

ACTUARIAL VALUATION  
OF  
Prepaid529  
AS OF JUNE 30, 2017

By:

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Board of the Virginia College Savings Plan  
Commonwealth of Virginia  
Virginia College Savings Plan  
9001 Arboretum Parkway  
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Ladies & Gentlemen:

This report presents the results of the actuarial valuation of the Prepaid529 Program as of June 30, 2017.

### Purpose

The main purposes of this report are:

- to calculate the actuarial present value of the obligations under Prepaid529 contracts purchased through June 30, 2017 and compare the value of those obligations with the assets in Prepaid529 as of that date;
- to review the experience and changes in the actuarial assumptions during the last year and indicate their effects on the results; and
- to set forth the basis for the actuarial assumptions and methods utilized in those calculations.

The results contained in this report are based on contract data and preliminary financial statements provided by the Virginia College Savings Plan. We have relied on this data in preparing this report.

### Background

In 1994, the Virginia General Assembly established the Virginia Higher Education Tuition Trust Fund (subsequently renamed the Virginia College Savings Plan) to enhance the accessibility and affordability of higher education for all citizens of the Commonwealth. The Prepaid529 fund consists of payments received pursuant to prepaid tuition contracts, bequests, endowments or grants from the United States government, its agencies and instrumentalities, and any other available sources of funds, public or private. Any moneys remaining in Prepaid529 at the end of a biennium shall remain in Prepaid529. Interest and income earned from the investment of such funds shall remain in Prepaid529.

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In 1998, the Virginia General Assembly passed legislation that requires the Governor to include in each year's state budget an amount to cover the Plan's obligations, which include Prepaid529, in the event "the Plan is unable to meet its current obligations." The Governor has included the provision in subsequent budget submissions to meet the Prepaid529 obligations, and the General Assembly has included the provision in subsequent Appropriation Acts, including Chapter 836 of the 2017 Virginia Acts of Assembly (2017 Appropriation Act).

### Program Design

Prepaid529 is one of three Section 529 options currently offered by the Virginia College Savings Plan. Under Prepaid529, participants purchase tuition contracts that provide coverage of tuition and mandatory fees at a public university and/or community college in Virginia. At redemption, the contract pays the current tuition and mandatory fees at the Virginia public university or community college that the beneficiary attends. The benefits vary if the beneficiary does not attend a Virginia public university or community college. With the establishment of Invest529 and other savings programs, contract holders have the option of rolling over the value of their Prepaid529 contract into a savings account. The value of the Prepaid529 contract for such rollovers is the accumulated contributions at the reasonable rate of interest set by Virginia529. This option to roll over the contract has effectively added a minimum benefit to the Program.

### Statutory Requirements

The Code of Virginia, Title 23.1, Subtitle II, Chapter 7 provides limited guidance for establishing the actuarial basis to evaluate Prepaid529. The Code requires an annual audit of Prepaid529 and states in part that if the annual accounting and audit reveal that there are insufficient funds to ensure the "actuarial soundness" of Prepaid529, the "Board may adjust the terms of subsequent prepaid tuition contracts, arrange refunds for current purchasers to ensure actuarial soundness, or take such other action the Board deems appropriate."

"Actuarial soundness" is not a precise concept and there is no generally accepted understanding of the meaning of this phrase within the actuarial profession, especially with respect to prepaid tuition plans. For purposes of this report, we have assumed that the phrase "actuarially sound," when applied to Prepaid529, means that the Fund has sufficient assets (including the value of future installment payments due under current contracts) to cover the actuarially estimated value of the tuition obligations under those contracts (including any administrative costs associated with those contracts).

We have also interpreted these Sections to require that the actuarial liabilities be evaluated using sound actuarial principles that are generally consistent with the practices and principles widely used for retirement programs. Reference to other programs is necessary because of the innovative nature of a prepaid tuition program. No generally accepted standard of practice has evolved within the actuarial profession specifically

addressing prepaid tuition programs. We chose the standards applicable to retirement programs because these programs generally provide for payments at some future date where that payment has a high probability of payment at, or close to, some specific age.

### Valuation Basis

The assumptions selected for this report are intended to be "best estimates".

The method for determining the "best estimate" liability for the Program reflects the possible variability of inflation, tuition, and investment returns and the correlation between each of these variables. The methodology is described in the section below, Variability of Results and Valuation Basis.

### Prepaid Investment Policy

On June 25, 2009, the Board of the Virginia College Savings Plan adopted a new target asset allocation strategy for Prepaid529. On June 21, 2016 the Board reviewed the allocation strategy and recommended no changes to the allocation.

The investment strategy is important because it sets forth acceptable investment allocations among asset classes. The asset allocation affects the magnitude and variability of expected investment returns and therefore the financial structure of the plan. For the valuation, we have assumed that Prepaid529 investments will be allocated as shown below, based on the investment policy target allocations:

#### Asset Category

Equities	32.5%
Core Fixed Income	25.0%
Non-Core Fixed Income	27.5%
Alternative Investments	15.0%

### Actuarial Assumptions

The actuarial assumptions used to prepare this report are summarized in Appendix C. The two most significant of those assumptions are the rates of investment return and tuition growth in the future. The Virginia College Savings Plan selected both of these assumptions. They are:

- the investment return assumption of 6.25% per year, net of investment related expenses (this is the same as the assumption used to prepare the prior year's report); and,
- the annual tuition growth rate assumptions summarized in the following table.

