

IN THE SUPREME COURT OF OHIO

**THE STATE OF OHIO, ex rel.
EDWARD SIEDLE**

*

CASE NO.

*

RELATOR

Original Action in Mandamus

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-vs-

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**STATE TEACHERS' RETIREMENT
SYSTEM OF OHIO, et al.**

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RESPONDENTS

AFFIDAVIT EXHIBITS 5 AND 6

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Investment
Cost Effectiveness Analysis
(for the 5-year period ending December 31, 2018)

STRS Ohio



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Prepared November 25, 2019. Although the information in this report has been based upon and obtained from sources we believe to be reliable, CEM Benchmarking Inc. ("CEM") does not guarantee its accuracy or completeness. The information contained herein is proprietary and confidential and may not be disclosed to third parties without the express written mutual consent of both CEM and STRS Ohio.

Key takeaways

Returns

- Your 5-year net total return of 6.25% was in the top quartile. This was above both the U.S. Public median of 5.42% and the peer median of 5.73%.
- Your 5-year policy return was 6.09%. This was above both the U.S. Public median of 5.30% and the peer median of 5.72%.

Value added

- Your 5-year net value added was 0.16%. This was above the U.S. Public median of 0.05% and above the peer median of 0.14%.

Cost

- Your investment cost of 40.1 bps was below your benchmark cost of 54.5 bps. This suggests that your fund was low cost compared to your peers.
- Your fund was low cost because you paid less than peers for similar services and you had a lower cost implementation style.

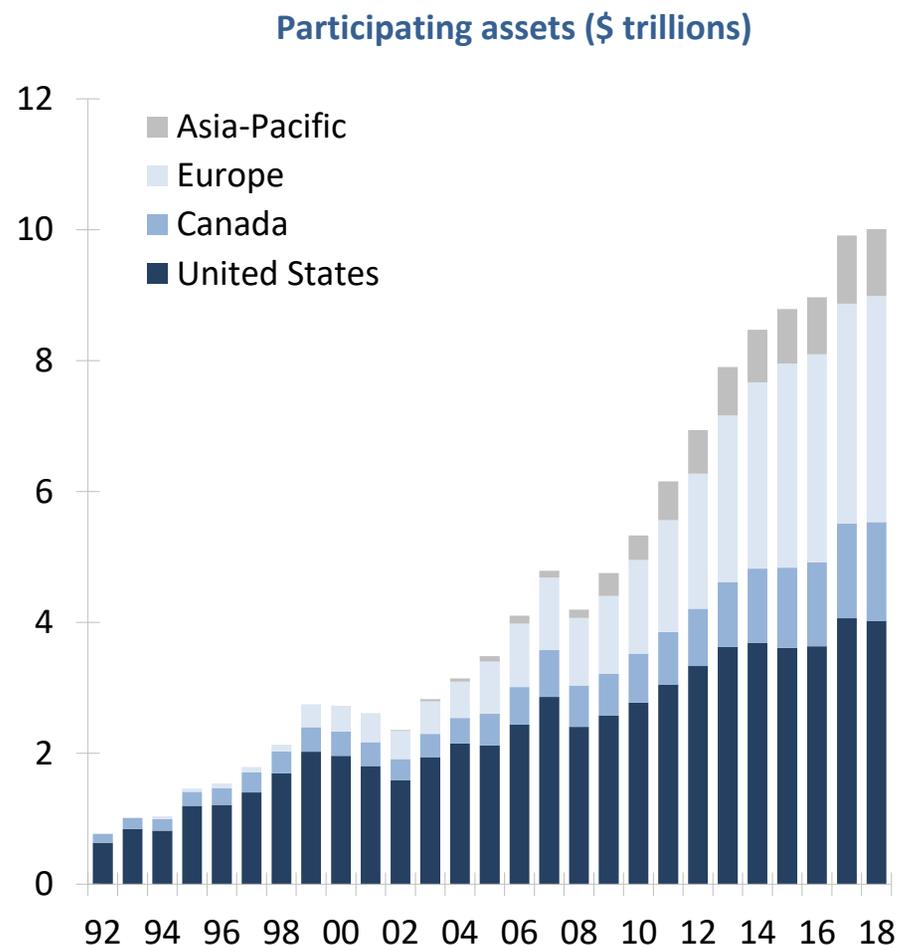
Risk

- Your asset risk of 11.8% was above the U.S. Public median of 10.4%.

This benchmarking report compares your cost and return performance to the 329 funds in CEM's extensive pension database.

- 166 U.S. pension funds participate. The median U.S. fund had assets of \$8.6 billion and the average U.S. fund had assets of \$24.2 billion. Total participating U.S. assets were \$4.0 trillion.
- 77 Canadian funds participate with assets totaling \$1.5 trillion.
- 77 European funds participate with aggregate assets of \$3.5 trillion. Included are funds from the Netherlands, Norway, Sweden, Finland, Ireland, Denmark and the U.K.
- 7 Asia-Pacific funds participate with aggregate assets of \$1.0 trillion. Included are funds from Australia, New Zealand, China and South Korea.
- 2 Gulf region funds participate.

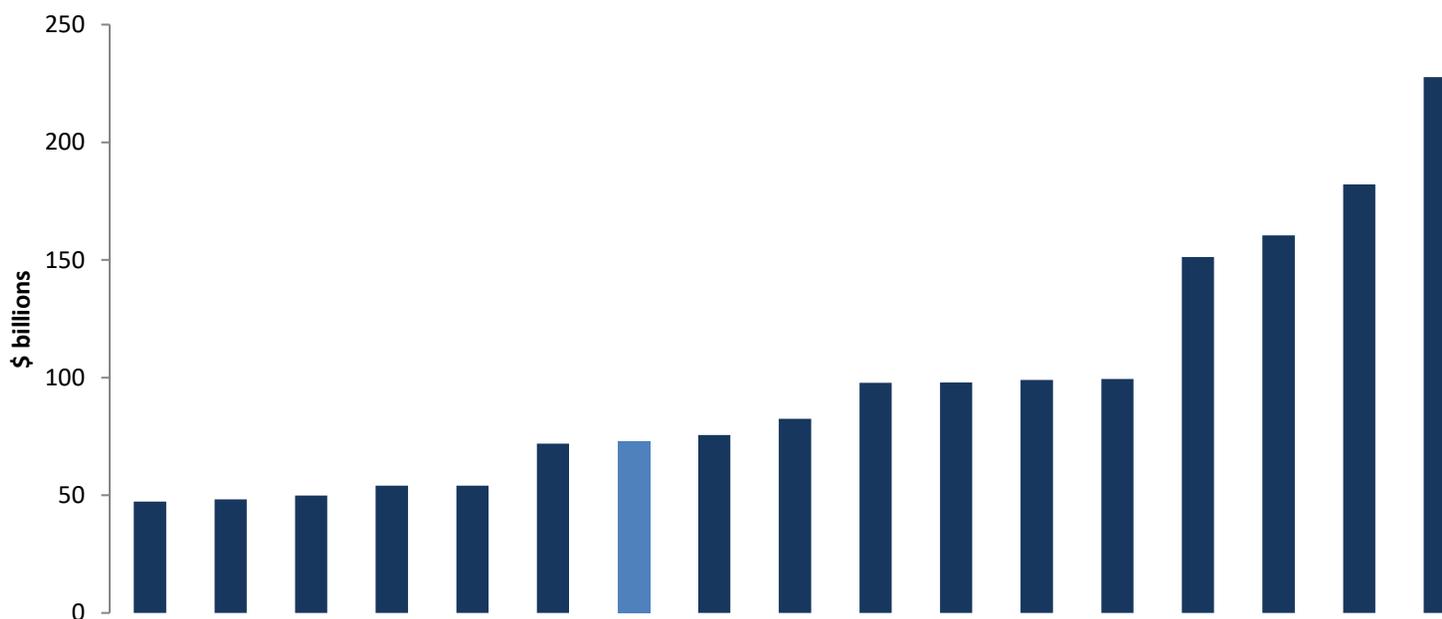
The most meaningful comparisons for your returns and value added are to your custom peer group.



