

Chief Investment Officer's Letter



Ronald D. Schmitz, Chief Investment Officer

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October 18, 2019

To: Members of the Board of Trustees and Participants of the Virginia Retirement System

Fiscal year 2019 has been both a “glass half-empty” and a “glass half-full” kind of year. On the negative side, we had the weakest manufacturing data in Europe since the sovereign debt crisis in 2008; a flat and sometimes negative yield curve in the U.S., which may be a precursor to a recession; and tariffs at the highest level in a half-century. On the positive side, we saw the strongest January rally in equities since 1987; historically low interest rates (in some cases negative); the longest U.S. expansion in history; and the lowest jobless claims since 1969. In fact, the last time unemployment was this low, Richard Nixon was in the White House, Neil Armstrong was on the moon and The Who was at Woodstock.

Against this backdrop, the global economy appears to be in a holding pattern of sub-trend growth while exhibiting late-cycle behavior. Trade and monetary policy dominated the economic narrative in 2019. With trade in particular, some growth metrics such as U.S. consumer data are robust, while other sectors, such as those that depend on trade and exports, are doing decidedly less well. On the other hand, markets seem to be pricing in the central banks’ continued tilt toward accommodation, even as much of the global economy has moved to negative rate territory.

PERFORMANCE OVERVIEW

As shown in the table below, the Total Fund has tended to perform well versus its benchmark for the longer term, generally exceeding the benchmark by about half a percent. However, the excess return over the last three and five years has been more modest and the return for the current fiscal year fell just short of the benchmark, in part due to central bank intervention in the markets, which created difficulties in equities and credit markets.

Annualized Return for Periods Ended June 30, 2019:

| | 1 Year | 3 Years | 5 Years | 10 Years | 15 Years | 20 Years | 25 Years |
|----------------|--------|---------|---------|----------|----------|----------|----------|
| VRS Total Fund | 6.7% | 8.8% | 6.5% | 9.4% | 7.1% | 6.2% | 8.4% |
| Benchmark* | 6.8% | 8.7% | 6.3% | 8.9% | 6.6% | 5.6% | 7.9% |

Investment return calculations were prepared using a time-weighted return methodology based on market value, net of investment expenses.

** The VRS Total Fund Benchmark is a blend of the asset class benchmarks at policy weights. Benchmarks are selected with the help of a third-party investment consultant.*

The VRS portfolio is positioned to provide diversification across five primary asset classes. Three of the five (Private Equity, Fixed Income and Real Assets) outperformed their benchmarks for the fiscal year and two (Public Equity and Credit Strategies) did not. The Total Fund generated 6.7%, slightly below the 7% assumed long-term return.

Returns by VRS primary asset classes from highest to lowest were as follows: Private Equity at 14.0%, Investment-Grade Fixed Income at 8.3%, Real Assets at 7.8%, Credit Strategies at 6.8% and Public Equity at 3.9%.

VRS also invests in several multi-asset class portfolios in an attempt to accomplish various portfolio objectives. The Private Investment Partnerships (PIP) portfolio comprises strategic relationships with two large private market general partners across the real estate, energy and credit opportunity sets. The Multi-Asset Public Strategies (MAPS) portfolios attempt to seek value-added returns through active decisions around asset class and industry exposures, as well as through a risk mitigation strategy that attempts to offset volatile equity market return patterns.

ASSET CLASS COMMENTARY

Figures 3.1 and 3.2, which follow this letter, show the asset allocation of the fund at June 30, 2019, as well as performance by asset class for various periods ended on that date. Comments about each portfolio's structure and holdings follow those graphics.

We continue to struggle in certain asset classes:

- Equity is still being plagued by the portfolio's tilt to the value, a factor based largely on price in the portfolio. More precisely, it isn't so much the degree to which we have value exposure above the underlying index, it's the degree of the abnormal relationship of value to growth factor returns. Revenue and earnings growth, even at expensive prices, have won the day in recent quarters. Value has been a good long-term play in equity portfolios over long periods of time and has always bounced back strongly after periods of dislocation such as we see now. We remain confident that our patience will pay off.
- Credit is under pressure in the short run: The biggest single driver of strong credit returns this calendar year has been falling interest rates, which have driven up prices of fixed coupon, or rate-sensitive, securities. The Credit Strategies program is overweight floating-rate debt, private debt and distressed debt. These positions are not as sensitive to falling interest rates, and that has caused the program to lag its benchmark in the near term. We remain confident that being exposed to higher yielding private debt, more senior in the capital structure, will serve us well across both interest rate and credit cycles in the longer term.

Also, a few comments regarding near-term performance in the multi-asset portfolios:

- Private Investment Partnerships (PIP) are doing exactly as expected. We are just exiting the startup period when costs are high relative to returns. We expect to see the

returns begin to significantly exceed costs and approach the levels of return that we see in the private market assets.

- The Multi-Asset Portfolio Strategies (MAPS) portfolio has two components. Risk-Based Investments (RBI) is more of an absolute return portfolio and is struggling with the strong performance of a benchmark that is more equity-oriented than the portfolio. Dynamic Strategies attempts to add value by moving assets opportunistically across geographies and asset classes. The portfolio is a bit behind the benchmark as it had a defensive posture during the January rally in the equity markets.
- Fixed Income, Real Assets and Private Equity all have solid near-term and long-term numbers. Private Equity posted strong three- and five-year results versus its benchmark and had good absolute numbers for the 10-year period. Our portfolio did lag its benchmark for the 10 years ended June 30, 2019, because of a mismatch between the benchmark and the portfolio. There is no public index for private equity assets, so we use a stock market benchmark. Although there is a general correlation between the two, they are not always in sync. In short, this lag in the 10-year return versus the benchmark is not a sign of poor performance. In fact, Private Equity delivered returns that were 4% per year higher than Public Equities. That is exactly what we aim to achieve.

ASSET ALLOCATION

The Board has adopted an efficient portfolio policy in a risk/reward sense, with the target portfolio expected to generate returns similar to our peer states and risk levels lower than average, defined by annual volatility. The Board of Trustees reviews the Fund's long-term expected returns annually and performs a more in-depth asset/liability analysis every three years. As of this writing, that study is nearing its conclusion. Although we do not expect to see major changes to the long-term policy portfolio, there will be some adjustments made to strategies and benchmarks for some asset classes and slightly different target weights for some asset classes as well.

MARKET OUTLOOK

Corporate activity is slowing for several reasons: diminishing effects of the corporate tax cuts from 2017; a general global slowdown, particularly in China; and growing uncertainty around trade tensions.

The “tariff war” is causing companies to slow their pace of cross-border investment, which is down 15% per a recent report from Bridgewater Associates. Further, a report from UBS states that imports affected by tariffs are down 40%. These are not statistics that bode well for the economy.

On the other hand, many economic statistics remain strong. Household income is rising and unemployment remains low. Recession risk is higher than a year ago. It is also possible that we will experience a slowdown in the rate of growth in the economy, without a reversal of economic output, and that growth will accelerate again next year.

For example, a positive sign is that we do *not* see inventory buildup or loan repayment stress.

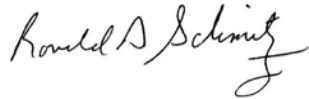
Given these circumstances, we have a guarded macro-economic outlook. The portfolio is positioned neutrally as compared to the policy portfolio. We remain watchful, however, for the negative signs mentioned above.

Despite our neutral stance in broad asset allocation terms, we do have several tilts within asset classes that can favorably affect results. For instance, we have a slight overweight to emerging markets in our equity portfolio; an underweight to treasuries in the fixed income portfolio; an underweight to rate-sensitive securities in the credit portfolio; an underweight to retail and office properties in the real assets portfolio; and an overweight to technology, healthcare and energy in the private equity portfolio.

A LAST WORD

I want to thank the Board of Trustees and the Investment Advisory Committee for their dedication and support over this past year. Many thanks, also, to my colleagues in VRS administration. Finally, my appreciation goes out to our superb team of investment professionals. Together, we will continue to build on the great legacy that exists at VRS.

