford & Marzec, LLC and WAMCO that they should divest of the bonds that are now under new parent company Glencore, which is a scrutinized company under the ERS's Sudan Investment Policy; CIO will provide a status report at a future Board meeting.

- Investment Managers on "Watch Status": C.S. McKee, L.P. (underperformance); Gateway Investment Advisers, LLC (organizational changes); and Mercator Asset Management, L.P. (underperformance).

- The CIO conducted due diligence site inspections of BlackRock (global inflation protection securities) and Quantitative Management Associates LLC (emerging markets) in June 2013.

- Trustee Matsumoto is scheduled to attend the National Conference on Public Employee Retirement Systems (NCPERS) Program for Advanced Trustee Studies in Massachusetts, August 19-21, 2013.

- The CIO will speak on a panel with Hank Kim, Executive Director of NCPERS, at the Truman Scholars Association National Conference on July 20, 2013 in Washington, D.C.

- "Save the Date" for ERS's Real Estate Symposium was emailed to the ERS's investment managers, consultants, etc. ERS staff is taking a different approach to this event by including private markets and private equity in an effort to streamline a more efficient way to convey the information to the Board, ERS staff, and attendees; the event name may change to Private Markets Symposium.

- Recruitment of Investment Specialists for the ERS's Investment Office is ongoing and in-person interviews with the finalists are scheduled for August 13-14, 2013; the three Investment Officer positions will be discussed at the Compensation Review Committee meeting scheduled for July 17, 2013.

- The CIO will be on vacation July 19-26, 2013.

INVESTMENT MANAGER MEETINGS, 2ND QUARTER 2013

The CIO reported on investment meetings attended by Investment Office staff with managers under contract and potential investment managers and other service providers in the second quarter of 2013.

DUE DILIGENCE REVIEW OF QUANTITATIVE MANAGEMENT ASSOCIATES LLC AND BLACKROCK, INC.

The CIO reported on the routine due diligence site inspections of BlackRock at its New York office on June 18, 2013 and Quantitative Management Associates LLC, at its New Jersey office on June 17, 2013. The site inspections were conducted by the CIO and PCA staff. The CIO and PCA did not discover any issues that would impact the ERS's portfolio.

CHIEF INVESTMENT OFFICER'S REPORT ON THE INSTITUTIONAL LIMITED PARTNERS ASSOCIATION (ILPA) INSTITUTE LEVEL 1 PROGRAM

The CIO reported on his attendance to the Institutional Limited Partners Association (ILPA) Institute Level 1 Program that was held in Chicago, Illinois, June 19-21, 2013.

OPERATIONS REPORT – JUNE 2013

The Executive Director reported on the status of the ERS's operations for June 2013. Highlights included:

- 1,650 pending pension finalizations

- Recruitment of 5 Retirement Claims Examiners for the ERS's Enrollment, Claims and Benefits Branch is ongoing; pending list of qualified applicants from the Department of Human Resources Development

- Recouped forty-four overpayments since the Board's decision in April 2013 to not forgive any overpayments

RECESS

Chair Kane called a recess at 3:38 p.m. and announced that the meeting will reconvene at 8:30 a.m. on Wednesday, July 17, 2013, at the Ballrooms Salon 1, 2, 3 and 4 of the Ritz-Carlton, Kapalua.

ROLL CALL FOR JULY 17, 2013	Trustees present:	Mr. Emmit Kane, Chair Mr. Vincent Barfield, Vice Chair Ms. Jackie Ferguson-Miyamoto Ms. Pilialoha Lee Loy Mr. Colbert Matsumoto Mr. Jerome Rauckhorst Mr. Wayne Yamasaki Mr. Kalbert Young
	Staff present:	Mr. Wesley Machida, Executive Director Ms. Kanoe Margol, Assistant Administrator Mr. Vijoy Chattergy, Chief Investment Officer Ms. Donna Curry, Program Specialist Ms. Jaime Hirata, Recording Secretary Ms. Raechele Joyo, Secretary Ms. Wanda Kugiya, Secretary
	Guests present:	See Attachment A.

RECONVENE

A quorum being present, Chair Kane reconvened the meeting at 8:47 a.m. on Wednesday, July 17, 2013, in the Ballrooms Salon 1, 2, 3 and 4 of the Ritz-Carlton, Kapalua, Maui.

PRESENTATIONS

WELCOME REMARKS – STATE OF HAWAII LIEUTENANT GOVERNOR SHAN TSUTSUI

Chair Kane introduced and welcomed State of Hawaii Lieutenant Governor Shan Tsutsui. The Lieutenant Governor welcomed the conferees to Maui.

The CIO introduced himself and the trustees, and recognized the participating firms. Mr. Chattergy acknowledged Trustee Jackie Ferguson-Miyamoto as the moderator for the day.

REPORT OF THE EXECUTIVE DIRECTOR

Trustee Ferguson-Miyamoto introduced the ERS's Executive Director. The Executive Director introduced the rest of the ERS staff, and provided a brief update on the ERS's operational activities and changes in State laws affecting member benefits.

THE HIERS PORTFOLIO: BEFORE, AFTER, AND BEYOND – ALLAN EMKIN, PENSION CONSULTING ALLIANCE, INC.

Trustee Ferguson-Miyamoto introduced Mr. Allan Emkin of PCA, who gave a presentation on the overview of the ERS's investment portfolio and its changes throughout the past and present, and discussed the ERS's and PCA's outlook for the future of the portfolio.

CAPITAL MARKET EXPECTATIONS: SOURCES OF RETURN AND SOURCES OF RISK – JARED GROSS, PACIFIC INVESTMENT MANAGEMENT COMPANY, LLC (PIMCO)

Trustee Ferguson-Miyamoto introduced Mr. Jared Gross of Pacific Investment Management Company, LLC (PIMCO), who gave a presentation and discussed sources of return and risk regarding capital market expectations.

RECESS

Chair Kane called a recess at 11:06 a.m.

RECONVENE	A quorum being present, Chair Kane reconvened the meeting at 11:25 a.m. and announced that Trustee Ferguson-Miyamoto would continue to serve as moderator.
INVESTING FOR SUSTAINABLE RETURNS IN A LOW GROWTH ENVIRONMENT – CHRIS BRIGHTMAN, RESEARCH AFFILIATES LLC	Trustee Ferguson-Miyamoto introduced Mr. Chris Brightman of Research Affiliates, LLC. who gave a presentation on investing for sustainable returns in a low growth environment.
RECESS	Chair Kane called a recess at 12:20 p.m. and announced that the meeting would immediately reconvene in the Ballroom Salon 3 and 4 for lunch and further business, and that after lunch the meeting would reconvene in the Ballroom Salon 1 and 2.
RECONVENE	A quorum being present, Chair Kane reconvened the meeting in the Ballroom Salon 3 and 4 at 12:30 p.m.
TRUSTEE PRESENTATION – RESOLUTION FOR EMMIT A. KANE	Trustee Ferguson-Miyamoto read proposed Resolutions recognizing Chair Kane, who was scheduled to retire from State service by August 2013. On a motion made by Trustee Ferguson-Miyamoto, seconded by Trustee Lee Loy, and unanimously carried, the Board adopted the Resolutions, a copy of which is attached to these Minutes and incorporated by reference (Attachment B).
2013 SUMMIT KEYNOTE ADDRESS - WILMONT KAMAUNU KAHA'IALI'I	Trustee Lee Loy announced that Maui Councilmember Michael Victorino, who was scheduled to give the keynote address, would not be available to speak due to a last minute personal matter. Trustee Lee Loy introduced Mr. Wilmont Kamaunu Kaha'iali'i of Kaha'iali'i Productions, who gave the keynote address on the history of Maui and Polynesia.
QUORUM	A quorum being present, Trustee Kane reconvened the meeting in Ballroom Salon 1 and 2 at 1:44 p.m. and announced that Trustee Ferguson-Miyamoto would continue to serve as moderator.
BUILDING A RESILIENT PORTFOLIO TO REACH EXPECTED RETURNS TARGETS – ALEXANDER HUBERTS, MELLON CAPITAL MANAGEMENT CORPORATION	Trustee Ferguson-Miyamoto introduced Mr. Alexander Huberts of Mellon Capital Management Corporation, who gave a presentation on how to build a portfolio to reach expected return targets.
TALK STORY "ALTERNATIVE VIEWS OF THE FUTURE" – ALLAN EMKIN, PENSION CONSULTING ALLIANCE, INC.; MICHAEL HUMPHREY, COURTLAND PARTNERS, LTD; AND PAUL YETT, HAMILTON LANE	Trustee Ferguson-Miyamoto announced that Mr. Emkin of PCA would serve as moderator for a discussion on alternative views of the future of investments. Mr. Michael Humphrey of Courtland Partners, and Mr. Paul Yett of Hamilton Lane, participated in the discussion.
RECESS	Chair Kane called a recess at 3:18 p.m. and announced that the meeting would reconvene at 8:45 a.m. on Thursday, July 19, 2012, in the Ballroom Salon 1and 2.

ROLL CALL FOR JULY 18, 2013	Trustees present:	Mr. Emmit Kane, Chair Mr. Vincent Barfield, Vice Chair Ms. Jackie Ferguson-Miyamoto Ms. Pilialoha Lee Loy Mr. Colbert Matsumoto Mr. Jerome Rauckhorst Mr. Wayne Yamasaki Mr. Kalbert Young
	Staff present:	Mr. Wesley Machida, Executive Director Ms. Kanoe Margol, Assistant Administrator Mr. Vijoy Chattergy, Chief Investment Officer Ms. Donna Curry, Program Specialist Ms. Jaime Hirata, Recording Secretary Ms. Raechele Joyo, Secretary Ms. Wanda Kugiya, Secretary
	Guests present:	See Attachment A.
RECONVENE		A quorum being present, Chair Kane reconvened the meeting at 9:01 a.m. on Friday, July 19, 2012, in the Ballroom Salon 1 and 2 at the Ritz-Carlton, Kapalua, Maui.
		Chair Kane announced that Trustee Wayne Yamasaki would serve as moderator for the day.
REPORT OF THE CHIEF INVESTMENT OFFICER		The CIO presented an update on the ERS's investment office.
POST-CRISIS TRENDS IN PUBLIC PENSION PLAN INVESTMENT MANAGEMENT – KED HOGAN, BLACKROCK		Trustee Yamasaki introduced Mr. Ked Hogan of BlackRock, who gave a presentation on post-crisis trends in public pension plan investment management.
RECESS		Chair Kane called a recess at 9:50 a.m.
RECONVENE		A quorum being present, Chair Kane reconvened the meeting at 10:08 a.m.
THE FUTURE OF RISK: ADVANCED TOOLS – DEBRA BAKER AND SAM OH, BNY MELLON ASSET SERVICING		Trustee Yamasaki introduced Ms. Debra Baker and Mr. Sam Oh of BNY Mellon Asset Servicing (BNY), ERS's new custodial bank, who gave a presentation on BNY's services and tools used to manage risk.

