MPERS

Missouri Department of Transportation and
Highway Patrol Employees' Retirement System
A Component Unit of the State of Missouri

2019

Comprehensive Annual Financial Report

For the Fiscal Year Ended June 30, 2019

Scott Simon, Executive Director
Jennifer Even, Chief Financial Officer

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MoDOT and Patrol Employees' Retirement System

MPERS' mission is to provide a foundation for financial security to plan participants by delivering quality benefits and exceptional member service through professional plan administration and prudent management of assets, at a reasonable cost to the taxpayers of Missouri.

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This is a digital publication of the Missouri Department of Transportation and Missouri State Highway Patrol Employees' Retirement System.

No printing costs were incurred.

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Introductory Section

Mark Twain

Birthplace: Florida, Missouri

Writer, humorist, entrepreneur, publisher and lecturer.

"The secret to getting ahead is getting started."

Letter of Transmittal

MoDOT & Patrol Employees' Retirement System

November 07, 2019

To the Board of Trustees and System Members:

We are pleased to provide this Comprehensive Annual Financial Report (CAFR), of the Missouri Department of Transportation and Highway Patrol Employees' Retirement System (MPERS), for the fiscal year ending June 30, 2019. This report is intended to provide MPERS' stakeholders with a thorough review of the System's operations for the past fiscal year. The material presented in this report has been prepared in a manner intended to be useful and informative to MPERS' members, the management of the Missouri Department of Transportation (MoDOT) and the Missouri State Highway Patrol (MSHP), and the elected officials of the state of Missouri.

MPERS is a defined benefit pension plan designed to be a valuable employee recruitment and retention tool for covered employers. It provides lifetime retirement benefits to eligible MoDOT and MSHP employees. The monthly retirement and survivor benefits provided by MPERS are a valuable source of retirement income for the members we serve. These benefits, when combined with social security and personal savings, provide the basic foundation for our members to leave the workforce and enjoy their retirement years with the dignity they deserve.

The average monthly benefit of a new MPERS retiree in Fiscal Year 2019 retiring directly from active employment was $2,441, which equates to $29,292 per year. Given the increasing cost of living, this amount alone will not provide a life of luxury for the retiree. However, this monthly benefit and those provided by other traditional pension plans have a significant impact that reaches beyond the retirees served. Over the past 10 years alone, MPERS has paid over $2.3 billion in benefit payments to its members. Nearly 95% of these retirees and beneficiaries reside in Missouri, reinvesting their retirement dollars in housing, goods, and services. This reinvestment improves the local economy which in turn, helps to fuel the state's overall economy. The result is that defined benefit pensions have a long-term positive impact on our economy and the lives of our members.

Report Contents and Structure:
This CAFR is designed to comply with the statutory reporting requirements stipulated in sections 104.190, 104.1006, and 105.661 of the Missouri Revised Statutes (RSMo), as amended.

To the best of our knowledge, the information presented is accurate in all material respects and is reported in a manner designed to fairly represent the financial position of the fund. Some amounts included in the financial statements and elsewhere may be based on estimates and judgments. These estimates and judgments are products of best business practices. The accounting policies followed in preparing the basic financial statements conform with U.S. generally accepted accounting principles. Financial information presented throughout the CAFR is consistent with information displayed in the basic financial statements.

The MPERS Board of Trustees (Board) is ultimately responsible for the CAFR and the basic financial statements. MPERS' executive director and staff prepare the information contained in the CAFR and the financial statements to assist the Board in fulfilling its statutory duty.

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Systems of internal controls and supporting procedures are maintained to provide assurances that transactions are authorized, assets are safeguarded and proper records are maintained. These controls include standards in the hiring and training of employees, the establishment of an organizational structure, and the communication of policies and guidelines throughout the organization. Inherent limitations exist in all control systems. No evaluation of controls can provide absolute assurance that misstatements due to error or fraud will not occur or that all control issues and instances of fraud have been detected. The objective of internal controls is to provide reasonable assurance the financial statements are free of any material misstatements, recognizing that the cost of a control should not exceed the benefits to be derived.

In accordance with section 104.190 RSMo, an independent auditing firm, Williams-Keepers, LLC, has audited the financial statements included in this report and has issued an unmodified opinion (i.e., no audit concerns relating to MPERS' financial statements). The opinion letter of Williams-Keepers, LLC is presented in the "Financial Section" of this CAFR. "Management's Discussion and Analysis" immediately follows the "Independent Auditors' Report" and provides a narrative introduction, overview, and analysis of the basic financial statements.

Background Information:
MPERS was established by Senate Bill 66 in the 68th General Assembly. In accordance with this legislation, employees of MoDOT and the MSHP became members of the retirement system on September 1, 1955. Effective October 1, 1955, the System accepted 109 retirements. Employees of MPERS became members of the system after passage of Senate Bill 371 in 2001.

The plan provisions have changed many times over the years. The System offers not only enhanced retirement and disability benefits, but also benefits for survivors of active and retired members, benefits for vested former members, and death benefits.

MPERS 11-member board is responsible for the oversight of the System. The trustees serve as fiduciaries to the members and are responsible for selecting and retaining competent management. The trustees and management jointly establish sound policies and objectives, monitor operations for compliance, and oversee performance.

MPERS is considered a component unit of the state of Missouri for financial reporting purposes and, as such, the financial statements in this report are also included in the State of Missouri's Comprehensive Annual Financial Report.

Fiscal Year 2019 Highlights:
With the beginning of this fiscal year, the statutory requirements for the education of trustees, primarily for new trustees, were changed and increased. This statutory change, along with feedback from existing trustees, served as the foundation for an expanded exchange of information to not only get new trustees off to a better start, but also to maintain and improve upon the exchange of information that is needed for trustees to fulfill their important role as fiduciaries to the System.

As new trustees are assigned to the Board, there is no "warm up" that allows them to get fully versed in the System's operations before they must get to work. Once the assignment is made, each trustee has full responsibility to the System and its members. The necessity of effective new trustee orientation cannot be over-emphasized. What was previously a three-hour orientation has become a minimum six-hour event where a wide array of information is shared with the new trustees. The extended time allotment combined with a broader utilization of personnel for the orientation has improved a very important function for the System. In addition, with the guidance of the Board, staff has identified a variety of topics to be presented to the Board annually to reinforce important details of the System that will ultimately improve decision-making. Staff has also created a "white paper" library intended to address more complicated topics. This library will be expanded as additional subject matter is identified and as time permits.

Risk management activities continue to be a priority for the System. With a sound enterprise risk management structure in place, the perpetual review of risk feels like a maintenance function but still very important to be sure we are prudently administering the plan. A few of the more prominent risk management efforts for the year included: establishing backup duties for key investment related activities, a segregation of duties analysis for operational activities, cross training on primary business activities, and a host of improved financial reporting/tracking activities intended to recognize soundness of processes and to utilize efficiencies connected to technological advancements.

With the addition of a communications specialist to the MPERS team last year, there were a number of improvements made during the year with plans for more changes in the years to come. Feedback from membership is generally very good regarding our communication efforts but improvements have been requested by our membership to provide information earlier in their careers. With that in mind, a focus on reaching our members earlier in their careers about the importance of the benefits MPERS administers has become a key objective for the System. This will also serve an important role for the recruitment and retention efforts these benefits provide for our covered employers.

The continued improvement of MPERS' funded status is vitally important and the continued success of MPERS' investment policy along with difficult and important funding policy decisions made by the Board should be recognized as playing major roles in that improvement. The aggressive funding policies and positive investment performance have combined to realize an upward-trending funded status for the System which is essential for its long-term success. With the steep cost associated with MPERS' aggressive funding policies, it is important to recognize the progress that has been made and the potential cost relief that is on the near-term horizon if these polices are maintained. Having implemented bold actions to correct the funded status, MPERS is on the cusp of being a true success story in the world of public pension funds.

Actuarial Funding Status:
MPERS' funding objective is to meet future benefit obligations of retirees and beneficiaries through investment earnings and payroll contributions that remain approximately level from generation to generation. Historical information relating to this objective is presented in the "Schedule of Funding Progress" in the "Actuarial Section" of this report. During the fiscal year ending June 30, 2019, the funded status of MPERS, which covers 18,553 participants, increased by 2.7% to 59.82%.

Each year an independent actuarial firm conducts a valuation study to determine the actuarial soundness of the Plan, based on its long-term obligations and the sufficiency of current contribution levels to fund the liabilities over a reasonable timeframe. In MPERS' most recent valuation dated June 30, 2019, the actuary concluded that the System continues to be financed in accordance with actuarial standards using the level percent of payroll financing method. The actuary's conclusion is based upon the fact that the employers are contributing to the System according to actuarially determined rates and presumes the continuation of payment of actuarially determined contributions. Additional information regarding the financial condition of the System can be found in the "Actuarial Section" of this report.

In an effort to address the System's underfunding situation, the Board has modified the actuarial funding policies over the course of the past 13 years. In September 2006, the Board adopted a permanent funding policy that was intended to improve MPERS' funded status over a shorter timeframe.

The permanent funding policy states the following:

- The total contribution is based on the Plan's normal cost with a 29-year amortization period for MPERS' unfunded actuarial accrued liabilities. The financing period is a closed period that started July 1, 2007.

On September 17, 2009, after the Great Recession, the Board adopted the following temporary accelerated funding policy:

- The total contribution is based on the Plan's normal cost with a 15-year amortization period for unfunded retiree liabilities and a 30-year amortization period for other unfunded liabilities. Both amortization periods are closed periods that started July 1, 2010.
- The temporary accelerated funding policy will remain in effect until such time as the retiree liability becomes 100% funded or the permanent funding policy produces a higher contribution rate.

On September 24, 2014, the Board adopted a Rate Stabilization Reserve Fund intended to further reinforce the aggressive funding polices noted in the temporary policy above. The reserve fund was developed by maintaining employer contribution rates at present levels by applying investment gains to the reserve fund rather than decreasing employer contribution rates. When actuarial losses are experienced the reserve fund would be used first rather than increasing employer contribution rates. The reserve fund provides a smoothing of the overall experience that further decreases the potential volatility of contributions for covered employers.

As of June 30, 2019, the permanent funding policy is at a closed amortization period of 17 years and the temporary accelerated funding policy is at a closed amortization period of 6 years for unfunded retiree liabilities and 21 years for other unfunded liabilities.

Investment Activities:
State statutes and other applicable laws require the fiduciaries of the System to make investments using the same care, skill, and diligence that prudent investors acting in a similar capacity would use. In fulfilling this obligation, the Board has established a formal investment policy to clearly define the roles and responsibilities of the Board, staff and consultants, and to ensure that System assets are invested in a diversified portfolio following prudent investment standards. The Board determines the broad asset allocation policies and return objectives of the Plan. To implement and execute these policies, the Board has retained investment staff, consultants, a master custodian, and other advisors.

As of June 30, 2019, MPERS' investment portfolio had a total fair value of $2.4 billion, representing a return of 6.84% for the fiscal year. The portfolio continues to perform well versus MPERS' peer group, particularly over longer periods. Relative to that peer group, which is the InvestorForce Public Fund Universe, the 6.84% return for Fiscal Year 2019 ranked MPERS in the 32nd percentile, outpacing 68% of other public funds within the peer group. The trailing three- and five-year performance of 9.15% and 6.97%, respectively, ranks MPERS in the top 32% and 9%, respectively, of the peer group. The trailing 10-year performance of 10.19% ranks MPERS in the top 7% of the peer group.

Awards:
The GFOA awarded a Certificate of Achievement for Excellence in Financial Reporting to MPERS for its Fiscal Year 2018 CAFR. MPERS has achieved this prestigious award each year since Fiscal Year 2005. The Certificate of Achievement is the highest form of recognition for excellence in state and local government financial reporting. To be awarded a Certificate of Achievement, a government must publish an easily readable and efficiently organized CAFR. This report must satisfy both generally accepted accounting principles and applicable legal and GFOA reporting requirements.

A Certificate of Achievement is valid for a period of one year. We believe that our current CAFR continues to meet the program's requirements, and therefore, we are submitting this report to GFOA to determine its eligibility for another certificate.

MPERS also received the Public Pension Coordinating Council's (PPCC) Public Pension Standards Award in recognition of meeting professional standards for plan design and administration. MPERS has received the Council's award each year since 2004. This award is presented by the PPCC, a confederation of the National Association of State Retirement Administrators, the National Conference on Public Employee Retirement

Systems, and the National Council on Teacher Retirement. MPERS' staff and Board is pleased to receive these prestigious awards for financial and professional standards of excellence and may be viewed after this transmittal letter.

Acknowledgements and Distribution:
This report, a product of the combined efforts of MPERS' staff and advisors, is intended to provide comprehensive and reliable information about the System, to demonstrate compliance with legal provisions, and to allow for the evaluation of responsible stewardship of the System's funds.

This report is provided to the governor, the state auditor, and the Joint Committee on Public Employee Retirement. It is also distributed electronically to all MoDOT divisions, district offices, MSHP general headquarters, and troop headquarters. These offices form the link between MPERS and its members, and their cooperation contributes significantly to the success of MPERS. We hope all readers of this report find it informative and useful. An electronic version of this report is available on the MPERS website at www.mpers.org/annual-reports.

We express our gratitude to the members of the Board, the staff, the consultants, and the many people who have worked so diligently to assure the continued successful operation of MPERS. The steady, monthly benefit payments offered by defined benefit plans, like MPERS, provide peace of mind and security for retirees and their families. For over 60 years, MPERS has been committed to providing a foundation for financial security to plan participants through the delivery of quality benefits, exceptional member service and professional plan administration.

Respectfully submitted,

Scott Simon
Executive Director

William "Bill" Seibert
Board Chair

Awards

Government Finance Officers Association

Certificate of
Achievement
for Excellence
in Financial
Reporting

Presented to

Missouri Department of Transportation
and Highway Patrol Employees'
Retirement System

For its Comprehensive Annual
Financial Report
for the Fiscal Year Ended

June 30, 2018

Christopher P. Morrill

Executive Director/CEO

Public Pension Coordinating Council

Public Pension Standards Award
For Funding and Administration
2019

Presented to

MoDOT & Patrol Employees' Retirement System

In recognition of meeting professional standards for
plan funding and administration as
set forth in the Public Pension Standards.

Presented by the Public Pension Coordinating Council, a confederation of

National Association of State Retirement Administrators (NASRA)
National Conference on Public Employee Retirement Systems (NCPERS)
National Council on Teacher Retirement (NCTR)

Alan H. Winkle

Alan H. Winkle
Program Administrator

Board of Trustees

MPERS is governed by an eleven-member Board of Trustees, as set out in section 104.160 of the Missouri Revised Statutes. Board members as of June 30, 2019:

William "Bill" Seibert

Board Chair
MSHP Retiree
Representative

Elected by Retired
Members of MSHP

Todd Tyler

Board Vice Chair
MoDOT Employee
Representative

Elected by MoDOT Employees

Senator Mike Bernskoetter

State Senator

District 6
Appointed by
President Pro-Tem
of the Senate

John Briscoe

Commission Member

Highways & Transportation
Commissioner

Sergeant Matt Broniec

**MSHP Employee
Representative**

Elected by MSHP Employees

Sue Cox

**MoDOT Retiree
Representative**

Elected by Retired
Members of MoDOT

Patrick McKenna

**Director of the Missouri
Department of
Transportation**

Ex-Officio Member

Colonel Eric Olson

**Superintendent
of the Missouri
State Highway Patrol**

Ex-Officio Member

Michael B. Pace

Commission Member

Highways & Transportation
Commissioner

Gregg Smith

Commission Member

Highways & Transportation
Commissioner

Representative Sara Walsh

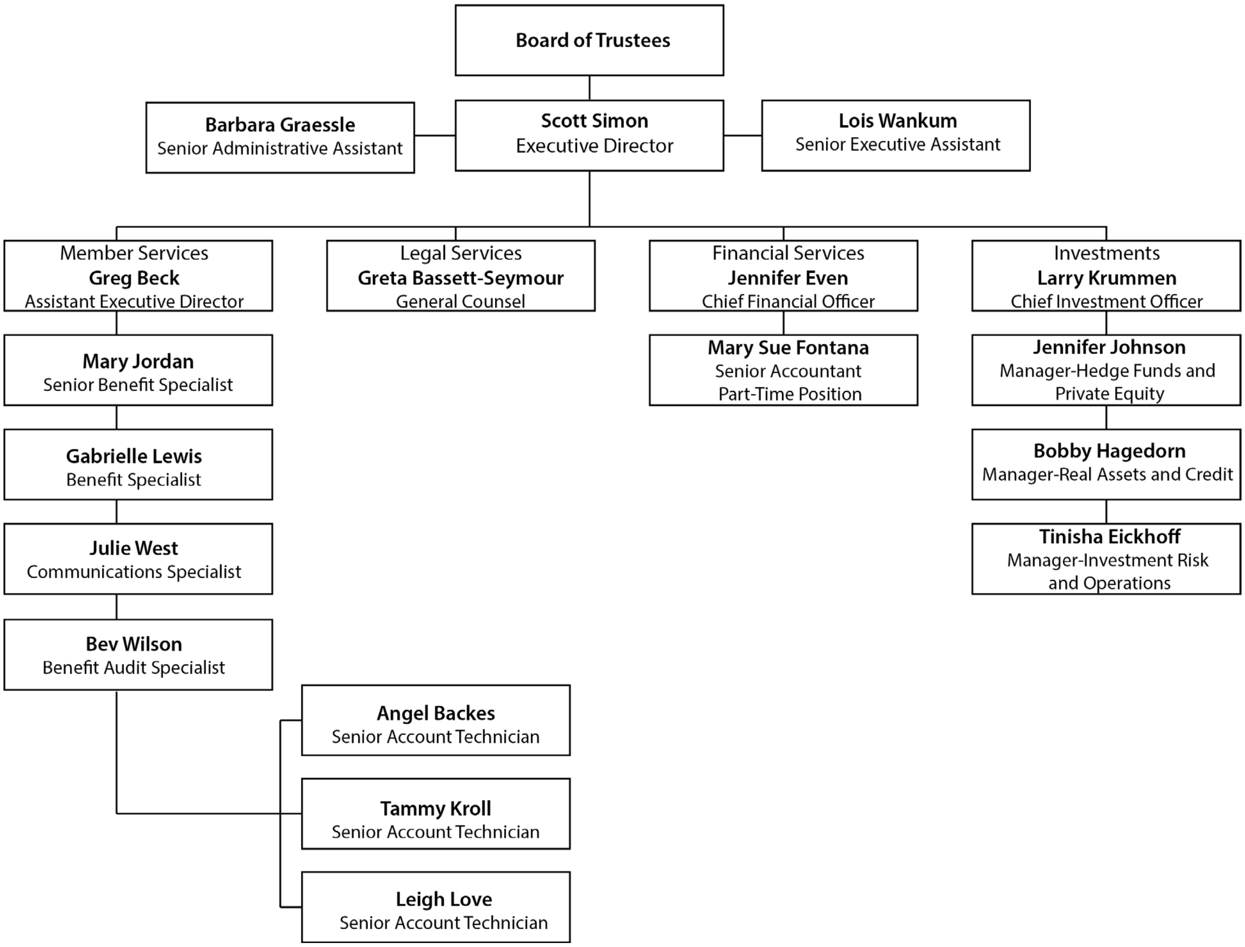
State Representative

District 50
Appointed by
Speaker of the House

MPERS
Serving those who keep us safe.

Administrative Organization

The executive director of MPERS has charge of the offices and records of the System and hires such employees deemed necessary, subject to the approval of the Board of Trustees. The System employs seventeen full-time and one part-time staff.



Executive Team:
Larry Krummen-Chief Investment Officer
Jennifer Even-Chief Financial Officer
Scott Simon-Executive Director
Greta Bassett-Seymour-General Counsel
Greg Beck-Assistant Executive Director

Administrative Organization

Director's Office

The Director's Office staff provides executive oversight for the System which includes, but is not limited to administrative support in the areas of legislation, stakeholder communications, operations, benefits, risk management, and investments. The Director's Office is also responsible for providing the Board with information and reports on the activities of the System.

Financial Services

The Financial Services section is responsible for maintaining all the financial records of MPERS. The chief financial officer (CFO) interacts with the investment custodian, the auditors, the depository bank, Missouri's Department of Revenue, and the Internal Revenue Service. In addition, the CFO assists the chief investment officer in tracking and predicting target cash balances, participates in annual budget development, prepares monthly budget-to-actual reports, and calculates monthly premium payments to the long-term disability insurer. The CFO also processes MPERS' semi-monthly office payrolls, reconciles monthly benefit payments and contributions/payrolls posted, and reconciles investment activity.

Investments

The Investments section staff works closely with the general investment consultant to manage the investment portfolio and provide consulting services to the Board and the executive director. This includes, but is not limited to: (a) formulating investment policy and asset recommendations, (b) sourcing, selecting, monitoring, and evaluating external investment advisors, (c) measuring and reporting investment performance, (d) conducting market research on political, financial, and economic developments that may affect the System, and (e) serving as a liaison to the investment community.

Legal Services

The Legal Services section advises the executive director and Board on legal matters, reviews and approves investment and other contracts for MPERS, advises staff on the application of state and federal statutes affecting the administration of plan benefits, responds to requests from members and their attorneys related to plan benefits, engages in or oversees litigation affecting MPERS, and assists in developing policies, rules, and legislation impacting MPERS' operations or the administration of plan benefits.

Member Services

The Member Services section consists of two units devoted to serving member needs.

The Benefits Unit is responsible for contact with the membership regarding the benefit programs administered by MPERS, which include retirement and disability. The benefit staff is responsible for preparing and delivering the pre-retirement and benefit basics seminars in addition to assisting with the development of member communication material. The benefit staff is the main point of contact with members who have questions about their retirement.

The Payroll Unit is responsible for establishing and maintaining all membership records including: (a) maintaining member data on the pension administration system, (b) verifying retirement calculations, (c) balancing payroll deductions, (d) verifying SAM II data against exception reports, and (e) entering payroll, service, and leave data into the System's computerized database. Payroll Unit staff will also create and publish communication materials, assist with pre-retirement seminars, provide data to the actuary, as well as reviewing member records for accuracy and completeness.

Professional Services

The following firms were retained at fiscal year-end by the Board of Trustees to serve in professional capacities or provide consultant services. Please refer to pages 49 through 52 in the Investment Section for the Schedule of Investment Expenses and Brokerage Commissions for the investment professionals.

Actuary

Gabriel, Roeder, Smith & Company
Southfield, Michigan

Auditor

Williams-Keepers, LLC
Jefferson City, Missouri

Investment Consultant

New England Pension Consultants (NEPC)
Cambridge, Massachusetts

Information Technology

Levi, Ray & Shoup, Inc.
Springfield, Illinois

Midwest Computech, Inc.
Columbia, Missouri

Legislative Consultant

Michael G. Winter Consultants, LLC
Jefferson City, Missouri

Master Trustee/Custodian

The Northern Trust Company
Chicago, Illinois

Risk Management/Insurance Consultant

Charlesworth Benefits
Overland Park, Kansas

Long-Term Disability Insurer

The Standard Insurance Company
Portland, Oregon

Professional Services

Investment Managers

Aberdeen Asset Management	Philadelphia, Pennsylvania
ABRY Partners	Boston, Massachusetts
Acadian Asset Management	Boston, Massachusetts
AEW Partners	Boston, Massachusetts
Aisling Capital	New York, New York
Albourne America	San Francisco, California
Alpstone Capital	Genève, Switzerland
Alyeska Investment Group	Chicago, Illinois
American Infrastructure MLP	Foster City, California
American Timberlands Company	Columbia, South Carolina
Anchorage Capital Group	New York, New York
Apollo Aviation Group	New York, New York
Ares Management	New York, New York
Arrowroot Capital	Santa Monica, California
Audax Group	Boston, Massachusetts
Blackstone	New York, New York
Blue Road Capital	New York, New York
Bridgewater Associates	Westport, Connecticut
Capital Partners	Norwalk, Connecticut
CarVal Investors (CVI)	Minnetonka, Minnesota
CatchMark Timber	Atlanta, Georgia
CBRE Investors	Baltimore, Maryland
Cevian Capital Limited	Jersy, Channel Islands
CenterSquare Investment Management	Plymouth Meeting, Pennsylvania
CIM Group	Los Angeles, California
Clarion Partners	Jersy, Channel Islands
Colony Capital	Los Angeles, California
Corrum Capital	San Francisco, California
DC Capital	Alexandria, Virginia
Deephaven Capital Management	Minnetonka, Minnesota
Drive Capital	Columbus, Ohio
Dyal Capital Partners	Palo Alto, California
EIF Management	Needham, Massachusetts
Energy & Mineral Group	Houston, Texas
GMO	Boston, Massachusetts
Golden Sciens Marine Investments	New York, New York
Golub Capital	New York, New York
Grey Rock Energy Partners	Dallas, Texas
Grove Street Advisors	Wellesley, Massachusetts
GSO Capital Partners	New York, New York
Indus Capital	New York, New York
Kennedy Capital	St. Louis, Missouri
KPS Capital Partners	New York, New York
Long Ridge Equity Partners	New York, New York
Long Ford Capital Management	Chicago, Illinois
Luxor Capital	New York, New York
M&G Investments	London, United Kingdom
MGG Investment Group	New York, New York
McCaslin Barros Henderson	Dallas, Texas
MiraVast	New York, New York
Metacapital Management	New York, New York
Millennium Management	New York, New York
Monomoy Capital Partners	New York, New York

Professional Services

Investment Managers

Natural Gas Partners	Houston, Texas
Ned Davis	Venice, Florida
NewQuest Capital Partners	Central, Hong Kong
New Mountain Capital	New York, New York
Nexus Capital Management	New York, New York
Northern Shipping	Stamford, Connecticut
Oak Street Real Estate Capital	Chicago, Illinois
Och-Ziff Real Estate	New York, New York
OCP Asia	Singapore
Opengate Capital Partners	Los Angeles, California
Orion Mine Finance Group	New York, New York
Octagon Credit Investors	New York, New York
Owl Rock Capital Partners	New York, New York
Parametric	Minneapolis, Minnesota
Pentwater	Evanston, Illinois
Pfingsten Partners	Chicago, Illinois
Principal Global Investors	Des Moines, Iowa
Quantum Energy Partners	Houston, Texas
Ridgewood Energy	Montvale, New Jersey
Riverstone Credit Partners	New York, New York
Shore Capital Partners	Chicago, Illinois
Shoreline Capital	Guangzhou, China
Sigular Guff and Company	Guangzhou, China
Silchester International Investors Limited	London, United Kingdom
Stark Investments (Shepherd)	Milwaukee, Wisconsin
Systematica Investments	New York, New York
Timberland Investment Resources	Atlanta, Georgia
Torchlight Investors	New York, New York
Tortoise Capital Advisors	Leawood, Kansas
Tristan Capital Partners	London, United Kingdom
Turnbridge Capital Partners	Houston, Texas
ValueAct Capital	San Francisco, California
Varde Asia	New York, New York
Vectis Healthcare	Boston, Massachusetts

Notes

Financial Section

Henry and Richard Bloch

Birthplace: Kansas City, Missouri

Founders of H&R Block, Inc.

"If you are in business for yourself, forget the bottom line. You are here to help people."

WILLIAMS KEEPERS LLC
CERTIFIED PUBLIC ACCOUNTANTS & CONSULTANTS

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3220 West Edgewood, Suite E, Jefferson City, MO 65109
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INDEPENDENT AUDITORS' REPORT

The Board of Trustees
Missouri Department of Transportation and
Highway Patrol Employees' Retirement System

Report on the Financial Statements

We have audited the accompanying statement of fiduciary net position of the Missouri Department of Transportation and Highway Patrol Employees' Retirement System (the System), as of June 30, 2019, and the related statement of changes in fiduciary net position for the year then ended, and the related notes to the financial statements, which collectively comprise the System's basic financial statements.

Management's Responsibility for the Financial Statements

Management is responsible for the preparation and fair presentation of these financial statements in accordance with U.S. generally accepted accounting principles; this includes the design, implementation, and maintenance of internal control relevant to the preparation and fair presentation of financial statements that are free from material misstatement, whether due to fraud or error.

Auditors' Responsibility

Our responsibility is to express an opinion on these financial statements based on our audit. We conducted our audit in accordance with U.S. generally accepted auditing standards. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free from material misstatement.

An audit involves performing procedures to obtain audit evidence about the amounts and disclosures in the financial statements. The procedures selected depend on the auditor's judgment, including the assessment of the risks of material misstatement of the financial statements, whether due to fraud or error. In making those risk assessments, the auditor considers internal control relevant to the System's preparation and fair presentation of the financial statements in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the System's internal control. Accordingly, we express no such opinion. An audit also includes evaluating the appropriateness of accounting policies used and the reasonableness of significant accounting estimates made by management, as well as evaluating the overall presentation of the financial statements.

We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our audit opinion.

Opinion

In our opinion, the financial statements referred to above present fairly, in all material respects, the fiduciary net position of the System at June 30, 2019, and the changes in fiduciary net position for the year then ended, in conformity with U.S. generally accepted accounting principles.

Other Matters

Required Supplementary Information

U.S. generally accepted accounting principles require that the management's discussion and analysis on pages 3 through 6 and the schedules of changes in the employers' net pension liability, employers' contributions, investment returns, changes in net OPEB liability and related ratios, MPERS' proportionate share of net OPEB liability, and related notes on pages 29 through 32 be presented to supplement the basic financial statements. Such information, although not a part of the basic financial statements, is required by the Governmental Accounting Standards Board, who considers it to be an essential part of financial reporting for placing the basic financial statements in an appropriate operational, economic, or historical context.

We have applied certain limited procedures to the required supplementary information in accordance with U.S. generally accepted auditing standards, which consisted of inquiries of management about the methods of preparing the information and comparing the information for consistency with management's responses to our inquiries, the basic financial statements, and other knowledge we obtained during our audit of the basic financial statements. We do not express an opinion or provide any assurance on the information because the limited procedures do not provide us with sufficient evidence to express an opinion or provide any assurance.

Other Information

Our audit was conducted for the purpose of forming an opinion on the financial statements that collectively comprise the System's basic financial statements. The additional information presented on pages 33 through 35 are presented for purposes of additional analysis and are not a required part of the basic financial statements.

The additional information is the responsibility of management and was derived from and relate directly to the underlying accounting and other records used to prepare the basic financial statements. The additional information has been subjected to the auditing procedures applied in the audit of the basic financial statements and certain additional procedures, including comparing and reconciling such information directly to the underlying accounting and other records used to prepare the basic financial statements or to the basic financial statements themselves, and other additional procedures in accordance with U.S. generally accepted auditing standards. In our opinion, the additional information presented on pages 33 through 35 is fairly stated in all material respects in relation to the basic financial statements as a whole.

Williams-Keepers LLC

November 6, 2019

Management's Discussion and Analysis

The management of the Missouri Department of Transportation and Highway Patrol Employees' Retirement System (the System, or MPERS) provides this discussion and analysis of the System's financial performance for the fiscal year ended June 30, 2019. While this discussion is intended to summarize the financial status of MPERS, readers should consider this information in conjunction with the information that is furnished in the more detailed financial statements and corresponding notes.