Sincerely,

A handwritten signature in cursive script, reading "Ronald D. Schmitz".

Ronald D. Schmitz
Chief Investment Officer

The Investment Section provides detailed information regarding the structure of the investment portfolio. This information includes performance, asset allocations, portfolio highlights, a list of VRS' money managers and public equity commissions for the fiscal year. The section also presents the System's investment management fees and expenses and an investment summary.

Investment Account

The VRS Board of Trustees has fiduciary responsibility to invest the fund solely in the interest of the beneficiaries of the System. As established by the *Code of Virginia*, “the Board shall invest the assets of the Retirement System with the care, skill, prudence and due diligence that a prudent person acting in a like capacity and familiar with such matters would use in the conduct of an enterprise of like character and with like aims.”

Benefit payments are projected to occur over a long period of time, allowing VRS to adopt a long-term investment horizon and asset allocation policy for the management of fund assets. Asset allocation policy is critical because it defines the basic risk and return characteristics of the VRS investment portfolio. Asset allocation targets are established using an asset-liability analysis designed to assist the Board in determining an acceptable volatility target for the fund and an optimal asset allocation policy mix. The asset-liability analysis considers both sides of the VRS balance sheet in order to estimate the potential impact of various asset class mixes on key measures of total plan risk, including the resulting estimated impact on funded status and contribution rates.

The Board delegates authority to the Chief Investment Officer to allocate the System's investments within the approved asset allocation policy and within the Board-approved active risk budget. The total fund active risk budget describes the degree of tolerance for yearly variation in the fund's performance relative to the Total Fund VRS Custom Benchmark. The primary risk measure used for this purpose is Total Fund Tracking Error, calculated as the standard deviation of the difference between the fund's return and the return of the Total Fund VRS Custom Benchmark. From this measure, probability estimates can be derived to help the Board estimate the risk of underperforming the benchmark by certain margins.

The investment staff manages the VRS portfolio on a day-to-day basis according to policies and guidelines established by the Board. The staff manages assets on a direct basis and through outside investment managers. Managers employ both active and passive investment strategies. The Board has established various performance benchmarks to serve as tools for measuring progress toward the achievement of long-term investment goals.

The asset allocation mix of the VRS fund as of June 30, 2019, is shown in Figure 3.1:

FIGURE 3.1: ASSET ALLOCATION MIX

AS OF JUNE 30, 2019

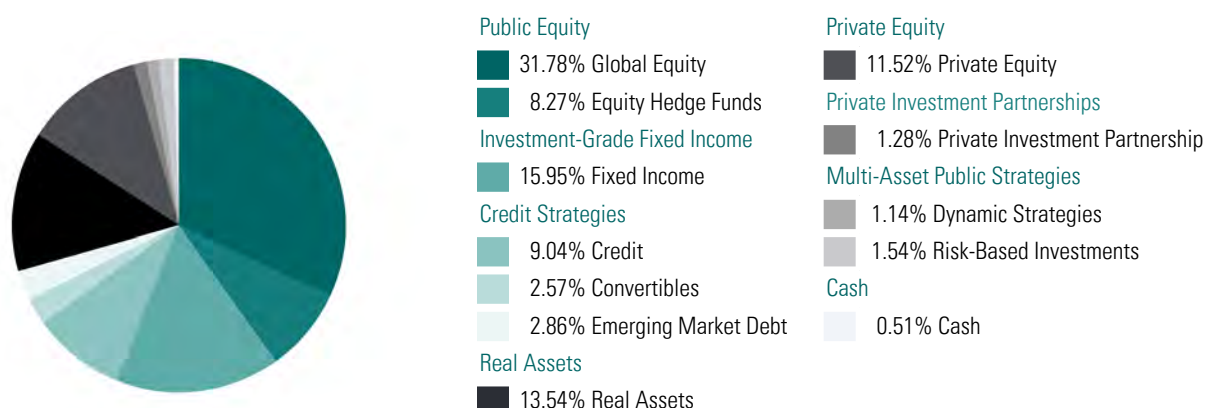


FIGURE 3.2: INVESTMENT PERFORMANCE SUMMARY

ANNUALIZED DATA FOR THE PERIOD ENDING JUNE 30, 2019

| | 1 Year | 3 Years | 5 Years | 10 Years |
|---|--------|---------|---------|----------|
| 1. Total Fund | | | | |
| VRS | 6.7% | 8.8% | 6.5% | 9.4% |
| VRS Custom Benchmark ¹ | 6.8% | 8.7% | 6.3% | 8.9% |
| 2. Total Public Equity | | | | |
| VRS | 3.9% | 10.3% | 6.5% | 10.7% |
| Custom Benchmark ² | 4.8% | 11.0% | 6.5% | 10.2% |
| 3. Total Investment-Grade Fixed Income | | | | |
| VRS | 8.3% | 2.8% | 3.4% | 4.9% |
| Custom Benchmark ³ | 7.9% | 2.3% | 2.9% | 3.9% |
| 4. Total Credit Strategies | | | | |
| VRS | 6.8% | 7.4% | 4.8% | 8.3% |
| Custom Benchmark ⁴ | 7.7% | 6.8% | 4.7% | 7.2% |
| 5. Total Real Assets | | | | |
| VRS | 7.8% | 9.4% | 10.3% | 11.2% |
| Custom Benchmark ⁵ | 6.9% | 7.3% | 8.5% | 9.3% |
| 6. Total Private Equity | | | | |
| VRS | 14.0% | 16.8% | 13.0% | 14.5% |
| Custom Benchmark ⁶ | 8.3% | 14.8% | 10.7% | 16.8% |
| 7. Total Private Investment Partnerships | | | | |
| VRS | 6.7% | 8.2% | N/A | N/A |
| Custom Benchmark ⁷ | 6.6% | 8.2% | N/A | N/A |
| 8. Total Multi-Asset Public Strategies | | | | |
| VRS | 2.2% | N/A | N/A | N/A |
| Custom Benchmark ⁸ | 6.0% | N/A | N/A | N/A |

Investment return calculations were prepared using a time-weighted return methodology based on market value, net of investment expenses.

FIGURE 3.2: INVESTMENT PERFORMANCE SUMMARY, cont.

- ¹ The VRS Custom Benchmark is a blend of the Asset Class Benchmarks at policy weights.
- ² Effective July 2015, the Public Equity Custom Benchmark is a blend of the MSCI ACWI IMI with Developed Market currencies 50% hedged (net VRS tax rates) index (80%) and the Credit Suisse Equity Long/Short Broad Index (20%).
- ³ Effective July 2014, the Investment-Grade Fixed Income Custom Benchmark consists of the Bloomberg Capital U.S. Aggregate Index.
- ⁴ Effective July 2012, the Credit Strategies Custom Benchmark is the weighted average of the Citigroup Broad Investment-Grade Index (10%), the Bank of America Merrill Lynch BB-B Constrained Index (20%), the S&P Performing Loan Index (30%), the Emerging Market Debt Custom Benchmark (20%) and the Bank of America Merrill Lynch All U.S. Convertibles Index (20%). For the four years prior to July 2012, the risk-adjusted benchmark is the weighted average of the Bank of America Merrill Lynch U.S. High Yield BB-B Constrained Index and the Bank of America All Convertibles Index.
- ⁵ Effective July 2014, the Real Assets Custom Benchmark is the market value weighted blend of the Total Real Estate Benchmark, of which 85% is the NCREIF Private Real Estate Benchmark (ODCE Index (net) lagged by three months) and 15% is the Total REIT Benchmark (FTSE/EPRA/NAREIT Developed REIT Index), and the Other Real Assets Custom Benchmark (the CPI-U Index plus 400 basis points per annum lagged by three months) with modified benchmarking for Other Real Assets during the increased allocation period.
- ⁶ Effective July 2013, the Private Equity Custom Benchmark is the MSCI ACWI IMI with the Developed Market currencies 50% hedged customized for the VRS dividend withholding tax rates lagged by three months plus 250 basis points per annum with modified benchmarking during the increased allocation period.
- ⁷ The Private Investment Partnerships Benchmark is the weighted average of the custom VRS Private Equity Benchmark (MSCI 50% hedged customized for the VRS dividend withholding tax rates lagged by three months plus 250 basis points) (40%), the NCREIF Private Real Estate Benchmark (ODCE Index (net) lagged by three months) (30%), the Other Real Assets Custom Benchmark (the CPI-U Index plus 400 basis points per annum lagged by three months) (10%), the Credit Strategies Rate Sensitive Benchmark (the Bank of America Merrill Lynch High Yield BB-B Constrained Index) (10%), and the Credit Strategies Non-Rate Sensitive Benchmark (the S&P Performing Loan Index) (10%).
- ⁸ Effective July 2018, the Multi-Asset Public Strategies Custom Benchmark is the market value weighted average of the benchmarks of the mandates (Dynamic Strategies and Risk-Based Investments) within the program