The most valuable comparisons for cost performance are to your custom peer group because size impacts costs.

Peer group for STRS Ohio

- 17 U.S. Public public sponsors from \$47 billion to \$228 billion
- Median size of \$83 billion versus your \$73 billion



To preserve client confidentiality, given potential access to documents as permitted by the Freedom of Information Act, we do not disclose your peers' names in this document.

What gets measured gets managed, so it is critical that you measure and compare the right things:

1. Returns

Why do total returns differ from other funds? What was the impact of your policy mix decisions versus implementation decisions?

2. Net value added

Are your implementation decisions adding value (i.e., mostly the effectiveness of active management, as well as the amount of active management versus passive management)?

3. Costs

Are your costs reasonable? Costs matter and can be managed.

4. Cost effectiveness

Net implementation value added versus excess cost. Does paying more get you more?

5. Risk

What is the risk of your policy mix?

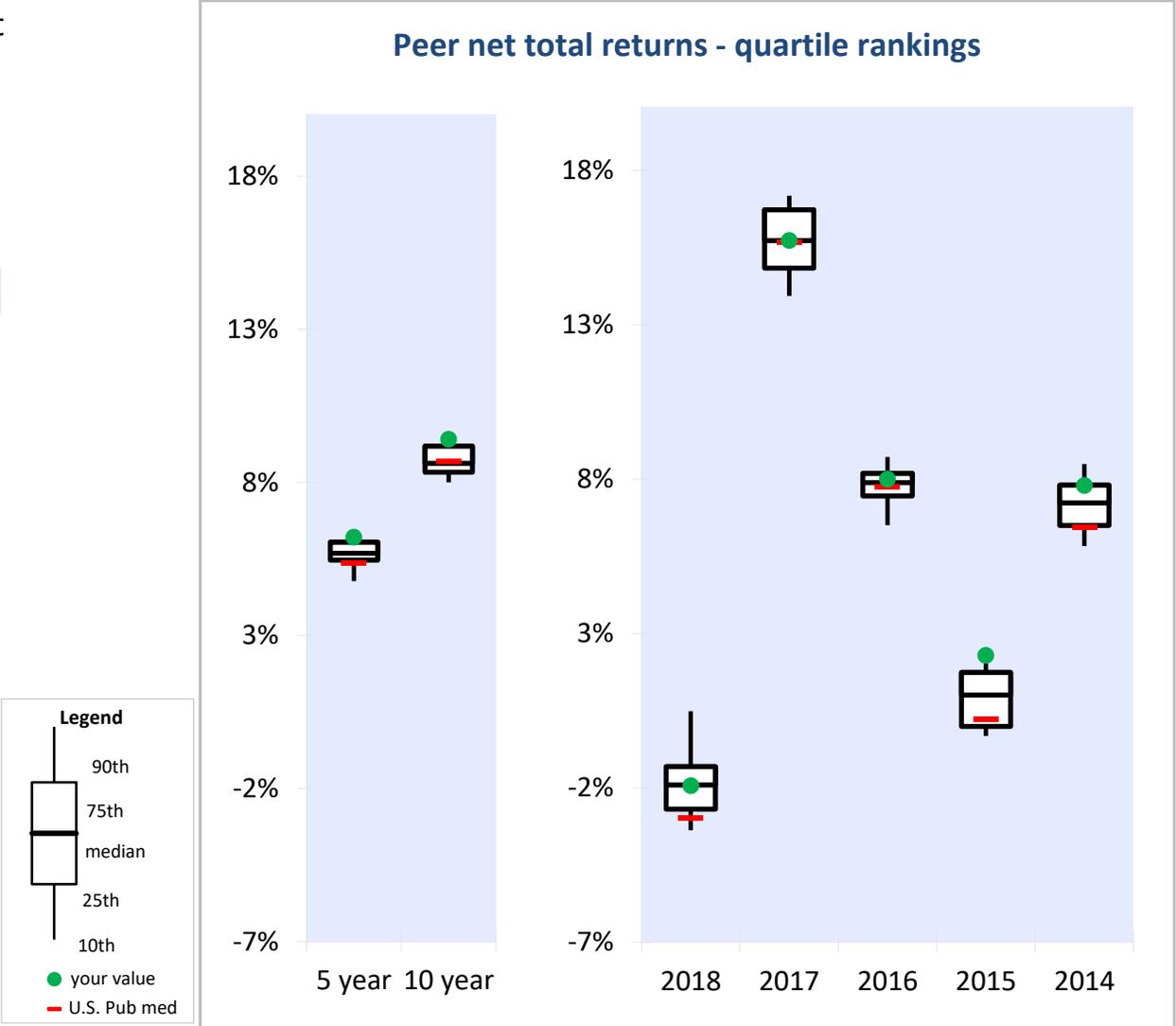
Your 5-year net total return of 6.25% was above the peer median of 5.73%.

Total returns, by themselves, provide little insight into the reasons behind relative performance. Therefore, we separate total return into its more meaningful components: policy return and value added.

	Your 5-year
Net total fund return	6.25%
- Policy return	6.09%
= Net value added	0.16%

This approach enables you to understand the contribution from both policy mix decisions (which tend to be the board's responsibility) and implementation decisions (which tend to be management's responsibility).

The median 5-year total return for the U.S. public universe was 5.4%.



Your 5-year policy return of 6.09% was above the peer median of 5.72%.