	<u>Universities</u>	<u>Community Colleges</u>
Fall 2018	5.0%	5.0%
Fall 2019 and thereafter	6.5%	6.5%

The tuition growth assumptions are consistent with those used in the prior year's report.

### Summary of Results

The actuarial value of the obligations of Prepaid529 as of June 30, 2017 is summarized below and compared with the total assets of Prepaid529.

	Present Value of Obligations For Future <u>Payments</u>	Value of Total Prepaid529 <u>Assets</u>	Actuarial Reserve/ <u>(Deficit)</u>
<i>(Amounts in Millions)</i>			
Prepaid529:			
Tuition Obligations	\$2,022.8	n/a	n/a
Administrative Expenses	<u>25.4</u>	<u>n/a</u>	<u>n/a</u>
Grand Total	\$2,048.2	\$2,835.0	\$786.8

As indicated above, Prepaid529 has assets that exceed the "best estimate" of the obligations by roughly \$786.8 million or 38.4%. Unfavorable future experience would adversely affect this position. It would be desirable to maintain and accumulate additional actuarial reserve over time to protect and strengthen this position.

The present value of future obligations for Administrative Expenses reflects the expected costs of maintaining each contract in place (as of June 30, 2017) until all tuition benefits have been paid and the expenses associated with making those payments. It does not include the future expenses of Prepaid529 associated with general overhead and marketing attributable to future contracts. The \$25.4 million administrative expense obligation is equivalent to about \$397 per contract.

### Actuarial Gain/Loss Analysis

During the 2017 fiscal year, the actuarial reserve position of Prepaid529 improved from a surplus of \$589.7 million to a surplus of \$786.8 million or 38.4% of obligations. Actuarial gains add to the reserve while actuarial losses decrease the reserve. This year's increase to the reserve is mostly attributable to higher than expected investment returns. Each of the factors affecting the change in the actuarial reserve/(deficit) is discussed below.

The actuarial surplus was expected to grow during the year by about \$36.9 million due to the passage of time. (The obligations are calculated as present values which grow with interest with the passage of time.)

The rate of return on Prepaid529 investments (net of investment management fees) for the fiscal year was 10.70% on both a time-weighted and a dollar-weighted basis. For the previous valuation, a 6.25% rate of return was assumed. This produced a net actuarial gain of approximately \$97.5 million.

The enrollment-weighted average university tuition and mandatory fee amount for the 2017-2018 school year increased by 4.5%, a smaller increase than the 5.0% rate assumed in the prior valuation. Enrollment-weighted tuition and mandatory fees at community colleges increased by about 3.3%, a smaller increase than the 5.0% rate assumed in the prior valuation. These smaller increases resulted in an actuarial gain of \$8.1 million.

Payouts for some of the contract holders are based on the account balance brought forward at the reasonable rate or the account balance brought forward at the actual rate of return on the portfolio. See Appendices C and F for an explanation of the assumptions and the payouts. During the past year the actual rate of return on the portfolio was 10.70% (4.45% higher than the 6.25% assumption). The higher than expected actual account balances resulted in an actuarial loss of approximately \$5.4 million.

The Plan sold 3,576 new contracts during the year. Each contract was priced so as to contribute to the actuarial reserve. We estimate that the reserve was increased by approximately \$11.3 million from these new contracts.

Prepaid529 received \$42.4 million in administrative fee revenue from all the Plan programs, including CollegeAmerica. Total agency operating expenses were \$22.8 million, of which \$7.3 million was expected to be provided by the Prepaid529 program. The balance of the fee revenue, \$26.9 million, is an increase to the reserve.

The methodology for valuing the present value of installment contract receivables for contracts that are behind in their scheduled payments was changed. We now assume that the scheduled monthly payment will be increased to an amount that will allow the full payment of the contract by June in the year of expected matriculation. The previous methodology assumed that the scheduled monthly payments would be made until the full amount under the contract had been paid. This increased the reserve by \$3.0 million.

The bias factor for participants attending private colleges in Virginia was increased from 50% to 76%. This lowered the reserve by \$1.6 million.

The assumption for the reasonable rate was changed, from 1.25% for 2017-2018, 2.25% for 2018-2019 and 3.25% thereafter, to a fixed .57% for the first quarter of the current fiscal year and 1.25% for the remainder of the fiscal year. The assumptions for the rates

in 2018-2019 and beyond are not changed. The volatility and correlation assumptions for the investment returns and tuition increases were updated. The combined impact of these changes was a \$3.0 million decrease to the reserve.

Other experience gains added about \$23.4 million to the reserve. These could be from rollovers, cancellations, forfeitures, or more beneficiaries attending colleges with lower tuition levels than assumed in last year's valuation or other variations from the actuarial assumptions.

In summary, the effect of experience and assumption changes on the actuarial reserve/ (deficit) can be summarized as follows:

*(Amounts in Millions)*

Actuarial Reserve / (Deficit) as of June 30, 2016	\$ 589.7
Interest on the reserve at 6.25%	36.9
Investment gain / (loss)	97.5
Tuition gain / (loss)	8.1
Higher than expected actual account balances	(5.4)
Sales of new contracts	11.3
Administrative fee revenue from Virginia529	26.9
Change in methodology for contracts behind in payments	3.0
Change in bias factor for private colleges in Virginia	(1.6)
Change in reasonable rate and other assumptions	(3.0)
Other experience gains	23.4
Actuarial Reserve / (Deficit) as of June 30, 2017	\$ 786.8

### Valuation Basis

The present values of the obligations shown above were based on assumptions which represent an estimate of anticipated experience under the Fund that are reasonably related to past educational cost and investment data. Differences between those projections and actual amounts will depend on the extent to which future experience conforms to the assumptions made for this analysis.