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Portfolio Highlights

PUBLIC EQUITY

The market value of the Total Public Equity Program as of June 30, 2019, was \$32.1 billion, representing approximately 39% of the total fund. The program is dominated by traditional strategies valued at \$25.3 billion or 78.8%. The program also employs equity-oriented hedge fund strategies valued at \$6.8 billion or 21.2%. The objective of the portfolio is to exceed the Custom Benchmark over longer-term periods, net of all costs. The Custom Benchmark is comprised of 80% MSCI All Country World Index (ACWI) IMI with Developed Market currencies 50% hedged and 20% Credit Suisse Equity Long/Short Broad Index.

The Traditional Public Equity portfolio had 52% invested in domestic equity and 48% in international equity, and 41% was managed internally.

At fiscal year-end, the ACWI IMI benchmark was comprised of 54.8% of the MSCI U.S. Investible Market Index (IMI), 33.6% of the MSCI World excluding U.S. IMI (50% hedged) and 11.6% in the MSCI Emerging IMI.

Traditional Public Equity versus the MSCI ACWI IMI strategic sectors and region weights are as follows:

FIGURE 3.3: TRADITIONAL EQUITY CUSTOM BENCHMARK SECTORS AND REGIONS*

| Strategic Sectors | VRS | MSCI ACWI | Regions | VRS | MSCI ACWI |
|------------------------|----------------|----------------|---------------------------|----------------|----------------|
| Communication Services | 7.95% | 8.09% | North America | 55.49% | 57.99% |
| Consumer Discretionary | 10.14% | 10.97% | Europe/Middle East/Africa | 22.15% | 20.87% |
| Consumer Staples | 7.95% | 7.82% | Asia/Pacific | 21.05% | 19.75% |
| Energy | 4.73% | 5.63% | Latin and South America | 1.31% | 1.39% |
| Financials | 16.26% | 16.46% | Total | 100.00% | 100.00% |
| Health Care | 13.26% | 11.35% | | | |
| Industrials | 10.61% | 11.31% | | | |
| Information Technology | 16.16% | 15.65% | | | |
| Materials | 4.60% | 5.28% | | | |
| Real Estate | 3.90% | 4.19% | | | |
| Utilities | 4.44% | 3.25% | | | |
| Total | 100.00% | 100.00% | | | |

* Based on Barra's classification of sectors and regions and excludes cash.

The top 10 holdings in the Total Public Equity Program comprised 6.6% of the program at fiscal

year-end. One company, Royal Dutch Shell, was replaced by MasterCard on this year's schedule.

FIGURE 3.4: PUBLIC EQUITY – TOP 10 EXPOSURES*

AS OF JUNE 30, 2019

| Company | Fair Value | Shares |
|------------------------|----------------|-----------|
| Microsoft | \$ 361,762,865 | 2,700,529 |
| Johnson & Johnson | 253,837,382 | 1,822,497 |
| Apple | 231,874,561 | 1,171,557 |
| Alphabet | 222,802,793 | 1,282,103 |
| Amazon.com | 216,843,359 | 114,512 |
| Roche Holding | 197,870,352 | 702,435 |
| Visa | 177,022,562 | 1,020,009 |
| MasterCard | 161,487,629 | 610,470 |
| Verizon Communications | 156,215,929 | 2,734,394 |
| Facebook | 125,284,985 | 649,145 |

* Aggregated various share classes based on parent company. Refer to the "More Information" section for details on how to request additional information.

FIXED INCOME

VRS invests a portion of its portfolio in fixed income investments to reduce total fund volatility, produce income and provide for some protection in the event of a deflationary environment. The market value of the Fixed Income Program as of June 30, 2019, was \$13.1 billion, representing 15.9% of the total fund.

The Fixed Income Program is internally invested in a diversified portfolio of high-quality assets, such as government securities, corporate securities and mortgage-backed securities. The objective of the program is to exceed the return of the Bloomberg Barclays U.S. Aggregate Index, while staying in compliance with risk limits. For fiscal year 2019, the return of the program was 8.3% versus a return of 7.9% for the benchmark.

FIGURE 3.5: FIXED INCOME PORTFOLIO BY SECTOR ALLOCATION

AS OF JUNE 30, 2019

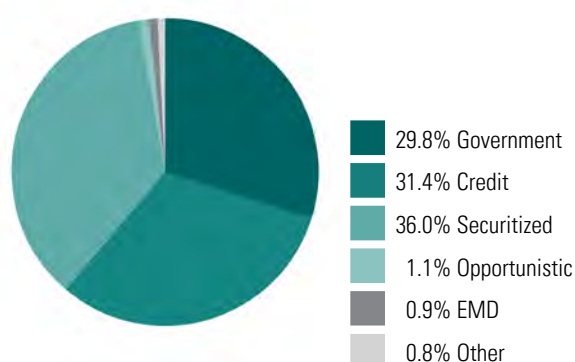


FIGURE 3.6: FIXED INCOME PORTFOLIO BY CREDIT QUALITY BREAKDOWN

AS OF JUNE 30, 2019

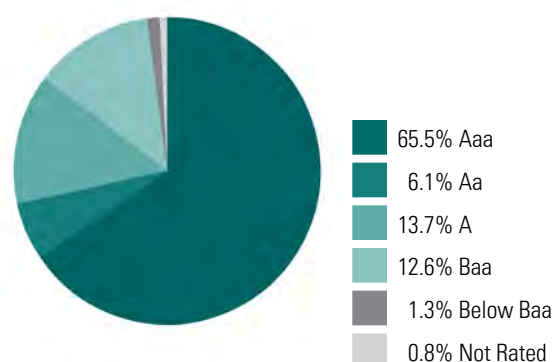


FIGURE 3.7: FIXED INCOME – TOP 10 HOLDINGS BY MARKET VALUE*

AS OF JUNE 30, 2019

| Security | Par Value | Fair Value |
|-----------------|----------------|----------------|
| TREASURY NOTE | \$ 200,000,000 | \$ 206,303,449 |
| TREASURY BOND | 111,300,000 | 117,911,171 |
| TREASURY NOTE | 113,000,000 | 110,767,401 |
| TREASURY NOTE | 106,000,000 | 109,515,885 |
| TREASURY NOTE | 100,000,000 | 103,037,503 |
| TREASURY NOTE | 95,000,000 | 97,941,158 |
| TREASURY NOTE | 90,000,000 | 92,644,630 |
| TREASURY NOTE | 85,000,000 | 87,460,252 |
| FREDDIE MAC MBS | 76,701,934 | 78,478,511 |
| TREASURY NOTE | 75,000,000 | 77,264,340 |

* Refer to the "More Information" section for details on how to request additional information.

SHORT-TERM INVESTMENTS AND TRANSITION ACTIVITY

Generally, VRS desires to remain fully invested at all times and seeks to minimize its holdings of cash investments. Temporary cash balances are invested in short-term money market instruments with the goal of maintaining high credit quality and liquidity, as well as to synthetically replicate exposure to equity and/or fixed income.