DESCRIPTION OF BASIC FINANCIAL STATEMENTS

As required by the Governmental Accounting Standards Board (GASB) accounting standards, this financial report consists of Management's Discussion and Analysis (this section), the basic financial statements (including notes to the basic financial statements), and other required supplementary information.

Financial Statements report information about MPERS, using accounting methods similar to those used by private-sector companies, by using the economic resources measurement focus and accrual basis of accounting. These statements provide both long-term and short-term information about the System's overall financial status. These statements follow this Management's Discussion and Analysis section:

- The *Statement of Fiduciary Net Position* includes all the System's assets and liabilities, with the difference between the two reported as net position.
- The *Statement of Changes in Fiduciary Net Position* accounts for all the current year's additions (income) and deductions (expenses), regardless of when cash is received or paid.

Notes to the Financial Statements are included following the financial statements. The notes to the financial statements provide additional information that is essential for a full understanding of the data provided in the financial statements.

Required Supplementary Information follows the notes and further supports the information in the financial statements.

ANALYSIS OF FINANCIAL POSITION AND RESULTS OF OPERATIONS

Overall, the financial position of MPERS strengthened by $109 million, reported as the "net increase." This is primarily a result of net appreciation in the fair value of investments for the year ended June 30, 2019. The funded status of the plan showed an increase of 2.7%, primarily due to actuarial gains and MPERS' contribution stabilization reserve fund.

The following schedules present summarized comparative data from the System's financial statements for each of the fiscal years ended June 30, 2019 and 2018. Following each schedule is a brief summary providing explanation and analyses of the major reasons for changes in the condensed financial statements.

Summarized Comparative Statements of Fiduciary Net Position

	As of June 30, 2019	As of June 30, 2018	% Change 2019/2018
Cash and Receivables	$ 19,474,188	$ 22,452,794	-13
Investments	2,419,349,739	2,306,942,650	5
Invested Securities Lending Collateral	104,247,159	133,616,408	-22
Capital Assets	569,044	858,546	-34
Total Assets	**2,543,640,130**	**2,463,870,398**	**3**
Deferred Outflows of Resources	**32,014**	**34,090**	**n/a**
Accounts Payable	7,708,336	8,789,084	-12
OPEB Obligation	1,538,442	1,545,180	0
Securities Lending Collateral	110,924,432	138,840,857	-20
Total Liabilities	**120,171,210**	**149,175,121**	**-19**
Deferred Inflows of Resources	**239,104**	**199,219**	**n/a**
Net Position	**$ 2,423,261,830**	**$ 2,314,530,148**	**5**

The decrease in cash and receivables is primarily attributable to decreased investment sales receivables as of June 30, 2019. Fluctuations in this area are normal, based on investment activity.

The System's investments represent the main component of total assets. These investments include equities, fixed income, limited partnerships, hedge funds, and short-term investments. The increase in fair value of investments as of June 30, 2019 is primarily due to favorable market conditions experienced during the year. The fiscal year 2019 investment return was 6.84% as calculated on a time-weighted rate of return methodology.

Capital assets decreased in fiscal year 2019 due primarily to depreciation of existing assets during the year.

Deferred outflows of resources is related to Other Post-Employment Benefits (OPEB), required by Governmental Accounting Standards Board (GASB) Statement 75. The deferred outflows of resources relate to the timing of contributions paid.

The decrease in accounts payable for fiscal year 2019 is primarily attributable to lower investment purchases payable. Fluctuations in this area are normal, based on investment activity. A decrease in salaries payable, and related contributions payable, resulted from no investment incentive for 2019.

The largest component of liabilities is securities lending collateral. This represents the amount owed for collateral to be returned as the result of investment securities lent. The decrease in securities lending collateral liability from fiscal year 2018 to fiscal year 2019 is due to fewer securities being utilized for lending. The corresponding securities lending collateral asset is valued at a lower amount than the securities lending collateral liability due to the fair value of the securities on loan being less than the collateral value.

Deferred inflows of resources is related to OPEB. The deferred inflows of resources relate primarily to the amortization of changes in actuarial assumptions.

The System's total net position was $2.423 billion at June 30, 2019, a $109 million increase from the $2.314 billion at June 30, 2018.

Summarized Comparative Statements of Changes in Fiduciary Net Position

	Year Ended June 30, 2019	Year Ended June 30, 2018	% Change 2019/2018
Contributions	$ 218,595,641	$ 211,824,042	3
Net Investment Income	154,326,511	197,619,367	-22
Other Income	307	472	-35
Total Additions	**372,922,459**	**409,443,881**	**-9**
Benefits	259,817,811	259,058,863	0
Administrative Expenses	4,372,966	4,693,492	-7
Total Deductions	**264,190,777**	**263,752,355**	**0**
Net Increase	108,731,682	145,691,526	-25
Net Position-Beginning	2,314,530,148	2,168,838,622	7
Net Position-Ending	**$ 2,423,261,830**	**$ 2,314,530,148**	**5**

Net investment income, a primary component of plan additions, was $154 million for fiscal year 2019, which represented a 6.84% return for the fiscal year ended June 30, 2019. In comparison, the fiscal year 2018 gain of $198 million represented an investment return of 9.45%. Annual fluctuations within the broad investment markets are outside the control of the System and are expected to fluctuate from year to year. The Board of Trustees has approved a diversified asset allocation that, over long periods of time, is expected to realize the assumed actuarial rate of investment return of 7.00%.

Total benefits increased only slightly overall from 2018 to 2019. A one-time buyout option offered to terminated, vested members in 2018 resulted in $5.69 million paid to 383 members. Benefits in 2019 increased due to an increase in the total number of retirees.

Administrative expenses decreased primarily due to a decrease in the salaries and benefits category, which was a result of no investment incentive for 2019.

CURRENTLY KNOWN FACTS AND RECENT EVENTS

Based on the June 30, 2019 actuarial valuation, the Board of Trustees approved no change in the required state contribution rate, effective July 1, 2020. The rate applied to both non-uniformed payroll (MoDOT, civilian patrol, and MPERS) and uniformed patrol payroll remains at 58.00%.

Based on the June 30, 2018 actuarial valuation, the Board of Trustees approved no change in the required state contribution, effective July 1, 2019. The rate applied to both non-uniformed payroll (MoDOT, civilian patrol and MPERS) and uniformed patrol payroll remained at 58.00%.

CONTACTING THE RETIREMENT SYSTEM'S MANAGEMENT

This financial report is designed to provide a general overview of the System's finances. Questions about this report or requests for additional financial information should be sent to:

MoDOT and Patrol Employees' Retirement System
PO Box 1930
Jefferson City, MO 65102-1930
mpers@mpers.org

Statement of Fiduciary Net Position

As of June 30, 2019

ASSETS:	
Cash	$ 384,571
Receivables	
Contributions	8,785,305
Accrued Interest and Income	6,426,373
Investment Sales	3,871,328
Other	6,611
Total Receivables	19,089,617
Investments, at Fair Value	
Equities	454,989,360
Fixed Income	656,761,582
Limited Partnerships	1,066,535,548
Hedge Funds	126,820,799
Short-Term Investments	114,242,450
Total Investments	2,419,349,739
Invested Securities Lending Collateral	104,247,159
Capital Assets, Net of Depreciation	
Land	84,000
Building	581,619
Furniture, Equipment and Software	3,430,651
Accumulated Depreciation	(3,527,226)
Capital Assets, Net of Depreciation	569,044
TOTAL ASSETS	**$ 2,543,640,130**
DEFERRED OUTFLOWS OF RESOURCES	**$ 32,014**
LIABILITIES:	
Accounts Payable	$1,239,075
OPEB Obligation	1,538,442
Security Lending Collateral	110,924,432
Investment Purchases	6,469,261
TOTAL LIABILITIES	**$ 120,171,210**
DEFERRED INFLOWS OF RESOURCES	**$ 239,104**
NET POSITION RESTRICTED FOR PENSIONS	**$2,423,261,830**

See accompanying Notes to the Financial Statements.

Statement of Changes in Fiduciary Net Position

For the Year Ended June 30, 2019

ADDITIONS:	
Contributions-Employer	$ 210,166,927
Contributions-Employee	4,449,428
Contributions-Service Transfers from Other System	2,432,370
Contributions-Other	1,546,916
Total Contributions	218,595,641
Investment Income from Investing Activities	
Net Appreciation in Fair Value of Investments	114,179,051
Interest and Dividends	74,631,867
Less: Investment Expenses	34,651,182
Net Investment Income	154,159,736
Income from Securities Lending Activities	
Securities Lending Gross Income	942,500
Less: Securities Lending Expenses, net	775,725
Net Income from Securities Lending Activities	166,775
Other Income	307
TOTAL ADDITIONS	**$ 372,922,459**
DEDUCTIONS:	
Monthly Benefits	
Retiree and Survivor Annuity Benefits	238,205,549
BackDROP Payments	15,424,880
Disability Benefits	2,475,837
Death Benefits	820,000
Service Transfer Payments	2,111,007
Employee Contribution Refunds	780,538
Administrative Expenses	4,372,966
TOTAL DEDUCTIONS	**$ 264,190,777**
NET INCREASE	108,731,682
NET POSITION RESTRICTED FOR PENSIONS	
Beginning of Year	**$2,314,530,148**
End of Year	**$2,423,261,830**

See accompanying Notes to the Financial Statements.

NOTE 1 - SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES

As established under Section 104.020 of the Revised Statutes of Missouri (RSMo.), the Missouri Department of Transportation and Highway Patrol Employees' Retirement System (MPERS) is a body corporate and an instrumentality of the State of Missouri (State). Due to the nature of MPERS' reliance on funding from the Missouri Department of Transportation (MoDOT) and the Missouri State Highway Patrol (MSHP) and control of the overall plan document by the legislative and executive branches of state government, MPERS is considered a part of the State of Missouri financial reporting entity and is included in the State's financial reports as a component unit shown as a pension trust fund.

Note 1 (a) - Basis of Accounting

The financial statements were prepared using the accrual basis of accounting. Contributions are due to MPERS when employee services have been performed and paid. Contributions are recognized as revenues when due, pursuant to statutory requirements. Benefits are recognized when due and payable and expenses are recorded when the corresponding obligations are incurred. Dividend income is recognized when dividends are declared. Interest income is recognized when earned.

Note 1 (b) - Method Used to Value Investments

Investments are reported at fair value on a trade date basis. Bonds and stocks traded on a national or international exchange are valued at the reported sales price at current exchange rates. Mortgages are valued on the basis of future principal and interest payments and are discounted at prevailing interest rates for similar instruments. The fair value of real estate and timber investments are based on net asset value estimates provided by the general partners' administrators or portfolio managers, which are compared to independent appraisals. Investments that do not have an established market are reported at estimated fair value. The fair value of the hedge fund portfolios and partnership portfolios are based on valuations of the underlying assets as reported by the general partner or portfolio manager.

Note 1 (c) - Net Investment in Capital Assets

MPERS capitalizes assets with an expected useful life greater than one year and a cost greater than $5,000. Capital assets are depreciated on the straight-line method over the estimated useful lives of the related assets. The estimated useful lives are as follows:

Furniture, Equipment and Software	3-10 years
Building and Improvements	30 years

Note 1 (d) - Use of Estimates

The preparation of financial statements in conformity with U.S. generally accepted accounting principles requires management to make estimates and assumptions that affect the reported amounts of assets and liabilities and disclosure of contingent assets and liabilities at the date of the financial statements, and the reported amounts of revenues and expenses during the reporting period. Actual results could differ from those estimates.

NOTE 2 – PLAN DESCRIPTIONS AND CONTRIBUTION INFORMATION

MPERS is a body corporate and an instrumentality of the state as a multiple-employer, public employee retirement system with one plan that has three benefit structures known as the Closed Plan, the Year 2000 Plan, and the Year 2000 Plan-2011 Tier. The plan provides retirement, survivor, and disability benefits for employees of MoDOT, MSHP, and MPERS. The plan is administered in accordance with the requirements of a cost sharing, multiple-employer, public employee retirement plan under the Revised Statutes of Missouri. In MPERS are vested the powers and duties specified in sections 104.010 to 104.312, 104.601 to 104.805, and 104.1003 to 104.1093, RSMo., and such other powers as may be necessary or proper to enable it, its officers, employees, and agents to carry out fully and effectively all the purposes outlined pursuant to these sections. Responsibility for the operation and administration of the System is vested in the Board of Trustees, which consists of eleven members, four elected by the active and retired plan members, three Highway and Transportation Commissioners, a State Senator appointed by the President Pro-Tem of the Senate, a State

Representative appointed by the Speaker of the House, and the MoDOT Director and MSHP Superintendent who serve as ex-officio members. Detailed information regarding contributions can be found in Note 5.

Generally, all covered employees hired before July 1, 2000, are eligible for membership in the Closed Plan. All covered employees hired on or after July 1, 2000, and before January 1, 2011, are eligible for membership in the Year 2000 Plan. All covered employees hired on or after January 1, 2011 are eligible for membership in the Year 2000 Plan's 2011 Tier.

Membership in the Closed Plan, Year 2000 Plan, and 2011 Tier As of June 30, 2019

	Closed	Year 2000	2011 Tier	Total
Retirees, Beneficiaries, and Disabilities				
Currently Receiving Benefits	4,955	4,120	11	9,086
Terminated Employees Entitled to				
But Not Yet Receiving Benefits	1,097	889	65	2,051
Active Employees				
Vested	2,189	2,292	681	5,162
Non-Vested	3	51	2,200	2,254
Total Membership	**8,244**	**7,352**	**2,957**	**18,553**

Closed Plan Description

Employees covered by the Closed Plan are fully vested for benefits upon receiving 5 years of creditable service. Under the Closed Plan, MoDOT and civilian employees may retire with full benefits upon the earliest of attaining:

- Age 65 with 4 or more years of creditable service (active);
- Age 65 with 5 or more years of creditable service (terminated & vested);
- Age 60 with 15 or more years of creditable service (active or terminated & vested); or
- "Rule of 80" – at least age 48 with sum of member's age and service equaling 80 or more (active or terminated & vested).

The following provisions apply for uniformed patrol members of the Closed Plan:

- Age 55 with 4 or more years of creditable service (active);
- Age 55 with 5 or more years of creditable service (terminated & vested);
- "Rule of 80" – at least age 48 with sum of member's age and service equaling 80 or more (active or terminated & vested); or
- Mandatory retirement at age 60 (active).
- All non-uniformed members may retire early, with reduced benefits, at age 55 with at least 10 years of creditable service.

The base benefit in the Closed Plan is equal to 1.6% multiplied by the final average pay multiplied by years of creditable service. For members of the uniformed patrol, the base benefit is calculated by applying the same formula, then multiplying the product by 1.333333.

Retired uniformed members will receive an additional benefit of $90 per month, plus cost-of-living adjustments (COLAs), until attainment of age 65. This payment, however, is reduced by any amount earned during gainful employment. This benefit is not available to uniformed members hired on or after January 1, 1995, or to vested deferred members.

For members employed prior to August 28, 1997, COLAs are provided annually based on 80% of the increase in the consumer price index for all urban consumers for the United States (CPI-U). The minimum rate is 4% and the maximum rate is 5%, until the cumulative amount of COLAs equals 65% of the original benefit. Thereafter, the 4% minimum rate is eliminated and the annual COLA rate will be equal to 80% of the increase in the CPI-U (annual maximum of 5%). For members employed on or after August 28, 1997, COLAs are provided annually based on 80% of the increase in the CPI-U, up to a maximum rate of 5%.

The BackDROP is a payment option that is available to eligible members upon retirement. This option provides for a benefit to be calculated as if the member elected to retire at a previous date. If the BackDROP is elected, the monthly benefit payable on the actual retirement date is based on the benefit that would have been received by the member had he/she left employment and retired on the BackDROP date. In addition, the member will receive a lump sum payment equal to 90% of the life income annuity amount the member would have received during the BackDROP period. This lump sum amount includes any COLAs and other benefit increases; also, credit will be received for the unused sick leave balance as of the date of retirement.

The life income annuity payment option (which contains no provision for survivorship) and the life income with 60 or 120 month guaranteed payment options are available to all members. Joint and 50% or 100% survivor options are available if married at the time of retirement. In the Closed Plan, the reduction for the joint & 100% survivor option is based on the difference between the age of the member and the survivor. There is no reduction for the joint and 50% survivor option.

If a reduced joint and survivor option is chosen at the time of retirement and the spouse precedes the member in death, the benefit will revert back (pop-up) to a normal annuity, upon appropriate notification to MPERS.

Members may name a new spouse as beneficiary if:

- They were single at retirement and since married;
- They elected a spouse option at the time of retirement, the spouse preceded the member in death, and then a remarriage occurred.

The member has 1 year from the date of marriage to re-elect a payment option and name a new spouse.

All members who retire from active employment or long-term disability, or begin receiving normal or work-related disability benefits, on or after September 28, 1985, are provided a $5,000 death benefit payable to designated beneficiaries.

Year 2000 Plan Description

Employees covered by the Year 2000 Plan are fully vested for benefits upon earning 5 years of creditable service. Under the Year 2000 Plan, MoDOT and civilian employees may retire with full benefits upon the earliest of attaining:

- Age 62 and with 5 or more years of creditable service (active or terminated & vested);
- “Rule of 80” – at least age 48 with sum of member’s age and service equaling 80 or more (active).

The following provisions apply for uniformed patrol members of the Year 2000 Plan:

- “Rule of 80” – at least age 48 with sum of member’s age and service equaling 80 or more (active);
- Mandatory retirement at age 60 (active only).

All members may retire early with reduced benefits at age 57 with at least 5 years of creditable service.

The base benefit in the Year 2000 Plan is equal to 1.7% multiplied by the final average pay multiplied by years of creditable service. Members retiring under the Rule of 80, and uniform patrol members retiring at the mandatory retirement age (currently 60), receive an additional temporary benefit until age 62. The temporary benefit is equivalent to 0.8% multiplied by final average pay multiplied by years of creditable service.

COLAs are provided annually based on 80% of the increase in the CPI-U, up to a maximum rate of 5%.

The BackDROP is a payment option that may be available to members upon retirement. This option provides for a monthly benefit to be calculated as if the member elected to retire at a previous date. If the BackDROP is elected, the monthly benefit payable on the actual retirement date is based on the benefit that would have been received by the member had he/she left employment and retired on the BackDROP date. In addition, the member will receive a lump sum payment equal to 90% of the life income annuity amount the member would have received during the BackDROP period. This lump sum amount includes any temporary benefits, COLAs and other benefit increases; also, credit will be received for the unused sick leave balance as of the date of retirement.

The life income annuity payment option (with no provision for survivorship) and the life income with 120 or 180 months guaranteed payment options are available to all members. Joint and 50% or 100% survivorship options are available if married at the time of retirement. The reduction for the joint and 50% or 100% survivor options is based on the member's age at retirement, as well as the age difference between the member and the survivor.

If a reduced joint and survivor option is chosen at the time of retirement and the spouse precedes the member in death, the benefit will revert back (pop-up) to a normal annuity, upon appropriate notification to MPERS.

Members may name a new spouse for survivor benefits if:

- They were single at retirement and since married;
- They elected a spouse option at the time of retirement, the spouse preceded the member in death, and then a remarriage occurred.

The member has 1 year from the date of marriage to re-elect the payment option and name a new spouse.

All members who retire from active employment or long-term disability, or begin receiving work-related disability benefits, on or after July 1, 2000, are provided a $5,000 death benefit payable to designated beneficiaries.

Year 2000 Plan-2011 Tier Description

Employees covered by the 2011 Tier are fully vested for benefits upon earning 5 years of creditable service if they were active on or after January 1, 2018. Under the 2011 Tier, MoDOT and civilian employees may retire with full benefits upon the earliest of attaining:

- Age 67 and with 5 or more years of creditable service (active or terminated & vested);
- "Rule of 90" – at least age 55 with sum of member's age and service equaling 90 or more (active only).

Active MoDOT and civilian employees may retire early with reduced benefits at age 62 with at least 5 years of creditable service.

The following provisions apply for uniformed patrol members of the 2011 Tier:

- Age 55 and with 5 or more years of creditable service (active only);
- Mandatory retirement at age 60 with no minimum service amount (active only).

Terminated and vested uniformed patrol employees may retire at age 67 with 5 or more years of creditable service.

The base benefit in the 2011 Tier is equal to 1.7% multiplied by the final average pay multiplied by years of creditable service. Members retiring under the Rule of 90, and uniform patrol members retiring at the mandatory retirement age (currently 60) or at age 55 with 5 years of creditable service, receive an additional temporary benefit until age 62. The temporary benefit is equivalent to 0.8% multiplied by final average pay multiplied by years of creditable service.

COLAs are provided annually based on 80% of the change in the CPI-U, up to a maximum rate of 5%.

The life income annuity payment option (with no provision for survivorship) and the life income with 120 or 180 months guaranteed payment options are available to all members. Joint and 50% or 100% survivorship options are available if married at the time of retirement. The reduction for the joint and 50% or 100% survivor options is based on the member's age at retirement, as well as the age difference between the member and the survivor.

If a reduced joint and survivor option is chosen at the time of retirement and the spouse precedes the member in death, the benefit will revert back (pop-up) to a normal annuity, upon appropriate notification to MPERS.

Members may name a new spouse for survivor benefits if:

- They were single at retirement and since married;
- They elected a spouse option at the time of retirement, the spouse preceded the member in death, and then a remarriage occurred.

The member has 1 year from the date of marriage to re-elect the payment option and name a new spouse.

All members who retire from active employment or long-term disability, or begin receiving work-related disability benefits, on or after January 1, 2011, are provided a $5,000 death benefit payable to designated beneficiaries.

Contributions
Beginning January 1, 2011, employee contributions of 4% of gross pay are required for those covered by the Year 2000 Plan-2011 Tier.

Employer contributions are determined through annual actuarial valuations. Administrative expenses are financed through contributions from participating employers and investment earnings.

Participating employers are required to make contributions to the plan based on the actuarially determined rate. Prior to August 13, 1976, contributions by all plan members were required. Accumulated employee contributions made prior to that time, plus interest, were refunded to applicable members. Maximum contribution rates were eliminated August 13, 1976. Detailed information regarding contributions can be found in Note 5.

NOTE 3 – DEPOSITS AND INVESTMENTS

The Board of Trustees has established policies and procedures by which funds are invested. Section 104.150, RSMo., provides the authority for the Board to invest MPERS funds. Plan assets are invested in a diversified portfolio following prudent standards for preservation of capital, with the goal of achieving the highest possible rate of return consistent with MPERS' tolerance for risk. The Board of Trustees establishes MPERS' asset allocation policy, and may amend the policy. The following is MPERS' current asset allocation policy:

Asset Class	Target Allocation
Public Equity	40.0%
Private Equity	10.0%
Traditional Fixed Income	22.5%
Opportunistic Debt	7.5%
Real Assets	10.0%
Real Estate	10.0%
Cash	0.0%

Note 3 (a) - Deposit and Investment Risk Policies

Concentration of Credit Risk
Concentration of credit risk is the risk of loss attributed to the magnitude of the System's investment in a single issuer. Within the traditional asset classes (equities and fixed income), the consultant will aggregate exposures across asset classes to create measures of concentration including industries, countries and security issuer for Investment staff review.

Investment Custodial Credit Risk
Custodial credit risk is an investment risk that, in the event of the failure of the counterparty to a transaction, the System will not be able to recover the value of its investment or the collateral securities that are in the possession of an outside party. Investment securities are exposed to custodial credit risk if the securities are uninsured, are not registered in the name of the System, and are held by either: a) the counterparty or b) the counterparty's trust department or agent but not in the System's name. It is the policy of the System to require that all investments be clearly marked as to ownership and, to the extent possible, shall be registered in the name of the System.

Cash Deposit Custodial Credit Risk
Cash deposit custodial credit risk is the risk that, in the event of the failure of depository financial institution, the System will not be able to recover deposits or will not be able to recover collateral securities that are in the possession of an outside party. Missouri state law requires that all public funds must be collateralized with acceptable securities having fair values of at least 100% of the amount of funds on deposit (less any amount covered by FDIC insurance).

Market Risk
Market risk is the risk that the fair value of an investment will be adversely impacted due to a change in value of the underlying market. The three primary market risks prevalent in the System's investment portfolio are equity prices, interest rates, and foreign currencies. Equity risk is the risk that stock prices fall and/or the volatility in the equity market increases. Interest rate risk is the risk that fixed income securities (or any investment primarily valued on a yield basis) will drop in value due to an increase in interest rates. Currency risk is the risk that changes to foreign exchange rates will adversely impact the fair value of non-U.S. Dollar denominated assets. The System protects the portfolio against market risks by adopting a diversified asset allocation that limits the amount of exposure to each underlying market risk. Market risks are also controlled by monitoring the types, amounts, and degree of risk that each investment manager takes for their specific mandate.

Investment Credit Risk
Investment credit risk is the risk that an issuer or other counterparty to an investment will not fulfill its obligations. Unless authorized under a separate Investment Management Agreement or operating agreement, it is the policy of the System to limit fixed income managers to purchasing securities that possess a minimum credit rating of "Baa" by Moody's and "BBB" by Standard & Poor's. Issues subsequently downgraded below these ratings must be brought to the attention of the Chief Investment Officer. Where counterparty risk is present, the System's investment managers seek to control credit risk through counterparty credit evaluations and approvals, counterparty credit limits and exposure monitoring procedures.

Note 3 (b) - Cash Deposits
Cash balances include short-term securities held by the custodial bank to meet future obligations and operating balances held by the depository bank. As of June 30, 2019, MPERS had a carrying amount of deposits of ($443,613), and a bank balance of $221. The FDIC covered the bank balances. To maximize investment income, cash is invested in overnight repurchase agreements, thus causing the negative cash amount disclosed above. The balances in these repurchase agreements at June 30, 2019 totaled $828,184. As of June 30, 2019, no investments were held as repurchase agreements that were uninsured or unregistered, with securities held by the counterparty or by its trust department or agent but not in MPERS' name.

Note 3 (c) – Concentrations
No investments in any one organization (other than those issued or sponsored by the U.S. government and those in pooled investments) represent 5% of plan net position.

Note 3 (d) – Rate of Return
For the year ended June 30, 2019, the annual money-weighted rate of return on pension plan investments, net of pension plan investment expense, was 6.84%. The money-weighted rate of return expresses investment performance, net of investment expense, adjusted for the changing amounts actually invested.

Note 3 (e) – Investments
The following table shows MPERS' investments by type.

Summary of Investments by Type at June 30, 2019

	Carrying Amount	Fair Value
Equities	$ 337,350,707	$ 454,989,360
Fixed Income	655,624,566	656,761,582
Limited partnerships	1,012,036,180	1,066,535,548
Hedge	79,528,676	126,820,799
Short Term Securities	115,010,001	115,070,634
Securities Lending Collateral	104,247,159	104,247,159
Total Investments	$2,303,797,289	$2,524,425,082
Reconciliation to Statement of Fiduciary Net Position:		
Less: Repurchase Agreements		(828,184)
Less: Securities Lending Collateral		(104,247,159)
Investments per Statement of Fiduciary Net Position		**$2,419,349,739**

Certain investments are not listed on national exchanges, over-the-counter markets, nor do they have quoted market prices. Their valuation is based on the most current net asset values, independent appraisals, and/or good faith estimates of the investment's fair value provided by the general partner or portfolio manager, cash flow adjusted through fiscal year end. The estimated fair value of these investments may differ significantly from values that would have been used had a ready market existed. The following investments were priced using those methods and comprised 49% of the total fair value of the System's investments as of June 30, 2019:

Hedge Funds	$ 126,820,799
Limited Partnerships	1,066,535,548
	$ 1,193,356,347

Note 3 (f) – Fair Value Measurements
MPERS categorizes its fair value measurements within the fair value hierarchy established by generally accepted accounting principles. The hierarchy is based on the valuation inputs used to measure the fair value of the asset and give the highest priority to unadjusted quoted prices in active markets for identical assets or liabilities (level 1 measurements) and the lowest priority to unobservable inputs (level 3 measurements).

Level 1: Unadjusted quoted prices for identical instruments in active markets.

Level 2: Quoted prices for similar instruments in active markets; quoted prices for identical or similar instruments in markets that are not active; and model-derived valuations in which all significant inputs are observable.

Level 3: Values derived from valuation techniques in which significant inputs are unobservable. Investments that are measured at fair value using the net asset value per share (or its equivalent) as a practical expedient are not classified in the fair value hierarchy.

Investments Measured at Fair Value, June 30, 2019

Investments by Fair Value Level	Fair Value	Level 1	Level 2	Level 3
Short Term Securities	$ 107,720,678	$ 107,720,678	$ 0	$ 0
Debt Securities				
Collateralized Debt Obligations	210,081,209	0	56,114,388	153,966,820
Commercial Mortgage-Backed Securities	21,186,319	0	20,620,334	565,985
Corporate Bonds	1,366,675	0	1,366,675	0
Government Commercial Mortgage-Backed Securities	12,308,127	0	702,445	11,605,682
Government Mortgage-Backed Securities	51,094,978	0	46,208,330	4,886,648
Municipal Bonds	177,480,231	0	78,688,839	98,791,391
U.S. Government Agencies	127,083,174	0	127,083,174	0
U.S. Treasury Securities	58,666,118	0	58,666,118	0
Total Debt Securities	659,266,830	0	389,450,303	269,816,527
Equity Securities				
Communication Services	529,832	529,832	0	0
Consumer Discretionary	5,633,051	5,633,051	0	0
Conumer Staples	632,722	632,722	0	0
Energy	67,840,882	67,840,882	0	0
Equity Other	22,160,484	22,160,484	0	0
Financials	34,976,363	33,301,382	1,674,981	0
Health Care	1,129,497	1,129,497	0	0
Industrials	5,396,847	5,396,847	0	0
Information Technology	5,042,451	5,042,451	0	0
Materials	390,611	390,611	0	0
Real Estate	3,133,158	3,133,158	0	0
Telecommunication Services	120,196	120,196	0	0
Utilities	567,990	567,990	0	0
Total Equity Securities	147,554,084	145,879,103	1,674,981	0
Private Markets				
Private Equity	371,305,159	0	0	371,305,159
Real Estate	137,091,217	19,448,349	(8)	117,642,876
Real Assets	320,539,758	0	0	320,539,758
Opportunistic Debt	208,667,792	0	0	208,667,792
Total Private Markets	1,037,603,926	19,448,349	(8)	1,018,155,585
Investment Derivative Instruments				
Equity Swaps	3,156,725	0	3,156,725	0
FX Contracts	2,300,000	2,300,000	0	0
Total Investment Derivative Instruments	5,456,725	2,300,000	3,156,725	0
Total Investments by Fair Value Level	1,957,602,243	**$275,348,130**	**$394,282,001**	**$1,287,972,112**
Investments Measured at Net Asset Value				
Activist Equity	29,989,586			
Commingled International Equity Fund	341,554,040			
Equity Long/Short	12,319,302			
Event	14,808,756			
Global Asset Allocation	32,486,360			
In-Liquidation	557,088			
Multi-Strategy	21,270,169			
Structured Credit - Relative Value	12,438,614			
Total Investments Measured at Net Asset Value	465,423,915			
Total Investments	**$2,423,026,158**			

Reconciliation to Statement of Fiduciary Net Position	
Total Investments Measured at Fair Value and Derivatives	$2,423,026,158
Investment Sales Receivable	(3,871,328)
Investment Purchases Payable	6,469,261
Accrued Interest and Income	(6,426,373)
Accrued Expenses	152,021
Total Investments per Statement of Fiduciary Net Position	**$2,419,349,739**

Investments listed as level 1 include equity securities and futures contracts where the price comes from an exchange.