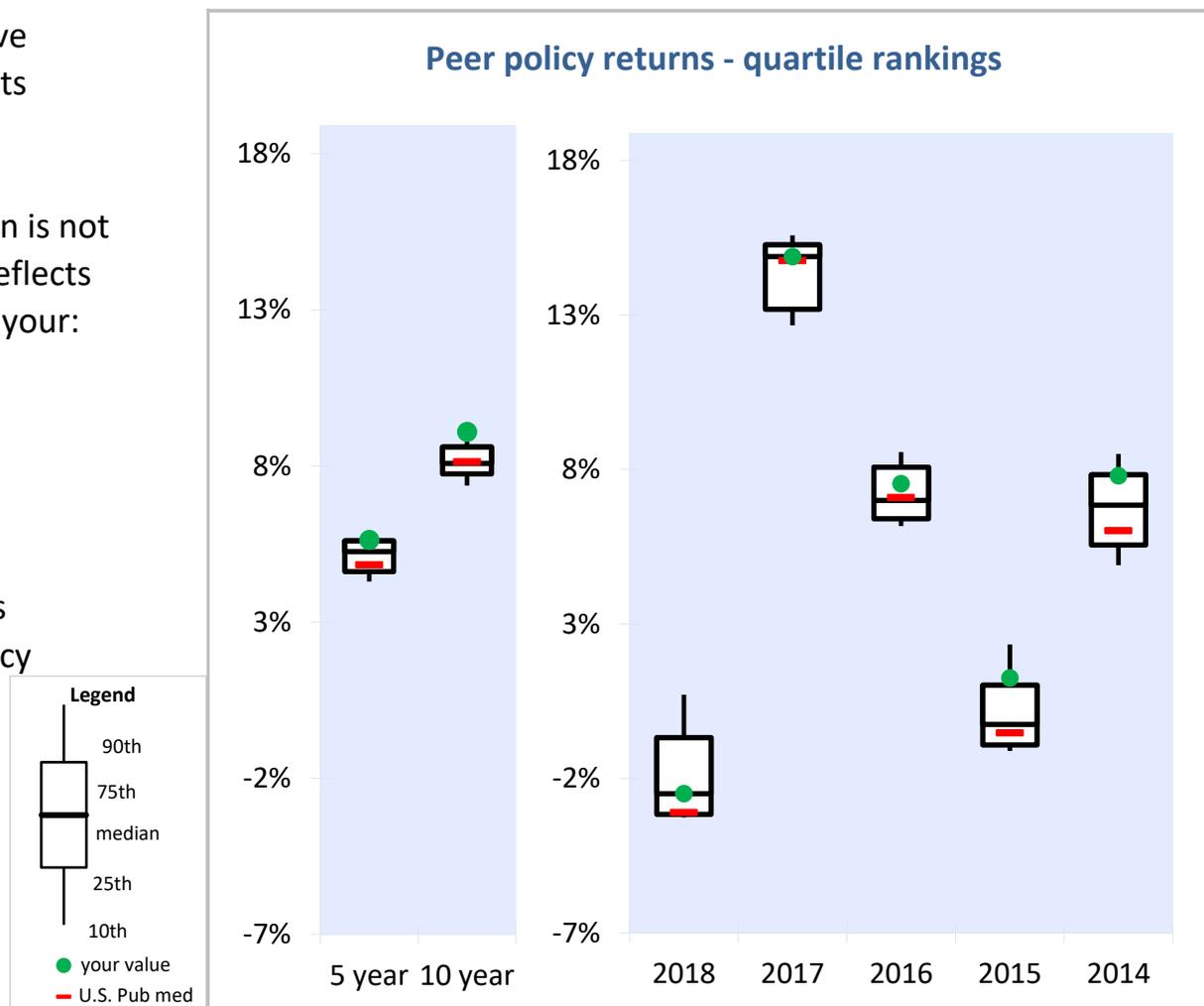
Your policy return is the return you could have earned passively by indexing your investments according to your policy mix.

Having a higher or lower relative policy return is not necessarily good or bad. Your policy return reflects your investment policy, which should reflect your:

- Long term capital market expectations
- Liabilities
- Appetite for risk

Each of these three factors is different across funds. Therefore, it is not surprising that policy returns often vary widely between funds.

The 5-year policy return of the U.S. public universe was 5.30%.



For peer comparison purposes, CEM uses a private equity benchmark that reflects lagged, investable public-market indices. If CEM used this same adjustment for your fund, your 5-year policy return would be 6.8%, 0.7% higher than your actual 5-year policy return of 6.1%.

Your 5-year policy return of 6.09% was above the peer median of 5.72% primarily because of:

- The positive impact of your higher weight in one of the better performing asset classes of the past 5 years: U.S. Stock.
- The positive impact of your lower weight in one of the weaker performing asset classes of the past 5 years: Fixed Income.

5-year average policy mix¹

	Your Fund	Peer Avg.	US pub Avg.
U.S. Stock	30%	17%	21%
Global Stock	0%	13%	10%
Non-US Stock	25%	16%	18%
Total Stock	56%	46%	49%
U.S. Bonds	19%	16%	16%
Cash	1%	0%	-1%
Other Fixed Income ²	0%	9%	12%
Total Fixed Income	20%	25%	27%
Risk Parity	0%	1%	1%
Real Estate incl. REITS	10%	11%	8%
Total Alternatives	14%	18%	17%
Total	100%	100%	100%

1. 5-year weights are based only on plans with 5 years of continuous data.