HAWAII INVESTMENT OPPORTUNITIES – ANDREW BETZ, MACQUARIE FUNDS MANAGEMENT; KARL FOOKS, STATE OF HAWAII STRATEGIC DEVELOPMENT CORPORATION; ARBEN KRYEZIU, MBLOOM BRIDGE FUND; JEFF MURPHEY, ULLICO INVESTMENT COMPANY; HANK WUH, SKAI VENTURES	Chair Kane announced that Mr. Andy Betz of Macquarie Funds Management, ERS's Hawaii Targeted Investment Program (HiTIP) manager, would serve as moderator for a discussion on Hawaii investment opportunities. Mr. Betz introduced himself, Mr. Karl Fooks of the State of Hawaii Strategic Development Corporation, Mr. Arben Kryeziu of Mbloom Bridge Fund, Mr. Jeff Murphey of ULLICO Investment Company, and Mr. Han Wuh of SKAI Ventures, who participated in the discussion.
CLOSING REMARKS	The CIO and Chair Kane thanked everyone for attending and also thanked the trustees and ERS staff for an outstanding job participating in and coordinating the event.
NEXT BOARD MEETING – AUGUST 12, 2013	Chair Kane announced that the next Board meeting is scheduled for August 12, 2013.
ADJOURNMENT	On a motion made by Trustee Lee Loy, seconded by Trustee Ferguson-Miyamoto, and unanimously carried, Chair Kane adjourned the Board meeting at 12:04 p.m.

REDACTED
SIGNATURE

Kanoe Margol
Assistant Administrator

for

Wesley K. Machida
Executive Director

WKM/KM: jh

Attachments

Attachment A

LIST OF GUESTS PRESENT

TUESDAY, JULY 16, 2013

Ed Kagiyama	Billy Casper Golf
Michael Humphrey Daniel Moore	Courtland Partners, Ltd.
Joe Newton	Gabriel Roeder Smith & Company
Paul Yett	Hamilton Lane Advisors, LLC
Jim Proud Paul Rezents	Heitman Capital Management, LLC
Colin Bebee Allan Emkin John Linder	Pension Consulting Alliance, Inc.

Attachment A

LIST OF GUESTS PRESENT

WEDNESDAY, JULY 17, 2013

Jonathan Roth Katie Stokel	Abbott Capital Management
Matthew Kaplan	Almanac Realty Investors, LLC
Aliana Spungen	Angelo, Gordon & Company
Paul Weinstein	Azure Capital Partners
Steve Rodgers	Bank of Hawaii
Cory Martin Ray Nixon, Jr.	Barrow, Hanley, Mewhinney & Strauss, LLC
Ked Hogan Kevin O'Donnell Brian Weinstein	BlackRock
BJ Kobayashi	BlackSand Capital, LLC
Karen Sprogis	The Blackstone Group
Debra Baker Sam Oh Rob Snyder	BNY Mellon Asset Servicing
David Smith Michael Young	BNY Mellon Beta & Transition Management
Graham Allen Zelda (Zee) Marzec	Bradford & Marzec, LLC
Michael McMenomy	CBRE Global Investors
Brett Bidwell Niall Kilcommons	C.M. Bidwell & Associates, Ltd.
Eugene Natali	C.S. McKee, L.P.
Kim Smallwood	ConvergEx
Michael Humphrey	Courtland Partners, Ltd.
Karl Fooks	Dept. of Business, Economic Development, and Tourism (Hawaii Strategic Development Corp.)
Richard Lim	Dept. of Business, Economic Development, and Tourism
Nick Efstratis	Epic Ventures
Alan Arizumi Michael Hirai	First Hawaiian Bank
Peter Hausmann	Fortress Investment Group
James Battaglia Ted Sheridan	Franklin Templeton Investment
Michael Buckius	Gateway Investment Advisers, LLC
Joe Newton	Gabriel Roeder Smith & Company
Paul Yett	Hamilton Lane Advisors, LLC
Jonathan Aggett	Hancock Timber Resource Group
Mary Ludgin Jim Proud Paul Rezents	Heitman, LLC
Jeff Cavanaugh David Farmer Delia Roges	Invesco Real Estate

Max Swango	Invesco Real Estate
Richard Mastain	Jennison Associates
Jonathan Sherman	J.P. Morgan
Joel Damon	J.P. Morgan Asset Management
Joseph Munoz	LaSalle Investment Management
Andrew Betz Rick Fratus	Macquarie Funds Management (USA), Inc.
Alexander Huberts	Mellon Capital Management
Brian Jacobs	Mellon Capital Management Corp.
Robin Kollannur	Mercator Asset Management
Ryan Krauch	Mesa West Capital
Phil Gutry	MPM Capital
Paul Anderson	Natixis Global Asset Management
Richard Clark	Northern Trust Global Investments
Francie Maletis	Oaktree Capital Management
Stephen Butters Roman Kostal Astrid Vogler	Oechsle International Advisors, LLC
Lloyd McAdams Brad Schluter Tim Tarpening	Pacific Income Advisers
Colin Bebee Allan Emkin John Linder Ashley Yoshida	Pension Consulting Alliance, Inc.
Michael Chandra Jared Gross	PIMCO
Noah Levy Mark Oczkus	Prudential Real Estate Investors
Brad Allinson	Quantitative Management Associates
Chris Brightman Jeff Wilson	Research Affiliates, LLC
A. Michael Sramek Samantha Toler	Sands Capital Management
Frank Alonso L. Kenneth Brooks Stephon Jackson David Orlando	T. Rowe Price
Luke Howe	Ullico Investment Co.
Derek Fan	Western Asset Management Co.
Peter Shoemaker	Wedbush Capital Partners

Attachment A

LIST OF GUESTS PRESENT

THURSDAY, JULY 18, 2013

Katie Stokel	Abbott Capital Management
Aliana Spungen	Angelo, Gordon & Company
Cory Martin Ray Nixon, Jr.	Barrow, Hanley, Mewhinney & Strauss, LLC
Ked Hogan Kevin O'Donnell Brian Weinstein	BlackRock
Karen Sprogis	The Blackstone Group
Debra Baker Sam Oh Rob Snyder	BNY Mellon Asset Servicing
Michael Young	BNY Mellon Beta & Transition Management
Michael McMenomy	CBRE Global Investors
Brett Bidwell Niall Kilcommons	C.M. Bidwell & Associates, Ltd.
Eugene Natali	C.S. McKee, L.P.
Kim Smallwood	ConvergEx
Karl Fooks	Dept. of Business, Economic Development, and Tourism (Hawaii Strategic Development Corp.)
Richard Lim	Dept. of Business, Economic Development, and Tourism
Nick Efstratis	Epic Ventures
Alan Arizumi Michael Hirai	First Hawaiian Bank
James Battaglia Ted Sheridan	Franklin Templeton Investment
Michael Buckius	Gateway Investment Advisers, LLC
Paul Yett	Hamilton Lane Advisors, LLC
Jonathan Aggett	Hancock Timber Resource Group
Mary Ludgin Jim Proud Paul Rezents	Heitman, LLC
David Farmer Max Swango	Invesco Real Estate
Richard Mastain	Jennison Associates
Jonathan Sherman	J.P. Morgan
Joseph Munoz	LaSalle Investment Management
Andrew Betz Rick Fratus	Macquarie Funds Management (USA), Inc.
Arben Kryeziu	Mbloom LLC
Brian Jacobs	Mellon Capital Management Corp.
James Chaney	Mercator Asset Management
Ryan Krauch	Mesa West Capital
Phil Gutry	MPM Capital
Paul Anderson	Natixis Global Asset Management

Richard Clark	Northern Trust Global Investments
Stephen Butters Roman Kostal Astrid Vogler	Oechsle International Advisors, LLC
Lloyd McAdams Brad Schluter Tim Tarpening	Pacific Income Advisers
Colin Bebee Allan Emkin John Linder Ashley Yoshida	Pension Consulting Alliance, Inc.
Michael Chandra Jared Gross	PIMCO
Noah Levy Mark Oczkus	Prudential Real Estate Investors
Brad Allinson	Quantitative Management Associates
Chris Brightman	Research Affiliates, LLC
A. Michael Sramek	Sands Capital Management
Frank Alonso David Orlando	T. Rowe Price
Jeff Murphy	Ullico Investment Co.
Derek Fan	Western Asset Management Co.
Peter Shoemaker	Wedbush Capital Partners

Resolution

WHEREAS, EMMIT A. KANE became a member of the Board of Trustees of the Employees' Retirement System of the State of Hawaii on February 10, 2010 when appointed to complete the 2-year term of a retiring trustee; and on January 11, 2012, Mr. Kane was elected to the Board of Trustees to serve until January 1, 2018, and the Board of Trustees of the Employees' Retirement System, on March 11, 2013, elected Mr. Emmit A. Kane as Chair of the Board; and

WHEREAS, during his tenure, he served as Deputy and Assistant Fire Chief with the Honolulu Fire Department and on the Executive Board of the Hawaii Fire Fighters Association; and

WHEREAS, during his tenure, the Employees' Retirement System's assets grew from $8.9 billion to $12.3 billion with positive investment returns for 4 years, its membership increased from 110,927 to 113,282 and the number of pensioners grew from 36,999 to 40,774 with the average pension payment increasing from $1,906 to $2,023; and