Investments listed as level 2 include debt securities where an independent pricing evaluator had direct observable information including: trading volume, multiple sources of market data and benchmark spreads. FX forwards are included due to the valuation coming from observable forward rates on the underlying currencies. The equity index swap is included because the valuation inputs include an observable interest rate and the underlying index.

Investments listed as level 3 include debt securities where an independent pricing evaluator did not have direct observable information and had limited market information for comparable securities. Significant inputs used in the valuation are not available aside from the evaluator providing the price. Direct investments in private equity, real estate, credit, and real assets are included because the valuation techniques utilize discounted cash flows or other non-observable market information by manager.

Investments Measured at Net Asset Value, June 30, 2019

Investments by Fair Value Level	Fair Value	Unfunded Commitments	Redemption Frequency (If Currently Eligible)	Redemption Notice Period
Hedge Funds				
Activist Equity	$ 29,989,586	$ 0	Yearly, Every 3 Years	90 Days
Equity Long/Short	12,319,302	0	Quarterly	45 Days
Event	14,808,756	0	Monthly	90 days
Global Asset Allocation	32,486,360	0	Monthly	5-60 Days
In-Liquidation	557,088	0	In Liquidation	
Multi-Strategy	21,270,169	0	Monthly	60-90 Days
Structured Credit - Relative Value	12,438,614	0	Quarterly	60 Days
Total Hedge Funds	123,869,875	0		
Commingled International Equity Funds	231,687,836	0	Daily, Monthly	0-30 Days
Commingled International Equity Funds	109,866,204	0	Daily	90 Days
Total Commingled International Equity Funds	341,554,040	0		
Total Investments at Net Asset Value	**$ 465,423,915**	**$0**		

Hedge Funds

Activist Equity: Consisting of two funds, this strategy focuses on obtaining publicly traded shares of companies and effecting changes within the companies that it owns whether that be value creation through operational, financial or corporate governance changes. One fund's focus is on North American companies and the other fund's focus is on European and Nordic companies. Due to contractual lock-up restrictions and the necessity for activist managers to retain capital in order to realize the desired company changes, 50% of this strategy's investments are eligible for redemption on a rolling three-year basis. The remaining 50% are eligible for redemption on a rolling one-year basis.

Equity Long/Short: Consisting of one fund, this strategy invests in both long and short in Asia Pacific equity securities, with a goal of adding growth and minimizing market exposure. Due to contractual lock-up restrictions, the value of these investments is eligible for redemption in the next six months.

Event Driven: Consisting of one fund, this strategy seeks to gain an advantage from pricing inefficiencies that may occur at the onset or aftermath of a merger, corporate action or related event. Due to contractual lock-up restrictions, the value of these investments is eligible for redemption in the next four months.

Global Asset Allocation: Consisting of one fund, this strategy is highly diversified and uses fundamental research to develop systematic rules for trading positions. Due to contractual lock-up restrictions, the value of these investments is eligible for redemption in the next 35 days.

In Liquidation: MPERS currently has a small investment in two hedge funds that are in liquidation. These funds have closed and MPERS is awaiting the sale of final assets.

Multi-Strategy: The two funds that make up this group aim to pursue varying strategies in order to diversify risks and reduce volatility. Due to contractual lock-up restrictions, the value of these investments is eligible for redemption in the next six months.

Structured Credit - Relative Value: Consisting of one fund, this strategy's main focus is to benefit from valuation discrepancies that may be present in related financial instruments by simultaneously purchasing or selling these instruments. Due to contractual lock-up restrictions, all funds are eligible for redemption within the next six months.

Commingled International Equity Funds

MPERS invests in three international equity funds that are considered to be commingled in nature. Due to contractual lock-up restrictions, 70% of this capital is eligible for redemption in one month; the remaining 30% has daily liquidity.

Private Markets

Private equity, real estate, real assets, and opportunistic debt are the four asset classes that fall into the category of private market funds. These funds invest in the equity or debt of private companies.

Private Equity: The private equity portfolio includes 21 direct fund investments and three fund of fund investments. These funds invest in private companies adding value through operational or industry expertise and vast networks. The majority of the private equity allocation is in buyout funds with a smaller portion in venture capital funds. These funds are not eligible for redemption. Distributions are received as underlying investments within the funds are liquidated, which on average can occur over the span of six to ten years.

Real Estate: The real estate portfolio consists of 23 real estate funds. The noncore real estate book includes 20 real estate funds that invest in value-add or opportunistic strategies. These funds are not eligible for redemption. Distributions are received as underlying investments within the funds are liquidated, which on average can occur over the span of six to ten years. The remaining three investments are in core real estate funds. These funds are open-ended. Two are eligible for redemption on a daily basis and one on a quarterly basis.

Real Assets: The real asset portfolio contains 26 funds that invest in private energy, aviation, mining and shipping companies. The timber portfolio, which includes both ownership in timber funds and direct timber investments, is also within the real assets portfolio. The timber portfolio has 10 direct timber investments. These funds and investments are not eligible for redemption. Distributions are received as underlying investments and investments within the funds are liquidated, which on average can occur over the span of six to ten years.

Opportunistic Debt: The opportunistic debt portfolio, comprised of 28 funds, provide financing to private companies. While this portfolio has a U.S. bias, some funds invest internationally with exposures in Europe and Asia. These funds are not eligible for redemption. Distributions are received as underlying investments within the funds are liquidated, which on average can occur over the span of three to five years.

Note 3 (g) – Investment Interest Rate Risk

The following table summarizes the maturities of government obligations, corporate bonds, convertible corporate bonds, mortgages, and asset-backed securities which are exposed to interest rate risk.

Summary of Weighted Average Maturities at June 30, 2019

Investment Type	Fair Value	Investment Maturities (in years) less than 1	1 - 5	6 - 10	more than 10
Asset-Backed Securities	$219,782,326	$ 0	$11,884,477	$40,536,613	$167,361,236
Commercial Mortgage-Backed Securities	12,191,531	61,254	0	0	12,130,277
Corporate Bonds	5,401,793	528	92,228	200,023	5,109,014
Government Agencies	122,488,433	1,263,735	0	25,585,413	95,639,285
Government Bonds	51,308,651	0	0	0	51,308,651
Government Mortgage-Backed Securities	24,770,924	0	601,543	1,489,529	22,679,852
Government-Issued Commercial Mortgage-Backed	2,697,000	181,076	0	0	2,515,924
Index Linked Govt Bonds	36,036,838	0	16,481,783	8,203,799	11,351,256
Municipal/Provincial Bonds	170,514,855	0	11,463,963	23,089,541	135,961,351
Non-Govt Backed C.M.O.s	11,569,231	0	0	0	11,569,231
Short Term Bills and Notes	10,402,031	10,402,031	0	0	0
Total	**$667,163,613**	**$11,908,624**	**$40,523,994**	**$99,104,918**	**$515,626,077**

Note 3 (h) – Investment Credit Ratings

The table on the following page summarizes the credit ratings of the government obligations, corporate bonds, mortgages, and asset-backed securities.

Summary of Credit Ratings as of June 30, 2019

Investment Type	AAA	AA	A	BBB	BB	B	CCC	CC	D	Not Rated	US Govt Guar	Total
Asset Backed Securities	$44,531,572	$44,152,642	$12,142,261	$3,119,685	$2,677,546	$4,284,984	$ 0	$ 0	$ 0	$108,873,636	$ 0	$219,782,326
Commercial Mortgage-Backed	152,184	0	0	0	0	0	0	0	0	11,692,273	347,074	12,191,531
Corporate Bonds	0	5,109,014	0	200,023	0	0	0	0	0	92,756	0	5,401,793
Government Agencies	0	111,162,686	0	0	0	0	0	0	0	0	11,325,747	122,488,433
Government Bonds	0	0	0	0	0	0	0	0	0	5,277,656	46,030,995	51,308,651
Government Mortgage Backed Securities	0	0	0	0	0	0	0	0	0	305,980	24,464,944	24,770,924
Gov't-issued Commercial Mortgage-Backed	0	0	0	0	0	0	0	0	0	0	2,697,000	2,697,000
Index Linked Government Bonds	0	0	0	0	0	0	0	0	0	24,685,582	11,351,256	36,036,838
Municipal/Provincial Bonds	54,281,632	90,127,602	3,061,290	0	0	0	0	0	0	23,044,331	0	170,514,855
Non-Government Backed C.M.O.s	0	104,664	328,843	0	86,210	414,107	212,452	161,412	804,316	9,457,227	0	11,569,231
Short Term Bills and Notes	0	0	0	0	0	0	0	0	0	0	10,402,031	10,402,031
Total	$98,965,388	$250,656,608	$15,532,394	$3,319,708	$2,763,756	$4,699,091	$212,452	$161,412	$804,316	$183,429,441	$106,619,047	**$667,163,613**

Note 3 (i) – Investment Foreign Currency Risk

Currency risk is the risk that changes to foreign exchange rates will adversely impact the fair value of non-U.S. Dollar denominated assets. The following table summarizes MPERS' exposure to foreign currencies for all assets that are held in custody at the System's custodial bank. MPERS has exposure to foreign currencies in other areas of the portfolio, such as commingled international funds, hedge funds and private partnerships, which are held in the custody of other banks acting as administrators for the funds.

Exposure to Foreign Currency Risk As of June 30, 2019

Foreign Currency	Equities	Real Estate / Partnerships	Cash	Total
Australian Dollar	$ 806,766	$ 0	$ 0	$ 806,766
British Pound Sterling	701,143	8,970,119	0	9,671,262
Canadian Dollar	325,819	0	0	325,819
Euro	1,561,019	20,972,310	1,450,373	23,983,702
Hong Kong Dollar	1,605,127	0	0	1,605,127
Japanese Yen	2,086,123	0	0	2,086,123
Norwegian Krone	102,682	0	0	102,682
Singapore Dollar	408,455	0	0	408,455
Swedish Krona	524,778	0	0	524,778
Total Exposure Risk	**$8,121,912**	**$29,942,429**	**$1,450,373**	**$39,514,714**

Note 3 (j) – Securities Lending

In accordance with the Board of Trustees' investment policy, MPERS participates in a securities lending program. The Northern Trust Company administers the program. There are no restrictions on the amount of securities that may be lent.

Securities that may be loaned include U.S. government and agency securities, corporate equity, and fixed income securities. Collateral may include cash, U.S. government securities and irrevocable letters of credit. U.S. securities are loaned in exchange for collateral valued at 102% of the fair value of the securities, plus any accrued interest. Non-U.S. securities are loaned in exchange for collateral valued at 105% of the fair value of the securities, plus any accrued interest. On June 30, 2019, MPERS had no credit risk exposure to borrowers, since the amount of collateral exceeded the amount of the loans.

Non-cash collateral cannot be pledged or sold unless the borrower defaults. The average term of the System's loans was approximately 147 days as of June 30, 2019. Cash open collateral is invested in a short-term investment pool, which had an interest sensitivity of 35 days as of June 30, 2019. Cash collateral may also be invested separately in "term loans", in which case the investments match the loan term. These loans can be terminated on demand by either lender or borrower. There were no known violations of legal or contractual provisions, or borrower or lending agent default losses. There were no dividends or coupon payments owing on the securities lent. Securities lending earnings are credited on approximately the fifteenth day of the following month.

Indemnification deals with a situation in which a client's securities would not be returned due to the insolvency of a borrower and Northern Trust would fail to live up to its contractual responsibilities relating to the lending of those securities. Northern Trust's responsibilities include performing appropriate borrower and collateral investment credit analyses and demanding adequate types and levels of collateral.

The collateral held (including both cash collateral recognized in the Statement of Fiduciary Net Position and non-cash collateral) is:

Collateral Held As of June 30, 2019

Investment Type	
Equities	$ 43,107,902
Government & Government Sponsored Securities	67,816,530
Total	**$110,924,432**

Note 3 (k) – Derivatives

A derivative financial instrument is an investment whose value depends on the values of one or more underlying assets, financial indexes, or commodity prices. These investments include futures contracts, options contracts, and forward foreign currency exchange. Derivative financial instruments involve credit risk and market risk, as described in Note 3(a), in varying levels.

Through MPERS' external managers, MPERS holds investments in futures contracts, swaps contracts, options contracts, and forward foreign currency exchange contracts. MPERS enters into futures and swaps contracts to gain exposure to certain markets and enters into forward foreign exchange contracts primarily to hedge foreign currency exposure.

The notional value related to these derivative instruments is generally not recorded on the financial statements; however, the change in fair value of these instruments is incorporated in performance. The notional/fair value of $376,861,616 for the various contracts in MPERS' portfolio as of June 30, 2019, is recorded in investments on the Statement of Fiduciary Net Position. The change in fair value of $45,837,048 for the year ended June 30, 2019, is recorded in investment income on the Statement of Changes in Fiduciary Net Position.

Investment Derivatives As of June 30, 2019

Type	**Classification**	**Notional/ Fair Value**	**Unrealized Gain**
Futures Contracts	Investments, at fair value	$287,227,286	$35,429,760
Swaps Contracts	Investments, at fair value	89,634,330	10,407,288
Total		**$376,861,616**	**$45,837,048**

Through the use of derivatives, MPERS is exposed to risk that the counterparties involved in the contracts are unable to meet the terms of their obligation. MPERS' investment managers seek to control this risk through counterparty credit evaluations and approvals, counterparty credit limits, and exposure monitoring procedures. MPERS anticipates the counterparties will be able to satisfy their obligations under contract. The associated counterparty's credit rating is an A+.

NOTE 4 – RECEIVABLES

Receivables As of June 30, 2019

Type	Total
Contributions-MoDOT	$ 5,539,293
Contributions-MSHP Non-Uniformed	1,221,356
Contributions-MSHP Uniformed	2,024,656
Investment Interest & Income	6,426,373
Investment Sales	3,871,328
Miscellaneous	6,611
Total	**$19,089,617**

NOTE 5 – CONTRIBUTIONS

MoDOT, MSHP, and MPERS make contributions to the System, as do employees covered under the Year 2000 Plan-2011 Tier. MPERS permanent funding policy provides for actuarially determined employer contributions using the entry-age normal cost method on a closed group basis (consisting of normal cost and amortization of any unfunded accrued liabilities over a 30-year period, beginning July 1, 2006). (The objective is to reduce the period by one year each year.) A temporary accelerated policy has been adopted where the total contribution is based on entry-age normal cost plus a 15-year amortization period for unfunded retiree liabilities and a 30-year amortization period for other unfunded liabilities. Both amortization periods are closed periods starting July 1, 2010. This temporary accelerated policy was adopted by the MPERS' Board of Trustees on September 17, 2009, and will remain in effect until such time as the retiree liability becomes 100% funded or the permanent policy produces a higher contribution rate. Actuarially determined rates, expressed as percentages of annual covered payroll, provide for amounts sufficient to fund those benefits designated by state statute to be funded in advance. Actuarial assumptions used to compute contribution requirements are the same as those used to compute the pension benefit obligation. The employee contribution rate for members of the Year 2000 Plan-2011 Tier is set by statute.

Required employer contributions totaling $210,166,927 for fiscal year 2019, represent funding of normal costs and amortization of the unfunded accrued liability. Actual contributions made were 100% of required contributions. Contribution rates as determined by the System's actuary for the year ended June 30, 2019, are shown in the following table. The Board established actual rates to be the same as the actuarially determined rates.

Contribution Rates

MoDOT, MPERS & Civilian Patrol	Uniformed Patrol	2011 Tier Employee
58.00%	**58.00%**	**4.00%**

At the September 26, 2014 Board meeting, the Board adopted the use of a contribution rate stabilization reserve that would result in an MPERS employer contribution rate similar to the fiscal year 2015 rates. The reserve is intended to keep the contribution relatively level over time and may be used if the investment market experiences a downturn in the future. The Board further adopted (in February 2015) that the employer contribution rate would not fall below 58% unless 1) the fund became fully funded or 2) the contribution stabilization reserve reached $250 million. The balance of the reserve as of June 30, 2019, was $204,781,636.

NOTE 6 – DEFERRED RETIREMENT OPTION PROGRAM

MPERS currently provides a BackDROP option. This is an election made at the time of actual retirement. In effect, it provides members an option to elect to receive a portion of their benefits as cash. Since the election is not made until the member actually retires, the option is not treated as a DROP provision in accordance with generally accepted accounting principles.

NOTE 7 – NET PENSION LIABILITY OF EMPLOYERS

The components of the net pension liability of the employers at June 30, 2019, were as follows:

Total pension liability	$4,037,369,708
Plan fiduciary net position	(2,423,261,830)
Employers' net pension liability	$1,614,107,878

Plan fiduciary net position as a percentage of the total pension liability	60.02%
Covered Payroll	$ 362,747,630
Employers' net pension liability as a percentage of covered payroll	444.97%

Actuarial Assumptions
The total pension liability amounts were determined by actuarial valuations as of June 30, 2019, using the following actuarial assumptions, applied to all prior periods included in the measurement:

Inflation	3.0%
Salary Increases	3.0% to 12.45%
Investment Rate of Return	7.00%

The mortality tables, for post-retirement mortality, used in evaluating allowances to be paid to non-disabled pensioners were the RP-2014 Healthy Mortality Tables projected to 2022 using projection scale MP-2017. Pre-retirement mortality used were the RP-2014 Employee Mortality Table projected to 2022 using projection scale MP-2017 and multiplied by a factor of 65%. Disabled pension mortality was based on RP-2014 Disabled Retiree Annuitant Mortality Tables projected to 2022 using projection scale MP-2017.

The long-term (30 year) expected rate of return on pension plan investments was determined using a building-block method in which best-estimate ranges of expected future real rates of return (expected returns, net of pension plan investment expense and inflation) are developed for each major asset class. These ranges are combined to produce the long-term expected rate of return by weighting the expected future real rates of return by the target asset allocation percentage and by adding expected inflation. Best estimates of arithmetic real rates of return were adopted by the plan's trustees after considering input from the plan's investment consultants and actuary. These estimates for each major asset class included in MPERS' target asset allocation as of June 30, 2019, (see Note 3) are summarized in the following table:

Asset Class	Long-Term Expected Real Rate of Return
Global Equity	6.0%
Private Equity	8.9%
Fixed Income	2.1%
Opportunistic Debt	5.9%
Real Assets	5.9%
Real Estate	4.6%

Discount Rate
A single discount rate of 7.00% was used to measure the total pension liability. This single discount rate was based on the expected rate of return on pension plan investments of 7.00%. The projection of cash flows used to determine this single discount rate assumed that plan member contributions will be made at the current contribution rate and that employer contributions will be made at rates equal to the difference between actuarially determined contribution rates and the member rate. The employers pay the same contribution rate for each employee regardless of the plan the employee was hired under. Based on these assumptions, the pension plan's fiduciary net position was projected to be available to make all projected future benefit payments of current plan members. Therefore, the long-term expected rate of return on pension plan investments was applied to all periods of projected benefit payments to determine the total pension liability.

Regarding the sensitivity of the net pension liability to changes in the single discount rate, the following presents the plan's June 30, 2019 net pension liability, calculated using a single discount rate of 7.00%, as well as what the plan's net pension liability would be if it were calculated using a single discount rate that is 1-percentage-point lower or 1-percentage-point higher:

Current Single Discount

	1% Decrease 6.0%	Rate Assumption 7.0%	1% Increase 8.0%
Net Pension Liability	$2,088,979,219	$1,614,107,878	$1,217,785,799

NOTE 8 – EMPLOYER PROPORTIONATE SHARE

MPERS, as the administrative agent for the pension system, is also an employer of the pension system. The administrative expenses of the pension system are included in the deductions to the pension system's fiduciary net position. While the employer contributions of the other participating employers are funded from outside revenue sources, the employer contributions of MPERS are funded from sources already recognized as revenues, such as earnings on plan investments or contributions paid by the other participating employers. Attempting to allocate a portion of the net pension liability to MPERS as an employer would result in an allocation of the net pension liability to the other participating employers. Accordingly, MPERS excludes its contributions from the employer proportionate share calculation for the reporting of a net pension liability, by assigning itself a proportionate share of 0%. This exclusion, in essence, shifts the portion of the net pension liability that would accrue to MPERS to the other participating employers.

NOTE 9 – PERSONAL SERVICES AND RETIREMENT PLAN

MPERS employed 17 full-time employees and 1 part-time employee on June 30, 2019. Ten former MPERS employees have retired. Full-time employees are members of the System (see Note 8). For these employees, MPERS accrued 58.00% of payroll during fiscal year 2019, amounting to $987,370. The amounts for fiscal year 2019 and the three preceding years are shown below. These amounts are recorded as both a contribution and administrative expense. Information regarding the retirement plans can be found in Notes 2 and 5.

Net Obligations

Year Ended	Annual Contribution Accrual	
June 30	Percent	Dollars
2016	58.05%	$ 996,378
2017	58.00%	1,087,268
2018	58.00%	1,127,506
2019	58.00%	987,370

NOTE 10 – OTHER POST-EMPLOYMENT BENEFITS (OPEB)

In addition to the retirement benefits described previously, MPERS provides a portion of health care insurance through the MoDOT and MSHP Medical and Life Insurance Plan (Insurance Plan) in accordance with Missouri State statutes. The Insurance Plan is considered an agent multiple-employer defined benefit plan and is administered by MoDOT. The Insurance Plan is financed on a pay-as-you-go basis and is an internal service fund of MoDOT. At June 30, 2019, there were 8 inactive (retired) members and 17 active employees participating in the Insurance Plan.

Medical insurance benefits are established by the Insurance Plan's Board of Trustees and are approved by the Missouri Highways and Transportation Commission. Benefits include general inpatient and outpatient medical services; mental, nervous and substance abuse care; and prescriptions. Eligible members are employees who retired from the System with a minimum of 5 years of service and who participate in the Insurance Plan. MoDOT issues a publicly available financial report that includes financial statements and required supplementary information for the Insurance Plan. Requests for this report should be addressed to MoDOT, Financial Services Division, P.O. Box 270, Jefferson City, MO 65102.

Employer and member contributions are established by the Insurance Plan's Board of Trustees and are approved by the Missouri Highways and Transportation Commission. Premiums vary by coverage categories, which include retirees, certain disabled employees, spouses, certain dependents, and survivors of deceased employees and retirees.

Changes in Total OPEB Liability

MPERS' proportionate share (0.14%) of the Insurance Plan's net OPEB liability is $1,538,442 which was measured as of July 1, 2018 and the total OPEB liability used to calculate the net OPEB liability was determined by an actuarial valuation as of that date.

Summary of Changes in Net OPEB Liability for the Year Ended June 30, 2019

	Total
Beginning Balance	$1,545,180
Changes for the year:	
Service Cost	66,676
Interest Cost	54,714
Changes of benefit terms	0
Differences between expected and actual experience	(12,565)
Changes in assumptions	(81,559)
Benefit payments	(34,004)
Net changes	(6,738)
Balance at June 30, 2019	**$1,538,442**

Deferred Outflows of Resources and Deferred Inflows of Resources Related to OPEB

For the year ended June 30, 2019, MPERS recognized net OPEB expense of $67,151. MPERS reported deferred outflows of resources and deferred inflows of resources related to OPEB from the following sources:

Deferred Outflows / Inflows

	Deferred Outflows	Deferred Inflows
Differences between expected and actual experience	$0	($10,519)
Changes of assumptions or other inputs	0	(228,585)
Contributions subsequent to measurement date	32,014	0
Total	**$32,014**	**($239,104)**

Deferred outflows resulting from contributions subsequent to the measurement date will be recognized as a change to the net pension liability in each subsequent year. Other deferred mounts related to OPEB will be recognized in expenses as follows:

Amortization of Deferred Inflows/Outflows

Fiscal year	Deferred Outflows	Deferred Inflows
2020	$32,014	($54,239)
2021	0	(54,239)
2022	0	(54,239)
2023	0	(54,239)
2024	0	(19,998)
Total Thereafter	0	(2,150)

Actuarial Assumptions

The following actuarial assumptions and other inputs, applied to all periods included in the measurement:

Actuarial Methods and Assumption	
Cost method	Entry Age Normal based upon salary
Salary increases	2.50%
Discount rate	3.87%
Investment rate of return	n/a; the plan is unfunded
Health care cost trend rates	7.7%, decreasing to 4.9% in 2025
Retirees' share of benefit-related costs	43% - 60%
Admin Expense Trend (Inflation) Rate	4%

- The salary increases were based on projected salaries, which include COLAs, provided by MoDOT.
- The discount rate was based on Bond Buyer General Obligation 20-Bond Municipal Bond Index.
- Mortality rates were based on Pub-2010 Public Retirement Plans Safety Employees Mortality Table weighted by Headcount projected by MP-2018.
- The actuarial assumptions used in the June 30, 2018 valuation were based on the results of an actuarial experience study for the period July 1, 2017-June 30, 2018.
- It is assumed the current employer and member contributions will continue as approved by the Commission.

Changes of assumptions and other inputs reflect a change in the discount rate from 3.58 percent in 2018 to 3.87 percent in 2019.

The following table illustrates the impact of interest rate sensitivity on the Net OPEB Liability as of June 30, 2019:

Interest Rate Sensitivity

	1% Decrease	Current Discount Rate	1% Increase
Net OPEB Liability	$1,867,249	$1,538,442	$1,287,004

The following table illustrates the impact of healthcare cost trend sensitivity on the Net OPEB Liability as of June 30, 2019:

Healthcare Cost Trend Sensitivity

	1% Decrease	Current Discount Rate	1% Increase
Net OPEB Liability	$1,288,802	$1,538,442	$1,940,950

NOTE 11 – CAPITAL ASSETS

Summary of Changes in Capital Assets

	June 30, 2018 Balance	Additions	Deletions/ Retirements	June 30, 2019 Balance
Land	$ 84,000	$ 0	$0	$ 84,000
Building	581,619	0	0	581,619
Furniture, Equipment and Software	3,504,218	8,510	(82,076)	3,430,652
Less: Accumulated Depreciation	(3,311,291)	(298,011)	82,076	(3,527,226)
Total	**$858,546**	**($289,501)**	**$0**	**$569,045**

NOTE 12 – COMMITMENTS

MPERS has committed $1,541,077,501 of which $1,037,603,926 has been invested, leaving total unfunded commitments to private equity, real estate, real assets and opportunistic debt of $503,473,575 as of June 30, 2019. The total unfunded investment commitments are not recorded in the accompanying Statement of Fiduciary Net Position.

NOTE 13 – RISK MANAGEMENT

MPERS is exposed to various risks of loss related to natural disasters, asset theft or damage, errors and omissions, torts, and employee injuries.

MPERS has purchased commercial insurance related to capital asset loss and damage. Ancillary coverage provided through the property policy includes coverage for accounts receivable, loss of money and securities, employee dishonesty, and forgery and alterations. MPERS carries a $2 million umbrella liability policy. MPERS has coverage through Missouri Highway and Transportation Commission's Self-Insurance Fund related to workers' compensation. MPERS has also purchased a directors and officers liability policy with $1 million aggregate coverage. This coverage is inclusive of legal defense costs and carries a $35,000 deductible. The State's Legal Expense Fund covers all state employees and officers, and MPERS has purchased surety bonds for the executive director and staff. Settlements have not exceeded coverages for each of the past three fiscal years.

MPERS has a disaster recovery plan that provides for continued computer operations at a remote location should the retirement office be unavailable for normal operations.

Required Supplementary Information

Schedule of Changes in the Employers' Net Pension Liability
Year Ended June 30,

	2019	2018	2017	2016
Total Pension Liability				
Service Cost	$ 43,971,030	$ 46,621,377	$ 45,713,403	$ 45,441,305
Interest on the Total Pension Liability	271,174,089	286,457,436	283,568,441	280,432,068
Benefit Changes	0	(7,684)	0	0
Difference Between Expected and Actual Experience	203,459	(37,173,164)	(37,286,966)	(39,810,009)
Assumption Change	0	142,556,109	0	0
Benefit Payments	(255,310,406)	(254,131,209)	(246,617,775)	(236,488,629)
Refunds	(780,538)	(503,007)	(321,328)	(198,106)
Disability Premiums	(1,615,860)	(1,601,605)	(1,620,418)	(1,567,825)
Transfers to Other Retirement Systems	(2,111,007)	(2,823,042)	(2,724,631)	(1,921,451)
Net Change in Total Pension Liability	**55,530,767**	**179,395,211**	**40,710,726**	**45,887,353**
Total Pension Liability - Beginning	3,981,838,941	3,802,443,730	3,761,733,004	3,715,845,651
Total Pension Liability - Ending (a)	**$ 4,037,369,708**	**3,981,838,941**	**3,802,443,730**	**3,761,733,004**
Plan Fiduciary Net Position				
Contributions - Employer	$ 210,166,927	$ 204,955,180	$ 206,562,924	$ 199,609,396
Contributions - Employee	5,966,344	5,001,418	4,891,932	3,482,513
Pension Plan Net Investment Income	154,326,818	197,619,838	220,301,741	21,432,095
Benefit Payments	(255,310,406)	(254,131,209)	(246,617,775)	(236,488,629)
Refunds	(780,538)	(503,007)	(321,328)	(198,106)
Disabilty Premiums	(1,615,860)	(1,601,605)	(1,620,418)	(1,567,825)
Pension Plan Administrative Expense	(4,372,966)	(4,693,492)	(4,515,458)	(4,370,860)
Net Transfers	321,363	(955,597)	(980,524)	808,228
Net Change in Plan Fiduciary Net Position	**108,731,682**	**145,691,526**	**177,701,094**	**(17,293,188)**
Plan Fiduciary Net Position - Beginning	**2,314,530,148**	**2,168,838,622**	**1,992,073,946**	**2,009,367,134**
Plan Fiduciary Net Position - Ending (b)	**$ 2,423,261,830**	**$ 2,314,530,148**	**$ 2,169,775,040**	**$ 1,992,073,946**
Adjustment - GASB 75 Implementation			**(936,418)**	
Plan Fiduciary Net Position - Ending as Restated			**$ 2,168,838,622**	
Employers' Net Pension Liability - Ending (a) - (b)	**$ 1,614,107,878**	**$ 1,667,308,793**	**$ 1,632,668,690**	**$ 1,769,659,058**
Plan Fiduciary Net Position as a % of Total Pension Liability	60.02%	58.13%	57.06%	52.96%
Covered Payroll	$ 362,747,630	$ 353,751,292	$ 356,515,416	$ 344,635,441
Employers' Net Pension Liability as a % of Covered Payroll	444.97%	471.32%	457.95%	513.49%

Note: These schedules are intended to present information for 10 years, but may be built prospectively. Additional years will be displayed as they become available.