2. Other fixed income includes Inflation Indexed, High Yield, Emerging, Long and Global bonds.

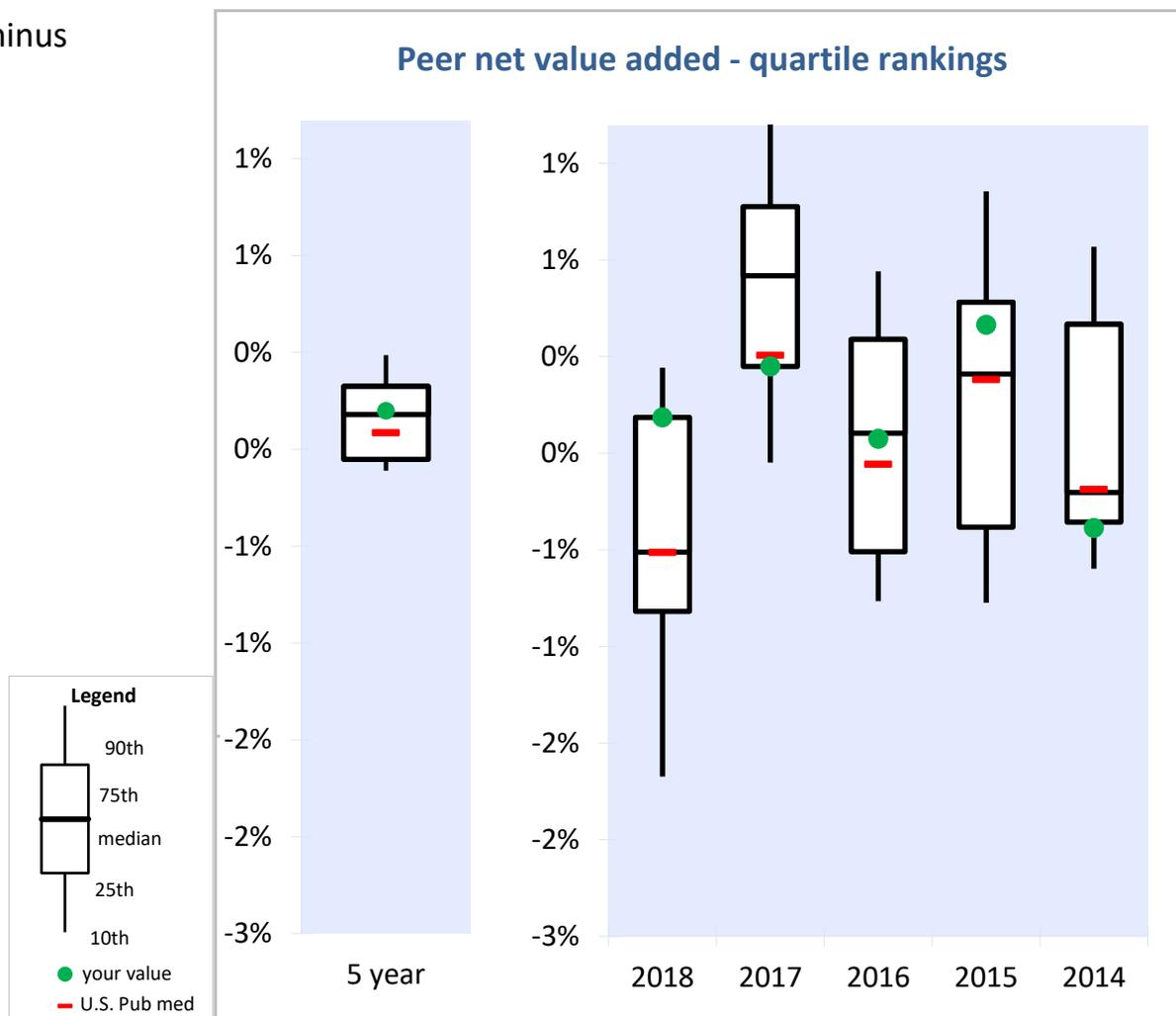
Net value added is the component of total return from active management. Your 5-year net value added was 0.16%.

Net value added equals total net return minus policy return.

Value added for STRS Ohio

Year	Net Return	Policy Return	Net value Added
2018	-1.89%	-2.04%	0.15%
2017	15.76%	15.35%	0.41%
2016	8.03%	8.00%	0.03%
2015	2.33%	1.71%	0.63%
2014	7.83%	8.26%	-0.43%
5-Year	6.25%	6.09%	0.16%

Your 5-year net value added of 0.16% compares to a median of 0.14% for your peers and 0.05% for the U.S. Public universe.



Your investment costs were \$279.1 million or 36.9 basis points in 2018.

Asset management costs by asset class and style (\$000s)	Internal Management*			External Active base fees	Total	
	Passive	Active	Overseeing of external			
Stock - U.S. Large Cap	73	12,688	211	2,310	15,281	
Stock - U.S. Small Cap		323	105	9,437	9,866	
Stock - EAFE		2,968	206	19,126	22,300	
Stock - Emerging		3,184	252	5,778	9,214	
Stock - Global		488			488	
Stock - ACWI x U.S.		468	20	5,474	5,962	
Fixed Income - U.S.		3,466			3,466	
Fixed Income - Emerging			143	3,476	3,619	
Fixed Income - High Yield			144	3,161	3,305	
Cash		299			299	
REITs	106				106	
Global TAA		1,667	96	2,306	4,069	
Hedge Funds			255	26,479	26,734	
Real Estate ex-REITs		17,796			17,796	
Real Estate ex-REITs - LP			481	12,843	13,324	
Infrastructure - FoFs			9	718	727	
Natural Resources - LP			57	5,277	5,334	
Natural Resources - Co-Invest.			24		24	
Diversified Private Equity - LP		320	512	25,115	25,946	
Diversified Private Equity - Co-Invest.			88		88	
LBO - LP			1,068	50,838	51,906	
LBO - FoFs			183	16,442	16,625	
Venture Capital - LP			406	16,274	16,680	
Venture Capital - FoFs			61	6,214	6,275	
Private Credit - LP		74	190	10,946	11,210	
Derivatives/Overlays	326		163		488	
Total excluding private asset performance fees					271,132	35.9bp
Oversight, custodial and other costs ¹						
Oversight & consulting					4,965	
Trustee & custodial					2,293	
Audit					168	
Other					511	
Total oversight, custodial & other costs					7,937	1.0bp
Total investment costs (excl. transaction costs & private asset performance fees**)					279,069	36.9bp

*Internal investment costs were 6.3 bps while external investment costs were 29.6 bps.

Of the total investment management costs of 36.9 bps, external manager fees for alternative and real estate investments were 23.1 bps; other investment costs for internal assets, external equity and external fixed income investments that were used to arrive at the net of fee Total Fund return were 13.8 bps."

Footnotes

1. Excludes non-investment costs, such as benefit insurance premiums and preparing cheques for retirees.

** Total cost excludes carry/performance fees for hedge funds, real estate, infrastructure, natural resources and private equity.