A prime source of variation will be normal fluctuations that occur in the rate of increase in tuition, investment returns, and expense inflation. One way of estimating the range of possible outcomes is to stochastically model the financial operation of Prepaid529 using "Monte Carlo" techniques. This approach involves preparing 1,000 projections of financial results under randomly derived scenarios of tuition growth, investment returns, and expense inflation. Each of these scenarios is based on statistical factors such as standard deviation and correlation that were established by reviewing historical results adjusted where appropriate to reflect current conditions. By tabulating the results under all of these projections we estimated the probability that current assets, along with all

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anticipated contract payments plus investment returns, will be sufficient to cover the obligations of Prepaid529.

We have summarized in the table below the results of this process. It is important to understand that these results are only illustrative of the range of results that are possible and are dependent on the assumptions utilized. The assumptions are presented in Appendix C.

*(Amounts in Millions)*

<u>Percentage of "Best Estimate" Reserve</u>	<u>Total Prepaid529 Fund Value at June 30, 2017</u>	<u>Probability of Prepaid529 Funds Exceeding Obligation</u>
80%	\$1,638.5	6%
90%	1,843.4	24%
100%	2,048.2	50%
110%	2,253.0	76%
120%	2,457.8	89%
130%	2,662.6	96%
138%	2,835.0	98%*
140%	2,867.4	99%
150%	3,072.3	99%

\*actual Fund position.

The present value of obligations for future payments shown previously is the amount of assets necessary to have a 50% probability of meeting all program obligations, including administrative costs, associated with current contracts. The actual Prepaid529 fund balance at June 30, 2017 of \$2,835.0 million is 138.0% of the actuarially determined "Best Estimate" Reserve amount of \$2,048.2 million. As indicated in the above table, this Prepaid529 fund balance is estimated to have a 98% probability of being adequate to satisfy all Prepaid529 obligations using current assumptions.

### Cash Flow Projection

The table in Appendix E shows a cash flow projection based on a set of deterministic assumptions that produce the same Present Value of Obligations for Future Payments as the "best estimate" actuarial assumptions used in the Monte Carlo simulations. The deterministic cash flow projection assumes that University and Community College tuition increase 5.0% for the next year and then 6.5% per year thereafter, and Prepaid529 assets earn 5.87% each year. The starting Market Value of Invested Assets as of July 1, 2017 is \$2,640.4 million. At the end of the 2042 Fiscal Year all tuition obligations associated with contracts already purchased are expected to have been paid resulting in a final



cumulative surplus of \$3,272.5 million. Since the actuarial assumptions are intended to represent “best estimates” of future expenses, there is a 50% chance that actual results will be better than this projection and a 50% chance that actual results will be worse.

### Variability of Results

Future actuarial measurements may differ significantly from the current measurements presented in this report due to such factors as the following: future experience differing from that anticipated by the economic or demographic assumptions; changes in economic or demographic assumptions; and increases or decreases expected as part of the natural operation of the methodology used for these measurements. Due to the limited scope of our assignment, we did not perform an analysis of the potential range of future measurements.

### Data Reliance

In performing this analysis, we relied on data and other information (some oral and some in writing) provided by the staff of the Virginia College Savings Plan. This information includes, but is not limited to, contractual provisions, contract holder data, and financial information. We found this information to be reasonably consistent and comparable with information used for other purposes. The valuation results depend on the integrity of this information. If any of this information is inaccurate or incomplete our results may be different and our calculations may need to be revised.

### Actuarial Assumptions

All costs, liabilities, and other factors for Prepaid529 have been determined on the basis of actuarial assumptions and methods which are individually reasonable (taking into account the experience of Prepaid529 and reasonable expectations). Further, the actuarial assumptions in the aggregate are reasonable and are related to the experience of Prepaid529 and to reasonable expectations. The following actuarial assumptions were set by the Virginia College Savings Plan:

- 1) the investment return assumption of 6.25% per year, and;
- 2) the tuition growth assumption for universities of 5.0% in Fall 2018 and 6.5% per year thereafter and the tuition growth assumption for community colleges of 5.0% for Fall 2018 and 6.5% per year thereafter.

### Certification

Based on the foregoing assumptions, Prepaid529 has sufficient assets, including the value of future installment payments, to cover the actuarially estimated value of the tuition obligations under all contracts outstanding as of the valuation date (including any administrative costs associated with those contracts). This determination has been based on reasonable actuarial assumptions that represent the Virginia College Savings Plan’s

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best estimate of anticipated experience under Prepaid529 taking into account past experience and future expectations.

On the basis of the foregoing, we hereby certify that, to the best of our knowledge and belief, this report is complete and accurate and has been prepared in accordance with generally recognized and accepted actuarial principles and practices.

### Third Party Distribution

This report was prepared exclusively for the Virginia College Savings Plan for a specific and limited purpose. It is a complex, technical analysis that assumes a high level of knowledge concerning the Virginia College Savings Plan's operations, and uses the Virginia College Savings Plan's data, which Milliman has not audited. It is not for the use or benefit of any third party for any purpose. Any third party recipient of Milliman's work product who desires professional guidance should not rely upon Milliman's work product, but should engage qualified professionals for advice appropriate to its own specific needs.