Continued on next page

Required Supplementary Information

Schedule of Changes in the Employers' Net Pension Liability

Year Ended June 30, *(continued)*

	2015	2014	2013
Total Pension Liability			
Service Cost	$ 45,358,095	$ 44,739,603	$ 44,446,279
Interest on the Total Pension Liability	275,284,910	270,525,608	265,339,848
Benefit Changes	0	0	0
Difference Between Expected and Actual Experience	(13,324,219)	(17,614,321)	(13,690,794)
Assumption Change	0	0	204,396,180
Benefit Payments	(236,905,323)	(227,958,108)	(220,623,394)
Refunds	(107,395)	(18,686)	(29,300)
Disability Premiums	(1,554,676)	(1,531,578)	(1,512,685)
Transfers to Other Retirement Systems	(3,147,482)	(1,876,336)	(629,246)
Net Change in Total Pension Liability	**65,603,910**	**66,266,182**	**277,696,888**
Total Pension Liability - Beginning	**3,650,241,741**	**3,583,975,559**	**3,306,278,671**
Total Pension Liability - Ending (a)$	**$ 3,715,845,651**	**3,650,241,741**	**3,583,975,559**
Plan Fiduciary Net Position			
Contributions - Employer	$ 200,638,571	$ 183,353,841	$ 170,836,117
Contributions - Employee	3,294,162	2,260,563	1,139,450
Pension Plan Net Investment Income	92,645,571	319,445,780	198,141,088
Benefit Payments	(236,905,323)	(227,958,108)	(220,619,035)
Refunds	(107,395)	(18,686)	(29,300)
Disabilty Premiums	(1,554,676)	(1,531,578)	(1,512,685)
Pension Plan Administrative Expense	(4,066,944)	(3,736,355)	(2,997,225)
Net Transfers	(2,033,045)	(91,954)	(629,246)
Net Change in Plan Fiduciary Net Position	**51,910,921**	**271,723,503**	**144,329,164**
Plan Fiduciary Net Position - Beginning	**1,957,456,213**	**1,685,732,710**	**1,541,403,546**
Plan Fiduciary Net Position - Ending (b)	**$ 2,009,367,134**	**$ 1,957,456,213**	**$ 1,685,732,710**
Adjustment - GASB 75 Implementation			
Plan Fiduciary Net Position - Ending as Restated			
Employers' Net Pension Liability - Ending (a) - (b)	**$ 1,706,478,517**	**$ 1,692,785,528**	**$ 1,898,242,849**
Plan Fiduciary Net Position as a % of Total Pension Liability	54.08%	53.63%	47.04%
Covered Payroll	$ 342,264,593	$ 336,590,797	$ 323,205,767
Employers' Net Pension Liability as a % of Covered Payroll	498.58%	502.92%	587.32%

Note: These schedules are intended to present information for 10 years, but may be built prospectively. Additional years will be displayed as they become available.

Required Supplementary Information

Schedule of Employers' Contributions
Last 10 Fiscal Years

	Actuarially Determined Contributions	Actual Contributions	Contribution Deficiency (Excess)	Covered Payroll*	Contributions as a Percentage of Covered Payroll
2010	$124,052,534	$124,052,534	$0	$376,258,823	32.97%
2011	149,952,750	149,952,750	0	363,345,651	41.27
2012	164,884,467	164,884,467	0	344,514,139	47.86
2013	170,836,117	170,836,117	0	329,863,134	51.79
2014	183,353,841	183,353,841	0	336,799,855	54.44
2015	200,638,571	200,638,571	0	342,211,446	58.63
2016	199,609,396	199,609,396	0	344,154,131	58.00
2017	206,562,924	206,562,924	0	356,142,972	58.00
2018	204,955,180	204,955,180	0	353,371,000	58.00
2019	210,166,927	210,166,927	0	362,356,771	58.00

**Values are estimated from contribution rate and actual contribution amount.*

Schedule Of Investment Returns
Last 10 Fiscal Years

Fiscal Year Ended June 30	Annual Money-Weighted Rate of Return
2010	12.72%
2011	21.57%
2012	2.80%
2013	13.37%
2014	17.58%
2015	6.62%
2016	1.02%
2017	11.22%
2018	9.45%
2019	6.84%

Notes To Required Supplementary Information

The information presented in the required supplementary schedules was determined as part of the actuarial valuation at the dates indicated. Additional information as of the latest actuarial valuation follows:

Valuation Date .... June 30, 2019
Actuarial Cost Method .... Entry Age
Amortized Method .... Level Percentage of Payroll, Closed
Remaining Amortization Period .... 13 Years (single equivalent period)
Asset Valuation Method .... 3-Year Smoothed Market: 20% Corridor
Inflation .... 2.25% (price inflation)
Actuarial Assumptions:
- Investment Rate of Return 7.0%
- Projected Salary Increase .... 3.0% to 12.45% (including 3.0% wage inflation)
- Cost-of-Living Adjustments .... 1.8% Compound

Required Supplementary Information

Other Post-Employment Benefit (OPEB) Plan
Schedule of Changes in Net OPEB Liability and Related Ratios for
MoDOT and MSHP Medical and Life Insurance Plan

	2019	2018
Total OPEB Liability		
Service Cost	$ 66,676	$ 81,000
Interest Cost	54,714	49,929
Changes of benefit terms	0	0
Differences between expected and actual experience	(12,565)	0
Changes in assumptions	(81,559)	(238,129)
Benefit payments	(34,004)	(37,055)
Net Change in total OPEB Liability	**(6,738)**	**(144,255)**
Total OPEB Liability (Beginning)	**1,545,180**	**1,689,435**
Total OPEB Liability (Ending)	**$ 1,538,442**	**$ 1,545,180**
Plan Fiduciary Net Position		
Contributions	$ 34,004	$ 37,055
Benefit Payments	(34,004)	(37,055)
Net Change in Plan Fiduciary Net Position	**0**	**0**
Plan Fiduciary Net Position (Beginning)	**0**	**0**
Plan Fiduciary Net Position (Ending)	**$ 0**	**$ 0**
Net OPEB Liability (Ending)	$ 1,538,442	$ 1,545,180
Net Position as a Percentage of OPEB Liability	N/A	N/A
Covered-Employee Payroll	$ 1,639,523	$ 790,000
Net OPEB Liability as a Percentage of Payroll	93.83%	195.59%

Other Post-Employment Benefit (OPEB) Plan
Schedule of MPERS' Proportionate Share of Net OPEB Liability
for MoDOT and MSHP Medical and Life Insurance Plan

Year Ended June 30	Proportion of Net OPEB Liability	Proportionate Share of Net OPEB Liability	Covered Employee Payroll	Net OPEB Liability as % of Covered Employee Payroll	Net Position as % of Total OPEB Liability
2018	0.14%	$1,545,180	$790,000	195.59%	N/A
2019	0.14%	1,538,442	1,639,523	93.83%	N/A

Note: These schedules are intended to present information for 10 years, but may be built prospectively. Additional years will be displayed as they become available.

Supplementary Information

Schedule of Administrative Expenses

For the Year Ended June 30, 2019

Personnel Services:	
Salary Expense	$ 1,764,302
Employee Benefit Expense	1,397,324
Total Personnel Services	**3,161,626**
Professional Services:	
Actuarial Services	97,030
Audit Services	49,750
Legislative Consultant	30,000
Investment Special Consulting	15,000
Insurance Consultant	6,000
Other Consultant Fees	65,540
Fiduciary Insurance	17,236
IT Hosting and Support	293,981
Other	12,800
Total Professional Services	**587,337**
Miscellaneous:	
Depreciation	298,012
Meetings/Travel/Education	89,010
Equipment/Supplies	79,013
Printing/Postage	27,525
Bank Service Charge	9,261
Building Expenses	61,810
Other	59,372
Total Miscellaneous	**624,003**
Total Administrative Expenses	**$ 4,372,966**

Supplementary Information

Schedule of Investment Expenses

For the Year Ended June 30, 2019

Investment Income Expenses:	
Management and Performance Fees by Asset Class	
Equities	$ 3,093,087
Fixed Income Core	108,243
Opportunistic Debt	7,304,242
Real Estate	5,144,246
Private Equity	5,842,397
Real Assets	7,134,011
Hedge Funds	4,574,280
Total Management and Performance Fees	**33,200,507**
Investment Custodial Fee	72,351
Performance Management	200,583
General Consultant (Monitoring) Fee	336,702
Professional Fees	532,001
Other Fees/Expenses	309,038
Total Investment Income Expenses	**$ 34,651,182**

Securities Lending Expenses:	
Borrower Rebates (Refunds)	$ 704,374
Bank Fees	71,351
Total Securities Lending Expenses	**$ 775,725**

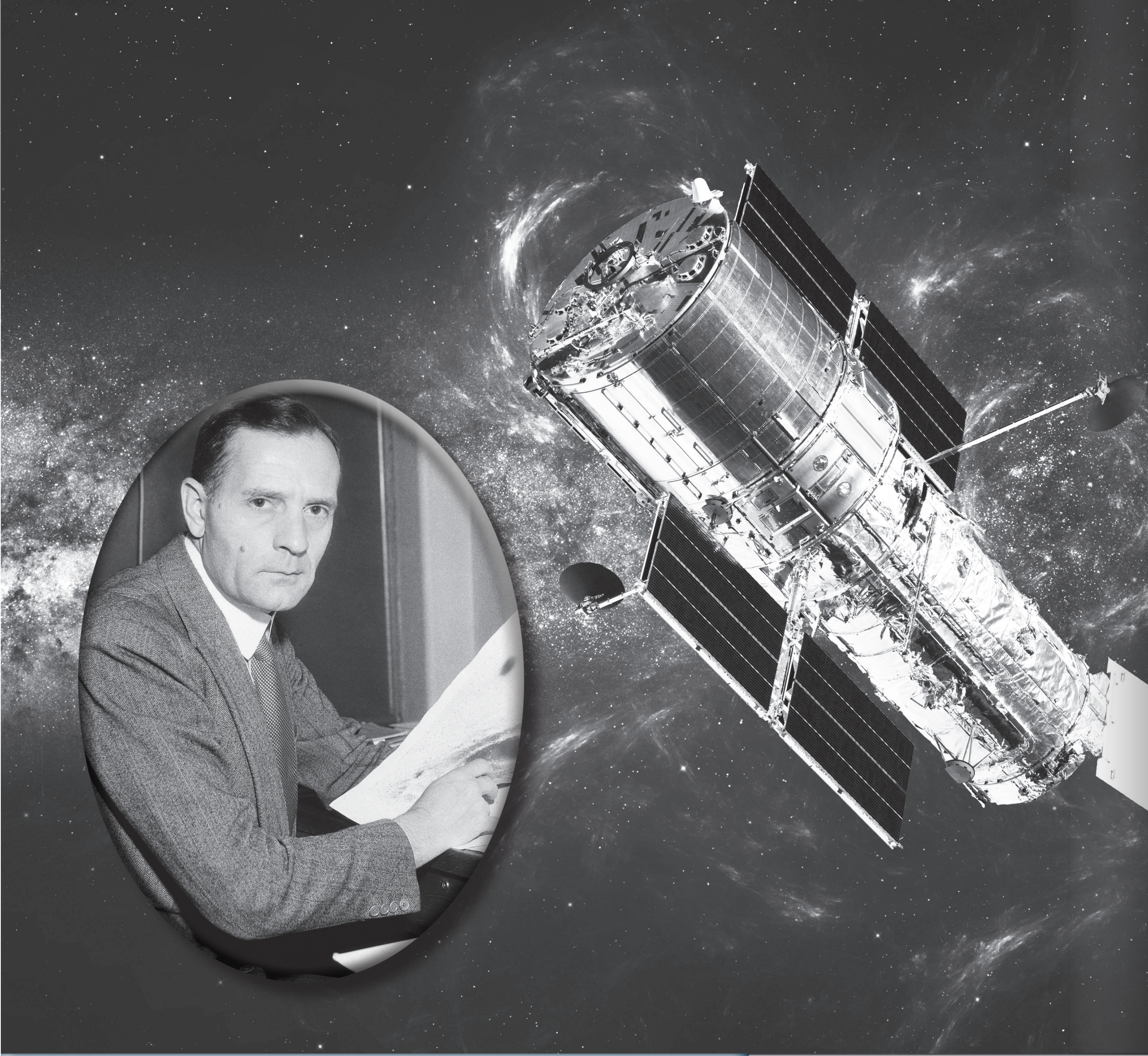
Supplementary Information

Schedule of Consultant and Professional Expenses

For the Year Ended June 30, 2019

Professional/Consultant	Nature of Service	
Gabriel, Roeder, Smith & Co.	Actuarial	$ 97,030
LexisNexis Risk Data Management	Death Audit Services	600
MO Dept. of Health & Senior Services	Death Audit Services	934
MO Division of Employment Security	Death Audit Services	16
Pension Benefit Information	Death Audit Services	1,750
Naught-Naught	Director's & Officer's Insurance	16,118
Alliant Insurance Services, Inc.	Employee Crime Bond	1,118
Williams-Keepers, LLC	Financial Audit Services	49,750
Huber & Associates	Information Technology	44,480
Levi, Ray & Shoup, Inc.	Information Technology	217,847
Sikich, LLP	Information Technology	31,654
Thompson Coburn, LLP	Legal Consulting	65,540
Michael G. Winter Consultants, LLC	Legislative Consulting	30,000
Evercore Group LLC	Market Research	15,000
Charlesworth Benefits	Risk Management Consulting	6,000
CBIZ Human Capital Services	Compensation Study	9,500
Total Operating Consultant and Professional Expenses		**$ 587,337**
New England Pension Consultants	General Consulting/Monitoring	$ 336,702
The Northern Trust Company	Performance Management	200,583
The Northern Trust Company	Investment Custodian	72,351
Total Investment Consultant and Professional Expenses		**$ 609,636**

Investment Section



Edwin Hubble

Birthplace: Marshfield, Missouri

Mathematician, astronomer, namesake of the Hubble telescope.

"Observations always involve theory."

MPERS
Serving those who keep us safe.

MoDOT & Patrol Employees' Retirement System

October 24, 2019

To the Board of Trustees and System Members:

It is my pleasure to provide you with the Investment Section of this year's Comprehensive Annual Financial Report (CAFR). This letter provides an overview of investment performance over the past year and our view of the investment market in the years to come.

MPERS' portfolio generated a 6.84% return in Fiscal Year 2019 (net of all management fees and based on time-weighted rates of return and market valuations). For the second consecutive year, each individual asset class delivered a positive return, led by MPERS' private equity portfolio which produced a 16.22% return. The real estate portfolio also delivered a double-digit return of 10.49%. The traditional fixed income portfolio generated an 8.61% return, followed by the opportunistic debt with a 7.46% return, real assets with a 6.48% return, and public equities with a 1.23% return. The overall fund return of 6.84% ranked in the top 32% of the public fund universe. Longer term, MPERS' three-, five-, and ten-year returns rank in the top 32%, 9%, and 7% of the peer universe, respectively. Those numbers look even better on a risk-adjusted basis, as MPERS' portfolio continues to maintain a lower risk profile than 99% of our peer group (with risk measured by standard deviation of returns over the past ten-year period).

Looking deeper into Fiscal Year 2019 performance, it was certainly a tale of two halves for the financial markets. The first half of the year (the second half of calendar year 2018) saw equity markets fall significantly following concerns over falling economic growth and the escalating trade tensions between the U.S. and China. The fourth quarter of 2018 was especially challenging, as global equities fell over 12% in the quarter which left equities down over 9% for the calendar year. As we turned to calendar year 2019, market sentiment seemingly turned positive overnight as the Federal Reserve and central banks across the globe once again stepped in to support the markets. The pivoting of the Federal Reserve to a more accommodative stance (signaling future interest rate cuts) sent bond yields tumbling lower and investors rushing back to the equity markets. Global equity markets subsequently rallied over 16% in the first half of 2019, erasing the losses from the prior six months and ending Fiscal Year 2019 with positive returns.

The market volatility in Fiscal Year 2019 highlights the rationale behind MPERS' restructuring of the investment portfolio that started over 15 years ago, and how alternative investment structures can be utilized to diversify investment portfolios across market cycles. As equity markets struggled in the fourth quarter of 2018, the median public fund lost 8.0% while MPERS' portfolio lost only 2.8%. The reverse was true in the first quarter of 2019 when equity markets rallied, as the median public fund gained 8.7% while MPERS only gained 4.1%. Over that six-month period (fourth quarter 2018 and first quarter 2019), the median public fund lost 0.1% in value and experienced a tremendous amount of volatility. Meanwhile, MPERS' portfolio gained 1.1% in value over the same timeframe with considerably less volatility. Over this volatile period, MPERS outperformed the average public fund and took far less risk in the process (as measured by volatility of returns). The same message holds true over longer periods of time, as MPERS' ten-year return ranks in the top 7% of the peer universe while our portfolio risk

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Website: www.mpers.org • **E-Mail:** mpers@mpers.org

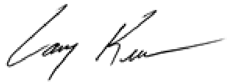
ranks in the bottom 1% of the peer universe. That combination has produced one of the highest Sharpe ratios (a measure of return per unit of risk) across the entire peer universe. A lower volatility investment portfolio also lowers the volatility of contribution rates for the employers, which smooths the overall pension cost structure during a difficult budget environment.

The volatility in the markets over the past year are a stark reminder that markets are always changing. As we assess the current environment, the falling yields in traditional fixed income markets leave a big dilemma for pension investors going forward. At the time of this report, the 30-year Treasury had a yield of roughly 2.0%, while government bonds across most of developed Europe were trading at negative yields. Bond markets are clearly expecting minimal growth out of the global economy for the foreseeable future. The dilemma is that for every dollar invested in a U.S. Treasury bond that earns 2.0%, another dollar must be invested in “something” that earns 12% to meet MPERS’ actuarial return target of 7.0%. With the economy entering the “late-cycle” by most any metric, and bond markets predicting limited economic growth going forward, very few strategies have the potential to generate those types of returns.

With that in mind, MPERS’ is currently performing an asset/liability study to determine what, if any, changes should be made to the System’s asset allocation or actuarial return assumptions. The study will review a wide range of asset allocations, calculate projected returns for those portfolios, and then forecast how those returns would impact the expected employer contributions and the funded status of the plan. MPERS’ current asset allocation has served the system well, and we are in a position to make significant improvements in our funded status over the coming years. But as the financial markets change, we must always look forward and evaluate whether the current portfolio is appropriate for the markets going forward. Regardless of whether a change in strategy or allocation is implemented, our goal is always to deliver strong risk-adjusted performance for the members of the System.

Thank you for the opportunity to serve as your Chief Investment Officer, and I hope you enjoy this year’s annual report.

Sincerely,



Larry Krummen, CFA
Chief Investment Officer

NEPC, LLC

KEVIN M. LEONARD
PARTNER

September 2019

The Board of Trustees
MoDOT & Patrol Employees' Retirement System
PO Box 1930
Jefferson City, MO 65102

Dear Board Members:

In our role as the general investment consultant, we assist the Board in several manners: determining and executing the overall asset allocation strategy of the Plan; advising on the investment policy of the Plan; facilitating investment manager searches (both traditional and alternative asset classes); conducting custodial service searches; providing ongoing performance evaluation for each individual investment manager and the overall investment portfolio; as well as providing pertinent education to the Board.

MPERS' objective is to provide service, disability, death and vested retirement benefits to members and their beneficiaries. To ensure a solid foundation for the future of the System, MPERS has developed an investment program designed to achieve the actuarially assumed rate of return over the long term, while prudently managing the risk of the portfolio. The pension plan is required to satisfy the need to pay accumulated/earned retirement benefits today, while at the same time be prepared for "uncertain" future benefits. This balancing of short-term versus long-term needs is a key tenant in the overall construction of the portfolio. To facilitate this balance, the Board has adopted a diversified asset allocation structure. Our goal is to diversify the System's assets within the traditional and non-traditional asset classes to reduce volatility, achieve above market returns, and to better protect the portfolio against difficult market conditions.

MPERS Fiscal Year 2019 Performance and Key Initiatives

For the fiscal-year-ending June 30, 2019, the MPERS Total Plan returned 6.84% on a net-of-fees basis, underperforming the policy index return of 8.81%. For the fiscal-year-ending June 30, 2019, relative to the peer group comparison (InvestorForce Public Fund Universe), MPERS ranked in the 32nd percentile (1st percentile being the highest, 100th percentile being the lowest), outpacing 68% of other public funds within the universe. For the fiscal year, total Plan performance (relative to policy index) was driven by strong absolute and relative returns within the Fund's private equity, fixed income, and real estate portfolios. On a relative basis, the real assets portfolio performed strongly and on an absolute basis, the opportunistic credit portfolio performed strongly.

During Fiscal Year 2019, key initiatives accomplished included:

- Conducted a comprehensive review of the Plan's asset allocation in concert with NEPC's 2019 Client Actions and Asset Class Assumptions.
    - As part of the review, NEPC and Staff evaluated the Plan's existing asset allocation and discussed any potential changes to its current structure.
        - Based on the review and discussions, NEPC and Staff recommended that the following changes be made to the current investment target allocation.

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NEPC

- Decrease private equity portfolio by 5%
- Decrease hedge fund portfolio by 10%
- Increase global equity portfolio by 10%
- Increase fixed income portfolio by 2.5%
- Increase real assets portfolio by 2.5%
- A liquidity study was conducted as part of the asset allocation review.
  - The results of the liquidity study reaffirmed that the Plan's liquidity remains healthy enough to support the current allocation to alternative investments, but certain economic environments may change the liquidity profile of the Plan meaningfully.

- Continued work on the alternative investment portfolio.
  - A private market pacing plan was conducted for the opportunistic debt, private equity, real assets, and real estate portfolios. Each pacing plan provided a recommended commitment amount for upcoming vintage years and allocations to specific strategy types.
  - New commitments were made to the opportunistic debt, private equity, real assets, and real estate portfolios

- From a reporting perspective, asset classes were re-bucketed within "beta groups" to be consistent with how NEPC and Staff are modeling/viewing asset class implementation

As the asset allocation strategy evolves year-after-year, diversification and risk mitigation will continue to be the pillars of MPERS' asset allocation structure.

NEPC, LLC appreciates the opportunity to serve as your consultant. It is a pleasure to work with MPERS and we look forward to continuing our relationship for the benefit of the Board, Staff, and most importantly, the members of the System.

Sincerely,

Kevin M. Leonard
Partner

Investment Activity Overview

Summary of Investment Policy

The primary objective of the Missouri Department of Transportation and Highway Patrol Employees' Retirement System (MPERS or System) is to provide active and retired employees with the retirement benefits provided under Missouri law. The investment portfolio is constructed to generate a total return that, when combined with employer contributions, is sufficient to meet these benefit obligations. Following prudent standards for preservation of capital, the goal is to achieve the highest possible rate of return consistent with the plan's tolerance for risk as determined by the Board of Trustees (Board) in its role as fiduciary. The Board has adopted the following guiding principles to fulfill its fiduciary duty:

1. Preserve the long-term corpus of the fund.
2. Maximize total return within prudent risk parameters.
3. Act in the exclusive interest of the members of the system.

Risk awareness and risk management are essential to any organization. MPERS' Investment Policy is the starting point of our investment risk management process. Through the Investment Policy, the Board has defined the desired goals and outcomes of the investment program, including provisions that

- define the assumed rate of return for the portfolio (currently 7%),
- establish an asset allocation that is expected to meet the assumed rate of return while minimizing the volatility of the fund's contribution rates,
- define the approved asset classes and investment strategies,
- delegate the day-to-day management of the investment portfolio to MPERS' staff and external asset managers,
- establish a range of asset class allocations from which the CIO can operate,
- establish procedures for hiring and terminating investment managers, and
- establish ongoing due diligence requirements for existing managers.

Throughout the Investment Policy, two key investment beliefs dominate the daily management of the investment portfolio.

1. Diversification is critical because the future is unknown.
2. Flexibility in investment policy implementation is critical because particular asset classes will be in or out of favor at various points in the economic cycle.

To ensure the fund is operating within the risk parameters established in the Investment Policy, staff monitors the performance of the fund relative to MPERS' policy index. The policy index is the return that would be generated if MPERS' portfolio were invested passively across the targeted asset allocation. MPERS' investment staff strive to achieve returns that are equal to or greater than the policy index while taking equal or less risk relative to the policy index (with risk defined by standard deviation of return). The table below shows how MPERS' portfolio compares to both the policy index and the median fund in MPERS' public fund peer universe as well as to commonly used risk measures.

Total Portfolio – Statistical Performance

Portfolio Characteristic	1-Year	3-Year	5-Year	10-Year
Annualized Total Plan Return (net of all fees and expenses)	**6.84%**	**9.15%**	**6.97%**	**10.19%**
Annualized Policy Benchmark Return	*8.80%*	*9.13%*	*6.85%*	*9.22%*
Annualized Peer Median Return	*6.20%*	*8.70%*	*5.80%*	*9.00%*
Total Plan Standard Deviation[(1)]	**4.97**	**3.52**	**3.71**	**5.09**
Policy Benchmark Standard Deviation	*6.14*	*4.19*	*4.30*	*5.36*
Peer Median Standard Deviation	*10.95*	*7.24*	*7.28*	*8.08*
Total Plan Sharpe Ratio[(2)]	**0.92**	**2.21**	**1.65**	**1.91**
Policy Benchmark Sharpe Ratio	*1.06*	*1.86*	*1.40*	*1.63*
Peer Median Sharpe Ratio	*0.38*	*1.01*	*0.70*	*1.05*
Correlation to Policy Benchmark[(3)]	**0.93**	**0.90**	**0.86**	**0.90**

1. *Standard Deviation* measures historical volatility and specifically measures the dispersion of a set of data points (i.e., monthly returns) from their mean. If the data points are further from the mean, the standard deviation is higher.
2. *Sharpe Ratio* measures historical volatility and specifically measures the dispersion of a set of data points (i.e., monthly returns) from their mean. If the data points are further from the mean, the standard deviation is higher.
3. *Correlation* measures how the System's portfolio and the policy benchmark moves are related and if both have reacted to market forces in the same manner. The System's portfolio has a correlation of less than 1, indicating that while it will typically move in the same direction as the policy benchmark, it will not move in lockstep with the total policy benchmark.

Investment Activity Overview

When evaluating these results, it is important to note that MPERS' policy index is comprised of a mix of asset classes, including several alternative asset classes, with benchmarks that are not investable (notably private equity with its S&P 500 + 3% illiquidity benchmark, real assets with its CPI + 4% real return benchmark, as well as the real estate and hedge fund benchmarks). MPERS also evaluates investment performance on a net-of-fees basis, while acknowledging that most asset class benchmarks report performance on a gross-of-fees basis. Investment fees represent a significant hurdle for staff to overcome when comparing results to MPERS' policy index, which is demonstrated by how well MPERS' policy index has performed relative to the broader public fund peer universe. MPERS' strong risk-adjusted performance provides the Board with the confidence that it has adopted a prudent investment strategy, fulfilling the Board's fiduciary duty.

Fair Value of Investments

As of June 30, 2019, MPERS' investment portfolio had a total fair value of $2.42 billion, representing an increase of $111 million from Fiscal Year 2018. Over the course of the year, an additional $46 million was transferred out of the fund to make benefit payments and meet other obligations. When viewed together, the net increase to the portfolio from investment activity equated to $157 million.

Investment Performance

MPERS' investment portfolio generated a 6.84% return for Fiscal Year 2019, net of all investment fees and based on time-weighted rates of return and market valuations. Each individual asset class delivered positive net-of-fee returns for the year, led by the private equity portfolio with a 16.22% return and the real estate portfolio with a return of 10.49%. The traditional fixed income, opportunistic debt, real assets and public equity portfolios (including hedge fund structures) generated returns of 8.61%, 7.46%, 6.48%, and 1.23%, respectively. The performance across the major asset classes (and respective benchmarks) as they were defined at the start of this fiscal year is listed below.

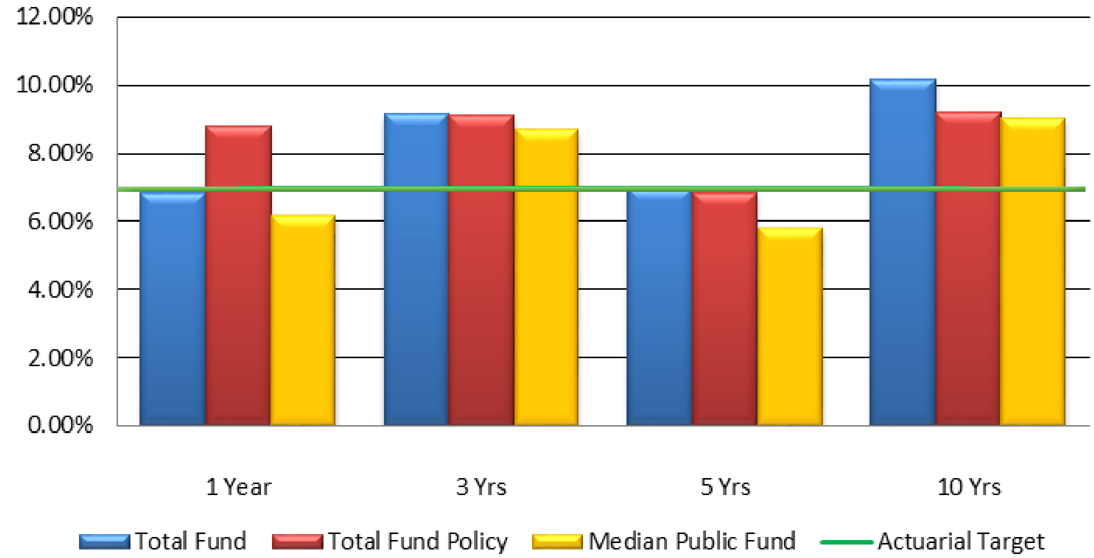
Investment Performance (including Benchmarks)	**1-Year**	**3-Year**	**5-Year**	**10-Year**
Total Fund	**6.84%**	**9.15%**	**6.97%**	**10.18%**
Policy Benchmark	*8.80*	*9.13*	*6.85*	*9.22*
Peer Universe Ranking (%)	*32*	*32*	*9*	*7*
Global Equity	**1.06**	**10.33**	**5.60**	**11.20**
MSCI ACWI	*5.74*	*11.62*	*6.16*	*10.15*
Private Equity	**16.22**	**14.36**	**12.41**	**12.95**
S&P 500 + 3%	*12.76*	*16.88*	*14.21*	*19.47*
Fixed Income	**8.61**	**4.75**	**5.57**	**8.15**
Barclays US Agg Gov/Credit	*8.52*	*2.87*	*3.20*	*4.38*
Opportunistic Debt	**7.44**	**n/a**	**n/a**	**n/a**
Barclays US Corp HY	*7.48*	*n/a*	*n/a*	*n/a*
Real Estate	**10.48**	**9.24**	**0.16**	**10.13**
NFI-ODCE	*6.00*	*6.97*	*9.12*	*9.39*
Real Assets	**6.55**	**8.70**	**3.99**	**n/a**
CPI + 4%	*5.71*	*6.12*	*5.50*	*n/a*
Hedge Funds	**-0.25**	**5.81**	**2.68**	**5.22**
HFRI Fund of Funds	*1.15*	*4.25*	*2.19*	*3.21*

***All MPERS' investment returns are reported net of all investment fees.*

When evaluating performance, the Board of Trustees looks at three primary performance objectives: a) meet or exceed the actuarial assumed rate of return of 7% over long periods of time, b) outperform a policy benchmark that represents the return that could be achieved by investing passively in the broad markets in the same percentages to MPERS' target asset allocation, and c) rank at or above the public fund peer group's median investment return.