WHEREAS, during his term as a Trustee, the Board introduced the following proposals that became state law to deal with the System's growing pension and unfunded liabilities that jeopardizes its sustainability: (1) the 2011 moratorium on benefit enhancements until the Employees' Retirement System is 100% funded, (2) the pension benefit reforms of 2011 which lowered benefits and costs for new members, increased eligibility requirements, and increased the employee contribution rates for all new members from July 1, 2012, (3) the graduated increase in employer contributions from 2012 to 2016, (4) the employer assessments for significant increases in non-base compensation prior to retirement resulting in "pension spiking" for retirees after June 30, 2012, and (5) the elimination of overtime and certain differentials in the calculation of retirement benefits for new members from July 1, 2012; and

WHEREAS, during Mr. Kane's tenure on the Board's investment committee, the Board's effective investment strategy became more complex and diversified by including asset classes such as Covered Calls and Real Returns to better take advantage of market opportunities, increasing exposure to global investments in public and private markets, reconstructing the portfolio to include more passive strategies and opportunistic real estate funds, and hiring a private equity consultant to support efforts to increase exposure to private equity going forward; and

WHEREAS, while Mr. Kane served as a Trustee, the Employees' Retirement System, with the Board's encouragement, greatly improved its customer service through timely Holomua newsletters, an expanded website and a member self-service module, providing employees and retirees with a more responsive, open and professional organization that elicits confidence and trust confirming that, for the Board and Staff, the membership is their main priority; and

WHEREAS, Emmit A. Kane was a public servant in the true sense of the word, committing himself to serving the people of Hawaii with dedication and unselfishness, and worked relentlessly and diligently to insure that the quality of life of retired public employees was of the highest standard, and dedicated himself to improving the resources of the program which would enable the members to retire knowing that such years would be lived with dignity; and

WHEREAS, under his stewardship, the Employees' Retirement System continued to be nationally recognized and emulated by sister states; and

WHEREAS, during his tenure as a Trustee, he won the respect and admiration of his peers; and his distinguished and exemplary service merits the highest recognition;

NOW THEREFORE BE IT RESOLVED by the Board of Trustees of the Employees' Retirement System, on July 16, 2013, that it commends and congratulates Emmit A. Kane for his outstanding leadership and service to the Employees' Retirement System and the people of Hawaii; and that sincerest best wishes be extended to Emmit A. Kane for a distinguished career in public service;

BE IT FURTHER RESOLVED that a certified copy of this Resolution be transmitted to **Mr. Emmit A. Kane.**

Table 1 - Annuity Factors and Insurance Reserve Factors (Tier II)

Age	Annuity Factors	Age	Insurance Reserve Factors
45	14.1959	45	14.33
46	14.0873	46	14.25
47	13.9726	47	14.16
48	13.8512	48	14.07
49	13.7231	49	13.97
50	13.5880	50	13.88
51	13.4530	51	13.78
52	13.3220	52	13.69
53	13.1918	53	13.59
54	13.0621	54	13.48
55	12.9321	55	13.37
56	12.8007	56	13.26
57	12.6666	57	13.14
58	12.5290	58	13.02
59	12.3875	59	12.89
60	12.2419	60	12.75
61	12.0917	61	12.61
62	11.9351	62	12.46
63	11.7694	63	12.30
64	11.5934	64	12.13
65	11.4058	65	11.96
66	11.2062	66	11.77
67	10.9945	67	11.58
68	10.7714	68	11.39
69	10.5380	69	11.18
70	10.2956	70	10.98
71	10.0448	71	10.76
72	9.7860	72	10.54
73	9.5193	73	10.31
74	9.2446	74	10.07
75	8.9623	75	9.83
76	8.6731	76	9.59
77	8.3774	77	9.34
78	8.0760	78	9.08
79	7.7693	79	8.83
80	7.4575	80	8.57
81	7.1415	81	8.32
82	6.8232	82	8.05
83	6.5050	83	7.80
84	6.1895	84	7.55
85	5.8792	85	7.31

Table 2 - Insurance Reserve Death Benefit (Tier II)

Ratio of accumulated contribution to maximum allowance

Age	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
21	0.998	0.998	0.999	0.999	0.999	0.999	0.999	0.999	0.999	0.999	0.999	0.999	0.999	1.000	1.000	1.000
22	0.998	0.998	0.998	0.998	0.999	0.999	0.999	0.999	0.999	0.999	0.999	0.999	0.999	1.000	1.000	1.000
23	0.998	0.998	0.998	0.998	0.998	0.999	0.999	0.999	0.999	0.999	0.999	0.999	0.999	1.000	1.000	1.000
24	0.998	0.998	0.998	0.998	0.998	0.998	0.999	0.999	0.999	0.999	0.999	0.999	0.999	1.000	1.000	1.000
25	0.998	0.998	0.998	0.998	0.998	0.998	0.998	0.999	0.999	0.999	0.999	0.999	0.999	0.999	1.000	1.000
26	0.998	0.998	0.998	0.998	0.998	0.998	0.998	0.999	0.999	0.999	0.999	0.999	0.999	0.999	1.000	1.000
27	0.998	0.998	0.998	0.998	0.998	0.998	0.998	0.998	0.999	0.999	0.999	0.999	0.999	0.999	1.000	1.000
28	0.998	0.998	0.998	0.998	0.998	0.998	0.998	0.998	0.998	0.999	0.999	0.999	0.999	0.999	1.000	1.000
29	0.998	0.998	0.998	0.998	0.998	0.998	0.998	0.998	0.998	0.999	0.999	0.999	0.999	0.999	1.000	1.000
30	0.998	0.998	0.998	0.998	0.998	0.998	0.998	0.998	0.998	0.998	0.999	0.999	0.999	0.999	1.000	1.000
31	0.997	0.997	0.997	0.997	0.998	0.998	0.998	0.998	0.998	0.998	0.999	0.999	0.999	0.999	1.000	1.000
32	0.997	0.997	0.997	0.997	0.997	0.997	0.998	0.998	0.998	0.998	0.998	0.999	0.999	0.999	1.000	1.000
33	0.997	0.997	0.997	0.997	0.997	0.997	0.997	0.998	0.998	0.998	0.998	0.999	0.999	0.999	1.000	1.000
34	0.997	0.997	0.997	0.997	0.997	0.997	0.997	0.997	0.998	0.998	0.998	0.998	0.999	0.999	1.000	1.000
35	0.996	0.997	0.997	0.997	0.997	0.997	0.997	0.997	0.998	0.998	0.998	0.998	0.999	0.999	1.000	1.000
36	0.996	0.996	0.996	0.996	0.997	0.997	0.997	0.997	0.997	0.998	0.998	0.998	0.999	0.999	1.000	1.000
37	0.996	0.996	0.996	0.996	0.996	0.996	0.997	0.997	0.997	0.997	0.998	0.998	0.999	0.999	1.000	1.000
38	0.996	0.996	0.996	0.996	0.996	0.996	0.996	0.997	0.997	0.997	0.998	0.998	0.999	0.999	1.000	1.000
39	0.995	0.995	0.995	0.996	0.996	0.996	0.996	0.996	0.997	0.997	0.997	0.998	0.998	0.999	0.999	1.000
40	0.995	0.995	0.995	0.995	0.995	0.995	0.996	0.996	0.996	0.997	0.997	0.998	0.998	0.999	0.999	1.000
41	0.994	0.994	0.994	0.995	0.995	0.995	0.995	0.996	0.996	0.996	0.997	0.997	0.998	0.999	0.999	1.000
42	0.994	0.994	0.994	0.994	0.994	0.994	0.995	0.995	0.995	0.996	0.996	0.997	0.998	0.998	0.999	1.000
43	0.993	0.993	0.993	0.993	0.993	0.993	0.994	0.994	0.995	0.995	0.996	0.996	0.997	0.998	0.999	1.000
44	0.992	0.992	0.992	0.992	0.992	0.992	0.993	0.993	0.994	0.994	0.995	0.996	0.997	0.998	0.999	1.000
45	0.990	0.990	0.990	0.991	0.991	0.991	0.992	0.992	0.993	0.993	0.994	0.995	0.997	0.998	0.999	1.000
46	0.989	0.989	0.989	0.989	0.989	0.990	0.990	0.991	0.992	0.992	0.994	0.995	0.996	0.998	1.000	1.000
47	0.987	0.987	0.987	0.987	0.988	0.988	0.989	0.989	0.990	0.991	0.993	0.994	0.996	0.998	1.000	1.000
48	0.985	0.985	0.985	0.985	0.985	0.986	0.987	0.988	0.989	0.990	0.992	0.993	0.995	0.998	1.000	1.000
49	0.982	0.982	0.982	0.983	0.983	0.984	0.985	0.986	0.987	0.989	0.991	0.993	0.995	0.997	1.000	1.000
50	0.979	0.979	0.979	0.980	0.980	0.981	0.982	0.984	0.986	0.987	0.990	0.992	0.995	0.997	1.000	1.000
51	0.976	0.976	0.976	0.977	0.978	0.979	0.980	0.982	0.984	0.986	0.989	0.991	0.994	0.997	1.000	1.000
52	0.973	0.974	0.974	0.975	0.976	0.977	0.979	0.980	0.983	0.985	0.988	0.991	0.994	0.998	1.000	1.000
53	0.971	0.971	0.972	0.972	0.974	0.975	0.977	0.979	0.981	0.984	0.987	0.990	0.994	0.998	1.000	1.000
54	0.969	0.969	0.970	0.971	0.972	0.973	0.975	0.978	0.980	0.983	0.987	0.990	0.994	0.998	1.000	1.000
55	0.967	0.967	0.968	0.969	0.970	0.972	0.974	0.977	0.980	0.983	0.986	0.990	0.994	0.998	1.000	1.000

Table 2 - Insurance Reserve Death Benefit (Tier II)