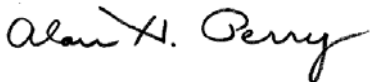
### Qualifications

We are members of the American Academy of Actuaries and meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinion contained herein.

The consultants who worked on this assignment are actuaries. Milliman's advice is not intended to be a substitute for qualified legal or accounting counsel.

We look forward to reviewing the results of our analyses with you at your earliest convenience.

Respectfully submitted,



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Member American Academy of Actuaries



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## Prepaid529

### I. Statement of Assets as of June 30, 2017

<u>Investments</u>	<u>Market Value</u>
1) Equities	\$ 1,151,786,041
2) Fixed Income including Accrued Interest	1,328,595,545
3) REIT Fund and Real Estate	95,776,456
4) Cash & Cash Equivalents	77,789,941
5) Prepaid Assets	399,728
6) Property & Equipment	8,305,475
7) Accounts Receivable	10,820,493
8) Other Receivables	4,366,536
9) Accounts Payable	(19,206,233)
10) Other Payables	(2,975,300)
11) Deferred Outflow	2,487,745
12) Deferred Inflow	(318,000)
13) Accrued Liabilities	(17,435,442)
Total Market Value of Investments	\$ 2,640,392,985
Present Value of Installment Contract Receivables	<u>194,568,035</u>
Value of Total Fund Assets	\$ 2,834,961,020

### II. Reconciliation of Investments

1) Market Value of Investments at June 30, 2016	\$ 2,426,559,071
2) Contract Purchase Payments	114,409,452
3) Application Fees	204,000
4) Administrative Fee Revenue	42,435,386
5) Interest and Dividends	66,634,108
6) Realized and Unrealized Gains/(Losses)	197,934,711
7) Tuition Benefits Paid	(120,349,915)
8) Refunds Paid	(10,867,637)
9) Net Rollovers	(36,422,907)
10) Administrative Expenses	(22,838,606)
11) Investment Management Fees	(8,755,903)
12) Net Transfers to the Commonwealth	(934,577)
13) Net Effect of Changes in Accruals of Assets and Liabilities	<u>(7,614,197)</u>
14) Market Value of Investments at June 30, 2017	\$ 2,640,392,985
Time-weighted rate of return	10.68%
Dollar-weighted rate of return	10.67%

## Appendix A

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Prepaid529

Contract Data as of June 30, 2017 – Contracts Purchasing Tier I Units Only - Number of Contracts

Matriculation Year	Total Years of Community College Purchased										Total by Payout Year	Percent of Total
	0	0	0	0	0	0	0	0	0	0		
	0.5	1	1.5	2	2.5	3	3.5	4	4.5	5		
2000-2001	0	0	0	3	0	1	0	20	0	1	25	0.0%
2001-2002	0	3	0	2	0	0	0	34	0	0	39	0.1%
2002-2003	0	10	0	5	0	0	0	45	0	6	66	0.1%
2003-2004	0	3	0	8	0	1	0	65	0	1	78	0.1%
2004-2005	0	7	0	12	0	2	0	93	0	7	121	0.2%
2005-2006	0	19	0	23	0	3	0	167	0	12	224	0.4%
2006-2007	0	16	0	30	0	14	0	207	0	23	290	0.5%
2007-2008	0	30	0	46	0	9	0	244	0	21	350	0.6%
2008-2009	0	44	0	42	0	12	0	369	0	37	504	0.9%
2009-2010	0	50	0	51	0	23	0	493	0	41	658	1.1%
2010-2011	0	74	0	90	0	20	0	549	0	64	797	1.4%
2011-2012	0	75	0	87	0	25	0	693	0	63	943	1.6%
2012-2013	0	107	0	121	0	35	0	834	0	97	1,194	2.0%
2013-2014	0	126	0	159	0	50	1	1,239	0	104	1,679	2.9%
2014-2015	1	253	1	261	1	82	2	2,699	0	130	3,430	5.8%
2015-2016	0	272	1	409	2	118	6	2,768	0	114	3,690	6.3%
2016-2017	7	417	7	551	6	167	3	2,768	0	126	4,052	6.9%
2017-2018	51	621	12	574	11	165	9	2,619	1	144	4,207	7.2%
2018-2019	81	632	26	601	6	123	6	2,603	1	161	4,240	7.2%
2019-2020	156	616	32	586	14	140	3	2,377	1	138	4,063	6.9%
2020-2021	196	627	34	536	15	131	5	2,037	0	114	3,695	6.3%
2021-2022	230	672	41	549	27	155	5	2,056	2	133	3,870	6.6%
2022-2023	278	600	53	577	19	118	6	1,500	2	57	3,210	5.5%
2023-2024	287	570	33	450	18	106	7	1,359	1	63	2,894	4.9%
2024-2025	294	478	47	400	17	87	2	1,102	4	75	2,506	4.3%
2025-2026	263	444	34	380	17	59	6	944	1	51	2,199	3.7%
2026-2027	269	408	23	264	6	50	2	737	2	28	1,789	3.0%
2027-2028	242	380	39	304	11	56	5	682	2	38	1,759	3.0%
2028-2029	234	302	26	234	12	31	4	541	1	21	1,406	2.4%
2029-2030	230	282	23	183	6	17	2	432	0	22	1,197	2.0%
2030-2031	240	227	26	165	9	22	2	299	1	13	1,004	1.7%
2031-2032	250	198	18	116	7	11	4	234	2	13	853	1.5%
2032-2033	200	138	10	92	4	16	5	191	1	15	672	1.1%
2033-2034	164	111	20	77	6	11	3	144	0	9	545	0.9%
2034-2035	100	76	10	54	5	8	2	103	1	9	368	0.6%
2035-2036	45	32	1	26	4	10	0	57	0	3	178	0.3%
2036-2037	0	0	0	0	0	0	0	0	0	0	0	0.0%
<b>Total</b>	3,818	8,920	517	8,068	223	1,878	90	33,304	23	1,954	58,795	
<b>Percent of Total</b>	6.5%	15.2%	0.9%	13.7%	0.4%	3.2%	0.2%	56.6%	0.0%	3.3%		