Investment Activity Overview

Historical returns compared to the three primary performance goals are listed graphically below:



In reviewing Fiscal Year 2019 investment performance relative to these metrics, MPERS' return of 6.84% fell largely in line with MPERS' actuarial hurdle and outperformed industry peers (the public fund median), yet meaningfully underperformed MPERS' policy index. As a reminder, MPERS' policy index is the return expected to be earned if MPERS invested passively across the approved asset allocation over the entire measurement period. The underperformance to the policy benchmark comes down to an issue of timing. In the middle of the fiscal year (effective January 1, 2019), the Board approved a very sizeable asset allocation change including, but not limited to, an increased target allocation to public equities from 30% to 40% of assets and decreased target allocation to private equity from 15% to 10%. In their entirety, these changes will take multiple years to fully implement, and as a result when the changes went into effect, MPERS had a significant underweight to public equities relative to the new policy index. With the benefit of hindsight, making a significant asset allocation change during the broad equity market selloff in the fourth quarter of calendar year 2018 and the subsequent rebound in the first quarter of 2019 led to a meaningful impact on MPERS' policy benchmark return. Had there been no change to MPERS' asset allocation during the year – in other words, had the allocation target remained the same that which was in effect on July 1, 2018 – MPERS' policy benchmark would have returned 6.96% (much closer to actual performance). If the newly adopted asset allocation had been in place for the full fiscal year, the policy benchmark would have returned 7.1% (also much closer to actual performance). Significant differences between actual fund performance and the performance of policy benchmarks will be expected until the portfolio has had time to transition to the new policy targets.

Longer term, MPERS continues to perform well according to any metric. The fund is either above or within a few basis points of the actuarial target across all timeframes. Despite the significant underperformance relative to the policy benchmark during the fiscal year, fund performance remains in line with the policy benchmarks over three- and five-year periods and significantly outperforms the policy benchmark over ten years. Performance relative to the public fund peer universe remains very strong, with MPERS' long-term performance for five- and ten-year returns ranking in the top 9th and 7th percentile, respectively.

Asset Allocation Overview

As mentioned above, MPERS underwent a significant asset allocation change in Fiscal Year 2019. As of January 1, 2019, MPERS increased its policy target allocation to global equities from 30% to 40%, increased the policy target to traditional fixed income from 20% to 22.5%, and increased its target to real assets from 7.5% to 10%. The subsequent changes that allowed for those reallocations were a policy target reduction to private equity from 15% to 10% and to hedge funds from 10% to 0%. As part of the new asset allocation, MPERS will begin reporting investments in a beta group construct. The beta groups are equities, rates and credit, and real assets. These groupings provide a framework to align the various portfolio exposures, regardless of the structure of the investment vehicle, and allows for more transparent reporting of alternative assets according to their underlying market (or beta) exposure. As it relates to hedge funds, they will no longer represent a standalone asset allocation but will be allocated according to the market risk represented in the underlying strategy or will be part of the portable alpha program within the equity beta group. The use of hedge fund strategies is subject to a 10% cap across all underlying beta groups. Additionally, the Board approved a widening of the bands around each target allocation from 5% to 7.5%.

As of June 30, 2019, all of the sub-asset class allocations were within the acceptable ranges established by MPERS' Investment Policy. Currently there is a wider divergence relative to the target allocation which is a result of the asset allocation shift that took place on January 1, 2019. Staff continues to work toward bringing the actual allocation closer to those targets, but is aware that the transition will take time and makes conscious decisions based on the staff's view of the market. The table below lists the target allocations as June 30, 2018, along with the target and actual asset allocation as of June 30, 2019, using the new beta group construct. Following the table are descriptions of each new beta group and its underlying assets.

Beta Group *Sub Asset Allocation*	**FY18 Target Allocation**	**FY19 Target Allocation**	**Ending FY19 Allocation**
Equity Beta	**45%**	**50%**	**50.26%**
Public Equity	*30%*	*40%*	*34.94%*
Private Equity	*15%*	*10%*	*15.32%*
Rates and Credit	**27.5%**	**30%**	**27.03%**
Traditional Fixed Income	*20%*	*22.5%*	*15.95%*
Opportunistic Debt	*7.5%*	*7.5%*	*11.08%*
Real Assets	**17.5%**	**20%**	**22.31%**
Real Assets	*7.5%*	*10%*	*12.14%*
Real Estate	*10%*	*10%*	*10.17%*
Cash	**0%**	**0%**	**0.40%**
Hedge Funds	**10%**	**0%**	**0%**

Equity Beta

The equity beta group is comprised of three asset types: public equity, private equity and hedged equity. The equity beta group currently represents 50.26% of the overall portfolio, essentially neutral to the target allocation of 50%. Within that overall equity allocation, the fund is overweight private equity structures (15.3% versus the new target of 10%), which is offset by an underweight to public equity (34.9% versus new target of 40%). In addition, 5.6% of the 35% of public equity is within the hedged equity allocation which did not have the same market exposure as the broad equity benchmarks for the majority of the fiscal year. The result of the current positioning is a considerable underweight to the traditional equity markets, which marred the fund's relative performance during the equity market rally since January 1, 2019.

Public Equity

Public equity markets performed altogether differently from one half of the year to the next in Fiscal Year 2019. During the first half of the year (the second half of calendar year 2018), markets fell significantly as rising interest rates threatened to choke off the economic expansion. Investors were also concerned over the escalating trade tensions between the U.S. and China. The fourth quarter of 2018 was especially challenging as global equities fell 12.8% which left equities down over 9.0% for the calendar year. As the calendar turned over to 2019, market sentiment turned positive as the Federal Reserve and central banks across the globe once again stepped in to support the markets. The pivoting of the Federal Reserve to a more accommodative stance (signaling future interest rate cuts) sent bond yields tumbling lower and investors back to the equity markets. Global equity markets rallied over 16% in the first half of 2019, erasing the losses from the prior six months and ending Fiscal Year 2019 with a 5.7% return.

MPERS' public equity portfolio struggled to keep up with the policy benchmarks for the year, generating an overall 1.1% return relative to the 5.7% benchmark return. MPERS' value bias, use of master limited partnerships (MLPs), and the overweight to small cap equities all underperformed the broader public benchmarks. Confidence continues, however, that these tilts will serve the portfolio well over the long term, but staff will monitor whether to deemphasize them if underperformance continues.

Hedged Equity

As part of the revised asset allocation on January 1, 2019, MPERS moved away from a standalone hedge fund target of 10% in favor of using certain hedge funds within a portable alpha construct in the global equity portfolio. Alpha is the return that is earned over the overall market return. The use of portable alpha involves taking the alpha that hedge fund managers can generate, and "porting" that alpha over the overall market return. To implement this approach, staff monitors the overall equity market risk (beta) within the hedge fund managers. For Fiscal Year 2019, the hedge funds utilized in the hedged equity allocation had a beta that ranged between 0.4% and 0.5%. It is expected that the hedge fund portfolio will gradually transition to a market neutral (or low to no beta portfolio) over the next few years, but regardless there must be an appropriate adjustment to account for the market risk embedded in the hedge fund portfolio relative to the broader equity markets. After calculating the current beta of the hedge fund managers, staff overlays additional equity exposure to move the beta of the entire portfolio closer to 90-100%. Hedged equity implies an overall less volatile equity portfolio given the hedge fund managers ability to deliver alpha, and an overall beta (market risk) below 100%. As of June 30, 2019, hedged equity represented 5.6% of the overall portfolio (or approximately 11% of the equity portfolio), using the S&P 500 as the desired market exposure.

Private Equity

On January 1, 2019, MPERS lowered the target to private equity from 15% to 10%. While private equity continues to be the best performing asset class in MPERS' portfolio over the long term, staff is cognizant of the massive amounts of money raised in the sector over the past several years and the risks that it brings to future performance. Staff remains disciplined by slowing the investment pace and not "following the herd" of capital that is aggressively coming to the market during this late stage of an economic recovery. New commitments are focused on existing managers who are coming back to market and who have performed well and because the new commitments are focused on a smaller group of funds, it will take several years to transition the portfolio to the lower targets. Distributions from existing investments continue to occur at a strong pace. As less money is committed to new funds during the coming years, the allocation to private equity should gradually decline in the direction of the new targeted allocation.

Private equity generated a 16.22% fiscal year return, surpassing the benchmark (S&P 500 + 3%) return of 12.76%. The "public equity plus" benchmark has been difficult to outperform given the strength of public equity markets coming out of the financial crisis and the relative immaturity of MPERS' private equity portfolio. Relative performance over longer time periods should continue to improve as the private equity portfolio continues to mature and more underlying companies advance toward their ultimate exit strategy. The portfolio continues to mature nicely as evidenced by Fiscal Year 2019 being the fifth consecutive year where distributions from investments outpaced new capital calls.

Rates and Credit Beta

The rates and credit beta group consists of the traditional fixed income portfolio and the opportunistic debt portfolio. The overall allocation stands at 27% versus the new target of 30%. The portfolios performed largely in line with their respective benchmarks in Fiscal Year 2019, with the traditional portfolio delivering an 8.6% return (versus the benchmark of 8.5%) and the opportunistic debt portfolio generating 7.3% (versus the benchmark of 7.5%).

Traditional Fixed Income

MPERS remained consistently underweight the targeted fixed income allocation of 20% throughout the first half of the year and ended the year with a larger underweight of a 15.95% allocation compared to the new target asset allocation of 22.5%. Yields on the U.S. Treasury bonds fell considerably during the year, with the 10-year Treasury bond falling from 2.86% to 2.00% and the 30-year Treasury bond dropping from 2.99% down to 2.53%. The falling interest rate environment sent existing bond prices higher, which led to an 8.6% return for MPERS' traditional fixed income portfolio.

The falling yields in traditional fixed income markets create a dilemma for pension investors looking forward. While fixed income strategies (particularly long duration treasuries) offer the best diversification against equity market risk, their low yields create challenges in meeting MPERS' long-term actuarial return target of 7.0%. At the time of this report, the 30-year Treasury bond had a yield of roughly 2.0%. Simple mathematics show that for every dollar invested that earns 2.0%, another dollar must be invested in "something" that earns 12% to generate an average return of 7.0%. With the economy entering the "late-cycle" by most any metric, very few strategies have the potential to generate those returns. The dilemma is that investing in the asset class that offers the best protection against equity market risk is also the same asset class that virtually guarantees underperformance of the actuarial hurdle in the coming years. For these reasons, opportunistic debt strategies are favored over the traditional fixed income markets.

Opportunistic Debt

The offset to MPERS' underweight position to traditional fixed income is the overweight position to opportunistic debt strategies. The year began with a 10.25% allocation relative to a 7.5% policy target and increased the allocation slightly to end the year at 11.08%. The asset class generated a 7.44% return which was essentially in line with its benchmark return of 7.48%. The publicly traded high-yield benchmark suffered during the first half of the fiscal year but rallied significantly in the second half. Over the two years since opportunistic debt performance was reported separately, it has generated 9.7% returns compared to the benchmark of 5%.

The opportunistic debt portfolio is diversified among direct lending, public market investments and distressed investments. To date, the portfolio is largely built out and most of the focus is on pivoting commitments away from direct lending and toward strategies that have flexibility to be more opportunistic. Direct lending involves making loans to healthy companies, generating high current income and benefits from stable and growing economies. As the economic cycle continues to mature and growth begins to slowdown, there is an increasing likelihood that the next several years will offer a better opportunity set for managers who focus on taking advantage of market volatility. Direct lending will remain an important part of MPERS' portfolio, but most recent commitments to the space have been to sector-focused or niche-oriented managers. The pace of new commitments is also expected to slow in anticipation of a more interesting environment in the coming years.

Real Assets Beta

The real assets beta group includes MPERS' real estate holdings along with the broader real asset strategies, e.g., energy, infrastructure, timber, and mining. Overall, this beta group performed well in Fiscal Year 2019, with real estate generating a 10.5% return (versus the benchmark of 6.0%) and the broader real assets sector generating a 6.5% return (versus the benchmark of 5.7%).

Real Assets

As part of the change to the asset allocation, the target to real assets was increased from 7.5% to 10%. This was both a reflection of a consistent flow of opportunities from the space and of MPERS' historical overweight to the asset class. The diversification and inflation participation qualities of the portfolio remain attractive in the current market environment. The portfolio returned 6.55% during the fiscal year, outperforming its benchmark return of 5.71%. Performance was driven by solid returns out of the energy and metals and mining portfolio, which offsets weakness in the infrastructure allocations and slightly positive returns from the timber strategy. Since the inception of the asset class it has generated 6.6% annual returns, outperforming its benchmark of 5.6%.

New commitments are balanced across various sub-strategies in the portfolio. The portfolio is well balanced between energy (42%), timber (30%), metals and mining (14%) and infrastructure (14%). The energy and metals and mining exposure continues to be mixed and driven by volatility within the commodity price market. The timber exposure delivered a small positive return of 2.4%. The overall construction of the timber portfolio should serve as a low-volatility diversifier to other volatility strategies within the portfolio. The pace of commitments is expected to slow in the coming years as a reflection of the overweight to the asset class.

Real Estate

The underlying real estate allocation has a target of 10% of assets and includes a mix of public and private equity strategies, along with tactical exposures to public and private debt strategies. MPERS started the year with a 9.73% allocation and marginally increased the allocation, ending with a 10.17% allocation. The portfolio generated a 10.48% return for the year, outperforming the policy benchmark return of 6.00%. All strategies within real estate performed well during the year. The core real estate portfolio (primarily stabilized and fully leased properties) generated an 8.92% return, while the non-core portfolio (value-added or opportunistic real estate strategies) returned an impressive 12.72% return. The publicly traded REIT (real estate investment trust) portfolio also contributed positive performance, returning 9.02% for the year.

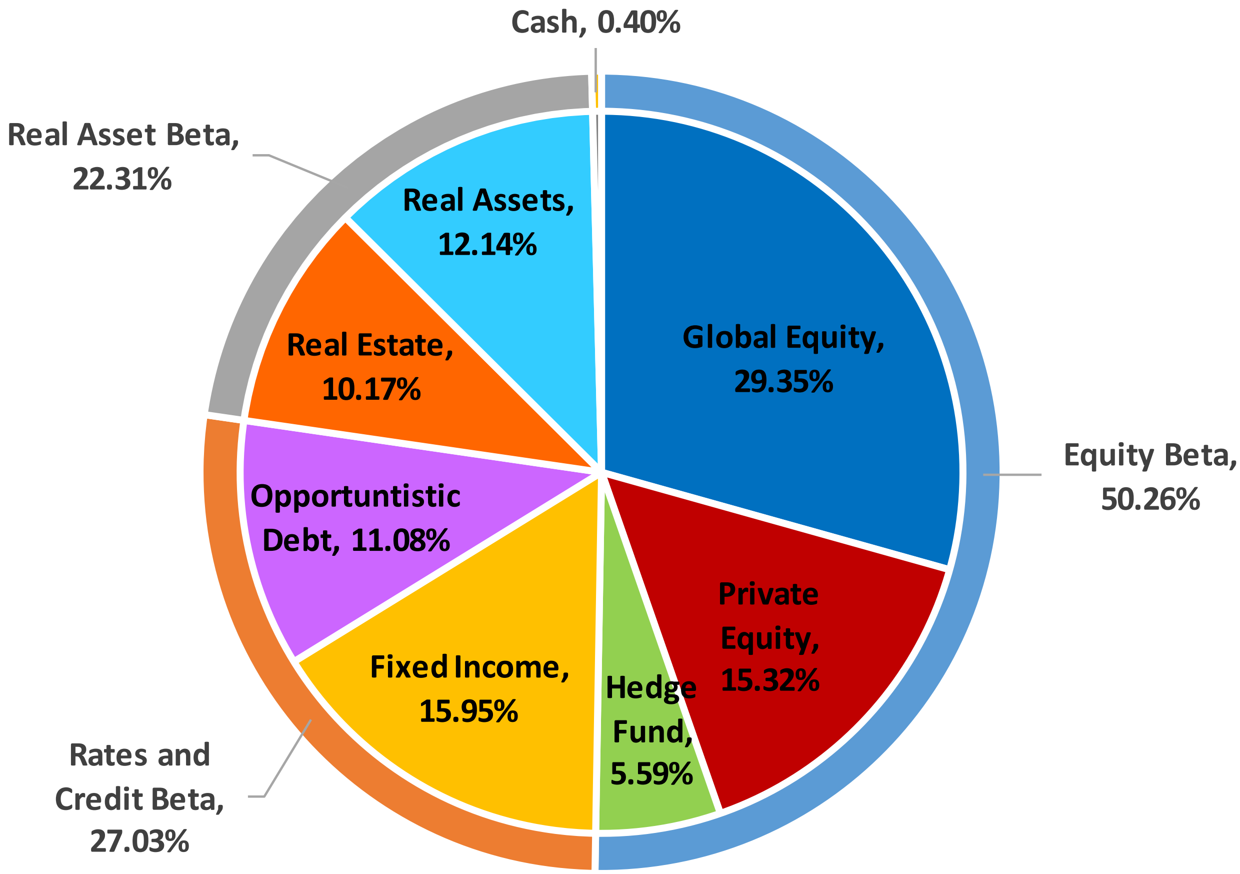
The current economic and interest rate environment continue to be monitored for clues on to how to best position the real estate portfolio going forward. Given the low level of interest rates, focus remains on managers who can drive value at the asset level through property improvements and on markets with long-term growth potential. Manager-specific performance was the main driver of the strong out-performance from the asset class this year. Expectations are to continue to actively commit new dollars to the asset class as market weight relative positioning is either maintained or increased over time.

Looking Forward

Looking forward, economic growth is definitely slowing but the Federal Reserve and global central banks are doing everything they can to support the current expansion. That support will be critical, as the ongoing trade disputes between the U.S. and China, a potential hard "Brexit", and the looming U.S. presidential race in 2020 will likely add additional volatility to the marketplace. The fixed income dilemma referenced above is a constant concern, as the bond and stock markets seem to offer mixed views. The bond market is pricing in falling interest rates and economic growth, while equity markets are still trading close to all-time highs. It seems logical that one of those two markets must be "off" because it is difficult to envision how a world of increasing uncertainty and falling economic growth could lead to a positive environment for investing in the stock market. Regardless of whether the recent round of volatility is here to stay, tempering return expectations would be wise.

As of now, the portfolio remains overweight the diverse set of alternative investment managers during the transition to the new asset allocation targets, and the expectation is to remain overweight those strategies (relative to traditional stocks and bonds) over the next several years.

Investment Summary



Amounts Reported by Beta Groups and Management-Type Allocation 6/30/2019

	Fair Value	% of Fair Value
Global Equity		
Global Public Equity	$ 711,077,448	29.35%
Private Equity	371,305,159	15.32%
Hedged Equity	135,450,461	5.59%
Rates and Credit		
Fixed Income	386,493,767	15.95%
Opportunistic Debt	268,568,816	11.08%
Real Assets		
Real Estate	246,330,291	10.17%
Real Assets	294,214,930	12.14%
Cash	9,585,286	0.40%
Total Investments	$ 2,423,026,158	100.00%
Reconciliation to Statement of Plan Net Assets		
Less Accrued Investment Interest and Income	$ (6,426,373)	
Less Investment Sales Receivable	(3,871,328)	
Plus Investment purchases Payable	6,469,261	
Currency Adjustment	152,021	
	$ 2,419,349,739	

Largest Investment Holdings

Largest Equity Securities

(Non-Commingled Funds)

Security	Fair Value	% of Total
PLAINS ALL AMERICAN PIPELINE L P	$7,142,975	1.570%
ENTERPRISE PRODS PARTNERS L P	6,916,039	1.520%
ENERGY TRANSFER LP	6,680,692	1.468%
MAGELLAN MIDSTREAM PARTNERS LP	6,004,032	1.320%
MPLX LP	5,004,772	1.100%
WESTERN MIDSTREAM PARTNERS L P	4,985,663	1.096%
ONEOK INC	4,762,547	1.047%
WILLIAMS CO INC	4,590,456	1.009%
EQM MIDSTREAM PARTNERS LP	3,636,997	0.799%
PHILLIPS 66 PARTNERS LP	2,690,661	0.591%

Largest Fixed Income Securities

(Non-Commingled Funds)

Par Value	Security	Fair Value
14,000,000	USA TREASURY NTS 1.125% TIPS 15/1/21 USD1000 01-15-2021	$16,481,783
15,000,000	FEDERAL FARM CR BKS 3.1% 01-04-2035	15,671,250
15,052,000	TVA 6.235 BD DUE 07-15-2045 ONE-TIME OPTPUT PAY 7-15-2001 @ PAR LAST NOTF 1**PUT	15,606,666
15,200,000	CONNECTICUT STUDENT LN FNDTN STUDENT LN ARCS-SR SER A-1 01 JUN 2046	15,049,368
15,000,000	UNITED STATES TREAS BDS 2.25% DUE 08-15-2046	14,171,490
15,000,000	PVTPL U S ED LN TR III LLC SER 2004 SUB NT 144A CL B VAR DUE 06-01-2039 BEO	12,520,205
11,400,000	UNITED STATES OF AMER TREAS BONDS 2.75 BDS DUE 08-15-2042 USD100'BONDS 08/42'	11,962,430
11,302,577	MISSOURI HIGHER ED LN AUTH STUD LN REV VAR-SER A-1 VAR RT DUE 11-26-2032 REG	11,385,199
10,000,000	UNITED STATES OF AMER TREAS BONDS 0.75 DEB TIPS 02-15-2042	11,351,256
10,000,000	FFCB DTD 2.93 04-27-2029	10,504,500
10,503,000	FEDERAL FARM CR BKS CONS SYSTEMWIDE 3.56% 01-11-2038	10,503,063
10,513,000	PVTPL ED LN AST-BACKED TR I 2013-1 SR NTCL A2 144A VAR RT DUE 04-26-2032 BEO	10,470,349
10,000,000	UNITED STATES OF AMER TREAS BONDS DTD 05/15/2016 2.5% DUE 05-15-2046 REG	9,942,190
9,650,000	CONNECTICUT STUDENT LN FNDTN STUDENT LN ARCS-SR SER A-2 01 JUN 2046	9,554,369
10,000,000	ACCESS GROUP INC DEL 2004-1 STUD LN AST BKD NT CL A-4 12-27-2032/09-27-2007 REG	9,508,185
9,150,000	BRAZOS HIGHER ED AUTH INC STUD LN BKD NT2007-1 CL I-A-4 VAR RT DUE 06-25-2043	8,889,683
9,600,000	EDUCATION LN ASSET BACKED TR I FLTG RT 4.25% 08-01-2043 REG	8,304,000
6,000,000	UNITED STATES TREAS BDS INDEX LINKED 1.75 DUE 01-15-2028 REG	8,203,799
6,995,000	FFCB 3.89% DUE 06-01-2043	8,167,782
25,644,000	TN VY AUTH FED BOOK ENTRY PRIN STRIPS GENERIC PRIN PMT 04-01-2056 (UNDDATE)	7,860,912

Space and cost restrictions make it impractical to print the entire investment portfolio in this report. However, a portfolio listing is available for review in the office of the executive director of MPERS.

Schedule of Investment Expenses

Investment Fees

Historically, MPERS has reported investment management fees and accrued incentive fees (performance fees), and this year MPERS has expanded reporting to include fund pass-through expenses and portfolio company expenses. MPERS reports returns net of all fees and expenses; the additional fee categories reported have no impact on investment performance or returns. Comparing fees among peers is challenging given the lack of industry standard governing fee reporting. MPERS has taken a very conservative approach and reports all fees.

The strongest driver of fees is MPERS' asset allocation and use of private assets. Private assets have served an important role in MPERS' asset allocation including diversification and alpha generation. MPERS continues to monitor fees during the manager due diligence process and considers fees to be one factor when making investment decisions. MPERS strives to produce the highest net-of-fee returns regardless of the investment structure.

Summary of Investment Expenses

For the Year Ended June 30, 2019

Investment Income Expenses:	
Management and Performance Fees by Asset Class	
Equities	$3,093,087
Fixed Income Core	108,243
Opportunistic Debt	7,304,242
Real Estate	5,144,246
Private Equity	5,842,397
Real Assets	7,134,011
Hedge Funds	4,574,280
Total Management and Performance Fees	**$33,200,507**
Investment Custodial Fee	72,351
Performance Management	200,583
General Consultant (Monitoring) Fee	336,702
Professional Fees	532,001
Other Fees/Expenses	309,038
Total Investment Income Expenses	**$34,651,182**

Schedule of Investment Expenses

Expenses Accrued, Fiscal Year 2019

Manager	Base Fees	Expenses (1)	Performance Fees	Port. Co. Expenses (2)	Total
Aberdeen Asset Management	$12,318	$0	$0	$0	$12,318
ABRY Partners	18,947	5,112	33,685	0	57,743
Acadian Asset Managers	597,856	0	0	0	597,856
American Infrastructure	91,137	56,874	0	0	148,011
Aisling Capital	184,040	30,304	122,444	0	336,788
Alpstone Capital	176,117	18,604	209,420	0	404,141
Alyeska	46,792	0	0	0	46,792
Anchorage Advisors	321,694	6,702	44,085	0	372,481
Apollo Real Estate	39,296	9,168	0	0	48,464
Carlyle Aviation	243,801	14,592	684,513	0	942,906
Ares Management	107,452	247,289	111,651	0	466,392
Arrowroot Capital	247,489	95,129	448,091	0	790,709
Audax Group	1,177	1,169	(18,458)	0	(16,112)
Blackstone Investment	745,853	282,506	277,725	0	1,306,084
Blue Road	131,252	20,165	0	0	151,417
Brooke Private Equity Advisors	112,500	9,660	15,729	0	137,889
Systematica Investments	74,913	0	0	0	74,913
Bridgewater	549,965	23,829	386,821	0	960,614
Capital Partners	176,037	123,829	12,816	0	312,681
CBRE Investors	83,999	0	0	0	83,999
Centersquare Investment Management	240,916	213,572	295,717	0	750,205
Cevian Capital	218,795	8,979	0	0	227,774
CIM Group	574,863	70,086	0	4,411	649,360
Clarion Partners	292,064	61,896	0	0	353,960
Parametrics	226,160	0	0	0	226,160
Corrum Capital	76,580	25,836	66,304	0	168,719
Car Val Investors	175,781	73,637	(140,291)	0	109,127
DC Capital	77,488	32,415	(60,030)	80,889	130,762
Dyal Capital Partners	394,521	43,128	0	0	437,649
GMO	233,785	0	0	0	233,785
Golub Capital	496,241	0	279,937	0	776,178
Grey Rock Energy Partners	395,295	67,774	465,186	0	928,255
Grove Street	468,613	89,426	0	0	558,039
Indus Capital Partners	591,329	23,498	0	0	614,827
Kennedy Capital	285,100	0	0	0	285,100
KKR	71,428	45,532	0	0	116,960
KPS Capital Partners	0	1,088	31,638	0	32,726
Longford Investments	400,000	53,855	266,598	0	720,453
Long Ridge Equity Partners	200,000	47,111	617,512	1,101	865,724
Luxor Capital Group	9,265	0	0	0	9,265
M&G Investments	98,389	140,331	133,420	0	372,141
Metacapital Management	153,232	0	125,511	0	278,743
Millennium Management	1,355,129	0	214,561	0	1,569,690

Continued on next page

1. *Fund pass through expenses* are administrative expenses charged to the fund and paid by the limited partners (or investors, including MPERS), in addition to the management fee. These expenses may include, but are not limited to, accounting, audit, legal, and custody expenses directly related to the administration of the underlying fund investments.
2. *Portfolio company charges* are fees or costs paid to the general partners (fund managers) of private equity funds which are not applied as offsets to gross management fees. These charges are paid by the underlying portfolio companies of the funds, and therefore, are indirectly paid by MPERS.