Ratio of accumulated contribution to maximum allowance

Age	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
56	0.965	0.966	0.966	0.967	0.969	0.971	0.973	0.976	0.979	0.982	0.986	0.990	0.994	0.999	1.000	1.000
57	0.964	0.964	0.965	0.966	0.968	0.970	0.972	0.975	0.978	0.982	0.986	0.990	0.995	0.999	1.000	1.000
58	0.962	0.963	0.963	0.965	0.967	0.969	0.971	0.974	0.978	0.982	0.986	0.990	0.995	1.000	1.000	1.000
59	0.961	0.961	0.962	0.964	0.966	0.968	0.971	0.974	0.978	0.981	0.986	0.990	0.995	1.000	1.000	1.000
60	0.960	0.960	0.961	0.963	0.965	0.967	0.970	0.973	0.977	0.981	0.986	0.991	0.996	1.000	1.000	1.000
61	0.959	0.959	0.960	0.962	0.964	0.967	0.970	0.973	0.977	0.981	0.986	0.991	0.997	1.000	1.000	1.000
62	0.958	0.959	0.960	0.961	0.963	0.966	0.969	0.973	0.977	0.981	0.986	0.992	0.997	1.000	1.000	1.000
63	0.957	0.957	0.959	0.960	0.962	0.965	0.968	0.972	0.976	0.981	0.986	0.992	0.998	1.000	1.000	1.000
64	0.956	0.956	0.957	0.959	0.961	0.964	0.967	0.971	0.976	0.981	0.986	0.993	0.999	1.000	1.000	1.000
65	0.954	0.954	0.955	0.957	0.960	0.963	0.966	0.970	0.975	0.981	0.987	0.993	1.000	1.000	1.000	1.000
66	0.952	0.952	0.953	0.955	0.958	0.961	0.965	0.969	0.975	0.980	0.987	0.994	1.000	1.000	1.000	1.000
67	0.949	0.949	0.951	0.953	0.955	0.959	0.963	0.968	0.974	0.980	0.987	0.995	1.000	1.000	1.000	1.000
68	0.946	0.946	0.948	0.950	0.953	0.957	0.961	0.967	0.973	0.980	0.988	0.996	1.000	1.000	1.000	1.000
69	0.942	0.943	0.944	0.947	0.950	0.954	0.959	0.965	0.972	0.980	0.989	0.998	1.000	1.000	1.000	1.000
70	0.938	0.939	0.940	0.943	0.946	0.951	0.957	0.964	0.971	0.980	0.990	1.000	1.000	1.000	1.000	1.000
71	0.933	0.934	0.936	0.939	0.943	0.948	0.954	0.962	0.970	0.980	0.991	1.000	1.000	1.000	1.000	1.000
72	0.929	0.929	0.931	0.935	0.939	0.945	0.952	0.960	0.970	0.981	0.993	1.000	1.000	1.000	1.000	1.000
73	0.923	0.924	0.926	0.930	0.935	0.942	0.950	0.959	0.970	0.982	0.995	1.000	1.000	1.000	1.000	1.000
74	0.918	0.919	0.921	0.925	0.931	0.938	0.947	0.958	0.970	0.984	0.999	1.000	1.000	1.000	1.000	1.000
75	0.911	0.912	0.915	0.920	0.926	0.935	0.945	0.957	0.970	0.986	1.000	1.000	1.000	1.000	1.000	1.000
76	0.904	0.905	0.909	0.914	0.921	0.931	0.942	0.956	0.971	0.988	1.000	1.000	1.000	1.000	1.000	1.000
77	0.897	0.898	0.902	0.908	0.916	0.927	0.940	0.955	0.973	0.992	1.000	1.000	1.000	1.000	1.000	1.000
78	0.889	0.890	0.894	0.901	0.911	0.923	0.938	0.955	0.975	0.998	1.000	1.000	1.000	1.000	1.000	1.000
79	0.880	0.882	0.886	0.894	0.905	0.919	0.936	0.956	0.979	1.000	1.000	1.000	1.000	1.000	1.000	1.000
80	0.870	0.872	0.877	0.886	0.899	0.915	0.934	0.957	0.983	1.000	1.000	1.000	1.000	1.000	1.000	1.000
81	0.859	0.861	0.867	0.878	0.892	0.911	0.933	0.959	0.989	1.000	1.000	1.000	1.000	1.000	1.000	1.000
82	0.847	0.850	0.857	0.869	0.886	0.907	0.933	0.963	0.998	1.000	1.000	1.000	1.000	1.000	1.000	1.000
83	0.834	0.837	0.846	0.860	0.879	0.904	0.934	0.969	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
84	0.820	0.823	0.833	0.849	0.872	0.901	0.936	0.976	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
85	0.805	0.809	0.820	0.839	0.866	0.899	0.939	0.985	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
86	0.789	0.794	0.807	0.830	0.860	0.899	0.944	0.996	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
87	0.773	0.779	0.795	0.821	0.856	0.900	0.952	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
88	0.756	0.763	0.781	0.811	0.852	0.902	0.960	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
89	0.739	0.746	0.767	0.802	0.848	0.905	0.971	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
90	0.722	0.730	0.755	0.794	0.847	0.910	0.983	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000

Table 3 - Joint and 100% Pop-up Factors (Tier II)

Age	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
45	0.937	0.939	0.940	0.942	0.944	0.945	0.947	0.948	0.950	0.951	0.953	0.955	0.956	0.958	0.959	0.961
46	0.931	0.933	0.935	0.937	0.938	0.940	0.942	0.944	0.945	0.947	0.949	0.950	0.952	0.953	0.955	0.957
47	0.926	0.927	0.929	0.931	0.933	0.935	0.937	0.938	0.940	0.942	0.944	0.945	0.947	0.949	0.951	0.952
48	0.919	0.921	0.923	0.925	0.927	0.929	0.931	0.933	0.935	0.937	0.938	0.940	0.942	0.944	0.946	0.948
49	0.912	0.914	0.916	0.918	0.921	0.923	0.925	0.927	0.929	0.931	0.933	0.935	0.937	0.939	0.940	0.942
50	0.905	0.907	0.909	0.911	0.914	0.916	0.918	0.920	0.922	0.924	0.926	0.929	0.931	0.933	0.935	0.937
51	0.897	0.900	0.902	0.904	0.906	0.909	0.911	0.913	0.916	0.918	0.920	0.922	0.925	0.927	0.929	0.931
52	0.890	0.893	0.895	0.897	0.900	0.902	0.904	0.907	0.909	0.912	0.914	0.916	0.919	0.921	0.923	0.926
53	0.883	0.885	0.888	0.890	0.893	0.895	0.898	0.900	0.903	0.905	0.908	0.911	0.913	0.916	0.918	0.921
54	0.876	0.878	0.881	0.883	0.886	0.889	0.891	0.894	0.897	0.899	0.902	0.905	0.907	0.910	0.913	0.915
55	0.869	0.871	0.874	0.876	0.879	0.882	0.885	0.887	0.890	0.893	0.896	0.899	0.902	0.904	0.907	0.910
56	0.861	0.864	0.867	0.869	0.872	0.875	0.878	0.881	0.884	0.887	0.890	0.893	0.896	0.899	0.902	0.905
57	0.854	0.856	0.859	0.862	0.865	0.868	0.871	0.874	0.877	0.880	0.883	0.886	0.889	0.893	0.896	0.899
58	0.846	0.848	0.851	0.854	0.857	0.860	0.863	0.867	0.870	0.873	0.876	0.880	0.883	0.886	0.890	0.893
59	0.837	0.840	0.843	0.846	0.849	0.853	0.856	0.859	0.862	0.866	0.869	0.873	0.876	0.880	0.883	0.887
60	0.829	0.832	0.835	0.838	0.841	0.844	0.848	0.851	0.855	0.858	0.862	0.865	0.869	0.873	0.876	0.880
61	0.820	0.823	0.826	0.829	0.833	0.836	0.839	0.843	0.846	0.850	0.854	0.858	0.861	0.865	0.869	0.873
62	0.811	0.814	0.817	0.820	0.823	0.827	0.830	0.834	0.838	0.841	0.845	0.849	0.853	0.857	0.862	0.866
63	0.801	0.804	0.807	0.810	0.814	0.817	0.821	0.825	0.828	0.832	0.836	0.840	0.844	0.849	0.853	0.857
64	0.790	0.793	0.796	0.800	0.803	0.807	0.810	0.814	0.818	0.822	0.826	0.830	0.835	0.839	0.844	0.848
65	0.778	0.781	0.785	0.788	0.792	0.795	0.799	0.803	0.807	0.811	0.815	0.820	0.824	0.829	0.833	0.838
66	0.766	0.769	0.772	0.776	0.779	0.783	0.787	0.791	0.795	0.799	0.803	0.808	0.812	0.817	0.822	0.827
67	0.752	0.756	0.759	0.763	0.766	0.770	0.774	0.778	0.782	0.786	0.790	0.795	0.800	0.805	0.810	0.815
68	0.738	0.742	0.745	0.748	0.752	0.756	0.760	0.764	0.768	0.772	0.777	0.781	0.786	0.791	0.796	0.801
69	0.723	0.727	0.730	0.734	0.737	0.741	0.745	0.749	0.753	0.757	0.762	0.767	0.771	0.777	0.782	0.787
70	0.708	0.711	0.714	0.718	0.722	0.725	0.729	0.733	0.737	0.742	0.746	0.751	0.756	0.761	0.767	0.772
71	0.691	0.695	0.698	0.702	0.705	0.709	0.713	0.717	0.721	0.726	0.730	0.735	0.740	0.745	0.751	0.756
72	0.674	0.678	0.681	0.685	0.688	0.692	0.696	0.700	0.704	0.709	0.713	0.718	0.723	0.728	0.734	0.739
73	0.657	0.660	0.664	0.667	0.671	0.675	0.678	0.682	0.687	0.691	0.696	0.700	0.705	0.711	0.716	0.722
74	0.639	0.642	0.645	0.649	0.653	0.656	0.660	0.664	0.668	0.673	0.677	0.682	0.687	0.692	0.698	0.703
75	0.620	0.623	0.627	0.630	0.634	0.637	0.641	0.645	0.649	0.654	0.658	0.663	0.668	0.673	0.679	0.684
76	0.601	0.604	0.607	0.611	0.614	0.618	0.622	0.626	0.630	0.634	0.638	0.643	0.648	0.653	0.659	0.664
77	0.581	0.584	0.587	0.591	0.594	0.598	0.602	0.605	0.609	0.614	0.618	0.623	0.628	0.633	0.638	0.644
78	0.561	0.564	0.567	0.570	0.574	0.577	0.581	0.585	0.589	0.593	0.597	0.602	0.607	0.612	0.617	0.623
79	0.540	0.543	0.546	0.550	0.553	0.556	0.560	0.564	0.568	0.572	0.576	0.580	0.585	0.590	0.595	0.601
80	0.519	0.522	0.525	0.528	0.532	0.535	0.538	0.542	0.546	0.550	0.554	0.558	0.563	0.568	0.573	0.578
81	0.498	0.500	0.503	0.507	0.510	0.513	0.516	0.520	0.524	0.527	0.531	0.536	0.540	0.545	0.550	0.555
82	0.476	0.479	0.482	0.485	0.488	0.491	0.494	0.498	0.501	0.505	0.509	0.513	0.517	0.522	0.527	0.532
83	0.454	0.457	0.460	0.463	0.466	0.469	0.472	0.475	0.479	0.482	0.486	0.490	0.494	0.499	0.503	0.508
84	0.432	0.435	0.438	0.441	0.444	0.447	0.450	0.453	0.456	0.460	0.463	0.467	0.471	0.476	0.480	0.485
85	0.411	0.414	0.416	0.419	0.422	0.425	0.428	0.431	0.434	0.437	0.441	0.445	0.448	0.453	0.457	0.462