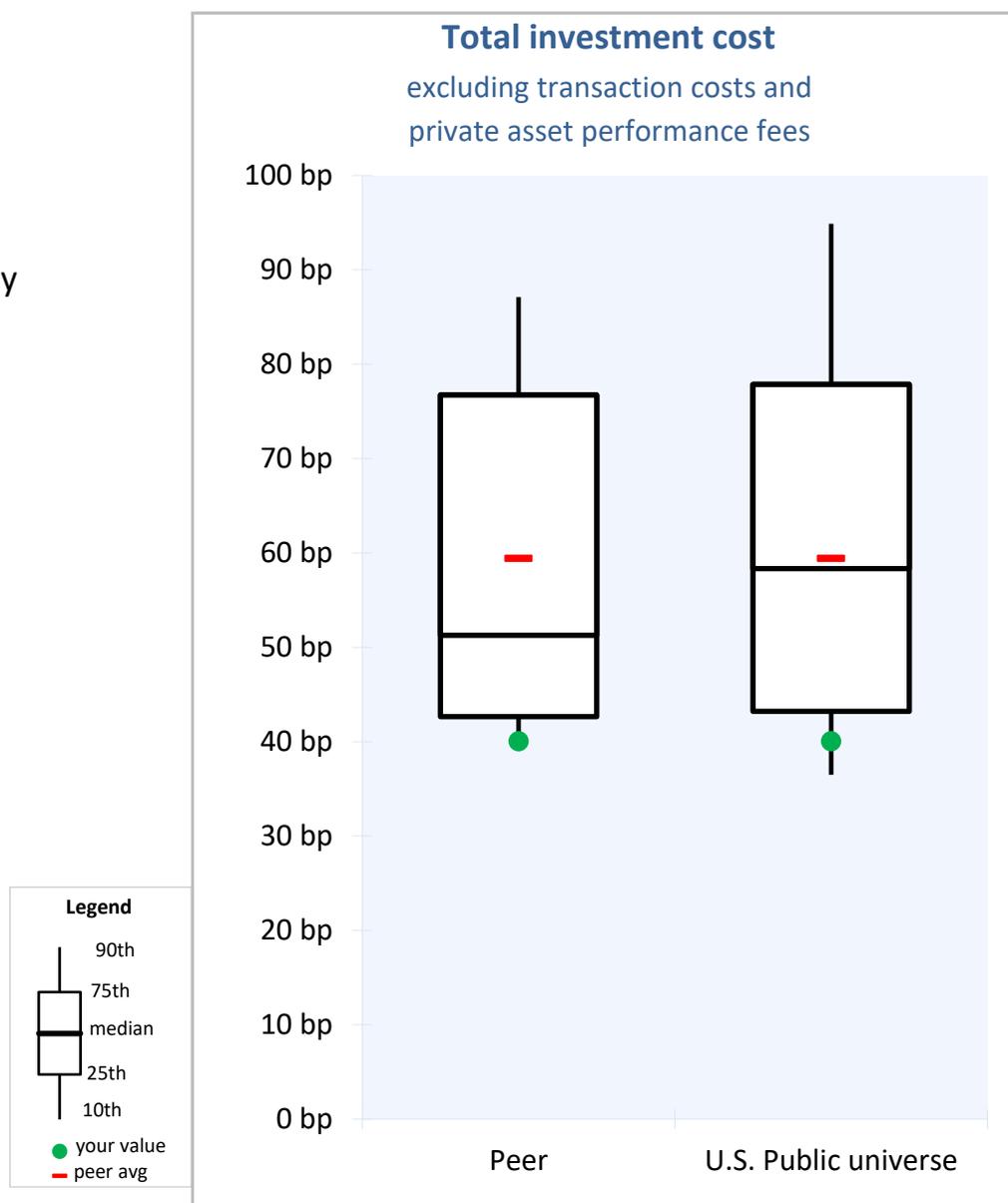
Your total investment cost of 40.1 bps was below the peer median of 51.3 bps.

For the comparison to the peer group, CEM has included your 36.9 bps in costs from page 9 and added hedge fund performance fees and private equity management fee offsets.

Differences in total investment cost are often caused by two factors that are often outside of management's control:

- Asset mix, particularly holdings of the highest cost asset classes: real estate (excl. REITS), infrastructure, hedge funds and private equity. These high cost assets equaled 24% of your funds assets at the end of 2018 versus a peer average of 28%.
- Fund size. Bigger funds have advantages of scale.

Therefore, to assess whether your costs are high or low given your unique asset mix and size, CEM calculates a benchmark cost for your fund. This analysis is shown on the following page.



Benchmark cost analysis suggests that, after adjusting for fund size and asset mix, your fund was low cost by 14.5 basis points in 2018.

Your benchmark cost is an estimate of what your cost would be given your actual asset mix and the median costs that your peers pay for similar services. It represents the cost your peers would incur if they had your actual asset mix.

Your total cost of 40.1 bp was below your benchmark cost of 54.5 bp. Thus, your cost savings were 14.5 bp.

Your cost versus benchmark

	\$000s	basis points
Your total investment cost	302,813	40.1 bp
Your benchmark cost	412,071	54.5 bp
Your excess cost	(109,258)	(14.5) bp

Your fund was low cost because you paid less than peers for similar services and you had a lower cost implementation style.

Reasons for your low cost status

	Excess Cost/ (Savings)	
	\$000s	bps
1. Lower cost implementation style		
• More active management, less lower cost passive	20,188	2.7
• Less external management, more lower cost internal	(74,593)	(9.9)
• More partnerships as a percentage of external	9,797	1.3
• Use of fund of funds	(1,396)	(0.2)
• Less co-investment as a percentage of LP/Co	3,433	0.5
• Less overlays	(1,601)	(0.2)
	<u>(44,173)</u>	<u>(5.8)</u>
2. Paying less than peers for similar services		
• External investment management costs	(66,820)	(8.8)
• Internal investment management costs	1,735	0.2
	<u>(65,085)</u>	<u>(8.6)</u>
Total savings	(109,258)	(14.5)

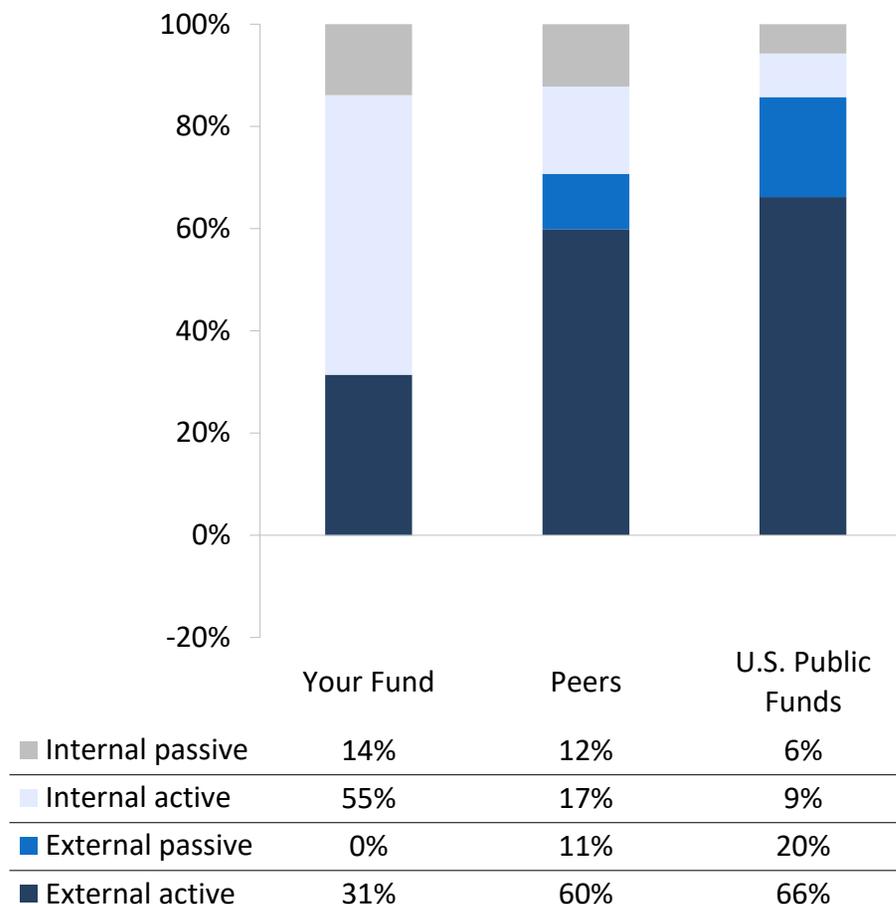
Differences in cost performance are often caused by differences in implementation style.