Schedule of Investment Expenses

Expenses Accrued, Fiscal Year 2019 (*continued*)

Manager	Base Fees	Expenses (1)	Performance Fees	Port. Co. Expenses (2)	Total
Miravast	205,993	197,025	0	0	403,018
MGG Investment Group	113,253	96,764	101,265	0	311,282
Monomoy Capital Partners	132,174	141,241	0	53,676	327,091
Timberland Investment Resources	350,826	0	0	0	350,826
American Timberland Co.	271,804	0	0	0	271,804
Catchmark	91,468	0	0	0	91,468
MCB	73,561	0	0	0	73,561
New Mountain Capital	0	(102,919)	0	0	(102,919)
New Quest Capital Partners	123,136	32,198	164,226	15,965	335,525
Nexus Investments	179,000	33,652	0	0	212,652
Northern Shipping	316,626	124,222	136,613	0	577,461
Natural Gas Partners	314,032	34,738	57,435	0	406,205
Energy & Mineral Group	630,383	60,782	1,123,266	0	1,814,431
Golden Sciens Marine Investments	97,702	26,591	0	0	124,293
Oak Street Real Estate	32,742	20,165	10,629	0	63,536
OZ Management	16,868	89,705	505,932	0	612,504
OCP Asia Limited	276,586	85,797	232,435	0	594,818
Octagon Credit Investors	293,048	0	0	0	293,048
OpenGate Capital	221,957	176,314	394,439	0	792,711
Orion Mine Finance	294,059	232,567	(78,438)	0	448,188
Owl Rock Capital	485,655	0	5,052	0	490,707
Pentwater Capital Management	283,741	0	297,773	0	581,514
Pfingsten Partners	148,395	3,094	0	25,495	176,984
Principal Real Estate Investors	964,973	8,970	0	0	973,944
Ridgewood Energy	365,487	42,618	3,813	0	411,918
Riverstone Credit	190,751	236,516	318,087	22,008	767,362
Shore Capital	(2,657)	26,273	0	0	23,616
Shoreline Capital	26,085	9,215	66,063	571	101,934
Sigular Guff & Co.	192,022	122,005	339,998	0	654,025
Silchester International Investors	849,327	0	0	0	849,327
Torchlight Investors	187,150	82,875	254,440	0	524,465
Tortoise Investment Management	508,495	0	0	0	508,495
Tristan Capital	488,696	398,716	44,585	0	931,997
Turnbridge Capital	177,694	24,562	0	0	202,256
ValueAct Capital	179,303	0	19,068	0	198,371
Varde	18,322	132,080	0	0	150,402
Total Manager Expenses	**$20,096,265**	**$4,278,862**	**$8,621,264**	**$204,116**	**$33,200,507**
Professional Expenses					
Investment Custodial Fee	72,351	0	0	0	72,351
Performance Management	200,583	0	0	0	200,583
General Consultant (monitoring) Fee	336,701	0	0	0	336,701
Professional Fees	532,001	0	0	0	532,001
Other Investment Expenses	309,038	0	0	0	309,038
Total Professional Expenses	**$1,450,675**	**$0**	**$0**	**$0**	**$1,450,675**
TOTAL INVESTMENT EXPENSES	**$21,546,940**	**$4,278,862**	**$8,621,264**	**$204,116**	**$34,651,182**

Schedule of Brokerage Commissions

Brokerage Firm	Total Commission	Number of Shares	Commission Rate
BTIG LLC	$33,585	1,586,910	$0.0212
WEEDEN AND CO	19,885	1,862,947	0.0107
KEEFE BRUYETTE	12,682	492,360	0.0258
VIRTU AMERICAS LLC	9,795	822,371	0.0119
D. A. DAVIDSON & CO.	7,987	209,832	0.0381
SANDLER O’NEILL & PARTNERS L.P.	7,817	205,822	0.0380
STEPHENS INC.	7,537	192,160	0.0392
FIG PARTNERS LLC	6,940	192,346	0.0361
RAYMOND JAMES & ASSOCIATES, INC.	5,560	140,613	0.0395
CREDIT SUISSE SECURITIES (USA) LLC	3,592	5,721,695	0.0006
PIPER JAFFRAY & CO	2,409	65,447	0.0368
J.P. MORGAN SECURITIES LLC	2,135	4,946,539	0.0004
WELLS FARGO BANK MINNESOTA NA	1,869	4,220,603	0.0004
JPMORGAN SECURITIES (ASIA PACIFIC)	1,858	325,316	0.0057
WEDBUSH SECURITIES INC.	1,763	54,980	0.0321
NORTHLAND SECURITIES INC.	1,586	45,331	0.0350
B. RILEY AND CO., LLC	1,491	47,310	0.0315
DOUGHERTY & COMPANY LLC	1,457	38,570	0.0378
KEMPEN AND CO N.V.	1,317	24,200	0.0544
GOLDMAN, SACHS & CO.	1,271	2,542,350	0.0005
CITIGROUP GLOBAL MARKETS INC.CP AND CD	1,159	103,478	0.0112
US PHYSICALS	1,120	28,193	0.0397
JONESTRADING INSTITUTIONAL SERVICES, LLC.	1,014	89,594	0.0113
OTHER (115 firms less than $1,000 each)	25,310	954,134,398	0.0000
Total	**$161,139**	**978,093,365**	
Average Commission Rates			**$0.0002**

Notes

You may write me down in history with your bitter, twisted lies, you may trod me in the very dirt but still, like dust, I'll rise. Does my sassiness upset you? Why are you beset with gloom? 'Cause I walk like I've got oil wells pumping in my living room. Just like moons and like suns, with the certainty of tides, just like hopes springing high, still I'll rise. Did you want to see me broken? Bowed head and lowered eyes? Shoulders falling down like teardro… …y my soulful cries? Does my haughtiness offend you? Don't y… …'cause I laugh like I've got gold mines diggin' in my… …hoot me with your words, you may cut me with your… …your hatefulness, but still, like air, I'll rise. Does… …es it come as a surprise that I dance like I've got di… …thighs? Out of the huts of history's shame rise u… …in pain I rise I'm a black ocean, leaping and wide, w… …ar in the tide. Leaving behind nights of terror and fear… …that's wondrously clear I rise Bringing the gift that my ance… …am the dream and the hope of the slave. I rise I rise I rise.

Maya Angelou

Birthplace: St. Louis, Missouri

Poet, singer, memoirist and civil rights activist.

"You can't really know where you are going until you know where you have been."

Actuary's Certification Letter

GRS Retirement Consulting

800.521.0498 | P: 248.799.9000 | F: 248.799.9020 | www.grsconsulting.com

September 23, 2019

Retirement Board
Missouri Department of Transportation
and Highway Patrol Employees' Retirement System
1913 William Street
Jefferson City, Missouri 65102-1930

Ladies and Gentlemen:

This report was prepared at the request of the Board and is intended for use by the Retirement System and those designated or approved by the Board. This report may be provided to parties other than the System only in its entirety and only with the permission of the Board. GRS is not responsible for unauthorized use of this report. This report should not be relied on for any purpose other than the purpose described.

The basic financial objective of the Missouri Department of Transportation and Highway Patrol Employees' Retirement System (MPERS) is to establish and receive contributions which:

(1) when expressed in terms of percents of active member payroll, will remain approximately level from generation to generation of Missouri citizens; and
(2) when combined with present assets and future investment returns, will be sufficient to meet the present and future financial obligations of MPERS.

In order to measure progress toward this fundamental objective, MPERS has annual actuarial valuations performed. The valuations (i) measure the present financial position, and (ii) establish contribution rates that provide for the current cost and level percent-of-payroll amortization of unfunded actuarial liabilities over a reasonable period. An actuarial valuation was performed based upon benefit conditions, data and assumptions as of June 30, 2019. This valuation indicates that contribution rates for the period beginning July 1, 2020 that are at least equal to the calculated contribution rates will meet the Board's financial objective. The calculated contribution rates are 58.00% of payroll for the 6,210 Non-Uniformed employees and 58.00% of payroll for the 1,211 Uniformed patrol employees.

The plan administrative staff provides the actuary with data for the actuarial valuation. The actuary relies on the data after reviewing it for internal and year to year consistency. Member data was not audited by the actuary. The actuary summarizes and tabulates population data in order to analyze longer term trends. We are not responsible for the accuracy or completeness of the data provided by MPERS.

Retirement Board
September 23, 2019
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Gabriel, Roeder, Smith & Company was responsible for the following schedules found in the Actuarial Section:

Summary of Actuarial Assumptions and Methods
- Probabilities of Separation from Active Employment
- Individual Salary Increases
- Joint Life Retirement Values
- Probabilities of Retirement for Members
- Probabilities of Disability for Members

Summary of Member Data Included in Valuations
- Active Members by Attained Age and Years of Service
- Schedule of Active Member Valuation Data

Solvency Test
Derivation of Financial Experience
Schedule of Retirees and Beneficiaries Added and Removed
Summary of Plan Provisions
Legislative Changes

Gabriel, Roeder, Smith & Company was responsible for the following schedules found in the Financial Section:

- Schedule of Changes in the Employer's Net Pension Liability
- Schedule of Employer's Net Pension Liability
- Schedule of Employer Contributions
- Schedule of the Actuarially Determined Contributions

Actuarial valuations are based upon assumptions regarding future activity in specific risk areas including the rates of investment return and payroll growth, eligibility for the various classes of benefits, and longevity among retired lives. These assumptions are adopted by the Board. The assumptions and the methods comply with the requirements of the Governmental Accounting Standards Board. Each actuarial valuation takes into account all prior differences between actual and assumed experience in each risk area and adjusts the contribution rates as needed. Actuarial methods and assumptions were adopted by the Board pursuant to the June 30, 2017 Experience Study. Gabriel, Roeder, Smith & Company has produced the following reports as of June 30, 2019:

- Annual Actuarial Valuation Report
- GASB Nos. 67 and 68 Valuation Report

In order to gain a full understanding of the condition of this plan, these reports should be read in their entirety.

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To the best of our knowledge, the report is complete and accurate and was made in accordance with standards of practice promulgated by the Actuarial Standards Board. The assumptions and methods used for funding purposes meet the parameters set by Actuarial Standards of Practice. The actuarial assumptions used for the valuation produce results which, individually and in the aggregate, are reasonable.

The employer contributions determined in this report are based on Board funding policy. This policy is discussed on page 3 of the annual actuarial valuation report. We commend the Board for its aggressive monitoring and updating of the funding policy over the recent past. However, continued employer contributions at the current level do not guarantee benefit security. We therefore encourage the Board to continue to routinely monitor and update its funding policy and to continue to consider benefit security when doing so.

Future actuarial measurements may differ significantly from the current measurements presented in this report due to such factors as the following: plan experience differing from that anticipated by the economic or demographic assumptions; changes in economic or demographic assumptions; increases or decreases expected as part of the natural operation of the methodology used for these measurements (such as the end of an amortization period or additional cost or contribution requirements based on the plan's funded status); and changes in plan provisions or applicable law.

This report has been prepared by individuals who have substantial experience valuing public employee retirement systems. Heidi G. Barry is a Member of the American Academy of Actuaries (MAAA) and meets the Qualification Standards of the American Academy of Actuaries to render the actuarial opinions contained herein.

The signing individuals are independent of the plan sponsor.

Based upon the valuation results, it is our opinion that the Missouri Department of Transportation and Highway Patrol Employees' Retirement System continues to operate in accordance with actuarial principles of level percent-of-payroll financing. It is important to the well-being of the System that it continues to receive contributions at the actuarially determined levels. It is also important to continue to monitor both the total funded status and the funded status of the retiree liabilities to ensure that the funding policy is consistent with the expected life span of the respective unfunded obligation.

Respectfully submitted,

Heidi G Barry   Kenneth G. Alberts

Heidi G. Barry, ASA, FCA, MAAA   Kenneth G. Alberts

Summary of Actuarial Methods and Assumptions

Valuation Date:..June 30, 2019
Actuarial Cost Method:..Entry Age
Amortized Method:..Closed, level percent-of-payroll
Remaining Amortization Period:..13 years*
Asset Valuation Method:..3-year smoothing
Actuarial Assumptions:

Investment Rate of Return:..7.00%
Projected Salary Increase:..3.00% to 12.45%
Cost-of-Living Adjustments:..1.80% Compound
Includes Wage Inflation at:..3.00%

**Single equivalent period.*

An actuarial valuation is based upon an actuarial cost method, an asset valuation method, and actuarial assumptions. These methods and assumptions are chosen by the Board of Trustees after consultation with the Actuary and other advisors.

The actuarial cost method is called the Entry Age Actuarial Cost Method. This method is consistent with the Board's level percent-of-payroll funding objective. With this method, the level percent-of-payroll is determined that will fund a member's retirement benefit over the member's entire working lifetime, from date of hire (Entry Age) to date of exit from the active member population. Differences in the past between assumed and actual experience become part of unfunded actuarial accrued liabilities and are amortized with level percent-of-payroll contributions. This cost method was first used in the June 30, 1999 valuation.

The asset valuation method is a three-year smoothed market value method in which assumed investment return is recognized immediately each year and differences between actual and assumed investment return are phased-in over a closed three-year period. This asset valuation method is intended to give recognition to the long term accuracy of market values while filtering out and dampening short term market swings. This method was first used in the June 30, 1999 valuation.

The actuarial assumptions used in producing the valuation fall into two broad classes: economic assumptions, and demographic assumptions. Economic assumptions refer to long term rates of investment return, wage growth, covered population growth, and inflation. Demographic assumptions refer to retirement rates, turnover rates, disability rates, merit and seniority pay increases, and mortality rates. The current assumptions are based upon a 2012-2017 study of experience of the MPERS. The assumptions are reviewed from time to time to keep them reasonably current with expected experience. The next experience study is scheduled to follow the June 30, 2022 valuation.

Economic Assumptions

The investment return rate used in making the valuation was 7.00% per year, compounded annually (net after administrative expenses). This rate of return is not the assumed real rate of return. The real rate of return over wage inflation is defined to be the portion of investment return which is more than the wage inflation rate. Considering wage inflation recognition of 3.00%, the 7.00% rate translates to an assumed real rate of return over wage inflation of 4.00%. This rate was first used for the June 30, 2018 valuation.

Pay increase assumptions for individual active members are shown on Table I. Part of the assumption for each year of service is for a merit and/or seniority increase, and the other 3.00% recognizes wage inflation. These rates were first used for the June 30, 2018 valuation.

Summary of Actuarial Assumptions and Methods

Price Inflation is assumed to be 2.25%. This results in a 1.8% annual COLA assumption. It is assumed that the 1.8% COLA will always be paid.

The Active Member Group size is assumed to remain constant at its present level.

The active member payroll for all members is assumed to increase 3.00% annually.

Non-Economic Assumptions

The mortality table used to measure Post-Retirement Healthy Mortality Rates are from the RP-2014 Healthy Annuitant Mortality Tables projected to 2022 using projection scale MP-2017, shown in Table II. Post-Retirement Disabled Mortality Rates use the RP-2014 Disabled Retiree Annuitant Mortality Tables projected to 2022 using projection scale MP-2017, shown in Table III. Pre-Retirement Mortality Rates use the RP-2014 Employee Mortality Tables projected to 2022 using projection scale MP-2017 and multiplied by a factor of 65%, shown in Table IV. These tables were first used for the June 30, 2018 valuation.

The probabilities of retirement for members eligible to retire are shown on Table VI. The rates for full retirement were first used in the June 30, 2018 valuation. The rates for reduced retirement were first used in the June 30, 2018 valuation. Upon retirement, members are assumed to pick the BackDROP period that when combined with the remaining annuity produces the highest liability.

The probabilities of disability for members eligible to retire are shown on Table VII. The rates for disability were first used in the June 30, 2018 valuation.

The probabilities of withdrawal from service, death-in-service and disability are shown for sample ages on Table VIII. The death-in-service and disability rates were first used in the June 30, 2018 valuation. The withdrawal rates were first used in the June 30, 2018 valuation.

The data about persons now covered and about present assets was furnished by the System's administrative staff. Although examined for general reasonableness, the data was not audited by the Actuary. Data was furnished as of May 31 and assumed to be statistically equivalent to June 30.

The actuarial valuation computations were made by or under the supervision of a Member of the American Academy of Actuaries (MAAA).

Probabilities of Separation From Active Employment
Less Than 5 Years of Service

	MoDOT, Civilian Patrol and MPERS		Uniformed Patrol	
Service	Male	Female	Male	Female
0-1	30.00%	20.00%	12.00%	12.00%
1-2	16.00	14.00	6.00	6.00
2-3	9.00	11.00	2.50	2.50
3-4	7.00	9.00	2.50	2.50
4-5	5.50	6.00	2.50	2.50

Probabilities of Separation From Active Employment
More Than 5 Years of Service

	MoDOT, Civilian Patrol and MPERS		Uniformed Patrol	
Age	Male	Female	Male	Female
25	5.60%	6.00%	1.89%	1.89%
30	5.60	6.00	1.89	1.89
35	5.25	6.00	1.34	1.34
40	4.90	5.54	0.79	0.79
45	2.80	4.32	0.55	0.55
50	2.10	3.00	0.32	0.32
55	1.40	3.00	0.16	0.16
60	1.40	3.00	0.12	0.12

Salary Increase Assumptions
Service Based
% Merit Increases in Salaries Next Year

Service Index	MoDOT, Civilian Patrol and MPERS Rate	Uniformed Patrol Rate
1	6.80%	9.45%
2	4.50	5.00
3	2.80	2.75
4	1.50	2.50
5	1.00	2.00
6	0.80	1.50
7	0.00	1.25
8	0.00	1.25
9	0.00	1.00
10	0.00	0.75
11	0.00	0.75
12	0.00	0.75
13	0.00	0.50
14	0.00	0.50
15	0.00	0.25
16	0.00	0.25
17	0.00	0.25
18	0.00	0.25
19	0.00	0.25
20	0.00	0.25
21	0.00	0.00
22	0.00	0.00
23	0.00	0.00
24	0.00	0.00
25	0.00	0.00

Joint Life Retirement Values
(7.00% Interest)

Sample Attained Ages	Present Value of $1 Monthly for Life		Percent Dying Next Year		Future Life Expectancy (years)	
	Men	Women	Men	Women	Men	Women
50	$149.37	$153.84	0.3922%	0.2660%	32.36	34.85
55	142.00	147.02	0.5582%	0.3734%	28.05	30.34
60	132.97	138.52	0.7938%	0.5667%	23.89	25.97
65	122.06	128.13	1.1511%	0.8398%	19.90	21.76
70	109.01	115.45	1.7034%	1.2770%	16.11	17.74
75	93.80	100.44	2.6823%	2.0723%	12.58	13.97
80	76.99	83.55	4.5024%	3.5553%	9.41	10.56

The present values shown above are for illustrative purposes only and include a 50% survivor benefit but do not include the value of future post-retirement increases. Males are assumed to be 3 years older than their spouses.

Summary of Actuarial Assumptions and Methods

Percent of Eligible Active Members Retiring Next Year
(Rates of Retirement)

Closed and Year 2000 Plans

	MoDOT, Civilian Patrol and MPERS				Uniformed Patrol	
	Male		Female		Male	Female
Age	Normal	Early	Normal	Early	Normal	
50	40.00%	0.00%	25.00%	0.00 %	45.00%	45.00%
55	27.00	3.00	32.00	3.00	25.00	25.00
60	19.00	5.00	22.00	5.00	100.00	100.00
65	35.00	0.00	35.00	0.00	100.00	100.00
70	40.00	0.00	50.00	0.00	100.00	100.00

Year 2000 Plan – 2011 Tier

	MoDOT, Civilian Patrol and MPERS Normal		Uniformed Patrol	
Age	Age & Service	Rule of 90	Early	Normal
55	0.00%	30.00%	0.00%	30.00%
60	0.00	30.00	0.00	100.00
65	0.00	30.00	10.00	100.00
70	100.00	100.00	0.00	100.00

Percent of Members Becoming Disabled at the Indicated Age
(Rates of Disability)

	MoDOT, Civilian Patrol and MPERS		Uniformed Patrol	
Age	Male	Female	Male	Female
25	0.08%	0.08%	0.10%	0.10%
30	0.10	0.10	0.10	0.10
35	0.13	0.13	0.10	0.10
40	0.17	0.17	0.10	0.10
45	0.27	0.27	0.10	0.10
50	0.46	0.46	0.10	0.10
55	0.86	0.86	0.10	0.10
60	1.49	1.49	0.10	0.10

Summary of Funding and Contributions

Schedule of Funding Progress

Year Ended June 30	Actuarial Asset Value	Accrued Liability – Entry Age	Unfunded Accrued Liability (UAAL)	Funded Ratio	Actuarial Covered Payroll(1)	UAAL as a Percentage of Covered Payroll
2010	1,375,844,573	3,258,866,925	1,883,022,352	42.22%	378,063,006	498.07%
2011	1,427,290,718	3,297,589,869	1,870,299,151	43.28%	362,654,376	515.72%
2012	1,531,033,613	3,306,278,671	1,775,245,058	46.31%	341,637,559	519.63%
2013	1,657,402,393	3,583,975,559	1,926,573,166	46.24%	329,481,506	584.73%
2014	1,795,264,291	3,650,241,741	1,854,977,450	49.18%	336,590,797	551.11%
2015	1,967,001,509	3,715,845,651	1,748,844,142	52.94%	342,264,593	510.96%
2016	2,086,654,348	3,761,733,004	1,675,078,656	55.47%	344,275,147	486.55%
2017	2,172,787,144	3,802,443,730	1,629,656,586	57.14%	356,142,973	457.58%
2018	2,274,248,122	3,981,838,941	1,707,590,819	57.12%	353,371,000	483.23%
2019	2,415,343,431	4,037,369,708	1,622,026,277	59.82%	363,356,771	447.63%

(1) Values are estimated from contribution rate and amount.
(2) New assumptions and/or methods adopted.

See Note 5 of Notes to the Financial Statement in the Financial Section for Funding policy information.

Member and Employer Contribution Rates

Year Ended June 30	Employer Contributions All Benefit Structures		Member Contributions
	Uniformed Patrol Group	Non-Uniformed Group	2011 Tier All Groups
2010	39.95%	31.40%	4.00%
2011	49.53%	39.46%	4.00%
2012	58.63%	45.45%	4.00%
2013	55.03%	50.92%	4.00%
2014	55.23%	54.25%	4.00%
2015	58.19%	58.76%	4.00%
2016	57.76%	58.05%	4.00%
2017	58.00%	58.00%	4.00%
2018	58.00%	58.00%	4.00%
2019	58.00%	58.00%	4.00%

See Required Supplementary Information, Schedule of Employers' Contributions for more information.

Summary of Member Data Included In Valuations

	Non-Uniformed Civilian Patrol	Non-Uniformed MoDOT and MPERS	Non-Uniformed Total	Uniformed Patrol	Grand Total
Active Members					
Closed Plan	265	1,460	1,725	493	2,218
Year 2000 Plan (also closed)	402	1,577	1,979	368	2,347
Year 2000 Plan - 2011 Tier (open)	446	2,060	2,506	350	2,856
Total Active Members	1,113	5,097	6,210	1,211	7,421
Total Active Members Prior Year	1,114	5,046	6,160	1,231	7,391
Retiree - Regular Pensioners					
Closed Plan	488	3,374	3,862	971	4,833
Year 2000 Plan (also closed)	583	3,465	4,048	8	4,056
Year 2000 Plan - 2011 Tier (open)	3	2	5	0	5
Total Regular Pensioners	1,074	6,841	7,915	979	8,894
Self Insured Disability Pensioners	3	41	44	3	47
Fully Insured Disability Pensioners	11	76	87	7	94
Terminated Vested Members	240	1,626	1,866	176	2,042
Total	**2,441**	**13,681**	**16,122**	**2,376**	**18,498**
Active Member Valuation Payroll	$49,980,131	$224,584,899	$274,565,030	$84,731,026	$359,296,056
Active Member Valuation Payroll Prior Year	$47,859,971	$219,664,025	$267,523,996	$83,972,559	$351,496,555
Unfunded Actuarial Accrued Liability	N/A	N/A	$1,176,812,729	$445,213,548	$1,622,026,277

Member data for actuarial valuation is as of May 31, 2019.

Active Members By Attained Age and Years of Service

MoDOT and MPERS

Closed Plan

Attained Age	Counted by Complete Years of Service to Valuation Date							Totals	
	0-4	5-9	10-14	15-19	20-24	25-29	30+	No.	Valuation Payroll
Under 20	-	-	-	-	-	-	-	0	$0
20-24	-	-	-	-	-	-	-	0	0
25-29	-	-	-	-	-	-	-	0	0
30-34	-	-	-	-	-	-	-	0	0
35-39	-	-	-	7	8	-	-	15	669,645
40-44	-	1	2	59	94	1	-	157	7,906,408
45-49	-	2	-	42	200	108	3	355	19,357,633
50-54	-	2	2	47	140	200	55	446	24,283,753
55-59	-	2	2	28	122	77	86	317	16,549,817
60-64	-	-	-	10	55	49	32	146	7,364,119
65-69	-	-	-	4	5	8	4	21	1,073,797
70+	-	-	-	-	-	-	3	3	303,163
Totals	**0**	**7**	**6**	**197**	**624**	**443**	**183**	**1,460**	**$77,508,335**

Average Age	**51.9 years**
Average Service	**24.6 years**
Average Pay	**$53,088**

Year 2000 Plan

Attained Age	Counted by Complete Years of Service to Valuation Date							Totals	
	0-4	5-9	10-14	15-19	20-24	25-29	30+	No.	Valuation Payroll
Under 20	-	-	-	-	-	-	-	0	$0
20-24	-	-	-	-	-	-	-	0	0
25-29	-	1				-	-	1	40,232
30-34	7	18	81	1		-	-	107	4,701,946
35-39	4	20	180	80		-	-	284	13,075,670
40-44	8	21	127	149	1	-	-	306	14,222,226
45-49	10	29	101	111	1	-	-	252	11,380,935
50-54	5	11	97	106	3	-	-	222	9,504,141
55-59	3	21	93	119	2	3	-	241	10,234,234
60-64	2	12	67	54	2	-	-	137	5,717,346
65-69	1	1	12	9	-	-	1	24	1,060,880
70+	-	-	2	1	-	-	-	3	132,187
Totals	**40**	**134**	**760**	**630**	**9**	**3**	**1**	**1,577**	**$70,069,797**

Average Age	**47.1 years**
Average Service	**13.8 years**
Average Pay	**$44,432**

Member data for actuarial valuation is as of May 31, 2019.

Active Members By Attained Age and Years of Service

MoDOT and MPERS

Year 2000 Plan - 2011 Tier

	Counted by Complete Years of Service to Valuation Date							Totals	
Attained Age	**0-4**	**5-9**	**10-14**	**15-19**	**20-24**	**25-29**	**30+**	**No.**	**Valuation Payroll**
Under 20	12	-	-	-	-	-	-	12	$325,660
20-24	211		-	-	-	-	-	211	7,158,771
25-29	396	49	-	-	-	-	-	445	17,352,884
30-34	299	77	-	-	-	-	-	376	14,376,505
35-39	213	63	-	-	-	-	-	276	10,191,296
40-44	153	42	-	-	-	-	-	195	7,118,170
45-49	138	41	-	-	-	-	-	179	6,898,848
50-54	112	43	-	-	-	-	-	155	5,608,847
55-59	82	45	-	-	-	-	-	127	4,847,024
60-64	45	25	-	-	-	-	-	70	2,556,580
65-69	6	6	-	-	-	-	-	12	503,362
70+	2	-	-	-	-	-	-	2	68,820
Totals	**1,669**	**391**	**0**	**0**	**0**	**0**	**0**	**2,060**	**$77,006,767**

Average Age	**37.1 years**
Average Service	**2.9 years**
Average Pay	**$37,382**

Member data for actuarial valuation is as of May 31, 2019.

Active Members By Attained Age and Years of Service

Uniformed Patrol

Closed Plan

Attained Age	Counted by Complete Years of Service to Valuation Date							Totals	
	0-4	5-9	10-14	15-19	20-24	25-29	30+	No.	Valuation Payroll
Under 20	-	-	-	-	-	-	-	0	$0
20-24	-	-	-	-	-	-	-	0	0
25-29	-	-	-	-	-	-	-	0	0
30-34	-	-	-	-	-	-	-	0	0
35-39	-	1	-	-	-	-	-	1	51,510
40-44	-	-	-	15	33	-	-	48	3,866,151
45-49	-	-	1	8	135	46	-	190	15,471,071
50-54	1	-	-	4	73	100	21	199	16,517,323
55-59	-	-	-	1	11	16	26	54	4,542,200
60-64	-	-	-	-	-	1	-	1	73,678
65-69	-	-	-	-	-	-	-	0	0
70+	-	-	-	-	-	-	-	0	0
Totals	**1**	**1**	**1**	**28**	**252**	**163**	**47**	**493**	**$40,521,933**

Average Age	**49.7 years**
Average Service	**24.9 years**
Average Pay	**$82,195**

Year 2000 Plan

Attained Age	Counted by Complete Years of Service to Valuation Date							Totals	
	0-4	5-9	10-14	15-19	20-24	25-29	30+	No.	Valuation Payroll
Under 20	-	-	-	-	-	-	-	0	$0
20-24	-	-	-	-	-	-	-	0	0
25-29	-	1	-	-	-	-	-	1	59,142
30-34	-	31	50	1	-	-	-	82	5,014,959
35-39	-	10	82	28	-	-	-	120	8,224,928
40-44	-	3	33	64	1	-	-	101	7,525,575
45-49	-	4	15	32	-	-	-	51	3,502,056
50-54	-	-	3	7	-	-	-	10	688,554
55-59	-	-	2	1	-	-	-	3	206,157
60-64	-	-	-	-	-	-	-	0	0
65-69	-	-	-	-	-	-	-	0	0
70+	-	-	-	-	-	-	-	0	0
Totals	**0**	**49**	**185**	**133**	**1**	**0**	**0**	**368**	**$25,221,371**

Average Age	**39.2 years**
Average Service	**13.7 years**
Average Pay	**$68,536**

Member data for actuarial valuation is as of May 31, 2019.

Active Members By Attained Age and Years of Service

Uniformed Patrol

Year 2000 Plan - 2011 Tier

Attained Age	Counted by Complete Years of Service to Valuation Date							Totals	
	0-4	5-9	10-14	15-19	20-24	25-29	30+	No.	Valuation Payroll
Under 20	-	-	-	-	-	-	-	0	$0
20-24	48	-	-	-	-	-	-	48	2,517,867
25-29	100	44	-	-	-	-	-	144	7,680,879
30-34	29	88	-	-	-	-	-	117	6,518,140
35-39	11	12	-	-	-	-	-	23	1,265,815
40-44	5	8	-	-	-	-	-	13	722,169
45-49	-	2	-	-	-	-	-	2	115,409
50-54	1	2	-	-	-	-	-	3	167,443
55-59	-	-	-	-	-	-	-	0	0
60-64	-	-	-	-	-	-	-	0	0
65-69	-	-	-	-	-	-	-	0	0
70+	-	-	-	-	-	-	-	0	0
Totals	**194**	**156**	**0**	**0**	**0**	**0**	**0**	**350**	**$18,987,722**

Average Age	**29.6 years**
Average Service	**4.3 years**
Average Pay	**$54,251**

Member data for actuarial valuation is as of May 31, 2019.

Active Members By Attained Age and Years of Service

Civilian Patrol

Closed Plan

Attained Age	0-4	5-9	10-14	15-19	20-24	25-29	30+	No.	Valuation Payroll
	Counted by Complete Years of Service to Valuation Date							Totals	
Under 20	-	-	-	-	-	-	-	0	$0
20-24	-	-	-	-	-	-	-	0	0
25-29	-	-	-	-	-	-	-	0	0
30-34	-	-	-	-	-	-	-	0	0
35-39	-	-	-	1	-	-	-	1	33,182
40-44	-	-	-	5	16	1	-	22	1,114,785
45-49	-	1	-	7	35	11	-	54	2,759,881
50-54	-	2	1	8	35	28	13	87	4,658,512
55-59	1	1	1	4	24	15	19	65	3,371,554
60-64	-	-	1	2	13	7	5	28	1,329,963
65-69	-	-	-	1	3	-	2	6	299,302
70+	-	-	-	-	1	-	1	2	67,065
Totals	**1**	**4**	**3**	**28**	**127**	**62**	**40**	**265**	**$13,634,244**

Average Age	**52.7 years**
Average Service	**24.7 years**
Average Pay	**$51,450**

Year 2000 Plan

Attained Age	0-4	5-9	10-14	15-19	20-24	25-29	30+	No.	Valuation Payroll
	Counted by Complete Years of Service to Valuation Date							Totals	
Under 20	-	-	-	-	-	-	-	0	$0
20-24	-	-	-	-	-	-	-	0	0
25-29	1	-	1	-	-	-	-	2	96,878
30-34	1	15	23	1	-	-	-	40	1,977,243
35-39	1	15	44	23	-	-	-	83	4,013,615
40-44	3	12	29	27	-	-	-	71	3,597,651
45-49	-	9	22	23	1	-	-	55	2,556,761
50-54	2	8	30	19	1	-	-	60	2,733,590
55-59	1	9	16	23	2	-	-	51	2,320,363
60-64	-	6	10	9	2	-	-	27	1,104,569
65-69	1	5	-	3	1	-	-	10	358,004
70+	-	-	2	1	-	-	-	3	82,168
Totals	**10**	**79**	**177**	**129**	**7**	**0**	**0**	**402**	**$18,840,842**

Average Age	**46.2 years**
Average Service	**13.1 years**
Average Pay	**$46,868**

Member data for actuarial valuation is as of May 31, 2019.