Table 3 - Joint and 100% Pop-up Factors (Tier II)

Age	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76
45	0.962	0.963	0.965	0.966	0.968	0.969	0.971	0.972	0.973	0.975	0.976	0.977	0.979	0.980	0.981	0.982
46	0.958	0.960	0.961	0.963	0.964	0.966	0.967	0.969	0.970	0.972	0.973	0.974	0.976	0.977	0.978	0.980
47	0.954	0.956	0.957	0.959	0.961	0.962	0.964	0.965	0.967	0.968	0.970	0.971	0.973	0.974	0.976	0.977
48	0.949	0.951	0.953	0.955	0.956	0.958	0.960	0.961	0.963	0.965	0.966	0.968	0.969	0.971	0.973	0.974
49	0.944	0.946	0.948	0.950	0.952	0.954	0.955	0.957	0.959	0.961	0.962	0.964	0.966	0.967	0.969	0.971
50	0.939	0.941	0.943	0.945	0.947	0.949	0.951	0.952	0.954	0.956	0.958	0.960	0.962	0.963	0.965	0.967
51	0.933	0.935	0.938	0.940	0.942	0.944	0.946	0.948	0.950	0.952	0.954	0.956	0.957	0.959	0.961	0.963
52	0.928	0.930	0.933	0.935	0.937	0.939	0.941	0.944	0.946	0.948	0.950	0.952	0.954	0.956	0.958	0.959
53	0.923	0.925	0.928	0.930	0.933	0.935	0.937	0.939	0.942	0.944	0.946	0.948	0.950	0.952	0.954	0.956
54	0.918	0.920	0.923	0.926	0.928	0.931	0.933	0.935	0.938	0.940	0.942	0.945	0.947	0.949	0.951	0.953
55	0.913	0.916	0.918	0.921	0.924	0.926	0.929	0.931	0.934	0.936	0.939	0.941	0.944	0.946	0.948	0.950
56	0.908	0.910	0.913	0.916	0.919	0.922	0.925	0.928	0.930	0.933	0.935	0.938	0.940	0.943	0.945	0.948
57	0.902	0.905	0.908	0.911	0.915	0.918	0.921	0.923	0.926	0.929	0.932	0.935	0.937	0.940	0.942	0.945
58	0.896	0.900	0.903	0.906	0.910	0.913	0.916	0.919	0.922	0.925	0.928	0.931	0.934	0.937	0.939	0.942
59	0.890	0.894	0.898	0.901	0.905	0.908	0.911	0.915	0.918	0.921	0.924	0.928	0.931	0.933	0.936	0.939
60	0.884	0.888	0.892	0.895	0.899	0.903	0.907	0.910	0.914	0.917	0.920	0.924	0.927	0.930	0.933	0.936
61	0.877	0.881	0.885	0.889	0.893	0.897	0.901	0.905	0.909	0.913	0.916	0.920	0.923	0.927	0.930	0.933
62	0.870	0.874	0.879	0.883	0.887	0.891	0.896	0.900	0.904	0.908	0.912	0.915	0.919	0.923	0.926	0.930
63	0.862	0.866	0.871	0.875	0.880	0.885	0.889	0.893	0.898	0.902	0.906	0.910	0.915	0.918	0.922	0.926
64	0.853	0.858	0.862	0.867	0.872	0.877	0.882	0.886	0.891	0.896	0.900	0.905	0.909	0.913	0.917	0.921
65	0.843	0.848	0.853	0.858	0.863	0.868	0.873	0.879	0.884	0.888	0.893	0.898	0.903	0.907	0.912	0.916
66	0.832	0.837	0.843	0.848	0.853	0.859	0.864	0.869	0.875	0.880	0.885	0.891	0.896	0.901	0.905	0.910
67	0.820	0.825	0.831	0.837	0.842	0.848	0.854	0.859	0.865	0.871	0.876	0.882	0.887	0.893	0.898	0.903
68	0.807	0.812	0.818	0.824	0.830	0.836	0.842	0.848	0.854	0.860	0.866	0.872	0.878	0.884	0.889	0.895
69	0.793	0.799	0.805	0.811	0.817	0.823	0.829	0.836	0.842	0.849	0.855	0.861	0.867	0.874	0.880	0.886
70	0.778	0.784	0.790	0.796	0.803	0.809	0.816	0.822	0.829	0.836	0.843	0.849	0.856	0.863	0.869	0.875
71	0.762	0.768	0.774	0.781	0.787	0.794	0.801	0.808	0.815	0.822	0.829	0.837	0.844	0.851	0.858	0.864
72	0.745	0.752	0.758	0.765	0.771	0.778	0.786	0.793	0.800	0.808	0.815	0.823	0.830	0.838	0.845	0.852
73	0.728	0.734	0.741	0.747	0.754	0.762	0.769	0.777	0.784	0.792	0.800	0.808	0.816	0.823	0.831	0.839
74	0.710	0.716	0.722	0.729	0.736	0.744	0.751	0.759	0.767	0.775	0.783	0.792	0.800	0.808	0.816	0.825
75	0.690	0.697	0.703	0.710	0.718	0.725	0.733	0.741	0.749	0.757	0.766	0.774	0.783	0.792	0.800	0.809
76	0.670	0.677	0.684	0.691	0.698	0.705	0.713	0.721	0.730	0.738	0.747	0.756	0.765	0.774	0.783	0.792
77	0.650	0.656	0.663	0.670	0.677	0.685	0.693	0.701	0.710	0.718	0.727	0.736	0.746	0.755	0.765	0.774
78	0.629	0.635	0.642	0.649	0.656	0.664	0.672	0.680	0.689	0.697	0.707	0.716	0.726	0.735	0.745	0.755
79	0.607	0.613	0.619	0.626	0.634	0.641	0.649	0.658	0.667	0.676	0.685	0.694	0.704	0.714	0.724	0.735
80	0.584	0.590	0.597	0.604	0.611	0.619	0.627	0.635	0.644	0.653	0.662	0.672	0.682	0.692	0.702	0.713
81	0.561	0.567	0.573	0.580	0.587	0.595	0.603	0.611	0.620	0.629	0.638	0.648	0.658	0.669	0.679	0.690
82	0.538	0.543	0.550	0.556	0.563	0.571	0.579	0.587	0.596	0.605	0.614	0.624	0.634	0.644	0.655	0.666
83	0.514	0.520	0.526	0.532	0.539	0.546	0.554	0.562	0.571	0.580	0.589	0.599	0.609	0.619	0.630	0.641
84	0.490	0.496	0.502	0.508	0.515	0.522	0.529	0.537	0.546	0.555	0.564	0.573	0.583	0.594	0.605	0.616
85	0.467	0.472	0.478	0.484	0.491	0.497	0.505	0.513	0.521	0.529	0.539	0.548	0.558	0.568	0.579	0.590

Table 3 - Joint and 100% Pop-up Factors (Tier II)