Implementation style is defined as the way in which your fund implements asset allocation. It includes internal, external, active, passive and fund of funds styles.

The greatest cost impact is usually caused by differences in the use of:

- External active management because it tends to be much more expensive than internal or passive management. You used less external active management than your peers (your 31% versus 60% for your peers).
- Within external active holdings, fund of funds usage because it is more expensive than direct fund investment. You had more in fund of funds. Your 8% of hedge funds, real estate and private equity in fund of funds compared to 3% for your peers.

Implementation style¹



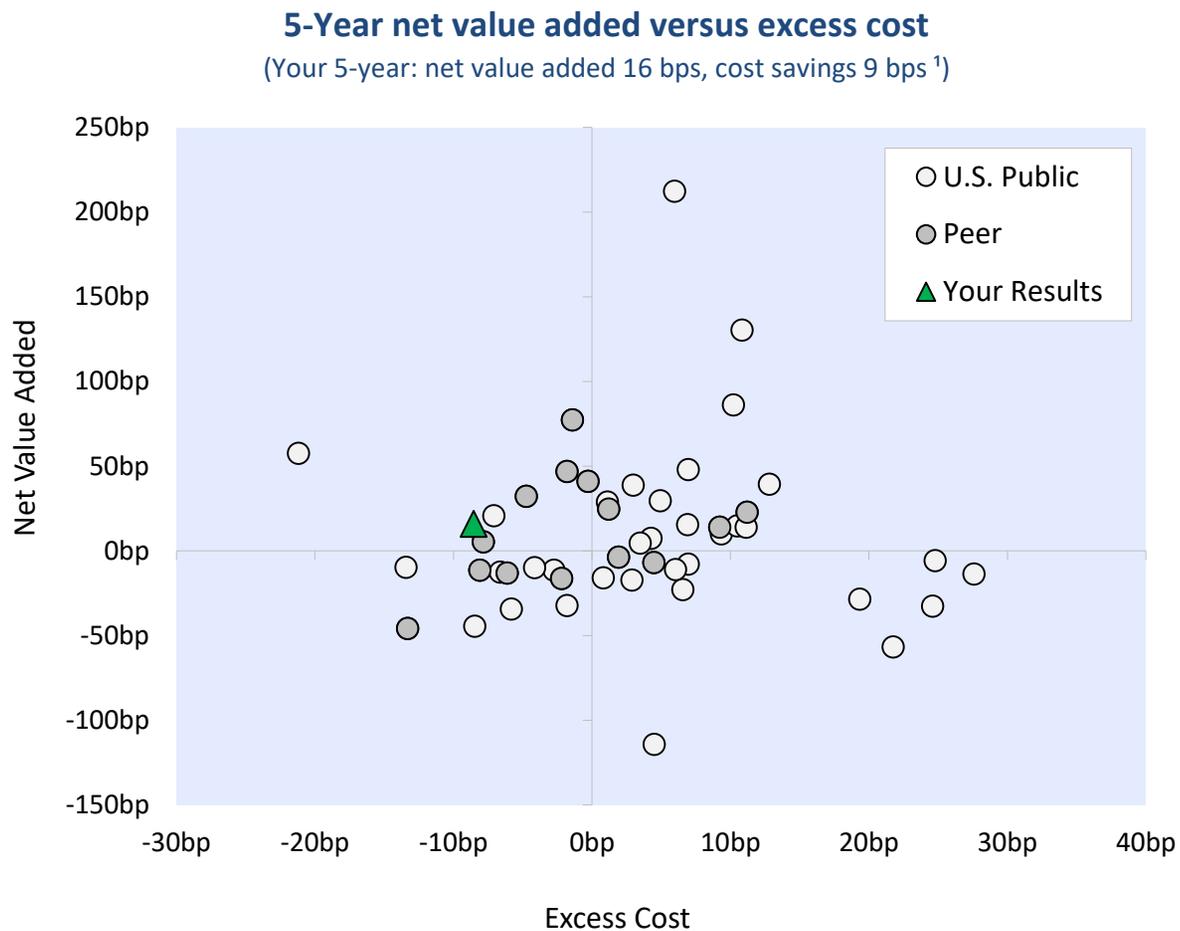
1. The graph above does not take into consideration the impact of derivatives. The values in the graph above are calculated using average holdings.

If your internally managed assets were managed externally and you paid the peer median costs, your costs would have been higher by approximately \$107 million.

Additional external investment management costs: assuming STRS Ohio no longer had internal holdings and paid peer median external costs

	Style	STRS Ohio		Peer median external cost	Difference	
		Avg holdings in \$mils	Internal cost		in bps	savings \$000s
Stock - U.S. Large Cap	passive	9,274	0.1	0.9	(0.8)	(762)
Stock - U.S. Large Cap	active	9,605	13.2	32.3	(19.1)	(18,340)
Stock - U.S. Small Cap	active	763	4.2	60.1	(55.9)	(4,265)
Stock - EAFE	active	5,290	5.6	35.3	(29.7)	(15,718)
Stock - Emerging	active	2,257	14.1	59.4	(45.3)	(10,214)
Stock - Global	active	591	8.3	43.9	(35.6)	(2,102)
Stock - ACWI x U.S.	active	2,958	1.6	39.9	(38.3)	(11,337)
Fixed Income - U.S.	active	12,627	2.7	17.0	(14.3)	(18,048)
Cash	active	1,351	2.2	n/a	--	--
REITs	passive	1,137	0.9	6.3	(5.3)	(608)
Real Estate ex-REITs	active	5,540	32.1	58.4	(26.3)	(14,581)
Natural Resources	co	152	1.6	57.7	(56.1)	(853)
Global TAA	active	261	64.0	44.7	19.3	502
Diversified Private Equity	co	294	3.0	154.7	(151.7)	(4,457)
Diversified Private Equity	active	400	8.0	154.7	(146.7)	(5,864)
Private Credit	active	95	7.8	22.7	(15.0)	(142)
Total					(14.1)	(106,788)

Your 5-year performance placed in the positive value added, low cost quadrant of the cost effectiveness chart.