Appendix B  
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Prepaid529

Contract Data as of June 30, 2017 – Contracts Purchasing Tier II Units Only - Number of Contracts

Matriculation Year	Total Years of Community College Purchased														Total by Payout Year	Percent of Total
	Total Years of University Purchased															
	0.5	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6	8	10		
2000-2001	0	1	0	4	0	0	0	0	0	0	0	0	0	0	5	0.2%
2001-2002	0	0	0	14	0	0	0	0	0	0	0	0	0	0	14	0.5%
2002-2003	0	2	0	8	0	0	0	0	0	0	0	0	0	0	10	0.4%
2003-2004	0	1	0	5	0	1	0	0	0	0	0	0	0	0	7	0.3%
2004-2005	0	2	0	15	0	1	0	0	0	0	0	0	0	0	18	0.7%
2005-2006	0	2	0	26	0	1	0	0	0	0	0	0	0	0	29	1.1%
2006-2007	0	1	0	21	0	1	0	0	0	0	0	0	0	0	23	0.8%
2007-2008	0	2	0	34	0	4	0	0	0	0	0	0	0	0	40	1.5%
2008-2009	0	3	0	29	0	2	0	0	0	0	0	0	0	0	34	1.3%
2009-2010	0	2	0	40	0	5	0	0	0	0	0	0	0	0	47	1.7%
2010-2011	0	13	0	44	0	2	0	0	0	0	0	0	0	0	59	2.2%
2011-2012	0	8	0	55	0	9	0	0	0	0	0	0	0	0	72	2.7%
2012-2013	1	13	0	57	0	11	0	0	0	0	0	0	0	0	82	3.0%
2013-2014	0	13	0	59	0	3	0	0	0	0	0	0	0	0	75	2.8%
2014-2015	0	22	0	84	0	17	0	0	0	0	0	0	0	0	123	4.5%
2015-2016	0	23	0	112	0	10	0	0	0	0	0	0	0	0	145	5.3%
2016-2017	0	27	0	108	1	11	0	1	0	0	0	0	0	0	148	5.5%
2017-2018	3	41	0	115	0	16	0	1	0	0	0	0	0	1	177	6.5%
2018-2019	8	35	1	103	1	16	0	0	0	1	0	0	0	1	166	6.1%
2019-2020	11	43	0	96	0	18	0	3	0	0	1	0	0	2	174	6.4%
2020-2021	9	42	1	100	1	10	0	0	0	0	0	0	0	0	163	6.0%
2021-2022	6	44	2	93	1	9	0	0	0	0	0	0	0	0	155	5.7%
2022-2023	11	38	0	85	1	3	0	1	0	0	0	0	0	0	139	5.1%
2023-2024	9	42	1	73	2	7	0	2	0	0	0	0	0	1	137	5.0%
2024-2025	9	39	1	51	1	4	0	1	0	0	0	0	0	0	106	3.9%
2025-2026	10	31	1	41	0	2	0	1	0	1	0	0	0	2	89	3.3%
2026-2027	8	12	0	43	0	8	0	1	1	0	0	0	0	0	73	2.7%
2027-2028	10	19	0	35	0	5	0	0	0	2	0	0	0	1	72	2.7%
2028-2029	11	21	1	40	1	2	0	1	0	0	0	0	0	0	77	2.8%
2029-2030	10	12	0	41	0	3	1	1	1	0	0	0	0	0	69	2.5%
2030-2031	20	12	0	22	1	1	1	3	0	0	0	0	0	1	61	2.2%
2031-2032	20	6	2	16	0	2	0	0	0	0	0	0	0	0	46	1.7%
2032-2033	11	11	0	14	0	2	0	0	0	0	0	0	0	0	38	1.4%
2033-2034	11	6	1	8	0	1	0	3	0	0	0	0	0	0	30	1.1%
2034-2035	4	4	0	4	0	0	0	0	0	0	0	0	0	0	12	0.4%
2035-2036	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
2036-2037	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
<b>Total</b>	182	593	11	1,695	10	187	2	19	2	4	1	0	0	9	2,715	
<b>Percent of Total</b>	6.7%	21.8%	0.4%	62.4%	0.4%	6.9%	0.1%	0.7%	0.1%	0.1%	0.0%	0.0%	0.0%	0.3%		