Age	77	78	79	80	81	82	83	84	85
45	0.983	0.984	0.985	0.986	0.987	0.988	0.989	0.990	0.991
46	0.981	0.982	0.983	0.984	0.986	0.987	0.987	0.988	0.989
47	0.978	0.980	0.981	0.982	0.983	0.984	0.986	0.987	0.987
48	0.975	0.977	0.978	0.980	0.981	0.982	0.983	0.984	0.985
49	0.972	0.974	0.975	0.977	0.978	0.979	0.981	0.982	0.983
50	0.968	0.970	0.971	0.973	0.975	0.976	0.977	0.979	0.980
51	0.965	0.966	0.968	0.970	0.971	0.973	0.974	0.976	0.977
52	0.961	0.963	0.965	0.967	0.968	0.970	0.971	0.973	0.974
53	0.958	0.960	0.962	0.964	0.966	0.967	0.969	0.970	0.972
54	0.955	0.957	0.959	0.961	0.963	0.965	0.967	0.968	0.970
55	0.952	0.955	0.957	0.959	0.961	0.962	0.964	0.966	0.968
56	0.950	0.952	0.954	0.956	0.958	0.960	0.962	0.964	0.966
57	0.947	0.949	0.952	0.954	0.956	0.958	0.960	0.962	0.964
58	0.945	0.947	0.949	0.952	0.954	0.956	0.958	0.960	0.962
59	0.942	0.944	0.947	0.949	0.952	0.954	0.956	0.959	0.961
60	0.939	0.942	0.945	0.947	0.950	0.952	0.955	0.957	0.959
61	0.936	0.939	0.942	0.945	0.948	0.950	0.953	0.955	0.957
62	0.933	0.936	0.939	0.942	0.945	0.948	0.951	0.953	0.956
63	0.930	0.933	0.936	0.940	0.943	0.946	0.949	0.951	0.954
64	0.925	0.929	0.933	0.936	0.940	0.943	0.946	0.949	0.952
65	0.920	0.924	0.928	0.932	0.936	0.939	0.943	0.946	0.949
66	0.915	0.919	0.923	0.927	0.931	0.935	0.939	0.942	0.945
67	0.908	0.913	0.917	0.922	0.926	0.930	0.934	0.938	0.941
68	0.900	0.905	0.910	0.915	0.920	0.924	0.928	0.933	0.936
69	0.891	0.897	0.902	0.908	0.913	0.918	0.922	0.927	0.931
70	0.882	0.888	0.894	0.899	0.905	0.910	0.915	0.920	0.924
71	0.871	0.878	0.884	0.890	0.896	0.902	0.907	0.913	0.917
72	0.859	0.866	0.873	0.880	0.886	0.893	0.899	0.904	0.910
73	0.847	0.854	0.862	0.869	0.876	0.883	0.889	0.895	0.901
74	0.833	0.841	0.849	0.857	0.864	0.871	0.878	0.885	0.892
75	0.818	0.826	0.835	0.843	0.851	0.859	0.867	0.874	0.881
76	0.802	0.811	0.820	0.829	0.837	0.846	0.854	0.862	0.869
77	0.784	0.794	0.803	0.813	0.822	0.831	0.840	0.848	0.856
78	0.765	0.775	0.785	0.795	0.805	0.815	0.824	0.833	0.842
79	0.745	0.756	0.766	0.777	0.787	0.797	0.807	0.817	0.827
80	0.724	0.735	0.746	0.757	0.768	0.779	0.789	0.800	0.810
81	0.701	0.713	0.724	0.735	0.747	0.758	0.769	0.780	0.791
82	0.678	0.689	0.701	0.713	0.725	0.736	0.748	0.760	0.771
83	0.653	0.665	0.677	0.689	0.701	0.713	0.726	0.738	0.749
84	0.628	0.640	0.652	0.664	0.677	0.689	0.702	0.715	0.727
85	0.602	0.614	0.626	0.639	0.652	0.665	0.678	0.691	0.703

Table 4 - Joint and 50% Pop-up Factors (Tier II)

Age	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
45	0.967	0.968	0.969	0.970	0.971	0.972	0.973	0.973	0.974	0.975	0.976	0.977	0.978	0.978	0.979	0.980
46	0.964	0.965	0.966	0.967	0.968	0.969	0.970	0.971	0.972	0.973	0.974	0.974	0.975	0.976	0.977	0.978
47	0.961	0.962	0.963	0.964	0.965	0.966	0.967	0.968	0.969	0.970	0.971	0.972	0.973	0.974	0.975	0.976
48	0.958	0.959	0.960	0.961	0.962	0.963	0.964	0.965	0.966	0.967	0.968	0.969	0.970	0.971	0.972	0.973
49	0.954	0.955	0.956	0.957	0.959	0.960	0.961	0.962	0.963	0.964	0.965	0.966	0.967	0.968	0.969	0.970
50	0.950	0.951	0.952	0.954	0.955	0.956	0.957	0.958	0.959	0.961	0.962	0.963	0.964	0.965	0.966	0.967
51	0.946	0.947	0.948	0.950	0.951	0.952	0.953	0.955	0.956	0.957	0.958	0.960	0.961	0.962	0.963	0.964
52	0.942	0.943	0.945	0.946	0.947	0.949	0.950	0.951	0.952	0.954	0.955	0.956	0.958	0.959	0.960	0.961
53	0.938	0.939	0.941	0.942	0.943	0.945	0.946	0.948	0.949	0.950	0.952	0.953	0.955	0.956	0.957	0.959
54	0.934	0.935	0.937	0.938	0.940	0.941	0.943	0.944	0.946	0.947	0.948	0.950	0.951	0.953	0.954	0.956
55	0.930	0.931	0.933	0.934	0.936	0.937	0.939	0.940	0.942	0.944	0.945	0.947	0.948	0.950	0.951	0.953
56	0.925	0.927	0.928	0.930	0.932	0.933	0.935	0.937	0.938	0.940	0.942	0.943	0.945	0.947	0.948	0.950
57	0.921	0.923	0.924	0.926	0.928	0.929	0.931	0.933	0.934	0.936	0.938	0.940	0.941	0.943	0.945	0.947
58	0.916	0.918	0.920	0.921	0.923	0.925	0.927	0.929	0.930	0.932	0.934	0.936	0.938	0.940	0.942	0.944
59	0.912	0.913	0.915	0.917	0.919	0.920	0.922	0.924	0.926	0.928	0.930	0.932	0.934	0.936	0.938	0.940
60	0.906	0.908	0.910	0.912	0.914	0.916	0.918	0.920	0.922	0.924	0.926	0.928	0.930	0.932	0.934	0.936
61	0.901	0.903	0.905	0.907	0.909	0.911	0.913	0.915	0.917	0.919	0.921	0.923	0.926	0.928	0.930	0.932
62	0.895	0.897	0.899	0.901	0.903	0.905	0.907	0.910	0.912	0.914	0.916	0.919	0.921	0.923	0.926	0.928
63	0.889	0.891	0.893	0.895	0.897	0.899	0.902	0.904	0.906	0.908	0.911	0.913	0.916	0.918	0.921	0.923
64	0.883	0.885	0.887	0.889	0.891	0.893	0.895	0.898	0.900	0.902	0.905	0.907	0.910	0.913	0.915	0.918
65	0.875	0.877	0.879	0.882	0.884	0.886	0.888	0.891	0.893	0.896	0.898	0.901	0.904	0.906	0.909	0.912
66	0.867	0.869	0.872	0.874	0.876	0.878	0.881	0.883	0.886	0.888	0.891	0.894	0.896	0.899	0.902	0.905
67	0.859	0.861	0.863	0.865	0.868	0.870	0.872	0.875	0.878	0.880	0.883	0.886	0.889	0.892	0.895	0.898
68	0.849	0.852	0.854	0.856	0.858	0.861	0.863	0.866	0.869	0.871	0.874	0.877	0.880	0.883	0.886	0.890
69	0.839	0.842	0.844	0.846	0.849	0.851	0.854	0.856	0.859	0.862	0.865	0.868	0.871	0.874	0.878	0.881
70	0.829	0.831	0.833	0.836	0.838	0.841	0.843	0.846	0.849	0.852	0.855	0.858	0.861	0.864	0.868	0.871
71	0.818	0.820	0.822	0.825	0.827	0.830	0.832	0.835	0.838	0.841	0.844	0.847	0.851	0.854	0.857	0.861
72	0.806	0.808	0.810	0.813	0.815	0.818	0.821	0.824	0.826	0.829	0.833	0.836	0.839	0.843	0.846	0.850
73	0.793	0.795	0.798	0.800	0.803	0.806	0.808	0.811	0.814	0.817	0.820	0.824	0.827	0.831	0.835	0.838
74	0.780	0.782	0.785	0.787	0.790	0.792	0.795	0.798	0.801	0.804	0.808	0.811	0.814	0.818	0.822	0.826
75	0.766	0.768	0.771	0.773	0.776	0.779	0.781	0.784	0.787	0.790	0.794	0.797	0.801	0.805	0.808	0.813
76	0.751	0.753	0.756	0.758	0.761	0.764	0.767	0.770	0.773	0.776	0.779	0.783	0.786	0.790	0.794	0.798
77	0.735	0.738	0.740	0.743	0.746	0.748	0.751	0.754	0.757	0.761	0.764	0.767	0.771	0.775	0.779	0.783
78	0.719	0.721	0.724	0.726	0.729	0.732	0.735	0.738	0.741	0.744	0.748	0.751	0.755	0.759	0.763	0.767
79	0.701	0.704	0.707	0.709	0.712	0.715	0.718	0.721	0.724	0.727	0.731	0.734	0.738	0.742	0.746	0.751
80	0.683	0.686	0.689	0.691	0.694	0.697	0.700	0.703	0.706	0.709	0.713	0.716	0.720	0.724	0.728	0.733
81	0.664	0.667	0.670	0.672	0.675	0.678	0.681	0.684	0.687	0.691	0.694	0.698	0.701	0.705	0.710	0.714
82	0.645	0.647	0.650	0.653	0.656	0.659	0.662	0.665	0.668	0.671	0.674	0.678	0.682	0.686	0.690	0.694
83	0.624	0.627	0.630	0.633	0.635	0.638	0.641	0.644	0.647	0.651	0.654	0.658	0.662	0.665	0.670	0.674
84	0.604	0.606	0.609	0.612	0.615	0.618	0.620	0.623	0.627	0.630	0.633	0.637	0.641	0.645	0.649	0.653
85	0.583	0.585	0.588	0.591	0.593	0.596	0.599	0.602	0.605	0.609	0.612	0.616	0.619	0.623	0.627	0.632

Table 4 - Joint and 50% Pop-up Factors (Tier II)