1. Your 5-year cost savings of 9 basis points is the average of your cost savings for the past 5 years.

	2018	2017	2016	2015	2014	5-year
Net value added	15bp	41bp	3bp	63bp	-43bp	16bp
Excess Cost	-14bp	-10bp	-8bp	-7bp	-4bp	-9bp

Summary of key takeaways

Returns

- Your 5-year net total return of 6.25% was in the top quartile. This was above both the U.S. Public median of 5.42% and the peer median of 5.73%.
- Your 5-year policy return was 6.09%. This was above both the U.S. Public median of 5.30% and the peer median of 5.72%.

Value added

- Your 5-year net value added was 0.16%. This was above the U.S. Public median of 0.05% and above the peer median of 0.14%.

Cost and cost effectiveness

- Your investment cost of 40.1 bps was below your benchmark cost of 54.5 bps. This suggests that your fund was low cost compared to your peers.
- Your fund was low cost because you paid less than peers for similar services and you had a lower cost implementation style.

Risk

- Your asset risk of 11.8% was above the U.S. Public median of 10.4%.

2

Description of peer group and universe

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Peer group

Your peer group is comprised of 17 U.S. Public funds, with assets ranging from \$47.4 billion to \$227.7 billion versus your \$72.9 billion. The median size is \$82.5 billion.

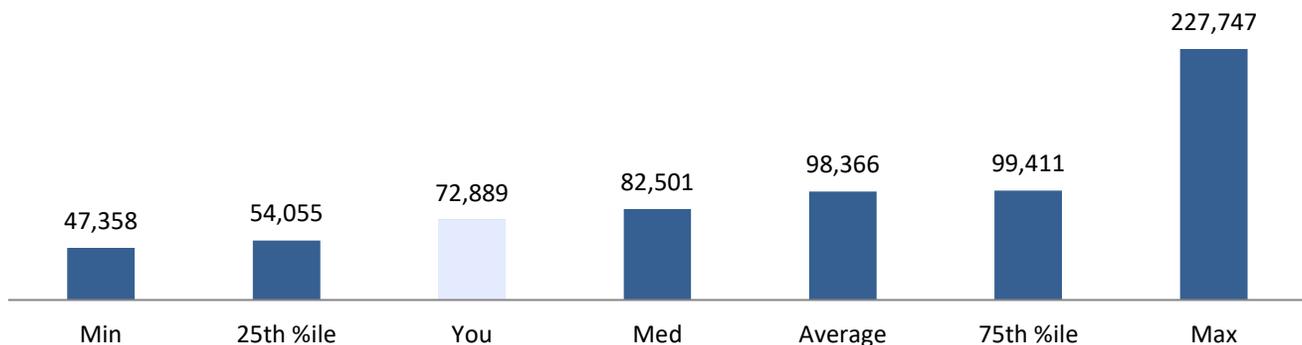
In order to preserve client confidentiality, we do not disclose your peers' names in this document due to the Freedom of Information Act. Your peer group consist of plans with the following characteristics:

Peer Group Characteristics - 2018

	Your Plan	Peers	U.S. Public
<u>Plan Assets (\$ billions)</u>			
Range	72.9	47.4 - 227.7	0.6 - 337.2
Median		82.5	22.5
<u># of Plans</u>			
Corporate		0	0
Public	1	17	56
Other		0	0
Total		17	56
<u>Implementation style</u>			
% External active	31.4	59.9	66.2
% External passive	0.0	10.8	19.5
% Internal active	54.7	17.1	8.6
% Internal passive	13.9	12.2	5.7
<u>Asset mix</u>			
% Stock	51.7	41.4	45.0
% Fixed Income	20.1	23.5	26.5
% Real Assets	11.5	13.1	10.8
% Private Equity	11.4	11.7	8.4
% Hedge Funds & Other	4.0	8.3	7.5

Your peer group is selected such that your fund size is usually close to the median of your peer group. Size is the primary criteria for choosing your peer group, because size greatly impacts how much you pay for services. Generally, the larger your fund, the smaller your unit operating costs (i.e., the economies of scale impact).

Total fund assets (\$ millions) - you versus peers

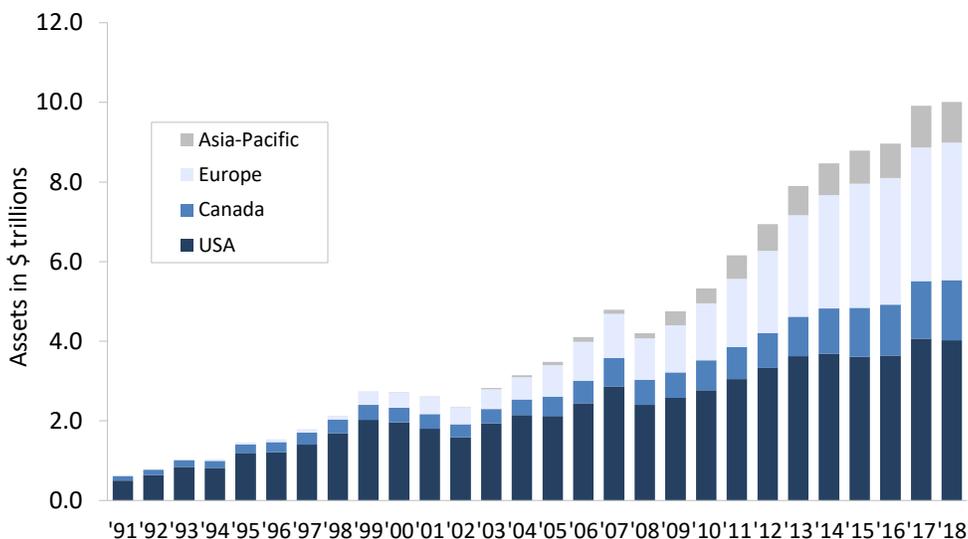


CEM global universe

CEM has been providing investment benchmarking solutions since 1991. The 2018 survey universe is comprised of 329 funds representing \$10.0 trillion in assets. The breakdown by region is as follows:

- 166 U.S. pension funds with aggregate assets of \$4.0 trillion.
- 77 Canadian pension funds with aggregate assets of \$1.5 trillion.
- 77 European pension funds with aggregate assets of \$3.5 trillion. Included are funds from the Netherlands, Norway, Sweden, Finland, Denmark, UK, and Ireland.
- 7 Asia-Pacific pension funds with aggregate assets of \$1.0 trillion.