Prepaid529

Participant Data as of June 30, 2017 – Remaining Years of Tuition

<u>Expected Payout Year</u>	<u>University Years</u>	<u>Community College Years</u>
2017-2018	20,583	1,130
2018-2019	16,959	902
2019-2020	15,659	758
2020-2021	14,703	736
2021-2022	12,747	623
2022-2023	11,699	578
2023-2024	10,507	513
2024-2025	9,031	427
2025-2026	7,646	362
2026-2027	6,459	303
2027-2028	5,502	261
2028-2029	4,644	230
2029-2030	3,845	200
2030-2031	3,171	171
2031-2032	2,546	135
2032-2033	2,003	109
2033-2034	1,572	87
2034-2035	1,215	61
2035-2036	889	38
2036-2037	570	24
2037-2038	334	12
2038-2039	168	5
2039-2040	64	2
2040-2041	26	1
2041-2042	<u>7</u>	<u>0</u>
Total	152,549	7,668

Summary of Actuarial Assumptions

## Investment / Economic Assumptions for Stochastic Simulation Model:

The standard deviation and correlation assumptions are based on actual historical returns and tuition growth. Expected return assumptions are based on Milliman's investment assumptions, but are adjusted so that the expected annualized return on the portfolio is 6.25%, which is the assumption set by the Board.

	<u>Inflation</u>	Reason -able Rate	Global Equity	Non- Core Fixed Income	Core Fixed Income	Alternative Investments	University Tuition	CC Tuition
Expected Arithmetic Mean Annual Return	2.50%	3.25%	8.75%	5.80%	3.85%	8.45%	6.57%	6.62%
Standard Deviation	2.00%	2.00%	18.60%	9.15%	3.90%	18.50%	4.35%	6.70%
Correlation:								
Inflation	1.00	0.62	0.25	0.09	0.23	0.21	0.20	-0.01
Reasonable Rate		1.00	0.21	0.19	0.53	0.00	0.03	-0.20
Global Equity			1.00	0.59	0.10	0.57	0.09	-0.09
Non-Core Fixed Income				1.00	0.57	0.35	0.35	-0.02
Core Fixed Income					1.00	-0.23	0.29	0.24
Alternative Investments						1.00	-0.18	-0.30
University Tuition							1.00	0.61
CC Tuition								1.00

Based on the economic assumptions above, the expected long-term annualized compound rate of return on investments is 6.25%. The expected annualized compound rate of tuition growth is 5.0% over the next year and then 6.5% thereafter for both university and community college tuition. The Reasonable Rate for 2017-2018 was fixed at 0.57% for the first quarter of the year and then the expected mean of the Reasonable Rate grades up to 1.25% for the remainder of 2017-2018, 2.25% for 2018-2019, and 3.25% thereafter.

## Matriculation and Bias:

Starting in the year of matriculation, it is assumed that 76% of beneficiaries will attend a public university in Virginia, 7.6% will attend a private university in Virginia, 11.4% will attend a university in another state, and 5.0% will request a cancellation, transfer, or rollover to a savings plan. Weighted average tuition for four-year public universities in Virginia was adjusted with an 8.0% load to add a bias for matriculation at more expensive schools. Weighted average tuition for two-year community colleges in Virginia was adjusted with a 1.0% load to add a bias for matriculation at more expensive schools. The highest tuition for a public university in Virginia was assumed to be 176% of weighted average tuition. Out-of-state students and contracts requesting a rollover are assumed to receive a benefit equal to the payments made on the contract plus interest at the composite reasonable rate of return.



Prepaid529

Summary of Actuarial Assumptions  
(continued)

Combination Contracts:

For combination contracts a portion of the remaining university and community college years are assumed to be paid each year. For combination contracts currently in payout with only university years or community college years remaining, the applicable remaining years are assumed to be paid.

Utilization:

It is assumed that participants will begin utilizing their contract at the following rates, and then redeem up to two semesters of tuition per year until the contract is depleted:

Years since Matriculation	Number of Semesters of Tuition Purchased							
	<u>Year</u>	<u>1 - 2</u>	<u>3 - 4</u>	<u>5 - 6</u>	<u>7 - 8</u>	<u>9 - 10</u>	<u>11-12</u>	<u>13+</u>
0		50%	60%	60%	80%	85%	85%	100%
1		15%	10%	20%	10%	8%	15%	
2		10%	15%	10%	5%	7%		
3		10%	5%	5%	5%			
4		5%	5%	5%				
5		5%	5%					
6		5%						

Forfeiture: It is assumed that contracts will be forfeited prior to the year of matriculation at a rate of 0.5% per year.

Expenses: The expenses included in the present value of future obligations are those relating to:

Annual Maintenance Expense per Contract = \$58.97

Annual Distribution Cost per Contract in Payment Status = \$26.11

The expense assumptions were developed from a cost analysis by Virginia College Savings Plan staff with adjustments for anticipated increases since the analysis was performed in 2013.

These expenses are assumed to increase annually at the rate of inflation plus 0.5%.

Appendix C  
(Page 2 of 3)

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Prepaid529

Summary of Actuarial Assumptions  
(continued)

Contracts behind in their monthly payments: The monthly scheduled payment amount is increased by an amount that allows for the full payment under the contract by June of the year of expected matriculation.

Rationale for Assumptions:

All of the actuarial assumptions with the exception of the investment return, the tuition growth rate, and the reasonable rate, were based on the results of an experience study performed in 2014 (see the Experience Study report dated September 22, 2014).

The reasonable rate assumption was based on the current money market yield used to set the rate and forecasts of future short-term interest rates from a survey of economists published in the *June 2017 Blue Chip Financial Forecasts*.