Age	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76
45	0.981	0.981	0.982	0.983	0.984	0.984	0.985	0.986	0.986	0.987	0.988	0.988	0.989	0.990	0.990	0.991
46	0.979	0.979	0.980	0.981	0.982	0.983	0.983	0.984	0.985	0.986	0.986	0.987	0.988	0.988	0.989	0.990
47	0.976	0.977	0.978	0.979	0.980	0.981	0.982	0.982	0.983	0.984	0.985	0.985	0.986	0.987	0.988	0.988
48	0.974	0.975	0.976	0.977	0.978	0.979	0.979	0.980	0.981	0.982	0.983	0.984	0.984	0.985	0.986	0.987
49	0.971	0.972	0.973	0.974	0.975	0.976	0.977	0.978	0.979	0.980	0.981	0.982	0.983	0.983	0.984	0.985
50	0.968	0.970	0.971	0.972	0.973	0.974	0.975	0.976	0.977	0.978	0.979	0.979	0.980	0.981	0.982	0.983
51	0.966	0.967	0.968	0.969	0.970	0.971	0.972	0.973	0.974	0.975	0.976	0.977	0.978	0.979	0.980	0.981
52	0.963	0.964	0.965	0.966	0.968	0.969	0.970	0.971	0.972	0.973	0.974	0.975	0.976	0.977	0.980	0.979
53	0.960	0.961	0.963	0.964	0.965	0.966	0.968	0.969	0.970	0.971	0.972	0.973	0.974	0.976	0.977	0.978
54	0.957	0.959	0.960	0.961	0.963	0.964	0.965	0.967	0.968	0.969	0.970	0.972	0.973	0.974	0.977	0.976
55	0.954	0.956	0.957	0.959	0.960	0.962	0.963	0.965	0.966	0.967	0.968	0.970	0.971	0.972	0.973	0.975
56	0.952	0.953	0.955	0.956	0.958	0.959	0.961	0.962	0.964	0.965	0.967	0.968	0.969	0.971	0.972	0.973
57	0.949	0.950	0.952	0.954	0.955	0.957	0.959	0.960	0.962	0.963	0.965	0.966	0.968	0.969	0.970	0.972
58	0.945	0.947	0.949	0.951	0.953	0.954	0.956	0.958	0.960	0.961	0.963	0.964	0.966	0.967	0.969	0.970
59	0.942	0.944	0.946	0.948	0.950	0.952	0.954	0.955	0.957	0.959	0.961	0.962	0.964	0.966	0.967	0.969
60	0.938	0.941	0.943	0.945	0.947	0.949	0.951	0.953	0.955	0.957	0.959	0.960	0.962	0.964	0.965	0.967
61	0.935	0.937	0.939	0.941	0.944	0.946	0.948	0.950	0.952	0.954	0.956	0.958	0.960	0.962	0.964	0.965
62	0.930	0.933	0.935	0.938	0.940	0.943	0.945	0.947	0.949	0.952	0.954	0.956	0.958	0.960	0.962	0.964
63	0.926	0.928	0.931	0.934	0.936	0.939	0.941	0.944	0.946	0.949	0.951	0.953	0.955	0.957	0.960	0.962
64	0.921	0.923	0.926	0.929	0.932	0.934	0.937	0.940	0.942	0.945	0.948	0.950	0.952	0.955	0.957	0.959
65	0.915	0.918	0.921	0.924	0.927	0.930	0.932	0.935	0.938	0.941	0.944	0.946	0.949	0.951	0.954	0.956
66	0.908	0.911	0.915	0.918	0.921	0.924	0.927	0.930	0.933	0.936	0.939	0.942	0.945	0.948	0.950	0.953
67	0.901	0.904	0.908	0.911	0.914	0.918	0.921	0.924	0.928	0.931	0.934	0.937	0.940	0.943	0.946	0.949
68	0.893	0.897	0.900	0.904	0.907	0.911	0.914	0.918	0.921	0.925	0.928	0.932	0.935	0.938	0.941	0.944
69	0.884	0.888	0.892	0.895	0.899	0.903	0.907	0.911	0.914	0.918	0.922	0.925	0.929	0.933	0.936	0.939
70	0.875	0.879	0.883	0.887	0.890	0.894	0.899	0.903	0.907	0.911	0.915	0.919	0.922	0.926	0.930	0.934
71	0.865	0.869	0.873	0.877	0.881	0.885	0.890	0.894	0.898	0.902	0.907	0.911	0.915	0.919	0.923	0.927
72	0.854	0.858	0.862	0.867	0.871	0.875	0.880	0.884	0.889	0.894	0.898	0.903	0.907	0.912	0.916	0.920
73	0.843	0.847	0.851	0.855	0.860	0.865	0.869	0.874	0.879	0.884	0.889	0.894	0.898	0.903	0.908	0.912
74	0.830	0.834	0.839	0.843	0.848	0.853	0.858	0.863	0.868	0.873	0.878	0.884	0.889	0.894	0.899	0.904
75	0.817	0.821	0.826	0.831	0.836	0.841	0.846	0.851	0.856	0.862	0.867	0.873	0.878	0.884	0.889	0.895
76	0.803	0.807	0.812	0.817	0.822	0.827	0.833	0.838	0.844	0.849	0.855	0.861	0.867	0.873	0.878	0.884
77	0.788	0.792	0.797	0.802	0.808	0.813	0.819	0.824	0.830	0.836	0.842	0.848	0.854	0.861	0.867	0.873
78	0.772	0.777	0.782	0.787	0.792	0.798	0.804	0.809	0.816	0.822	0.828	0.834	0.841	0.847	0.854	0.861
79	0.755	0.760	0.765	0.770	0.776	0.782	0.788	0.794	0.800	0.806	0.813	0.820	0.826	0.833	0.840	0.847
80	0.737	0.742	0.747	0.753	0.758	0.764	0.770	0.777	0.783	0.790	0.797	0.804	0.811	0.818	0.825	0.833
81	0.719	0.724	0.729	0.734	0.740	0.746	0.752	0.759	0.765	0.772	0.779	0.787	0.794	0.801	0.809	0.817
82	0.699	0.704	0.709	0.715	0.721	0.727	0.733	0.740	0.747	0.754	0.761	0.768	0.776	0.784	0.792	0.800
83	0.679	0.684	0.689	0.695	0.701	0.707	0.713	0.720	0.727	0.734	0.741	0.749	0.757	0.765	0.773	0.782
84	0.658	0.663	0.668	0.674	0.680	0.686	0.692	0.699	0.706	0.713	0.721	0.729	0.737	0.745	0.754	0.762
85	0.636	0.641	0.647	0.652	0.658	0.664	0.671	0.678	0.685	0.692	0.700	0.708	0.716	0.725	0.734	0.743

Table 4 - Joint and 50% Pop-up Factors (Tier II)

Age	77	78	79	80	81	82	83	84	85
45	0.992	0.992	0.993	0.993	0.994	0.994	0.995	0.995	0.995
46	0.990	0.991	0.992	0.992	0.993	0.993	0.994	0.994	0.995
47	0.989	0.990	0.990	0.991	0.992	0.992	0.993	0.993	0.994
48	0.988	0.988	0.989	0.990	0.990	0.991	0.992	0.992	0.993
49	0.986	0.987	0.987	0.988	0.989	0.990	0.990	0.991	0.991
50	0.984	0.985	0.986	0.986	0.987	0.988	0.989	0.989	0.990
51	0.982	0.983	0.984	0.985	0.985	0.986	0.987	0.988	0.988
52	0.980	0.981	0.982	0.983	0.984	0.985	0.986	0.986	0.987
53	0.979	0.980	0.981	0.982	0.982	0.983	0.984	0.985	0.986
54	0.977	0.978	0.979	0.980	0.981	0.982	0.983	0.984	0.985
55	0.976	0.977	0.978	0.979	0.980	0.981	0.982	0.983	0.984
56	0.974	0.975	0.977	0.978	0.979	0.980	0.981	0.982	0.983
57	0.973	0.974	0.975	0.976	0.978	0.979	0.980	0.981	0.982
58	0.971	0.973	0.974	0.975	0.976	0.978	0.979	0.980	0.981
59	0.970	0.971	0.973	0.974	0.975	0.977	0.978	0.979	0.980
60	0.969	0.970	0.971	0.973	0.974	0.976	0.977	0.978	0.979
61	0.967	0.969	0.970	0.972	0.973	0.974	0.976	0.977	0.978
62	0.965	0.967	0.969	0.970	0.972	0.973	0.975	0.976	0.977
63	0.963	0.965	0.967	0.969	0.971	0.972	0.974	0.975	0.976
64	0.961	0.963	0.965	0.967	0.969	0.971	0.972	0.974	0.975
65	0.959	0.961	0.963	0.965	0.967	0.969	0.970	0.972	0.974
66	0.955	0.958	0.960	0.962	0.964	0.966	0.968	0.970	0.972
67	0.952	0.954	0.957	0.959	0.962	0.964	0.966	0.968	0.970
68	0.947	0.950	0.953	0.956	0.958	0.961	0.963	0.965	0.967
69	0.943	0.946	0.949	0.952	0.954	0.957	0.960	0.962	0.964
70	0.937	0.941	0.944	0.947	0.950	0.953	0.956	0.958	0.961
71	0.931	0.935	0.938	0.942	0.945	0.948	0.951	0.954	0.957
72	0.924	0.928	0.932	0.936	0.940	0.943	0.947	0.950	0.953
73	0.917	0.921	0.926	0.930	0.934	0.938	0.941	0.945	0.948
74	0.909	0.914	0.918	0.923	0.927	0.931	0.935	0.939	0.943
75	0.900	0.905	0.910	0.915	0.920	0.924	0.929	0.933	0.937
76	0.890	0.895	0.901	0.906	0.911	0.916	0.921	0.926	0.930
77	0.879	0.885	0.891	0.897	0.902	0.908	0.913	0.918	0.923
78	0.867	0.873	0.880	0.886	0.892	0.898	0.904	0.909	0.914
79	0.854	0.861	0.868	0.874	0.881	0.887	0.893	0.899	0.905
80	0.840	0.847	0.854	0.862	0.869	0.876	0.882	0.889	0.895
81	0.824	0.832	0.840	0.848	0.855	0.862	0.870	0.877	0.883
82	0.808	0.816	0.824	0.832	0.840	0.848	0.856	0.863	0.871
83	0.790	0.799	0.807	0.816	0.824	0.833	0.841	0.849	0.857
84	0.771	0.780	0.789	0.798	0.807	0.816	0.825	0.834	0.842
85	0.752	0.761	0.770	0.780	0.789	0.799	0.808	0.817	0.826

Table 6 - Modified Cash Refund Factors (Tier II)