PRIVATE EQUITY

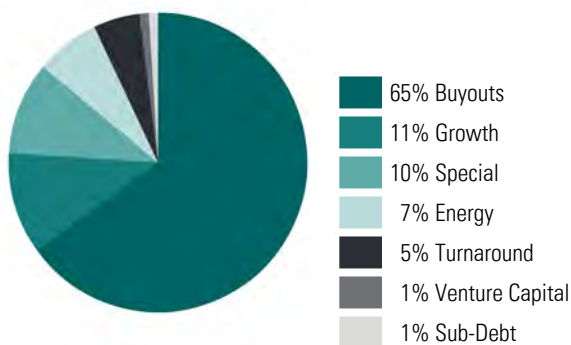
VRS invests in private equity to achieve returns greater than those available in the public equity markets. Specifically, the program seeks to outperform the Morgan Stanley Capital International All Country World Index (MSCI ACWI) by 2.5% per year. Program returns are calculated on both a time-weighted basis and a dollar-weighted or internal rate-of-return (IRR) basis. On a time-weighted basis, the program return for fiscal year 2019 was 14.0%. On a dollar-weighted or IRR basis, the private equity one-year return was 13.7% as of March 31, 2019.

As of June 30, 2019, the carrying value of the program was approximately \$9.5 billion. Most of the program is invested in limited partnerships.

Sectors in which the program invests include leveraged buyouts, venture capital, growth, sub-debt, turnaround, energy and special situations. The Private Equity Program's market value by subclass was as follows:

FIGURE 3.8: PRIVATE EQUITY PROGRAM

AS OF JUNE 30, 2019



REAL ASSETS

A portion of the VRS portfolio is invested in real assets to help diversify the Total Fund by providing exposure to asset classes and sectors that offer low historical correlations with the public markets and with the additional objectives of generating competitive risk-adjusted returns, significant operating cash flows and inflation linkages. The portfolio continued to grow in fiscal year 2019, producing a 7.8% return and outperforming the benchmark by 90 basis points. The private real estate portfolio delivered an 8.0% return while the real estate investment trusts (REITs) produced a total return of 8.5%. Investments in infrastructure, natural resources, timberland and farmland produced a 7.1% return for the fiscal year.

The percentage of the Total Fund represented by the real assets portfolio fluctuated over the course of the year but ended flat at 13.5%. In dollar terms, the real asset portfolio grew \$531 million due primarily to asset income and appreciation, with distributions from existing investments outpacing contributions to new investments by approximately \$287 million.

At fiscal year-end, the portfolio was composed of approximately 59.2% private real estate, 10.8% REITs, 16.2% infrastructure, 7.3% energy and mining, 4.3% timberland and 2.2% farmland. Portfolio leverage as a percentage of total real assets was 29.8% as of June 30, 2019.

FIGURE 3.9: REAL ASSETS BY SECTOR

AS OF JUNE 30, 2019

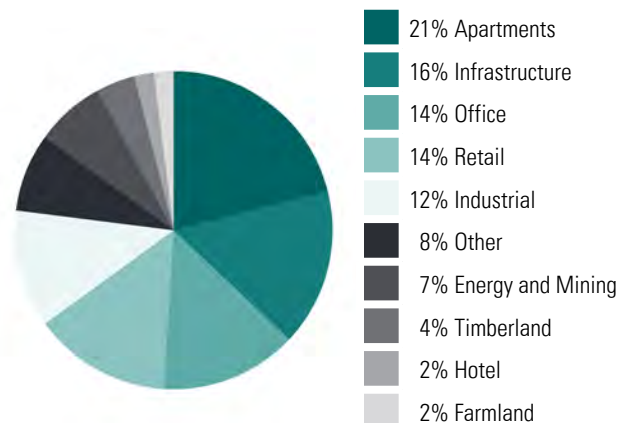
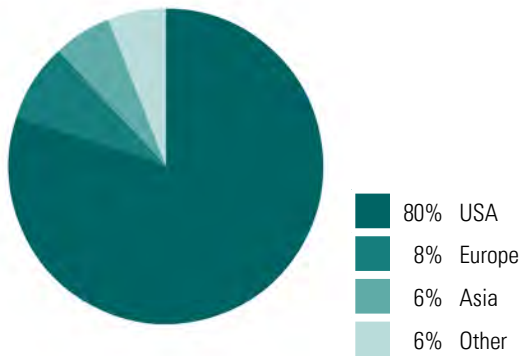


FIGURE 3.10: REAL ASSETS BY GEOGRAPHIC REGION

AS OF JUNE 30, 2019

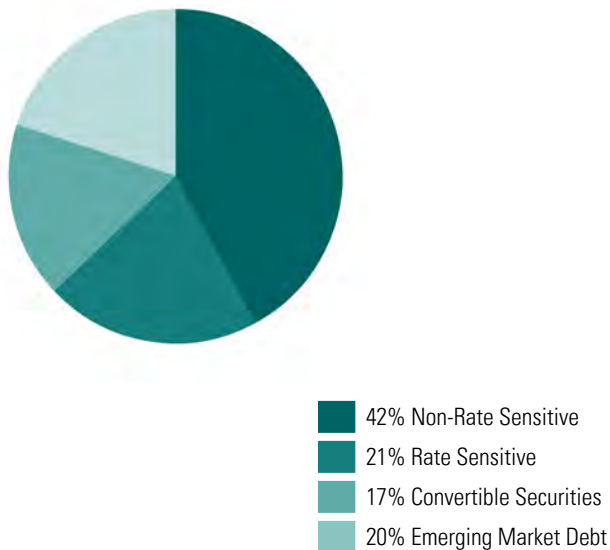


CREDIT STRATEGIES

VRS allocates a portion of the portfolio to credit-related investments. The Credit Strategies program generates returns through income and capital appreciation. The objective of the program is to provide an attractive risk/return profile relative to the Custom Credit Strategies benchmark. For the fiscal year, the program returned 6.8%, while the program's custom benchmark returned 7.7%.

FIGURE 3.11: CREDIT STRATEGIES PROGRAM

AS OF JUNE 30, 2019



CURRENCY

VRS has currency risk due to its investments in non-dollar-denominated assets. To help control this risk, VRS has a Currency Program that uses a

combination of internal hedging strategies and external managers. The external currency management part aims to lower overall Fund volatility and provide diversified alpha across the Fund. Investments include constrained positions in developed and emerging market currencies. The currency positions are typically traded on a forward basis, and thus no capital is necessary at the time of the trade. At forward settlement date, gains and losses are received/paid out against a notional value.

The current notional value, as of June 30, 2019, was \$1.8 billion. For the fiscal year, it returned -0.07% versus a zero benchmark.

MULTI-ASSET PUBLIC STRATEGIES

The Board of Trustees approved the Multi-Asset Public Strategies (MAPS) program on July 1, 2018, to manage strategies that add value and mitigate risk beyond the structure allowed by individual asset class program mandates. The program is separated into two portfolios with differing objectives. The Risk-Based Investment portfolio invests in strategies that offer meaningful diversification to the exposures of the overall Plan. The Dynamic Strategies portfolio seeks to add value across asset classes through the incorporation of macro perspectives. As of June 30, 2019, the total program had a market value of \$2.2 billion and was invested with six multi-asset class public investments managers and one internally managed fixed income strategy. During the fiscal year, it returned 2.2% against the program's custom benchmark, which returned 6.0%.

PRIVATE INVESTMENT PARTNERSHIPS

Beginning July 1, 2018, the VRS Board approved a strategic allocation to Private Investment Partnerships (PIP). These investments had previously been part of the Strategic Opportunities Portfolio. The objective of the program is to provide an attractive risk/return profile relative to the Private Investment Partnerships benchmark.

Managers in this program invest broadly across the private and less liquid components of the credit, private equity, real asset and real estate investment

spaces. During the fiscal year the program returned 6.7% while the program's custom benchmark returned 6.6%.

Address requests to the VRS FOIA Coordinator, Virginia Retirement System, P.O. Box 2500, Richmond, VA 23218-2500.

MORE INFORMATION

A complete list of the investment portfolio is available upon request.

More information is available at varetire.org/legal/foia.asp.

VRS Money Managers

The diversified investment structure as of June 30, 2019, is reflected in the following tables, which list

VRS managers by investment program and style.