The investment return assumption is set by the Board based on recommendations from Virginia529's investment consultant.

The tuition growth assumptions are also set by the Board. Milliman assisted Virginia529 staff in 2015 with a historical analysis of long-term tuition growth at public colleges in Virginia.

Prepaid529

Derivation of Enrollment-Weighted Average Tuition  
and Mandatory Fees at Four Year Universities  
Based on Projected Enrollment for 2017-2018

<u>School</u>	<u>Tuition and Fees 2017-2018</u>	Fall On Campus	<u>Percent Distribution</u>
		<u>In-State Undergraduate FTE for 2017-2018</u>	
Christopher Newport	\$13,654	4,414	3.29%
George Mason	11,924	19,458	14.48%
James Madison	10,878	14,574	10.85%
Longwood	12,720	4,303	3.20%
Mary Washington	12,188	3,765	2.80%
Norfolk State	9,036	3,815	2.84%
Old Dominion	10,350	16,088	11.97%
Radford	10,627	7,881	5.87%
University of Virginia 2017 Students	16,076	2,703	2.01%
University of Virginia 2016 Students	16,076	2,703	2.01%
University of Virginia 2015 Students	15,054	2,703	2.01%
University of Virginia Returning Students	14,032	2,703	2.01%
UVA - Wise	9,825	1,242	0.92%
Virginia Commonwealth Post-2012 Enrollment	13,624	20,879	15.54%
Virginia Military Institute	18,214	1,038	0.77%
Virginia Tech	13,230	18,636	13.87%
Virginia State	8,726	3,134	2.33%
William & Mary - 2017 Students	22,044	1,078	0.80%
William & Mary - 2016 Students	21,348	1,078	0.80%
William & Mary - 2015 Students	19,652	1,078	0.80%
William & Mary - 2014 Students	18,102	<u>1,078</u>	<u>0.80%</u>
<b>Weighted Average Tuition and Fees*</b>	<b>\$12,494</b>	134,351	100.00%

\*Assumes that 2014, 2015, 2016, and 2017 students are each 25% of total FTE for William & Mary.  
Assumes that 2015, 2016 and 2017 students are each 25% of total FTE for UVA.

Appendix D  
(Page 1 of 3)

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Prepaid529

Derivation of Enrollment-Weighted Average Tuition  
and Mandatory Fees at Community Colleges

<u>School</u>	<u>Tuition and Fees 2017-2018</u>	<u>Annualized In-State FTE Academic Year 2016-2017</u>	<u>Percent Distribution</u>
Blue Ridge	\$5,602	2,368	2.33%
Central Virginia	5,040	2,406	2.37%
Dabney S. Lancaster	4,920	738	0.73%
Danville	4,872	1,990	1.96%
Eastern Shore	5,000	369	0.36%
Germanna	5,120	4,049	3.99%
J Sargeant Reynolds	5,211	6,040	5.95%
John Tyler	4,915	5,273	5.19%
Lord Fairfax	4,934	3,796	3.74%
Mountain Empire	4,904	1,669	1.64%
New River	4,890	2,658	2.62%
Northern Virginia	5,864	29,758	29.30%
Patrick Henry	4,915	1,618	1.59%
Paul D Camp	4,893	802	0.79%
Piedmont Virginia	4,989	2,810	2.77%
Rappahannock	5,021	1,903	1.87%
Richard Bland	7,830	1,255	1.24%
Southside Virginia	4,888	2,345	2.31%
Southwest Virginia	4,896	1,699	1.67%
Thomas Nelson	4,990	5,465	5.38%
Tidewater	5,795	15,302	15.06%
Virginia Highlands	4,904	1,501	1.48%
Virginia Western	5,576	4,122	4.06%
Wytheville	4,920	<u>1,643</u>	<u>1.62%</u>
<b>Weighted Average Tuition and Fees</b>	<b>\$5,439</b>	101,579	100.00%

Prepaid529

History of Enrollment-Weighted Average Tuition and Mandatory Fees  
at Four Year Universities and Community Colleges in Virginia

<u>Academic Year</u>	<u>University Tuition and Fees</u>	<u>% Increase</u>	<u>Community College Tuition and Fees</u>	<u>% Increase</u>
1988-1989	\$2,377		\$778	
1989-1990	2,544	7.0%	798	2.5%
1990-1991	2,702	6.2%	894	12.0%
1991-1992	2,985	10.5%	1,050	17.4%
1992-1993	3,357	12.5%	1,230	17.1%
1993-1994	3,659	9.0%	1,320	7.3%
1994-1995	3,789	3.6%	1,359	3.0%
1995-1996	3,949	4.2%	1,445	6.3%
1996-1997	4,002	1.3%	1,445	0.0%
1997-1998	4,095	2.3%	1,445	0.0%
1998-1999	4,217	3.0%	1,445	0.0%
1999-2000	3,721	(11.8%)	1,159	(19.8%)
2000-2001	3,793	1.9%	1,159	0.0%
2001-2002	3,843	1.3%	1,159	0.0%
2002-2003	4,122	7.3%	1,671	44.3%
2003-2004	5,033	22.1%	1,882	12.6%
2004-2005	5,559	10.5%	2,006	6.5%
2005-2006	5,990	7.8%	2,135	6.4%
2006-2007	6,529	9.0%	2,269	6.3%
2007-2008	6,966	6.7%	2,404	5.9%
2008-2009	7,562	8.6%	2,584	7.5%
2009-2010	7,912	4.6%	2,781	7.6%
2010-2011	8,803	11.3%	3,285	18.1%
2011-2012	9,507	8.0%	4,179*	27.2%*
2012-2013	9,856	3.7%	4,426	5.9%
2013-2014	10,225	3.7%	4,619	4.4%
2014-2015	10,797	5.6%	4,835	4.7%
2015-2016	11,409	5.7%	5,101	5.5%
2016-2017	11,961	4.8%	5,263	3.2%
2017-2018	12,494	4.5%	5,439	3.3%

\* Starting with the 2011-2012 year, Community College Tuition and Fees is measured as an enrollment-weighted average. Prior to that, a non-enrollment-weighted average was used. Enrollment numbers taken from SCHEV's website.