Active Members By Attained Age and Years of Service

Civilian Patrol

Year 2000 Plan - 2011 Tier

Attained Age	Counted by Complete Years of Service to Valuation Date: 0-4	5-9	10-14	15-19	20-24	25-29	30+	Totals: No.	Valuation Payroll
Under 20	-	-	-	-	-	-	-	0	$0
20-24	38	-	-	-	-	-	-	38	1,290,870
25-29	81	15	-	-	-	-	-	96	3,934,115
30-34	44	38	-	-	-	-	-	82	3,545,588
35-39	31	16	-	-	-	-	-	47	2,043,674
40-44	19	15	-	-	-	-	-	34	1,320,858
45-49	25	19	-	-	-	-	-	44	1,721,453
50-54	25	14	-	-	-	-	-	39	1,407,647
55-59	28	10	-	-	-	-	-	38	1,316,737
60-64	13	9	-	-	-	-	-	22	726,383
65-69	3	3	-	-	-	-	-	6	197,720
70+	-	-	-	-	-	-	-	0	0
Totals	**307**	**139**	**0**	**0**	**0**	**0**	**0**	**446**	**$17,505,045**

Average Age	**38.7 years**
Average Service	**3.7 years**
Average Pay	**$39,249**

Member data for actuarial valuation is as of May 31, 2019.

Schedule of Active Member Valuation Data

Actuarial Valuation for June 30,	Number of Participating Employers	Number of Active Members	Covered Payroll	Average Pay	Percent Change in Average Pay from Prior Year
2010	3	8,457	369,911,252	43,740	1.7%
2011	3	8,231	361,639,001	43,936	0.4%
2012	3	7,458	329,293,168	44,153	0.5%
2013	3	7,319	323,205,767	44,160	0.0%
2014	3	7,390	332,085,689	44,937	1.8%
2015	3	7,358	334,400,980	45,447	1.1%
2016	3	7,441	339,799,379	45,666	0.5%
2017	3	7,456	348,979,212	46,805	2.5%
2018	3	7,391	351,496,555	47,557	1.6%
2019	3	7,421	359,296,056	48,416	1.8%
				Ten-Year Average	**1.2%**

Member data for actuarial valuation is as of May 31, 2019.

Solvency Test

The MPERS funding objective is to meet long term benefit promises through contributions that remain approximately level from year to year as a percent of member payroll. If the contributions to the System are level in concept and soundly executed, the System will pay all promised benefits when due – the ultimate test of financial soundness.

A solvency test is one means of checking a system's progress under its funding program. In a solvency test for a non-contributory plan, the plan's present assets (cash and investments) are compared with: 1) The liabilities for future benefits to present retired lives and 2) The liabilities for service already rendered by members. In a system that has been following the discipline of level percent-of-payroll financing, the liabilities for future benefits to present retired lives (liability 1) will be fully covered by present assets (except in rare circumstances). In addition, the liabilities for service already rendered by members (liability 2) will be partially covered by the remainder of present assets. The larger the funded portion of liability 2, the stronger the condition of the system.

The schedule below illustrates the history of liability 2 of the System.

Valuation Date June 30	(1) Member Contributions	(2) Retirees and Beneficiaries	(3) Active and Inactive Members	Present Valuation Assets	Portion of Present Values Covered by Present Assets			
					(1)	(2)	(3)	Total
	------------------------*Millions*------------------------							
2010*	0	2,034	1,225	1,376	100%	68%	0%	42%
2011	0	2,045	1,253	1,427	100%	70%	0%	43%
2012*	0	2,133	1,173	1,531	100%	72%	0%	46%
2013*	1	2,333	1,250	1,657	100%	71%	0%	46%
2014	2	2,384	1,264	1,795	100%	75%	0%	49%
2015	3	2,444	1,269	1,967	100%	80%	0%	53%
2016	5	2,470	1,287	2,087	100%	84%	0%	55%
2017	8	2,488	1,306	2,173	100%	87%	0%	57%
2018*	11	2,598	1,373	2,274	100%	87%	0%	57%
2019	14	2,656	1,367	2,415	100%	90%	0%	60%

** New assumptions and/or methods adopted.*

Derivation of Financial Experience

Actual experience will never coincide exactly with assumed experience (except by coincidence). Gains and losses may offset each other over a period of years, but sizeable year-to-year variations from assumed experience are common. Detail on the derivation of the experience gain (loss) is shown below.

UAAL Beginning of Year (at July 1)	$1,707,590,819
Normal Cost	48,532,753
Contributions	(218,595,641)
Interest	113,579,156
Net Change in LTD Assets	-
Expected UAAL Before Any Changes	1,651,107,087
Effect of Data Improvements	-
Effect of Changes in Assumptions & Methods	-
Effect of Adjustment	-
Expected UAAL After Changes	1,651,107,087
End of Year UAAL (at June 30)	1,622,026,277
Gain/(Loss) for Year	$29,080,810
Gain/(Loss) as a percent of actuarial accrued liabilities at start of year ($3,715.8 million)	0.7%

Valuation Date June 30	Experience Gain (Loss) as % of Beginning Accrued Liability
2010	(3.8)%
2011	2.2%
2012	3.2%
2013	2.1%
2014	2.1%
2015	2.4%
2016	1.1%
2017	0.1%
2018	0.6%
2019	0.7%

Schedule of Retirees and Beneficiaries Added and Removed

Valuation Date	Added to Rolls Number	Added to Rolls Annual Allowances	Removed from Rolls Number	Removed from Rolls Annual Allowances	Rolls End of Year Number	Rolls End of Year Annual Allowances	Average Annual Allowances	% Increase in Annual Allowance	% Increase in Average Annual Allowance
FY2019									
Retirees	308	$4,104,217	187	$2,746,320	7,077	$198,618,027	$28,065	2.54%	0.78%
Beneficiaries	133	1,424,022	130	1,211,576	1,866	$35,993,556	19,289	3.04%	2.87%
Disabilities	22	0	27	31,787	143	$855,947	5,986	1.26%	4.80%
FY2018									
Retirees	311	$3,842,195	201	$2,780,558	6,956	$193,705,411	$27,847	1.96%	0.34%
Beneficiaries	112	1,103,494	124	855,794	1,863	$34,930,984	18,750	1.97%	2.62%
Disabilities	18	0	25	26,921	148	$845,327	5,712	-2.82%	2.44%
FY2017									
Retirees	352	$4,642,501	196	$3,023,457	6,846	$189,990,373	$27,752	1.29%	-1.02%
Beneficiaries	127	1,536,955	134	1,099,249	1,875	$34,257,599	18,271	3.49%	3.88%
Disabilities	24	0	24	15,898	155	$869,833	5,576	-3.92%	-4.54%
FY2016									
Retirees	300	$3,820,071	193	$3,032,208	6,690	$187,571,039	$28,038	2.31%	0.68%
Beneficiaries	129	1,205,294	121	889,494	1,882	33,100,896	17,588	3.18%	2.74%
Disabilities	20	0	29	5,787	155	905,306	5,841	0.21%	6.05%
FY2015									
Retirees	406	$4,669,565	188	$2,712,395	6,583	$183,337,549	$27,850	2.61%	-0.79%
Beneficiaries	113	1,290,336	139	900,991	1,874	32,080,172	17,119	2.65%	4.07%
Disabilities	21	0	30	22,387	164	903,386	5,508	-3.43%	1.87%
FY2014									
Retirees	307	$4,434,888	176	$2,317,420	6,365	$178,670,075	$28,071	3.54%	1.41%
Beneficiaries	112	1,163,441	126	863,108	1,900	31,253,184	16,449	3.91%	4.68%
Disabilities	19	6,760	25	19,831	173	935,492	5,407	3.41%	6.40%
FY2013									
Retirees	395	$5,001,943	174	$2,761,791	6,234	$172,564,478	$27,681	4.56%	0.85%
Beneficiaries	130	1,349,835	96	717,434	1,914	30,077,515	15,714	6.79%	5.00%
Disabilities	27	0	23	6,788	179	904,683	5,082	-1.88%	-3.00%
FY2012									
Retirees	413	$5,988,784	171	$2,119,116	6,013	$165,042,751	$27,448	4.10%	-0.09%
Beneficiaries	130	1,206,259	105	610,931	1,880	28,166,374	14,966	5.20%	3.69%
Disabilities	34	0	25	16,712	175	922,027	5,239	0.39%	-5.31%
FY2011									
Retirees	311	$3,955,409	146	$2,406,006	5,771	$158,543,113	$27,472	0.74%	-2.14%
Beneficiaries	102	891,718	109	710,880	1,855	26,772,995	14,433	-1.17%	-0.79%
Disabilities	38	0	14	10,399	166	918,403	5,533	1.69%	-13.00%
FY2010									
Retirees	272	$3,218,890	137	$3,252,182	5,606	$157,380,575	$28,074	3.29%	0.80%
Beneficiaries	103	930,442	104	625,292	1,862	27,089,491	14,549	5.79%	5.85%
Disabilities	21	0	25	73,638	142	903,107	6,360	-40.95%	-39.29%

**New disabilities are covered / paid by the Standard Insurance Co.*
Data of this chart is As of June 30, 2019.

Summary of Plan Provisions *

For the Year Ended June 30, 2019

Plan Provision	Closed Plan	Year 2000 Plan	Year 2000 Plan - 2011 Tier
Membership Eligibility	• Members hired prior to July 1, 2000, who became vested, and worked or continue to work in a position normally requiring at least 1,040 hours of work annually	• Members hired for the first time on or after July 1, 2000, in a position normally requiring at least 1,040 hours of work annually • Members who left state employment prior to becoming vested and return to work (for 12 continuous months) on or after July 1, 2000, in a position normally requiring at least 1,040 hours of work annually	• Members hired for the first time on or after January 1, 2011, in a position normally requiring at least 1,040 hours of work annually • Members who have never worked for a state agency covered by MPERS or MOSERS prior to January 1, 2011
Normal Retirement Eligibility	• Age 65 & active with 4 years of service • Age 65 with 5 years of service • Age 60 with 15 years of service • "Rule of 80"/minimum age 48 Uniformed Members Only: • Age 55 & active with 4 years of service • Age 55 with 5 years of service • Mandatory retirement at age 60; no minimum service requirement (active only)	• Age 62 with 5 years of service • "Rule of 80"/minimum age 48 Uniformed Members Only: • Mandatory retirement at age 60; no minimum service requirement (active only)	• Age 67 with 5 years of service • "Rule of 90"/minimum age 55 Uniformed Members Only: • Age 55 & active with 5 years of creditable service (active only) • Mandatory retirement at age 60; no minimum service requirement (active only)
Early (Reduced) Retirement Eligibility	• Age 55 with 10 years creditable service	• Age 57 with 5 years creditable service	• Age 62 & active with 5 years of creditable service (active only)
Benefit Life Benefit	16% x FAP** x service (base benefit is increased by 33 1/2% for uniformed patrol members only)	17% x FAP** x service	17% x FAP** x service
Temporary Benefit	Not available	08% x FAP** x service Until age 62, only if retiring under "Rule of 80"	08% x FAP** x service Until age 62, only if retiring under "Rule of 90"
Special Benefit	Uniformed Members Only: $90/mo payable until age 65, offset by any amount earned from gainful employment (does not apply if hired on or after January 1, 1995)	Uniformed Members Only: Until age 62, if retiring under "Rule of 80" or at mandatory age 60	Uniformed Members Only: Until age 62, if retiring under either normal retirement eligibility provision
Death Benefit	$5,000 benefit paid to named beneficiary • Available to active employees or LTD recipients who retired after September 28, 1985 • Available work-related disability recipients after September 28, 1985	$5,000 benefit paid to named beneficiary • Available to active employees or LTD recipients who retired after September 28, 1985 • Available work-related disability recipients after September 28, 1985	$5,000 benefit paid to named beneficiary • Available to active employees or LTD recipients who retired after September 28, 1985 • Available work-related disability recipients after September 28, 1985
Vesting	5 years of service	5 years of service	5 years of service, if active on or after January 1, 2018

Summary of Plan Provisions *

Comparison of the Closed Plan, the Year 2000 Plan, and the Year 2000 Plan - 2011 Tier
For the Year Ended June 30, 2019

Plan Provision	Closed Plan	Year 2000 Plan	Year 2000 Plan - 2011 Tier
Cost-of-Living Allowance (COLA)	Annual COLA is equal to 80% of the change in the CPI-U with a maximum rate of 5%. Exception: If hired before August 28, 1997, annual COLA is a minimum of 4% until benefit increases reach 65% of the original benefit (cap). After 65% cap is reached, annual COLA will be equal to 80% of the change in the CPI-U, with a maximum rate of 5%.	Annual COLA is equal to 80% of the change in the CPI-U with a maximum rate of 5%.	Annual COLA is equal to 80% of the change in the CPI-U with a maximum rate of 5%.
Survivor Benefit (death before retirement) Non Duty-Related Death	If employee is vested: • Survivor benefit to eligible spouse calculated using the Joint & 100% survivor option or 80% of the member's life income annuity paid to eligible children under age 21 • If at least 3, but less than 5, years of service, the survivor benefit is calculated using 25% of the member's base benefit calculated as if the member retired on his/her date of death	If employee is vested: • Survivor benefit to eligible spouse calculated using the joint & 100% survivor option or 80% of the member's life income annuity paid to eligible children under age 21	If employee is vested: • Survivor benefit to eligible spouse calculated using the joint & 100% survivor option or 80% of the member's life income annuity paid to eligible children under age 21
Duty-Related Death	• Survivor benefit to eligible spouse or children no less than 50% of final average pay (no minimum service requirement)	• Survivor benefit to eligible spouse or children no less than 50% of final average pay (no minimum service requirement)	• Survivor benefit to eligible spouse or children no less than 50% of final average pay (no minimum service requirement)
Optional Forms of Payment	Payment options include: • Life income annuity • Unreduced joint & 50% survivor • Joint & 100% survivor • 60 or 120 guaranteed payments • BackDROP	Payment options include: • Life income annuity • Joint & 50% survivor • Joint & 100% survivor • 120 or 180 guaranteed payments • BackDROP	Payment options include: • Life income annuity • Joint & 50% survivor • Joint & 100% survivor • 120 or 180 guaranteed payments
Disability	Long-term disability and work-related disability	Long-term disability and work-related disability	Long-term disability and work-related disability
Employee Contributions	Non-contributory	Non-contributory	4% of gross pay

*This summary describes the plan provisions in chapter 104 of the Missouri Revised Statutes. It does not overrule any other applicable statute or administrative rule and, in the event of a conflict, the applicable statute or rule would apply. The Year 2000 Plan was effective July 1, 2000 and the Year 2000 Plan – 2011 Tier was effective January 1, 2011. A complete summary is available at the MPERS office.

**Final average pay (FAP) – average of highest 36 consecutive months of pay.

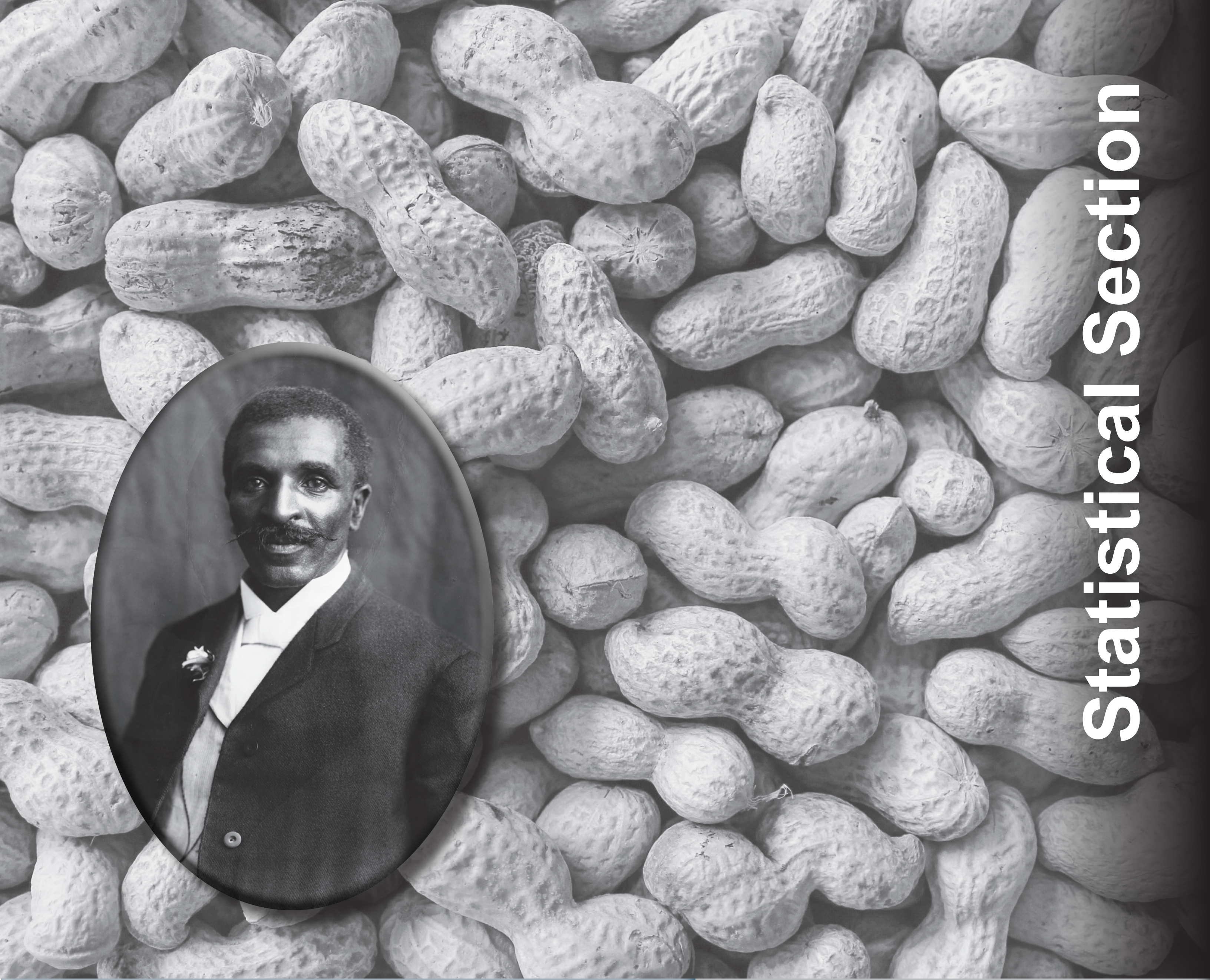
See Note 2 of Notes to the Financial Statements for more information.

Legislative Changes

During the 2019 legistlative session, no MPERS-related bills were signed into law.

Notes

Statistical Section



George Washington Carver

Birthplace: Diamond, Missouri

World-famous chemist, inventor and agricultural scientist.

"It is simply service that measures success."

Statistical Summary

Changes in Net Position
The chart on page 80 details a 10-year history of the additions (revenues) and deductions (expenses) of MPERS.

The chart on page 81 details a 10-year history of benefit payments by type.

Plan Membership
Overall, MPERS' membership increased by 186.

Retired members and their beneficiaries increased by 119, terminated-vested members increased by 66, and active members increased by 1.

Other charts and graphs in this section detail demographic information concerning our members and employers.

Sources: All non-accounting data in this section was derived from internal sources and the annual actuarial valuation reports. Member data may differ between some schedules because the valuations are performed using data as of May 31 each year.

Changes in Net Position

MoDOT and Patrol Employees' Retirement System
Changes in Net Position, Last Ten Fiscal Years

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Additions										
Employer Contributions	$124,052,534	$150,022,169	$164,880,140	$170,836,117	$183,353,841	$200,638,571	$199,609,396	$206,562,924	204,955,180	210,166,927
Employee Contributions (1)	0	45,361	202,843	503,550	1,282,379	2,086,000	2,503,824	3,238,502	3,721,983	4,449,428
Transfers from Other Systems (2)	0	17,609,276	264,954	1,727,834	1,784,382	1,114,437	2,729,679	1,752,050	1,867,445	2,432,370
Other Contributions	424,172	453,984	908,898	635,900	978,184	1,208,162	978,689	1,645,487	1,279,434	1,546,916
Net Investment Income	166,307,054	279,612,052	42,091,564	198,139,438	319,445,655	92,645,423	21,432,090	220,301,127	197,619,367	154,326,511
Other Income	33,145	33,141	13,760	1,650	125	148	5	614	472	307
Total Additions to Fiduciary Net Position	290,816,905	447,775,983	208,362,159	371,844,489	506,844,566	297,692,741	227,253,683	433,500,704	409,443,881	372,922,459
Deductions										
Benefit Payments	196,721,274	202,153,768	219,704,320	224,518,100	231,384,708	241,714,876	240,176,011	251,284,152	259,058,863	259,817,811
Administrative Expenses	2,512,181	2,658,849	2,934,969	2,997,225	3,736,355	4,066,944	4,370,860	4,515,458	4,693,492	4,372,966
Total Deductions from Fiduciary Net Position	199,233,455	204,812,617	222,639,289	227,515,325	235,121,063	245,781,820	244,546,871	255,799,610	263,752,355	264,190,777
Change in Net Position	**$91,583,450**	**$242,963,366**	**$(14,277,130)**	**$144,329,164**	**$271,723,503**	**$51,910,921**	**($17,293,188)**	**$177,701,094**	**$145,691,526**	**108,731,682**

(1) Employee contributions began January 1, 2011 for members in the Year 2000 Plan - 2011 Tier.
(2) 2011 transfer from MOSERS for Water Patrol employees.

Benefit Payments By Type

MoDOT and Patrol Employees' Retirement System
Benefit Payments by Type, Last Ten Fiscal Years

Type of Benefit	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Age and Service Benefits:										
Retiree and Survivor Annuity Payments	$183,103,253	$188,171,369	$195,964,396	$205,617,640	$212,840,210	$218,827,986	$224,098,038	$227,997,513	237,850,981	238,205,549
BackDROP Payments	10,358,181	10,792,932	18,138,891	13,426,923	13,438,730	16,366,338	10,677,166	16,887,349	14,546,108	15,424,880
Disability Benefits:										
Long-Term Disability	137,624	101,875	85,240	79,964	79,184	76,061	66,389	60,352	49,613	35,987
Work-Related Disability	664,469	648,320	668,821	691,227	774,541	716,047	718,009	707,953	714,197	711,990
Normal Disability	163,485	167,427	166,140	138,281	121,872	108,891	109,027	109,455	110,310	112,000
Insured Disability	1,759,262	1,696,845	1,592,517	1,512,685	1,531,578	1,554,676	1,567,825	1,620,418	1,601,605	1,615,860
Death Benefits	535,000	575,000	675,000	665,000	703,571	810,000	820,000	855,153	860,000	820,000
Service Transfer Payments[2]	0	0	2,410,526	2,357,080	1,876,336	3,147,482	1,921,451	2,724,631	2,823,042	2,111,007
Employee Contribution Refunds[1]	0	0	2,789	29,300	18,686	107,395	198,106	321,328	503,007	780,538
Total Benefits	**$196,721,274**	**$202,153,768**	**$219,704,320**	**$224,518,100**	**$231,384,708**	**$241,714,876**	**$240,176,011**	**$251,284,152**	**$259,058,863**	**$259,817,811**

(1) Employee contributions began January 1, 2011 for members in the Year 2000 Plan - 2011 Tier.
(2) Reciprocal transfer legislation enacted effective August 28, 2011.

BUDGET TO ACTUAL REPORT

As of June 30, 2019

	Annual Budget	Actual Year End	Actual % Spent	Budget Variance Favorable (Unfavorable)
Administrative Expenses				
Salary/Benefits	$ 2,082,170	$ 2,000,072	96.1%	$ 82,098
Professional Services	229,000	278,525	121.6%	(49,525)
Meetings/Travel/Education	27,150	23,087	85.0%	4,063
Member Education	16,250	9,795	60.3%	6,455
Office Supplies	6,500	7,111	109.4%	(611)
Printing/Postage	38,150	27,203	71.3%	10,947
Membership Dues/Subscriptions	18,315	16,262	88.8%	2,053
Utilities	40,220	34,776	86.5%	5,444
Building Expenses/Maintenance	70,860	61,810	87.2%	9,050
Rental/Lease	8,550	8,075	94.4%	475
Equipment/Furniture	7,400	3,541	47.9%	3,859
Information Technology	282,613	326,918	115.7%	(44,305)
Administrative Sub-total	$ 2,827,178	$ 2,797,175	98.9%	$ 30,003
Investment Expenses				
Salary/Benefits	$ 1,698,171	1,126,417	66.3%	571,754
Investment Services	633,800	624,635	98.6%	9,165
Meetings/Travel/Education	61,450	55,491	90.3%	5,959
Direct Operating Expenses	43,200	45,244	104.7%	(2,044)
Investment Sub-total	$ 2,436,621	$ 1,851,787	76.0%	$ 584,834
TOTALS	**$ 5,263,799**	**$ 4,648,962**	**88.3%**	**$ 614,837**

Reconciliation to Statement of Changes in Fiduciary Net Position, Administrative Expenses:

Total Administrative Expenses	$4,372,966
Investment General Consultant	336,701
Investment Custodian	272,934
Actuarial Experience Study	(9,000)
Depreciation Expense	(298,012)
OPEB Expense	(67,151)
OPEB Deferred Outflow	32,014
Capitalized Equipment Costs	8,510
	$4,648,962

Schedule of Retired Members By Type of Benefit

All Members*

Amount of Monthly Benefit	Retirement Normal	Retirement Early	Disability Normal	Disability Work-Related	Disability Long-Term	Survivor	Total Recipients
1 - 200	30	97	3	26	69	82	307
201 - 400	181	214	3	0	4	158	560
401 - 600	189	176	1	0	2	144	512
601 - 800	192	111	1	0	0	167	471
801 - 1000	175	62	3	2	1	156	399
1001 - 1200	264	38	1	1	0	136	440
1201 - 1400	332	18	0	1	0	138	489
1401 - 1600	431	13	1	1	0	107	553
1601 - 1800	469	7	1	1	0	101	579
1801 - 2000	473	4	0	5	0	87	569
2001 - 2200	422	1	0	4	0	79	506
2201 - 2400	318	1	0	3	0	67	389
2401 - 2600	297	0	0	2	0	62	361
2601 - 2800	267	2	0	1	0	58	328
2801 - 3000	273	0	0	2	0	48	323
> 3000	2,018	2	0	4	0	276	2,300
TOTALS	**6,331**	**746**	**14**	**53**	**76**	**1,866**	**9,086**

*** This chart includes ten retirement system staff retirees**

MoDOT

Amount of Monthly Benefit	Retirement Normal	Retirement Early	Disability Normal	Disability Work-Related	Disability Long-Term	Survivor	Total Recipients
1 - 200	22	74	3	22	55	76	252
201 - 400	135	178	3	0	3	136	455
401 - 600	139	146	1	0	1	126	413
601 - 800	141	100	1	0	0	147	389
801 - 1000	119	55	3	2	1	131	311
1001 - 1200	201	30	1	1	0	119	352
1201 - 1400	279	15	0	1	0	127	422
1401 - 1600	359	12	1	1	0	88	461
1601 - 1800	389	7	1	1	0	84	482
1801 - 2000	406	4	0	5	0	76	491
2001 - 2200	353	1	0	3	0	66	423
2201 - 2400	280	1	0	3	0	53	337
2401 - 2600	248	0	0	0	0	40	288
2601 - 2800	233	2	0	1	0	37	273
2801 - 3000	234	0	0	2	0	28	264
> 3000	1,169	1	0	3	0	203	1,376
TOTALS	**4,707**	**626**	**14**	**45**	**60**	**1,537**	**6,989**

Schedule of Retired Members By Type of Benefit

Uniformed Patrol

Amount of Monthly Benefit	Retirement Normal	Retirement Early	Disability Normal	Disability Work-Related	Disability Long-Term	Survivor	Total Recipients
1 - 200	0	0	0	3	4	0	7
201 - 400	6	0	0	0	0	5	11
401 - 600	9	0	0	0	0	5	14
601 - 800	14	0	0	0	0	2	16
801 - 1000	9	0	0	0	0	7	16
1001 - 1200	9	0	0	0	0	4	13
1201 - 1400	4	0	0	0	0	0	4
1401 - 1600	3	0	0	0	0	7	10
1601 - 1800	2	0	0	0	0	6	8
1801 - 2000	3	0	0	0	0	5	8
2001 - 2200	2	0	0	1	0	10	13
2201 - 2400	2	0	0	0	0	9	11
2401 - 2600	3	0	0	1	0	18	22
2601 - 2800	1	0	0	0	0	18	19
2801 - 3000	6	0	0	0	0	20	26
> 3000	728	0	0	1	0	67	796
TOTALS	**801**	**0**	**0**	**6**	**4**	**183**	**994**

Civilian Patrol

Amount of Monthly Benefit	Retirement Normal	Retirement Early	Disability Normal	Disability Work-Related	Disability Long-Term	Survivor	Total Recipients
1 - 200	7	23	0	1	10	6	47
201 - 400	40	36	0	0	1	17	94
401 - 600	41	30	0	0	1	13	85
601 - 800	37	11	0	0	0	18	66
801 - 1000	47	7	0	0	0	18	72
1001 - 1200	54	8	0	0	0	13	75
1201 - 1400	49	3	0	0	0	11	63
1401 - 1600	68	1	0	0	0	12	81
1601 - 1800	78	0	0	0	0	11	89
1801 - 2000	64	0	0	0	0	6	70
2001 - 2200	66	0	0	0	0	3	69
2201 - 2400	36	0	0	0	0	5	41
2401 - 2600	45	0	0	1	0	4	50
2601 - 2800	33	0	0	0	0	3	36
2801 - 3000	33	0	0	0	0	0	33
> 3000	116	0	0	0	0	6	122
TOTALS	**814**	**119**	**0**	**2**	**12**	**146**	**1,093**