PUBLIC EQUITY MONEY MANAGERS

| External Managers – Top 10 Managers | Style Description |
|-------------------------------------|--|
| Acadian Asset Management | Emerging, Non-U.S. Small-Cap |
| Ariel | Global |
| Arrowstreet Capital | Global |
| Baillie Gifford | Global |
| GMO | Emerging |
| J.P. Morgan | U.S. Large-Cap |
| Jackson Square | U.S. Small-Cap |
| LSV Asset Management | Global, Non-U.S. Small-Cap, U.S. Small-Cap |
| Nordea | Emerging, Global |
| Select | U.S. Small-Cap |
| Internal Portfolios | Style Description |
| Afton | U.S. Small |
| Matoaka | Non-U.S. Large |
| Mobjack | U.S. Large |
| Piedmont | Non-U.S. Large |
| Potomac | U.S. Large |
| Tuckahoe | Emerging |
| Top 10 Equity Hedge Funds | Style Description |
| Arisaig | Concentrated Long-Only |
| Cevian | Activist |
| Eminence | Long/Short |
| Farallon | Multi-Strat |
| Lansdowne Partners | Long/Short |
| Maverick Capital | Long/Short |
| Nitorum | Long/Short |
| Select | Long/Short |
| Theleme | Long/Short |
| ValueAct Capital | Activist |
| FIXED INCOME | |
| Internal Portfolios | Style Description |
| VRS Credit | High-Quality Corporates |
| VRS Securitized | Mortgage and Other Asset-Backed Securities |
| VRS Government | U.S. and Other Government-Related Debt |
| VRS Emerging Market Debt | EM Sovereign and Quasi-Sovereign Debt |
| VRS Fixed-Income Opportunistic | Various Fixed-Income Related Assets |

| PRIVATE EQUITY – TOP 10 MANAGERS | Style Description |
|--|---|
| Apax Partners | Buyout |
| Bain Capital | Buyout |
| CVC Capital | Buyout |
| Grosvenor | Customized Separate Account |
| Hellman and Friedman | Buyout |
| Littlejohn & Co. | Turnaround |
| Natural Gas Partners | Energy |
| Stone Point Capital | Buyout |
| TA Associates | Growth |
| TPG Partners | Buyout |
| CREDIT STRATEGIES – TOP 10 MANAGERS | Style Description |
| Advent Capital | Convertibles |
| Allianz Global Investors | Convertibles |
| Anchorage Capital | Hedge Fund, Opportunistic High-Yield |
| Beach Point Capital Management | Distressed, Leveraged Loans, Opportunistic |
| Pacific Investment Management Co. | Emerging Market Debt, High-Yield |
| Payden & Rygel | Emerging Market Debt |
| Prudential | High-Yield, Investment-Grade, Mezzanine |
| Schroders | Mortgage-Backed Securities, Private Debt |
| Solus | Hedge Fund, Leveraged Loan |
| Zazove Associates | Convertibles |
| PRIVATE INVESTMENT PARTNERSHIPS | Style Description |
| Carlyle | Multi-Asset Class Private Investments |
| KKR | Multi-Asset Class Private Investments |
| CURRENCY | Style Description |
| First Quadrant | Developed |
| REAL ASSETS – TOP 10 MANAGERS | Style Description |
| Blackstone Real Estate Partners | Core, Enhanced Core, Opportunistic Real Estate |
| Clarion Partners | Enhanced Core Real Estate |
| Global Infrastructure Partners | Global Infrastructure |
| Industry Funds Management | Global Infrastructure |
| J.P. Morgan Asset Management Inc. | Core Real Estate |
| Morgan Stanley | Core, Enhanced Core, Opportunistic Real Estate, International REITs & Global Infrastructure |
| Pantheon Ventures | Global Infrastructure, Global Natural Resources |
| PGIM | Core & Enhanced Core Real Estate |
| Pritzker Realty Group | Opportunistic Real Estate |
| VRS – Internal Equity Management | U.S. REITs |
| MULTI-ASSET PUBLIC STRATEGIES | Style Description |
| AQR | Multi-Asset Class Public Investments |
| Blackrock | Multi-Asset Class Public Investments |
| Bridgewater | Multi-Asset Class Public Investments |
| Capstone | Multi-Asset Class Public Investments |
| J.P. Morgan | Multi-Asset Class Public Investments |
| Morgan Stanley | Multi-Asset Class Public Investments |
| Internal Fixed Income | Long-Duration Treasuries |

Public Equity Commissions

AS OF JUNE 30, 2019

| Broker | Commission | Broker | Commission |
|--|-----------------|---|------------------------|
| National Financial Services Corp., New York | \$ 1,390,159.02 | Deutsche Bank Securities Inc., New York | |
| Goldman Sachs & Co., New York | 1,288,297.22 | (NWSCUS33) | 140,911.87 |
| Credit Suisse, New York (CSUS) | 701,423.04 | Instinet Europe Limited, London | 139,795.78 |
| Morgan Stanley & Co. Inc., New York | 325,725.73 | UBS Equities, London | 110,235.18 |
| Merrill Lynch Pierce Fenner Smith Inc., New York | 316,601.81 | JP Morgan Securities Ltd., London | 109,016.12 |
| Merrill Lynch International London Equities | 311,948.80 | Other Brokers | 1,914,826.41 |
| Sanford C. Bernstein & Co. Inc., New York | 250,097.18 | Total FY 2019 | \$ 7,208,610.65 |
| Sanford C. Bernstein & Co. Inc., London | 209,572.49 | | |

SCHEDULE OF INVESTMENT EXPENSES

FOR THE YEAR ENDED JUNE 30, 2019

(EXPRESSED IN THOUSANDS)

| | Assets Under Management | Management Fees and Expenses |
|---|-------------------------|------------------------------|
| External Management: | | |
| Public Equity Managers | \$ 12,022,625 | \$ 48,864 |
| Fixed Income Managers | 3,269,586 | 1,241 |
| Credit Strategies Managers | 11,172,952 | 58,953 |
| Real Assets Managers | 11,194,351 | 100,780 |
| Alternative Investment Managers | 9,592,339 | 127,552 |
| Hedge Funds Managers | 7,655,380 | 75,183 |
| Risk-Based Investments Managers | 2,267,360 | 15,492 |
| Currency Managers* | — | 2,700 |
| Dynamic Strategy | 907,534 | 4,329 |
| Internal Management: | 26,023,077 | 37,122 |
| Miscellaneous Fees and Expenses: | | |
| Custodial Fees | — | 4,500 |
| Legal Fees | — | 614 |
| Other Fees and Expenses | — | 9,169 |
| Total | \$ 84,105,204 | \$ 486,499 |

* The fees related to Active Currency Overlay Program are based on the managers' notional account values. The total notional value at June 30, 2019, was \$1.8 billion.

Investment Summary: Defined Benefit Plans

In accordance with Section 51.1-124.31 of the *Code of Virginia* (1950), as amended, the Board of Trustees has pooled substantially all defined benefit plan assets of the Virginia Retirement System, the State Police Officers' Retirement System, the Judicial Retirement System, the Group Life

Insurance Fund and the Retiree Health Insurance Credit Fund into a common investment pool. The common investment pool of the pension trust funds and other trust funds held the following composition of investments at June 30, 2019 and 2018:

(EXPRESSED IN THOUSANDS)

| | 2019 Fair Value | Percent of Total Value | 2018 Fair Value | Percent of Total Value |
|--|----------------------|---------------------------|----------------------|---------------------------|
| Bonds and Mortgage Securities: | | | | |
| U.S. Government and Agencies | \$ 4,317,660 | 5.11% | \$ 4,056,580 | 5.04% |
| Mortgage Securities | 4,889,973 | 5.79% | 4,361,474 | 5.42% |
| Corporate and Other Bonds | 12,689,298 | 15.04% | 13,355,608 | 16.60% |
| Total Bonds and Mortgage Securities | 21,896,931 | 25.94% | 21,773,662 | 27.06% |
| Common and Preferred Stocks | 24,722,983 | 29.28% | 24,452,265 | 30.40% |
| Index and Pooled Funds | | | | |
| Equity Index and Pooled Funds | 11,069,496 | 13.10% | 10,502,999 | 13.06% |
| Fixed-Income Commingled Funds | 1,342,413 | 1.59% | 1,360,209 | 1.69% |
| Total Index and Pooled Funds | 12,411,909 | 14.69% | 11,863,208 | 14.75% |
| Real Assets | 9,877,199 | 11.70% | 9,242,121 | 11.49% |
| Private Equity | 15,083,638 | 17.87% | 12,919,297 | 16.07% |
| Short-Term Investments | | | | |
| Treasurer of Virginia – LGIP Investment Pool | 331,823 | 0.38% | 99,344 | 0.12% |
| Foreign Currencies | 112,545 | 0.14% | 84,056 | 0.11% |
| Total Short-Term Investments | 444,368 | 0.52% | 183,400 | 0.23% |
| Total Investments | \$ 84,437,028 | 100.00% | \$ 80,433,953 | 100.00% |

Description of Hybrid Defined Contribution Plan

Defined contribution plan assets for Hybrid Retirement Plan members are maintained in two separate accounts. The Hybrid 401(a) Cash Match Plan account contains the hybrid plan member and employer mandatory contributions and the employer match on the voluntary member

contributions. The Hybrid 457 Deferred Compensation Plan account contains the hybrid plan member's voluntary contributions. The schedule below shows the assets in each investment option and the accumulated plan assets in each option.

HYBRID PARTICIPANT ACCOUNT PLAN ASSETS BY FUND OPTION

AS OF JUNE 30, 2019

| Fund Name | Hybrid 401(a) | Hybrid 457 | Total |
|-------------------------------------|-----------------------|-----------------------|-----------------------|
| Retirement Portfolio | \$ 3,098,668 | \$ 1,496,228 | \$ 4,594,896 |
| Target Date 2020 Portfolio | 12,415,383 | 6,333,720 | 18,749,103 |
| Target Date 2025 Portfolio | 22,687,848 | 11,269,156 | 33,957,004 |
| Target Date 2030 Portfolio | 30,300,937 | 15,996,764 | 46,297,701 |
| Target Date 2035 Portfolio | 36,285,958 | 17,515,707 | 53,801,665 |
| Target Date 2040 Portfolio | 36,582,128 | 16,260,867 | 52,842,995 |
| Target Date 2045 Portfolio | 42,115,252 | 17,880,926 | 59,996,178 |
| Target Date 2050 Portfolio | 52,563,415 | 20,095,956 | 72,659,371 |
| Target Date 2055 Portfolio | 83,984,779 | 25,890,929 | 109,875,708 |
| Target Date 2060 Portfolio | 26,516,325 | 7,462,941 | 33,979,266 |
| Money Market Fund | 2,495,184 | 440,023 | 2,935,207 |
| Stable Value Fund | 682,695 | 1,050,943 | 1,733,638 |
| Bond Fund | 548,720 | 656,579 | 1,205,299 |
| Inflation-Protected Bond Fund | 155,190 | 211,972 | 367,162 |
| High-Yield Bond Fund | 525,263 | 844,575 | 1,369,838 |
| Stock Fund | 6,934,513 | 8,332,424 | 15,266,937 |
| Small/Mid-Cap Stock Fund | 2,661,763 | 3,104,449 | 5,766,212 |
| International Stock Fund | 1,397,704 | 1,722,751 | 3,120,455 |
| Global Real Estate Fund | 702,462 | 863,392 | 1,565,854 |
| VRS Investment Portfolio – PIPVRSIP | 4,055 | 3,678 | 7,733 |
| VRS Investment Portfolio | 72,342 | 50,413 | 122,755 |
| Self-Directed Brokerage | 176,456 | 127,502 | 303,958 |
| Total Plan Assets | \$ 362,907,040 | \$ 157,611,895 | \$ 520,518,935 |

Description of Defined Contribution Plans Investment Options

Participants in the System's Hybrid Retirement Plan benefit structure have access to a number of core investment options for contributions to their defined contribution plans. These options are intended to provide participants with a variety of investment choices while controlling the associated costs. In addition to the option-specific annual operating expense detailed in the Investment Option Performance Summary, participants pay an annual record-keeping fee of \$30.50 that is deducted from their accounts on a monthly basis (approximately \$2.54 per month).

Participants with more than one account in the Plan pay only one annual fee of \$30.50. At June 30, 2019, the plans provided the following core investment options to participants. *Note: Some sector allocations may not total 100% due to rounding.*

DO-IT-FOR-ME FUNDS

Retirement Portfolio: Seeks to provide for retirement outcomes consistent with investor preferences throughout the savings and drawdown phase based on quantitatively measured risk that investors, on average, may be willing to accept. In pursuit of that object, the portfolio will be broadly diversified across global asset classes.

U.S. Bonds: 53.1% U.S. Large/Mid-Cap Stocks: 21.8% International Stocks: 11.6%
U.S. Inflation-Index Bonds: 6.8% U.S. Small-Cap Stocks: 3.3%
Commodities: 2.3% Developed Real Estate: 1.1%

Target Date 2020 Portfolio: Seeks to provide for retirement outcomes consistent with investor preferences throughout the savings and drawdown phase based on quantitatively measured risk that investors, on average, may be willing to accept. In pursuit of that objective, the portfolio will be broadly diversified across global asset classes, with asset allocations becoming more conservative over time.

U.S. Bonds: 51.0% U.S. Large/Mid-Cap Stocks: 22.7% International Stocks: 12.6%
U.S. Inflation-Index Bonds: 6.4% U.S. Small-Cap Stocks: 3.3%
Commodities: 2.2% Developed Real Estate: 1.8%

Target Date 2025 Portfolio: Seeks to provide for retirement outcomes consistent with investor preferences throughout the savings and drawdown phase based on quantitatively measured risk that investors, on average, may be willing to accept. In pursuit of that objective, the portfolio will be broadly diversified across global asset classes, with asset allocations becoming more conservative over time.

U.S. Bonds: 38.7% U.S. Large/Mid-Cap Stocks: 29.5% International Stocks: 18.6%
U.S. Inflation-Index Bonds: 5.3% U.S. Small-Cap Stocks: 3.0%
Developed Real Estate: 2.9% Commodities: 2.0%

Target Date 2030 Portfolio: Seeks to provide for retirement outcomes consistent with investor preferences throughout the savings and drawdown phase based on quantitatively measured risk that investors, on average, may be willing to accept. In pursuit of that objective, the portfolio will be broadly diversified across global asset classes, with asset allocations becoming more conservative over time.

U.S. Large/Mid-Cap Stocks: 35.3% U.S. Bonds: 28.0% International Stocks: 23.8%
Developed Real Estate: 4.2% U.S. Inflation-Index Bonds: 4.1%
U.S. Small-Cap Stocks: 2.8% Commodities: 1.8%

Target Date 2035 Portfolio: Seeks to provide for retirement outcomes consistent with investor preferences throughout the savings and drawdown phase based on quantitatively measured risk that investors, on average, may be willing to accept. In pursuit of that objective, the portfolio will be broadly diversified across global asset classes, with asset allocations becoming more conservative over time.

U.S. Large/Mid-Cap Stocks: 40.5% International Stocks: 28.5% U.S. Bonds: 18.2%
Developed Real Estate: 5.4% U.S. Inflation-Index Bonds: 2.9%
U.S. Small-Cap Stocks: 2.7% Commodities: 1.8%

Target Date 2040 Portfolio: Seeks to provide for retirement outcomes consistent with investor preferences throughout the savings and drawdown phase based on quantitatively measured risk that investors, on average, may be willing to accept. In pursuit of that objective, the portfolio will be broadly diversified across global asset classes, with asset allocations becoming more conservative over time.