Compounded Increase in Average Tuition

Over last 5 years:	4.9%	4.2%
Over last 10 years:	6.0%	8.5%
Over last 15 years:	7.7%	8.2%
Over last 20 years:	5.7%	6.9%
Over last 25 years:	5.4%	6.1%

Prepaid529

Cash Flow Projection  
(amounts in millions)

<u>Fiscal Year</u>	<u>Beginning Balance</u>	<u>Installment Payments*</u>	<u>Tuition Benefits</u>	<u>Expenses</u>	<u>Investment Income</u>	<u>Ending Balance</u>
2018	\$2,640.4	\$47.8	\$263.1	\$4.2	\$144.6	\$2,565.5
2019	2,565.5	38.5	229.6	4.0	141.6	2,512.0
2020	2,512.0	32.6	226.3	3.7	138.2	2,452.8
2021	2,452.8	27.0	227.6	3.5	134.7	2,383.4
2022	2,383.4	21.6	212.4	2.9	131.2	2,320.9
2023	2,320.9	17.7	209.3	2.6	127.4	2,254.1
2024	2,254.1	14.2	201.6	2.3	123.7	2,188.1
2025	2,188.1	11.2	186.0	2.0	120.5	2,131.8
2026	2,131.8	8.8	169.1	1.8	117.9	2,087.6
2027	2,087.6	6.9	152.8	1.5	116.0	2,056.2
2028	2,056.2	5.3	139.1	1.3	114.7	2,035.8
2029	2,035.8	3.9	125.5	1.1	114.2	2,027.3
2030	2,027.3	2.8	110.9	0.9	114.1	2,032.4
2031	2,032.4	2.1	97.5	0.7	115.0	2,051.3
2032	2,051.3	1.4	83.2	0.6	116.7	2,085.6
2033	2,085.6	0.9	69.6	0.5	119.4	2,135.8
2034	2,135.8	0.5	58.0	0.4	122.8	2,200.7
2035	2,200.7	0.2	47.5	0.3	127.0	2,280.1
2036	2,280.1	0.0	36.8	0.2	132.2	2,375.3
2037	2,375.3	0.0	25.0	0.1	138.2	2,488.4
2038	2,488.4	0.0	15.6	0.1	145.4	2,618.1
2039	2,618.1	0.0	8.3	0.0	153.2	2,763.0
2040	2,763.0	0.0	3.4	0.0	162.0	2,921.6
2041	2,921.6	0.0	1.4	0.0	171.3	3,091.5
2042	3,091.5	0.0	0.4	0.0	181.4	3,272.5

\* Future installment payments for contracts as of June 30, 2017.

Appendix E

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## Prepaid529

### Prepaid Tuition Benefits

For beneficiaries attending a Virginia public college, university, or community college, Prepaid will pay the full amount of in-state undergraduate tuition and all mandatory fees for a normal full-time course load for a general course of study on a semester-by-semester basis for the type of school and number of years purchased. Prepaid529 payments to in-state public schools will not exceed the actual cost of the in-state undergraduate tuition and mandatory fees. The contract-holder has the option to transfer the total amount of all payments, accumulated at the reasonable rate of return, to a Virginia529 savings program, and request a distribution from the respective program to pay for qualified higher education expenses.

For beneficiaries attending a Virginia independent (private) college or university, Prepaid529 will pay to the Virginia private school, including certain private career schools, the lesser of 1) the payments made on the contract plus the actual rate of return earned on the Fund or 2) the highest in-state undergraduate tuition and mandatory fees at a Virginia public school in the same academic year the benefits are used. All payments will be made directly to the school on a semester-by-semester basis following the school's add-drop period. The student or his or her family is responsible for any additional expenses not covered by Prepaid529. The contract-holder has the option to transfer the total amount of all payments, accumulated at the reasonable rate of return, to a Virginia529 savings program and request a distribution from the respective program to pay for qualified higher education expenses.

For beneficiaries attending an out-of-state public or private college or university, Prepaid529 will pay the lesser of 1) the payments made on the contract plus interest at the composite reasonable rate of return or 2) the average in-state undergraduate tuition and mandatory fees at Virginia public schools for the same academic year the benefits are used. Payments will be made on a semester-by-semester basis by depositing the amount of the benefit to an Invest529 account. The student or his or her family is responsible for any additional expenses not covered by Prepaid529. The contract-holder has the option to transfer the total amount of all payments, accumulated at the reasonable rate of return, to a Virginia529 savings program and request a distribution from the respective program to pay for qualified higher education expenses.

The reasonable rate of return tracks the quarterly performance of the Institutional Money Funds Index as reported in the Money Fund Monitor by iMoneyNet.

### Appendix F

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