Ratio of accumulated contribution to maximum allowance

Age	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
21	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.001	1.001	1.001	1.001	1.001	1.001	1.001
22	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.001	1.001	1.001	1.001	1.001	1.001	1.001
23	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.001	1.001	1.001	1.001	1.001	1.001	1.002
24	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.001	1.001	1.001	1.001	1.001	1.001	1.002
25	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.001	1.001	1.001	1.001	1.001	1.001	1.001	1.002
26	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.001	1.001	1.001	1.001	1.001	1.001	1.002	1.002
27	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.001	1.001	1.001	1.001	1.001	1.001	1.002	1.002
28	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.001	1.001	1.001	1.001	1.001	1.002	1.002	1.002
29	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.001	1.001	1.001	1.001	1.001	1.002	1.002	1.002
30	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.001	1.001	1.001	1.001	1.001	1.002	1.002	1.002	1.002
31	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.001	1.001	1.001	1.001	1.001	1.002	1.002	1.002	1.003
32	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.001	1.001	1.001	1.001	1.002	1.002	1.002	1.002	1.003
33	1.000	1.000	1.000	1.000	1.000	1.000	1.001	1.001	1.001	1.001	1.001	1.002	1.002	1.002	1.003	1.003
34	1.000	1.000	1.000	1.000	1.000	1.000	1.001	1.001	1.001	1.001	1.001	1.002	1.002	1.002	1.003	1.003
35	1.000	1.000	1.000	1.000	1.000	1.000	1.001	1.001	1.001	1.001	1.002	1.002	1.002	1.003	1.003	1.003
36	1.000	1.000	1.000	1.000	1.000	1.000	1.001	1.001	1.001	1.001	1.002	1.002	1.002	1.003	1.003	1.004
37	1.000	1.000	1.000	1.000	1.000	1.000	1.001	1.001	1.001	1.001	1.002	1.002	1.003	1.003	1.004	1.004
38	1.000	1.000	1.000	1.000	1.000	1.001	1.001	1.001	1.001	1.002	1.002	1.002	1.003	1.003	1.004	1.004
39	1.000	1.000	1.000	1.000	1.000	1.001	1.001	1.001	1.001	1.002	1.002	1.003	1.003	1.004	1.004	1.005
40	1.000	1.000	1.000	1.000	1.000	1.001	1.001	1.001	1.002	1.002	1.002	1.003	1.003	1.004	1.005	1.005
41	1.000	1.000	1.000	1.000	1.000	1.001	1.001	1.001	1.002	1.002	1.003	1.003	1.004	1.004	1.005	1.006
42	1.000	1.000	1.000	1.000	1.000	1.001	1.001	1.001	1.002	1.002	1.003	1.003	1.004	1.005	1.006	1.007
43	1.000	1.000	1.000	1.000	1.000	1.001	1.001	1.001	1.002	1.002	1.003	1.004	1.005	1.006	1.007	1.008
44	1.000	1.000	1.000	1.000	1.001	1.001	1.001	1.002	1.002	1.003	1.003	1.004	1.005	1.007	1.008	1.009
45	1.000	1.000	1.000	1.000	1.001	1.001	1.001	1.002	1.002	1.003	1.004	1.005	1.006	1.008	1.009	1.011
46	1.000	1.000	1.000	1.000	1.001	1.001	1.001	1.002	1.003	1.004	1.005	1.006	1.008	1.009	1.011	1.013
47	1.000	1.000	1.000	1.000	1.001	1.001	1.002	1.002	1.003	1.004	1.006	1.007	1.009	1.011	1.013	1.015
48	1.000	1.000	1.000	1.000	1.001	1.001	1.002	1.003	1.004	1.006	1.007	1.009	1.011	1.013	1.015	1.018
49	1.000	1.000	1.000	1.001	1.001	1.002	1.003	1.004	1.005	1.007	1.009	1.011	1.013	1.016	1.018	1.021
50	1.000	1.000	1.000	1.001	1.001	1.002	1.004	1.005	1.007	1.009	1.011	1.013	1.016	1.019	1.022	1.025
51	1.000	1.000	1.000	1.001	1.002	1.003	1.004	1.006	1.008	1.010	1.013	1.016	1.019	1.022	1.025	1.029
52	1.000	1.000	1.001	1.001	1.002	1.004	1.005	1.007	1.009	1.012	1.015	1.018	1.021	1.025	1.029	1.033
53	1.000	1.000	1.001	1.002	1.003	1.004	1.006	1.008	1.011	1.014	1.017	1.020	1.024	1.028	1.032	1.036
54	1.000	1.000	1.001	1.002	1.003	1.005	1.007	1.009	1.012	1.015	1.018	1.022	1.026	1.030	1.034	1.039
55	1.000	1.000	1.001	1.002	1.003	1.005	1.007	1.010	1.013	1.016	1.020	1.024	1.028	1.032	1.037	1.042

Table 6 - Modified Cash Refund Factors (Tier II)

Ratio of accumulated contribution to maximum allowance

Age	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
56	1.000	1.000	1.001	1.002	1.004	1.006	1.008	1.011	1.014	1.018	1.021	1.026	1.030	1.035	1.040	1.045
57	1.000	1.000	1.001	1.002	1.004	1.006	1.009	1.012	1.015	1.019	1.023	1.027	1.032	1.037	1.042	1.047
58	1.000	1.000	1.001	1.002	1.004	1.007	1.009	1.013	1.016	1.020	1.024	1.029	1.034	1.039	1.044	1.050
59	1.000	1.000	1.001	1.003	1.005	1.007	1.010	1.013	1.017	1.021	1.026	1.030	1.036	1.041	1.047	1.053
60	1.000	1.000	1.001	1.003	1.005	1.007	1.011	1.014	1.018	1.022	1.027	1.032	1.037	1.043	1.049	1.056
61	1.000	1.000	1.001	1.003	1.005	1.008	1.011	1.015	1.019	1.023	1.028	1.033	1.039	1.045	1.052	1.058
62	1.000	1.000	1.001	1.003	1.005	1.008	1.011	1.015	1.019	1.024	1.029	1.035	1.041	1.047	1.054	1.061
63	1.000	1.000	1.001	1.003	1.005	1.008	1.012	1.016	1.020	1.025	1.030	1.036	1.043	1.050	1.057	1.065
64	1.000	1.000	1.001	1.003	1.006	1.009	1.012	1.016	1.021	1.026	1.032	1.038	1.045	1.053	1.061	1.069
65	1.000	1.000	1.002	1.003	1.006	1.009	1.013	1.017	1.022	1.028	1.034	1.041	1.049	1.057	1.065	1.074
66	1.000	1.000	1.002	1.004	1.006	1.010	1.014	1.018	1.024	1.030	1.037	1.044	1.053	1.061	1.071	1.081
67	1.000	1.000	1.002	1.004	1.007	1.010	1.015	1.020	1.026	1.033	1.040	1.049	1.058	1.067	1.078	1.089
68	1.000	1.000	1.002	1.004	1.007	1.011	1.016	1.022	1.029	1.036	1.044	1.054	1.063	1.074	1.086	1.098
69	1.000	1.001	1.002	1.005	1.008	1.013	1.018	1.024	1.032	1.040	1.049	1.059	1.071	1.083	1.095	1.109
70	1.000	1.001	1.002	1.005	1.009	1.014	1.020	1.027	1.035	1.045	1.055	1.066	1.079	1.092	1.107	1.122
71	1.000	1.001	1.003	1.006	1.010	1.016	1.022	1.030	1.040	1.050	1.062	1.074	1.088	1.103	1.119	1.137
72	1.000	1.001	1.003	1.006	1.011	1.018	1.025	1.034	1.045	1.056	1.069	1.084	1.099	1.116	1.134	1.154
73	1.000	1.001	1.003	1.007	1.013	1.020	1.028	1.039	1.050	1.063	1.078	1.094	1.112	1.131	1.152	1.174
74	1.000	1.001	1.004	1.008	1.014	1.022	1.032	1.044	1.057	1.072	1.088	1.107	1.127	1.148	1.172	1.196
75	1.000	1.001	1.004	1.009	1.016	1.026	1.037	1.050	1.065	1.082	1.100	1.121	1.144	1.169	1.195	1.223
76	1.000	1.001	1.005	1.011	1.019	1.029	1.042	1.057	1.074	1.093	1.115	1.139	1.164	1.192	1.222	1.254
77	1.000	1.001	1.005	1.012	1.021	1.033	1.048	1.065	1.084	1.107	1.131	1.159	1.188	1.220	1.254	1.290
78	1.000	1.002	1.006	1.014	1.025	1.038	1.055	1.075	1.097	1.123	1.151	1.182	1.216	1.253	1.291	1.332
79	1.000	1.002	1.007	1.016	1.028	1.044	1.064	1.086	1.112	1.142	1.174	1.210	1.249	1.290	1.334	1.381
80	1.000	1.002	1.008	1.019	1.033	1.051	1.074	1.100	1.130	1.164	1.202	1.243	1.288	1.335	1.385	1.437
81	1.000	1.002	1.010	1.022	1.039	1.060	1.086	1.117	1.152	1.191	1.235	1.282	1.333	1.387	1.443	1.502
82	1.000	1.003	1.011	1.026	1.046	1.071	1.102	1.137	1.178	1.223	1.274	1.328	1.386	1.447	1.511	1.577
83	1.000	1.003	1.014	1.030	1.054	1.084	1.120	1.162	1.209	1.261	1.319	1.381	1.447	1.516	1.588	1.662
84	1.000	1.004	1.016	1.036	1.064	1.099	1.141	1.190	1.245	1.306	1.372	1.443	1.517	1.595	1.676	1.758
85	1.000	1.005	1.019	1.043	1.076	1.117	1.167	1.224	1.287	1.357	1.433	1.513	1.597	1.684	1.774	1.866
86	1.000	1.006	1.023	1.051	1.090	1.139	1.196	1.262	1.336	1.416	1.501	1.592	1.686	1.783	1.883	1.985
87	1.000	1.007	1.028	1.061	1.107	1.164	1.231	1.307	1.391	1.482	1.578	1.680	1.785	1.893	2.003	2.116
88	1.000	1.008	1.033	1.073	1.126	1.193	1.270	1.357	1.453	1.555	1.663	1.776	1.893	2.012	2.134	2.258
89	1.000	1.010	1.039	1.086	1.149	1.225	1.314	1.413	1.521	1.635	1.756	1.881	2.010	2.141	2.275	2.411
90	1.000	1.012	1.046	1.101	1.173	1.261	1.362	1.473	1.593	1.720	1.854	1.992	2.133	2.277	2.424	2.572