U.S. Large/Mid-Cap Stocks: 45.4% International Stocks: 33.0%
U.S. Bonds: 9.5% Developed Real Estate: 6.5% U.S. Small-Cap Stocks: 2.4%
U.S. Inflation-Index Bonds: 1.6% Commodities: 1.6%

Target Date 2045 Portfolio: Seeks to provide for retirement outcomes consistent with investor preferences throughout the savings and drawdown phase based on quantitatively measured risk that investors, on average, may be willing to accept. In pursuit of that objective, the portfolio will be broadly diversified across global asset classes, with asset allocations becoming more conservative over time.

U.S. Large/Mid-Cap Stocks: 48.6% International Stocks: 36.3%
Developed Real Estate: 7.3% U.S. Bonds: 3.6% U.S. Small-Cap Stocks: 2.3%
Commodities: 1.3% U.S. Inflation-Index Bonds: 0.6%

Target Date 2050 Portfolio: Seeks to provide for retirement outcomes consistent with investor preferences throughout the savings and drawdown phase based on quantitatively measured risk that investors, on average, may be willing to accept. In pursuit of that objective, the portfolio will be broadly diversified across global asset classes, with asset allocations becoming more conservative over time.

U.S. Large/Mid-Cap Stocks: 49.9% International Stocks: 37.8% Developed Real Estate: 7.6%
U.S. Small-Cap Stocks: 2.4% Commodities: 1.2% U.S. Bonds: 1.1%

Target Date 2055 Portfolio: Seeks to provide for retirement outcomes consistent with investor preferences throughout the savings and drawdown phase based on quantitatively measured risk that investors, on average, may be willing to accept. In pursuit of that objective, the portfolio will be broadly diversified across global asset classes, with asset allocations becoming more conservative over time.

U.S. Large/Mid-Cap Stocks: 49.9% International Stocks: 37.9% Developed Real Estate: 7.7%
U.S. Small-Cap Stocks: 2.4% Commodities: 1.1% U.S. Bonds: 1.0%

Target Date 2060 Portfolio: Seeks to provide for retirement outcomes consistent with investor preferences throughout the savings and drawdown phase based on quantitatively measured risk that investors, on average, may be willing to accept. In pursuit of that objective, the portfolio will be broadly diversified across global asset classes, with asset allocations becoming more conservative over time.

U.S. Large/Mid-Cap Stocks: 49.9% International Stocks: 37.9% Developed Real Estate: 7.7%
U.S. Small-Cap Stocks: 2.4% Commodities: 1.1% U.S. Bonds: 1.0%

HELP-ME-DO-IT FUNDS

Money Market Fund: Seeks to provide a high level of current income as is consistent with liquidity and stability of principal.

Other Repurchase Agreement: 38.3% Certificate of Deposit: 14.3%
Asset-Backed Commercial Paper: 12.4% Commercial Paper: 11.5% Time Deposits: 8.4%
Treasury Repurchase Agreement: 7.5% Government Agency Repurchase Agreement: 4.8%
Supranational: 1.7% Government Agency Debt: 1.1%

Stable Value Fund: Seeks to provide safety of principal, while earning a level of interest income consistent with an underlying portfolio of short- to intermediate-duration high-quality fixed income (bond) securities and cash or cash equivalents, and liquidity to accommodate participant transactions.

Corporates: 32.7% Agency MBS: 20.4% Asset-Backed: 14.7% U.S. Treasury/Agency: 10.7%
CMBS: 7.3% Other U.S. Government: 5.0% Cash/Equivalents: 4.6%
Taxable Municipals: 3.2% Non-Agency MBS: 1.4%

Bond Fund: Seeks to track the performance of the Bloomberg Barclays Aggregate Bond Index. The index is an unmanaged index that represents the broad U.S. investment-grade bond market and is comprised of U.S. treasury securities, government agency bonds, corporate bonds, mortgage-backed securities, asset-backed securities and a small amount of foreign bonds traded in the U.S.

Treasury: 37.8% Mortgages: 27.1% Industrials: 15.0% Financials: 7.9%
Non-U.S. Credit: 3.9% Agencies: 2.7% CMBS: 2.0% Utilities: 1.8%
Cash: 0.7% Taxable Municipals: 0.6% Asset-Backed Securities: 0.5%

Inflation-Protected Bond Fund: Seeks to track the performance of the Bloomberg Barclays U.S. Treasury Inflation-Protected Securities Index. The index is an unmanaged index that represents the U.S. Treasury Inflation-Protection Securities (TIPS) market. The index includes investment-grade TIPS with one or more years to final maturity.

U.S. Treasury: 99.4% Cash: 0.6%

High-Yield Bond Fund: Seeks to achieve returns that exceed, over time, its benchmark, the ICE BofAML U.S. High-Yield BB-B Constrained Index. The index is an unmanaged index of BB-B rated securities that caps any single issuer exposure to 2.0%. The index is indicative of the higher quality high-yield bond market.

Communications: 23.7% Consumer Non-Cyclical: 17.1% Consumer Cyclical: 13.7%
Other/Cash: 13.1% Energy: 9.1% Capital Goods: 7.9% Technology: 7.5% Basic Industry: 3.5%
Finance: 1.8% Transportation: 1.8% Utilities: 0.5% Other Industrial: 0.3%

Stock Fund: Seeks to track the performance of the Standard & Poor's 500 Index. The index is an unmanaged index that represents the broad large-capitalization U.S. stock market and is comprised of 500 widely held U.S. stocks chosen by Standard & Poor's.

Information Technology: 21.5% Health Care: 14.2% Financials: 13.1% Communication Services: 10.2%
Consumer Discretionary: 10.2% Industrials: 9.4% Consumer Staples: 7.3% Energy: 5.0%
Utilities: 3.3% Real Estate: 3.0% Materials: 2.8%

Small/Mid-Capitalization Stock Fund: Seeks to track the performance of the Russell 2500 Index. The index is an unmanaged index that represents the broad middle- to smaller-capitalization U.S. stock market.

Financials: 16.0% Information Technology: 15.9% Industrials: 15.1%
Health Care: 13.3% Consumer Discretionary: 11.7% Real Estate: 9.9% Materials: 5.2%
Utilities: 3.7% Energy: 3.3% Communication Services: 3.2% Consumer Staples: 2.7%

International Stock Fund: Seeks to track the performance of the MSCI ACWI ex-U.S. IMI Index. The index is an unmanaged index that represents the equity performance of large, mid- and small-cap segments of developed and emerging markets, excluding the U.S.

Financials: 20.5% Industrials: 12.9% Consumer Discretionary: 11.4%
Consumer Staples: 9.3% Information Technology: 8.7% Health Care: 8.1% Materials: 8.0%
Energy: 6.7% Communication Services: 6.6% Real Estate: 4.4% Utilities: 3.4%

Global Real Estate Fund: Seeks to track the performance of the FTSE EPRA/NAREIT Developed Index. The index is an unmanaged index that is designed to reflect the performance of listed real estate companies worldwide, including the U.S.

Retail REITs: 17.8% Office REITs: 12.4% Residential REITs: 12.2%
Diversified REITs: 9.6% Industrial REITs: 9.5% Real Estate Operating Companies: 9.4%
Specialized REITs: 8.2% Health Care REITs: 7.9% Diversified Real Estate Activities: 7.7%
Hotel & Resort REITs: 3.5% Real Estate Development: 1.7%
Hotels, Resorts & Cruise Lines: 0.1%

VRS Investment Portfolio (VRSIP): Seeks to maximize return while managing risk within an acceptable range. Due to the long-term nature of the defined benefit plan's liabilities, the horizon for investment decisions is generally defined as 10 years or longer.

Public Equity: 40.1% Fixed Income: 15.9% Credit Strategies: 14.5% Real Assets: 13.5%
Private Equity: 11.5% MAPS: 2.7%
PIP: 1.3% Cash: 0.5%

DO-IT-MYSELF FUNDS

Self-Directed Brokerage Account (SDBA): Allows investors to select from thousands of publicly traded mutual funds, exchange-traded funds (ETFs) and individual securities in addition to the available core investment options. The SDBA option is offered through TD Ameritrade. The SDBA option is for knowledgeable investors who acknowledge and understand the risks and costs associated with the investments contained in this option.