Schedule of Average Monthly Benefit Payments

MoDOT

By Years of Service

Retired In Fiscal Year		0 - 10	11 - 15	16 - 20	21 - 25	26 - 30	31 - 35	36 - 40	41+
2010	**Average Benefit**	**$309**	**637**	**1,292**	**1,664**	**2,151**	**2,752**	**3,029**	**3,959**
2010	Average FAP	$2,319	2,500	3,155	3,513	3,692	3,944	4,015	4,008
2010	**Current Retirees**	**24**	**21**	**12**	**38**	**56**	**40**	**3**	**3**
2011	**Average Benefit**	**$331**	**668**	**1,177**	**1,711**	**2,561**	**3,033**	**3,258**	**4,724**
2011	Average FAP	$2,650	2,651	3,140	3,610	3,923	3,932	3,863	4,167
2011	**Current Retirees**	**20**	**33**	**21**	**39**	**64**	**35**	**6**	**3**
2012	**Average Benefit**	**$375**	**576**	**1,214**	**1,652**	**2,787**	**3,287**	**2,854**	**0**
2012	Average FAP	$3,190	2,820	3,447	3,438	4,195	4,272	3,777	0
2012	**Current Retirees**	**31**	**22**	**37**	**61**	**100**	**56**	**3**	**0**
2013	**Average Benefit**	**$313**	**620**	**1,326**	**1,783**	**3,000**	**3,220**	**5,489**	**2,875**
2013	Average FAP	$2,691	2,977	3,509	3,805	4,335	3,982	5,516	2,802
2013	**Current Retirees**	**32**	**33**	**40**	**65**	**98**	**27**	**2**	**1**
2014	**Average Benefit**	**$312**	**709**	**1,226**	**1,785**	**3,182**	**3,616**	**2,917**	**0**
2014	Average FAP	$2,444	3,069	3,493	3,849	4,509	4,606	3,781	0
2014	**Current Retirees**	**27**	**24**	**19**	**43**	**75**	**14**	**2**	**0**
2015	**Average Benefit**	**$328**	**642**	**1,182**	**1,800**	**3,062**	**3,686**	**3,147**	**0**
2015	Average FAP	$2,657	3,031	3,437	3,605	4,380	4,659	4,286	0
2015	**Current Retirees**	**51**	**60**	**38**	**50**	**77**	**19**	**2**	**0**
2016	**Average Benefit**	**$322**	**516**	**872**	**1,883**	**2,993**	**3,516**	**4,114**	**0**
2016	Average FAP	$2,828	2,695	2,889	3,754	4,325	4,727	5,147	0
2016	**Current Retirees**	**30**	**24**	**24**	**45**	**80**	**14**	**2**	**0**
2017	**Average Benefit**	**$339**	**536**	**939**	**1,814**	**3,077**	**3,693**	**3,018**	**0**
2017	Average FAP	$2,568	2,707	3,053	3,616	4,639	4,801	3,717	0
2017	**Current Retirees**	**38**	**31**	**30**	**54**	**83**	**12**	**3**	**0**
2018	**Average Benefit**	**$319**	**587**	**1,026**	**1,976**	**3,010**	**3,692**	**2,915**	**0**
2018	Average FAP	$2,583	3,021	3,381	3,933	4,559	4,957	3,909	0
2018	**Current Retirees**	**32**	**34**	**40**	**51**	**69**	**10**	**1**	**0**
2019	**Average Benefit**	**$319**	**645**	**1,044**	**1,864**	**2,886**	**3,240**	**3,050**	**0**
2019	Average FAP	$2,617	3,040	3,444	3,868	4,704	4,594	4,015	0
2019	**Current Retirees**	**33**	**23**	**37**	**49**	**64**	**14**	**4**	**0**

FAP = Final Average Pay

Schedule of Average Monthly Benefit Payments

Uniformed Patrol

By Years of Service

Retired In Fiscal Year		0-10	11-15	16-20	21-25	26-30	31-35	36-40	41+
2010	**Average Benefit**	**$0**	**1,202**	**1,645**	**0**	**5,327**	**7,158**	**7,796**	**0**
2010	Average FAP	$0	2,749	3,072	0	5,625	6,668	7,201	0
2010	**Current Retirees**	**0**	**3**	**1**	**0**	**7**	**8**	**2**	**0**
2011	**Average Benefit**	**$672**	**1,221**	**0**	**3,007**	**5,290**	**6,741**	**8,184**	**0**
2011	Average FAP	$2,245	3,051	0	4,595	5,981	6,366	6,746	0
2011	**Current Retirees**	**1**	**2**	**0**	**2**	**8**	**8**	**1**	**0**
2012	**Average Benefit**	**$0**	**766**	**0**	**4,107**	**5,228**	**6,682**	**0**	**0**
2012	Average FAP	$0	2,463	0	5,098	6,012	6,461	0	0
2012	**Current Retirees**	**0**	**1**	**0**	**1**	**9**	**16**	**0**	**0**
2013	**Average Benefit**	**$589**	**0**	**1,758**	**4,465**	**5,342**	**6,317**	**8,900**	**0**
2013	Average FAP	$1,972	0	3,917	6,507	6,419	6,505	7,510	0
2013	**Current Retirees**	**2**	**0**	**2**	**2**	**8**	**8**	**1**	**0**
2014	**Average Benefit**	**$507**	**0**	**0**	**3,946**	**5,382**	**6,542**	**7,442**	**0**
2014	Average FAP	$2,503	0	0	6,070	6,528	6,580	6,237	0
2014	**Current Retirees**	**5**	**0**	**0**	**1**	**24**	**11**	**1**	**0**
2015	**Average Benefit**	**$791**	**921**	**0**	**4,180**	**5,367**	**6,631**	**0**	**0**
2015	Average FAP	$3,119	4,458	0	6,736	6,655	6,951	0	0
2015	**Current Retirees**	**1**	**1**	**0**	**2**	**20**	**10**	**0**	**0**
2016	**Average Benefit**	**$295**	**1,058**	**0**	**4,128**	**4,940**	**6,306**	**0**	**0**
2016	Average FAP	$2,599	3,804	0	6,405	6,607	7,039	0	0
2016	**Current Retirees**	**1**	**1**	**0**	**4**	**13**	**4**	**0**	**0**
2017	**Average Benefit**	**$554**	**1,071**	**2,975**	**4,090**	**4,935**	**6,881**	**7,166**	**0**
2017	Average FAP	$2,791	3,804	5,548	5,621	6,786	7,148	7,077	0
2017	**Current Retirees**	**2**	**2**	**1**	**1**	**29**	**2**	**1**	**0**
2018	**Average Benefit**	**$386**	**1,031**	**1,487**	**3,723**	**4,799**	**0**	**0**	**0**
2018	Average FAP	$2,566	3,430	3,943	7,001	6,771	0	0	0
2018	**Current Retirees**	**2**	**3**	**1**	**4**	**25**	**0**	**0**	**0**
2019	**Average Benefit**	**$344**	**1,037**	**1,801**	**3,536**	**4,608**	**5,790**	**0**	**0**
2019	Average FAP	$2,748	3,589	4,417	6,051	6,930	7,472	0	0
2019	**Current Retirees**	**3**	**1**	**2**	**4**	**33**	**6**	**0**	**0**

FAP = Final Average Pay

Schedule of Average Monthly Benefit Payments

Civilian Patrol

By Years of Service

Retired In Fiscal Year		0-10	11-15	16-20	21-25	26-30	31-35	36-40	41+
2010	**Average Benefit**	**$279**	**535**	**1,312**	**1,305**	**2,758**	**2,177**	**4,333**	**0**
2010	Average FAP	$1,823	2,125	3,091	2,654	4,445	3,317	5,179	0
2010	**Current Retirees**	**7**	**3**	**5**	**8**	**4**	**2**	**2**	**0**
2011	**Average Benefit**	**$346**	**569**	**978**	**1,696**	**2,720**	**2,909**	**0**	**0**
2011	Average FAP	$2,526	2,265	2,469	3,496	4,096	3,842	0	0
2011	**Current Retirees**	**4**	**6**	**6**	**11**	**13**	**8**	**0**	**0**
2012	**Average Benefit**	**$292**	**561**	**1,377**	**1,439**	**2,435**	**2,448**	**0**	**0**
2012	Average FAP	$2,133	2,537	3,501	3,086	3,690	3,458	0	0
2012	**Current Retirees**	**7**	**4**	**4**	**7**	**16**	**6**	**0**	**0**
2013	**Average Benefit**	**$333**	**564**	**1,113**	**1,658**	**2,136**	**3,171**	**0**	**0**
2013	Average FAP	$2,723	2,551	2,888	3,332	3,359	4,003	0	0
2013	**Current Retirees**	**13**	**9**	**7**	**9**	**9**	**6**	**0**	**0**
2014	**Average Benefit**	**$310**	**577**	**994**	**1,793**	**2,604**	**2,627**	**0**	**0**
2014	Average FAP	$2,319	2,802	2,505	3,580	3,792	3,105	0	0
2014	**Current Retirees**	**9**	**12**	**7**	**7**	**13**	**3**	**0**	**0**
2015	**Average Benefit**	**$305**	**619**	**1,098**	**1,703**	**2,424**	**3,355**	**0**	**0**
2015	Average FAP	$2,342	2,586	2,999	3,453	3,785	4,911	0	0
2015	**Current Retirees**	**12**	**11**	**8**	**13**	**13**	**6**	**0**	**0**
2016	**Average Benefit**	**$173**	**582**	**907**	**1,965**	**2,473**	**4,493**	**0**	**0**
2016	Average FAP	$2,457	2,629	2,989	3,532	3,820	5,718	0	0
2016	**Current Retirees**	**6**	**9**	**5**	**8**	**15**	**1**	**0**	**0**
2017	**Average Benefit**	**$310**	**630**	**1,171**	**1,459**	**2,757**	**3,186**	**2,936**	**0**
2017	Average FAP	$2,614	2,722	3,460	3,301	4,270	4,425	3,919	0
2017	**Current Retirees**	**7**	**6**	**7**	**13**	**18**	**5**	**1**	**0**
2018	**Average Benefit**	**$180**	**657**	**1,013**	**1,907**	**2,569**	**2,424**	**5,103**	**0**
2018	Average FAP	$1,955	3,030	3,452	4,002	3,996	3,379	7,510	0
2018	**Current Retirees**	**3**	**6**	**6**	**7**	**11**	**4**	**1**	**0**
2019	**Average Benefit**	**$428**	**733**	**838**	**1,446**	**2,145**	**2,729**	**0**	**0**
2019	Average FAP	$3,000	3,094	3,111	3,228	3,507	3,912	0	0
2019	**Current Retirees**	**5**	**6**	**6**	**6**	**6**	**5**	**0**	**0**

FAP = Final Average Pay

Schedule of Average Monthly Benefit Payments

MPERS

By Years of Service

Retired In Fiscal Year		0-10	11-15	16-20	21-25	26-30	31-35	36-40	41+
2012	**Average Benefit**	**$0**	**0**	**0**	**0**	**4,984**	**0**	**0**	**0**
2012	Average FAP	$0	0	0	0	7,087	0	0	0
2012	**Current Retirees**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**
2013	**Average Benefit**	**$0**	**0**	**0**	**0**	**0**	**6,914**	**0**	**0**
2013	Average FAP	$0	0	0	0	0	11,108	0	0
2013	**Current Retirees**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**
2015	**Average Benefit**	**$0**	**0**	**0**	**0**	**0**	**4,436**	**0**	**0**
2015	Average FAP	$0	0	0	0	0	4,764	0	0
2015	**Current Retirees**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**
2016	**Average Benefit**	**$0**	**0**	**0**	**3,541**	**0**	**0**	**0**	**0**
2016	Average FAP	$0	0	0	9,414	0	0	0	0
2016	**Current Retirees**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**

Note: There were no retirements during the years not shown above.
FAP = Final Average Pay

Active Member Data

Schedule of Participating Employers

	MoDOT		Patrol		MPERS		Total	
	Employees	%	Employees	%	Employees	%	Employees	%
2010	6,164	73.21	2,243	26.64	13	0.15	8,420	100
2011	5,796	71.03	2,350	28.80	14	0.17	8,160	100
2012	5,093	68.42	2,337	31.39	14	0.19	7,444	100
2013	4,985	67.95	2,336	31.84	15	0.21	7,336	100
2014	5,041	67.98	2,357	31.79	17	0.23	7,415	100
2015	4,993	67.72	2,364	32.06	16	0.22	7,373	100
2016	5,059	67.70	2,398	32.09	16	0.21	7,473	100
2017	5,056	67.86	2,379	31.93	16	0.21	7,451	100
2018	5,065	68.31	2,334	31.48	16	0.22	7,415	100
2019	5,081	68.51	2,318	31.26	17	0.23	7,416	100

Data for this chart is as of June 30, 2019.

Active Member Data

For the Year Ended June 30, 2019

By Age

Closed Plan

Age	Total	MoDOT	Civilian Patrol	Uniformed Patrol	MPERS
< 21	0	0	0	0	0
21 - 25	0	0	0	0	0
26 - 30	0	0	0	0	0
31 - 35	0	0	0	0	0
36 - 40	56	41	8	6	1
41 - 45	318	203	33	82	0
46 - 50	714	427	58	226	3
51 - 55	641	411	89	139	2
56 - 60	330	244	51	35	0
61 - 65	120	100	20	0	0
66+	13	9	4	0	0
Total	**2,192**	**1,435**	**263**	**488**	**6**
Average Age		**51**	**52**	**49**	**48**

Year 2000 Plan

Age	Total	MoDOT	Civilian Patrol	Uniformed Patrol	MPERS
< 21	0	0	0	0	0
21 - 25	0	0	0	0	0
26 - 30	29	17	6	6	0
31 - 35	317	163	49	105	0
36 - 40	546	315	97	132	2
41 - 45	419	268	61	89	1
46 - 50	331	245	57	26	3
51 - 55	290	218	60	11	1
56 - 60	276	237	39	0	0
61 - 65	115	91	24	0	0
66+	20	13	7	0	0
Total	**2,343**	**1,567**	**400**	**369**	**7**
Average Age		**46**	**45**	**38**	**44**

Year 2000 Plan - 2011 Tier

Age	Total	MoDOT	Civilian Patrol	Uniformed Patrol	MPERS
< 21	60	59	1	0	0
21 - 25	486	335	65	86	0
26 - 30	670	420	97	152	1
31 - 35	482	337	72	73	0
36 - 40	320	251	44	24	1
41 - 45	225	180	39	6	0
46 - 50	222	173	44	4	1
51 - 55	195	154	40	1	0
56 - 60	154	122	31	0	1
61 - 65	55	38	17	0	0
66+	12	10	2	0	0
Total	**2,881**	**2,079**	**452**	**346**	**4**
Average Age		**36**	**38**	**29**	**42**

Active Member Data

For the Year Ended June 30, 2019

By Years of Service

Closed Plan

Years of Service	Total	MoDOT	Civilian Patrol	Uniformed Patrol	MPERS
< 01	2	0	2	0	0
01 - 05	1	0	0	1	0
06 - 10	15	8	6	1	0
11 - 15	13	8	4	1	0
16 - 20	444	344	49	50	1
21 - 25	1,001	591	116	292	2
26 - 30	519	348	56	114	1
31 - 35	162	110	23	27	2
36 - 40	23	17	4	2	0
41 - 45	8	7	1	0	0
46+	4	2	2	0	0
Total	**2,192**	**1,435**	**263**	**488**	**6**
Average Service		**24**	**24**	**24**	**26**

Year 2000 Plan

Years of Service	Total	MoDOT	Civilian Patrol	Uniformed Patrol	MPERS
< 01	20	17	3	0	0
01 - 05	53	39	14	0	0
06 - 10	479	294	102	82	1
11 - 15	1,114	759	176	175	4
16 - 20	664	450	102	111	1
21 - 25	8	4	3	0	1
26 - 30	4	3	0	1	0
31 - 35	0	0	0	0	0
36 - 40	0	0	0	0	0
41 - 45	1	1	0	0	0
46+	0	0	0	0	0
Total	**2,343**	**1,567**	**400**	**369**	**7**
Average Service		**13**	**13**	**13**	**13**

Year 2000 Plan - 2011 Tier

Years of Service	Total	MoDOT	Civilian Patrol	Uniformed Patrol	MPERS
< 01	658	527	76	55	0
01 - 05	1,855	1,376	293	184	2
06 - 10	368	176	83	107	2
11 - 15	0	0	0	0	0
16 - 20	0	0	0	0	0
21 - 25	0	0	0	0	0
26 - 30	0	0	0	0	0
31 - 35	0	0	0	0	0
36 - 40	0	0	0	0	0
41 - 45	0	0	0	0	0
46+	0	0	0	0	0
Total	**2,881**	**2,079**	**452**	**346**	**4**
Average Service		**2**	**3**	**4**	**6**

Terminated Vested Member Data

For the Year Ended June 30, 2019

By Age

Closed Plan

Age	Total	MoDOT	Civilian Patrol	Uniformed Patrol	MPERS
< 21	0	0	0	0	0
21 - 25	0	0	0	0	0
26 - 30	0	0	0	0	0
31 - 35	0	0	0	0	0
36 - 40	28	23	5	0	0
41 - 45	163	133	20	9	1
46 - 50	320	230	30	60	0
51 - 55	340	274	29	37	0
56 - 60	216	188	28	0	0
61 - 65	29	26	3	0	0
66+	1	1	0	0	0
Total	**1,097**	**875**	**115**	**106**	**1**
Average Age		**51**	**50**	**49**	**42**

Year 2000 Plan

Age	Total	MoDOT	Civilian Patrol	Uniformed Patrol	MPERS
< 21	0	0	0	0	0
21 - 25	0	0	0	0	0
26 - 30	9	7	2	0	0
31 - 35	133	96	21	16	0
36 - 40	230	182	33	15	0
41 - 45	209	180	14	15	0
46 - 50	140	116	19	5	0
51 - 55	93	79	11	3	0
56 - 60	70	60	10	0	0
61 - 65	5	5	0	0	0
66+	0	0	0	0	0
Total	**889**	**725**	**110**	**54**	**0**
Average Age		**43**	**42**	**39**	**0**

Year 2000 Plan - 2011 Tier

Age	Total	MoDOT	Civilian Patrol	Uniformed Patrol	MPERS
< 21	0	0	0	0	0
21 - 25	2	2	0	0	0
26 - 30	24	10	6	8	0
31 - 35	16	7	4	5	0
36 - 40	3	1	0	2	0
41 - 45	7	5	1	1	0
46 - 50	7	2	3	2	0
51 - 55	2	2	0	0	0
56 - 60	2	1	1	0	0
61 - 65	2	2	0	0	0
66+	0	0	0	0	0
Total	**65**	**32**	**15**	**18**	**0**
Average Age		**37**	**36**	**33**	**0**

Terminated Vested Member Data
For the Year Ended June 30, 2019

By Years of Service

Closed Plan

Years of Service	Total	MoDOT	Civilian Patrol	Uniformed Patrol	MPERS
< 01	0	0	0	0	0
01 - 05	127	95	16	16	0
06 - 10	460	352	45	62	1
11 - 15	289	240	31	18	0
16 - 20	168	141	20	7	0
21 - 25	49	43	3	3	0
26 - 30	4	4	0	0	0
31 - 35	0	0	0	0	0
36 - 40	0	0	0	0	0
41 - 45	0	0	0	0	0
46+	0	0	0	0	0
Total	**1,097**	**875**	**115**	**106**	**1**
Average Service		**11**	**11**	**9**	**8**

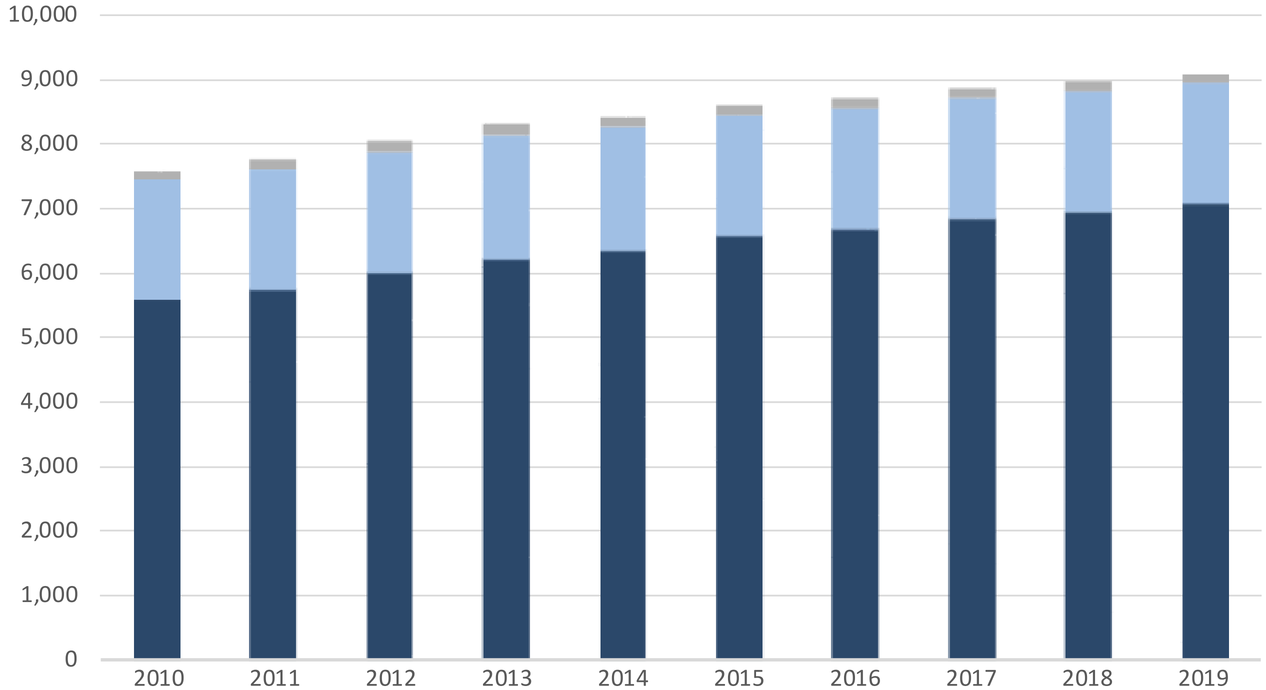
Year 2000 Plan

Years of Service	Total	MoDOT	Civilian Patrol	Uniformed Patrol	MPERS
< 01	0	0	0	0	0
01 - 05	125	102	19	4	0
06 - 10	555	451	69	35	0
11 - 15	188	156	22	10	0
16 - 20	21	16	0	5	0
21 - 25	0	0	0	0	0
26 - 30	0	0	0	0	0
31 - 35	0	0	0	0	0
36 - 40	0	0	0	0	0
41 - 45	0	0	0	0	0
46+	0	0	0	0	0
Total	**889**	**725**	**110**	**54**	**0**
Average Service		**9**	**8**	**10**	**0**

Year 2000 Plan - 2011 Tier

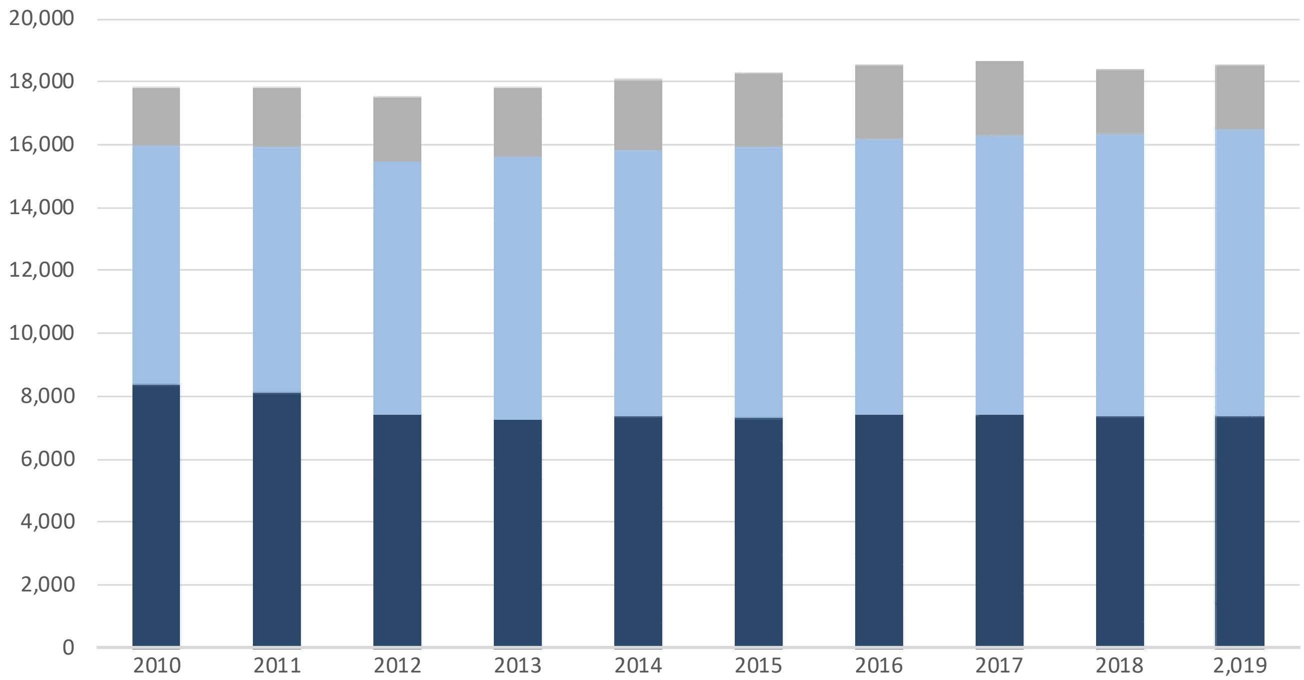
Years of Service	Total	MoDOT	Civilian Patrol	Uniformed Patrol	MPERS
< 01	0	0	0	0	0
01 - 05	39	25	5	9	0
06 - 10	26	7	10	9	0
11 - 15	0	0	0	0	0
16 - 20	0	0	0	0	0
21 - 25	0	0	0	0	0
26 - 30	0	0	0	0	0
31 - 35	0	0	0	0	0
36 - 40	0	0	0	0	0
41 - 45	0	0	0	0	0
46+	0	0	0	0	0
Total	**65**	**32**	**15**	**18**	**0**
Average Service		**4**	**6**	**4**	**0**

Benefit Recipients



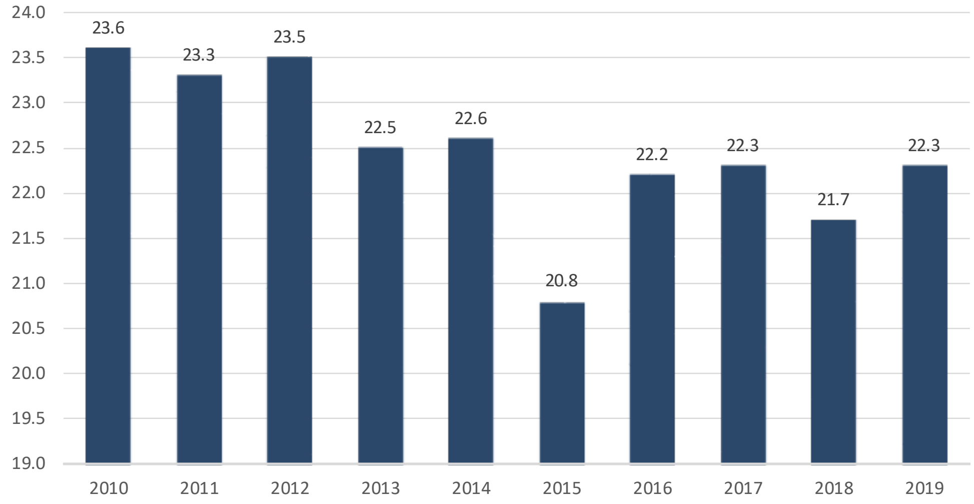
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Disabilities	142	166	175	178	173	164	155	155	148	143
Survivors	1,862	1,855	1,880	1,914	1,900	1,874	1,882	1,875	1,863	1,866
Retirees	5,606	5,771	6,013	6,234	6,365	6,583	6,690	6,846	6,956	7,077

Membership Distribution

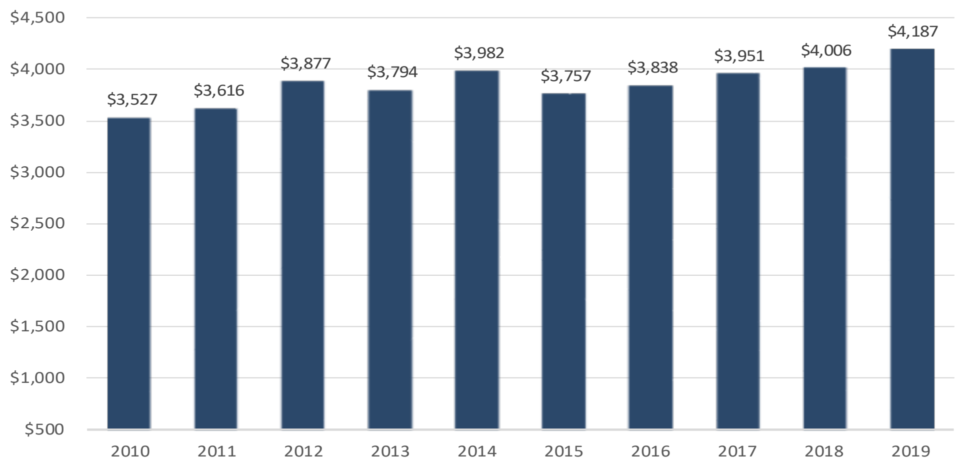


	2010	2011	2012	2013	2014	2015	2016	2017	2018	2,019
Term Vested Members	1,799	1,864	2,038	2,153	2,222	2,300	2,329	2,319	1,985	2,051
Benefit Recipients	7,610	7,792	8,068	8,326	8,438	8,621	8,727	8,876	8,967	9,086
Active Members	8,420	8,160	7,444	7,336	7,415	7,373	7,473	7,451	7,415	7,416

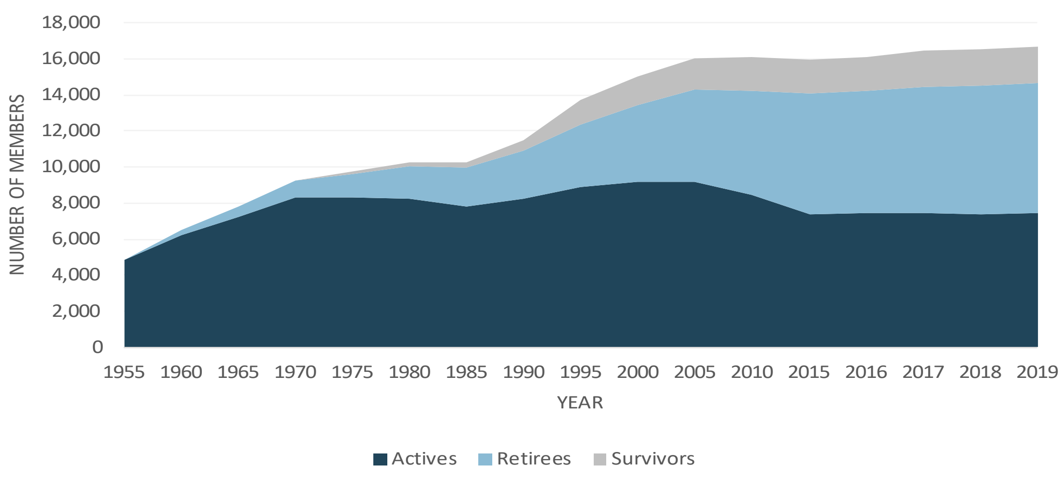
Average Years of Service for New Retirees



Final Average Pay for New Retirees



MPERS Membership Over the Years



Location of MPERS Retirees

For the Year Ended June 30, 2019

This map represents the demographic distribution of retirees by state and country.