In addition to the annual record-keeping fee and operating expenses, this option is subject to transaction fees charged by TD Ameritrade and investment management-related fees and expenses for the funds or investments selected.

Investment Option Performance Summary: Defined Contribution Plans

AS OF JUNE 30, 2019

(RETURNS GREATER THAN ONE YEAR ARE ANNUALIZED)

DO-IT-FOR-ME PATH: TARGET DATE PORTFOLIOS

| Investment Options | Inception Date | 1 Year | 3 Years | 5 Years | 10 Years or Since Inception | Total Annual Operating Expenses | |
|-----------------------------------|-----------------|--------------|---------------|--------------|-----------------------------|---------------------------------|---------------|
| | | | | | | As a % | Per \$1,000 |
| Retirement Portfolio | 08/01/05 | 6.56% | 5.83% | 4.23% | 6.77% | 0.08% | \$0.80 |
| Custom Benchmark ¹ | | 6.58% | 5.81% | 4.20% | 6.76% | | |
| Target Date 2020 Portfolio | 08/01/05 | 6.44% | 6.57% | 4.56% | 7.91% | 0.08% | \$0.80 |
| Custom Benchmark ¹ | | 6.46% | 6.54% | 4.51% | 7.88% | | |
| Target Date 2025 Portfolio | 07/05/06 | 6.50% | 7.61% | 5.06% | 8.62% | 0.08% | \$0.80 |
| Custom Benchmark ¹ | | 6.47% | 7.54% | 4.99% | 8.58% | | |
| Target Date 2030 Portfolio | 08/01/05 | 6.50% | 8.53% | 5.51% | 9.25% | 0.08% | \$0.80 |
| Custom Benchmark ¹ | | 6.44% | 8.43% | 5.40% | 9.18% | | |
| Target Date 2035 Portfolio | 07/05/06 | 6.49% | 9.41% | 5.91% | 9.82% | 0.08% | \$0.80 |
| Custom Benchmark ¹ | | 6.38% | 9.26% | 5.78% | 9.73% | | |
| Target Date 2040 Portfolio | 08/01/05 | 6.43% | 10.17% | 6.25% | 10.32% | 0.08% | \$0.80 |
| Custom Benchmark ¹ | | 6.30% | 10.00% | 6.10% | 10.21% | | |
| Target Date 2045 Portfolio | 07/05/06 | 6.31% | 10.61% | 6.45% | 10.71% | 0.08% | \$0.80 |
| Custom Benchmark ¹ | | 6.15% | 10.41% | 6.27% | 10.59% | | |
| Target Date 2050 Portfolio | 09/30/07 | 6.28% | 10.74% | 6.49% | 11.01% | 0.08% | \$0.80 |
| Custom Benchmark ¹ | | 6.07% | 10.55% | 6.32% | 10.90% | | |
| Target Date 2055 Portfolio | 05/19/10 | 6.29% | 10.74% | 6.45% | 9.85% | 0.08% | \$0.80 |
| Custom Benchmark ¹ | | 6.07% | 10.55% | 6.28% | 9.73% | | |
| Target Date 2060 Portfolio | 11/17/14 | 6.28% | 10.72% | N/A | 7.14% | 0.08% | \$0.80 |
| Custom Benchmark ¹ | | 6.07% | 10.55% | N/A | 6.96% | | |

HELP-ME-DO-IT PATH: INDIVIDUAL OPTIONS

| Investment Options | Inception Date | Total Annual Operating Expenses | | | | | |
|--|-----------------|---------------------------------|---------------|---------------|-----------------------------|--------------|---------------|
| | | 1 Year | 3 Years | 5 Years | 10 Years or Since Inception | As a % | Per \$1,000 |
| Money Market Fund | 11/01/99 | 2.50% | 1.65% | 1.03% | 0.58% | 0.08% | \$0.80 |
| Benchmark: Bloomberg Barclays 3-Month Treasury Bill Index | | | | | | | |
| Yield as of June 30, 2019, was 2.57% | | | | | | | |
| Stable Value Fund | 02/01/95 | 2.37% | 2.04% | 1.83% | 2.11% | 0.26% | \$2.60 |
| Custom Benchmark ² | | | | | | | |
| Yield as of June 30, 2019, was 2.53% | | | | | | | |
| Bond Fund | 11/01/99 | 7.92% | 2.36% | 3.01% | 3.95% | 0.03% | \$0.30 |
| Benchmark: Bloomberg Barclays U.S. Aggregate Bond Index | | | | | | | |
| Inflation-Protected Bond Fund | 07/30/02 | 4.90% | 2.22% | 1.85% | 3.71% | 0.03% | \$0.30 |
| Benchmark: Bloomberg Barclays U.S. Treasury Inflation-Protected Securities Index | | | | | | | |
| High-Yield Bond Fund | 05/31/04 | 8.19% | 7.45% | 5.17% | 8.99% | 0.40% | \$4.00 |
| Benchmark: ICE BofAML U.S. High-Yield BB-B Constrained Index | | | | | | | |
| Stock Fund | 11/01/99 | 10.48% | 14.22% | 10.75% | 14.73% | 0.01% | \$0.10 |
| Benchmark: S&P 500 Index | | | | | | | |
| Small/Mid-Cap Stock Fund | 11/01/99 | 1.77% | 12.40% | 7.78% | 14.38% | 0.03% | \$0.30 |
| Benchmark: Russell 2500 Index ³ | | | | | | | |
| International Stock Fund | 11/01/99 | 0.56% | 9.41% | 2.39% | 7.00% | 0.06% | \$0.60 |
| Benchmark: MSCI ACWI ex-U.S. IMI Index ⁴ | | | | | | | |
| Global Real Estate Fund | 10/01/02 | 8.82% | 5.40% | 5.75% | 15.00% | 0.08% | \$0.80 |
| Benchmark: FTSE EPRA/NAREIT Developed Index ⁵ | | | | | | | |
| VRS Investment Portfolio (VRSIP) | 07/01/08 | 6.66% | 8.75% | 6.53% | 9.36% | 0.58% | \$5.80 |
| VRS Custom Benchmark ⁶ | | | | | | | |

INVESTMENT OPTION PERFORMANCE SUMMARY: DEFINED CONTRIBUTION PLANS, cont.

- ¹ Benchmarks are calculated using blended returns of third-party indices that proportionately reflect the respective weightings of the Portfolios' asset classes. Weightings are adjusted quarterly to reflect the Portfolios' asset allocation shifts over time. Indices currently used to calculate the custom benchmarks are Russell 1000 Index, Russell 2000 Index, MSCI ACWI ex-U.S. IMI Index, Bloomberg Barclays U.S. Aggregate Bond Index, Bloomberg Barclays U.S. Treasury Inflation-Protected Securities Index, FTSE EPRA/NAREIT Developed Index and the Bloomberg Commodity Index Total Return.
- ² Effective August 2016, the benchmark represents a hypothetical return generated by the monthly yields of actively traded U.S. Treasuries based on [50% two-year maturity + 50% three-year maturity] plus an annualized spread of 0.25% and is representative of the Fund's expected return profile, given how the Fund is managed and book value accounting treatment. Prior to August 2016, the custom benchmark was based on the monthly yield of actively traded U.S. Treasuries with a three-year maturity plus an annualized spread of 0.50%. The benchmark returns are linked.
- ³ Effective July 2012, the performance benchmark is the Russell 2500 Index. Prior to July 2012, the performance benchmark was the Russell Small-Cap Completeness Index. The benchmark returns are linked.
- ⁴ Effective August 2016, the performance benchmark is the MSCI ACWI ex-U.S. IMI Index. It was the MSCI World ex-U.S. Index from July 2012 through July 2016, and prior to July 2012, it was the MSCI EAFE Index. The benchmark returns are linked.
- ⁵ Effective July 2012, the performance benchmark is the FTSE EPRA/NAREIT Developed Index. Prior to July 2012, the performance benchmark was the Dow Jones U.S. Select REIT Index. The benchmark returns are linked.
- ⁶ The VRS Custom Benchmark is a blend of the asset class benchmarks at policy weights.