CEM global universe



Universe subsets

CEM's global survey universe is comprised of 329 funds with total assets of \$10.0 trillion. Your fund's returns and costs are compared to the following two subsets of the global universe:

- Peers - Your peer group is comprised of 17 U.S. Public funds ranging in size from \$47.4 - \$227.7 billion. The peer median of \$82.5 billion compares to your \$72.9 billion.
- U.S. Public - The U.S. Public universe is comprised of 56 funds ranging in size from \$0.6 - \$337.2 billion. The median fund is \$22.5 billion.

Universe subsets by number of funds and assets

	Peer group ¹	Global by type				Global by Country				
		Corp.	Public	Other	Total	U.S.	Canada	Europe	Asia-Pacific	Total
# of funds										
2018	17	143	140	46	329	166	77	77	9	329
2017	17	151	151	48	350	168	79	90	13	350
2016	16	154	144	48	346	170	80	84	12	346
2015	15	161	148	55	364	176	80	95	13	364
2014	15	164	208	55	427	178	89	147	13	427
# of funds with uninterrupted data for:										
1 yr	17	143	140	46	329	166	77	77	9	329
2 yrs	17	131	131	40	302	152	68	74	8	302
3 yrs	16	119	124	38	281	141	63	70	7	281
4 yrs	15	108	117	35	260	132	54	67	7	260
5 yrs	15	100	117	34	251	128	52	64	7	251
Total assets (\$ billions)										
2018	1,672	1,496	6,659	1,881	10,036	4,023	1,509	3,456	1,048	10,036
2017	1,653	1,523	6,699	2,008	10,230	4,064	1,448	3,358	1,360	10,230
2016	1,429	1,473	5,864	1,886	9,223	3,637	1,284	3,177	1,125	9,223
2015	1,352	1,445	5,869	1,844	9,159	3,609	1,228	3,122	1,200	9,159
2014	1,351	1,495	5,643	1,656	8,794	3,689	1,132	2,850	1,123	8,794
2018 asset distribution (\$ billions)										
Avg	98.4	10.5	47.6	40.9	30.5	24.2	19.6	44.9	116.5	30.5
Max	227.7	68.9	1,206.8	588.6	1,206.8	337.2	314.6	1,206.8	569.5	1,206.8
75th %ile	99.4	13.5	38.6	36.0	22.2	24.4	10.5	31.8	95.8	22.2
Median	82.5	4.7	10.4	10.3	7.2	8.6	4.3	8.8	31.9	7.2
25th %ile	54.1	1.9	3.5	2.1	2.5	2.5	1.6	3.7	15.7	2.5
Min	47.4	0.2	0.2	0.0	0.0	0.2	0.0	0.6	3.1	0.0

1. Peer group statistics are for your 2018 peer group only as your peer group may have included different funds in prior years.

Implementation style, actual mix and policy mix by universe subset

Implementation style, actual mix and policy mix - 2018
(as a % of year-end assets)

	Your fund	Peer group	Global by type				Global by Country				
			Corp.	Public	Other	Total	U.S.	Canada	Europe	Asia-Pacific	Total
Implementation style											
External Active	29.5	59.0	69.8	57.3	63.4	63.6	69.9	65.1	50.7	45.2	63.6
Fund of funds	1.9	0.9	2.5	3.1	2.8	2.8	2.7	1.8	3.9	2.1	2.8
External passive	0.0	10.8	18.6	18.3	17.2	18.3	18.8	10.7	24.5	21.0	18.3
Internal Active	54.7	17.1	6.7	16.1	12.1	11.4	5.1	17.5	18.2	19.2	11.4
Internal Passive	<u>13.9</u>	<u>12.2</u>	<u>2.4</u>	<u>5.2</u>	<u>4.4</u>	<u>3.9</u>	<u>3.5</u>	<u>4.8</u>	<u>2.8</u>	<u>12.5</u>	<u>3.9</u>
Total	100	100	100	100	100	100	100	100	100	100	100
Actual asset mix											
Stock	51.7	41.4	31.6	46.8	43.0	39.6	37.1	40.4	43.5	46.6	39.6
Fixed Income	20.1	24.3	51.7	27.1	34.4	38.8	42.3	35.9	35.5	28.1	38.8
Global TAA	1.8	0.7	0.8	1.5	0.1	1.0	1.1	0.7	1.1	0.3	1.0
Real Assets	11.5	13.1	6.6	12.4	12.5	9.9	7.2	14.9	10.2	13.3	9.9
Hedge Funds	2.2	5.7	3.8	3.2	2.2	3.3	4.5	2.2	2.0	3.8	3.3
Balanced Funds	0.0	0.0	0.0	0.9	0.0	0.4	0.0	0.0	1.7	0.0	0.4
Risk Parity	0.0	1.1	0.4	0.5	0.6	0.5	0.7	0.2	0.1	0.9	0.5
Private Credit	1.3	1.9	1.4	1.6	3.4	1.8	1.2	2.2	2.5	1.3	1.8
Private Equity	<u>11.4</u>	<u>11.7</u>	<u>3.7</u>	<u>6.0</u>	<u>3.8</u>	<u>4.7</u>	<u>5.8</u>	<u>3.5</u>	<u>3.4</u>	<u>5.6</u>	<u>4.7</u>
Total	100	100	100	100	100	100	100	100	100	100	100
Policy asset mix											
Stock	52.0	42.0	32.2	47.6	43.6	40.3	38.4	40.4	43.1	51.6	40.3
Fixed Income	22.0	23.1	51.4	26.7	34.1	38.5	41.2	36.6	35.9	27.1	38.5
Global TAA	0.0	0.7	0.7	1.5	0.1	1.0	1.0	0.9	1.1	0.2	1.0
Real Assets	10.0	14.3	6.7	13.0	12.5	10.2	7.6	14.8	10.9	12.2	10.2
Hedge funds	0.0	5.3	3.5	2.8	2.4	3.1	4.2	1.9	1.8	2.7	3.1
Balanced Funds	0.0	0.0	0.0	0.5	0.0	0.2	0.0	0.0	0.9	0.0	0.2
Risk Parity	0.0	1.1	0.3	0.4	0.7	0.4	0.6	0.2	0.2	1.0	0.4
Private Credit	0.0	2.0	1.2	1.8	3.0	1.7	1.1	2.2	2.5	1.1	1.7
Private Equity	<u>16.0</u>	<u>11.6</u>	<u>4.0</u>	<u>5.8</u>	<u>3.6</u>	<u>4.7</u>	<u>6.0</u>	<u>3.1</u>	<u>3.6</u>	<u>4.1</u>	<u>4.7</u>
Total	100	100	100	100	100	100	100	100	100	100	100

Implementation style, actual mix and policy mix trends

Implementation style, actual mix and policy mix - 2014 to 2018
(as a % of year-end assets)

	Your fund					Peer average ¹					U.S. Public average ¹				
	2018	2017	2016	2015	2014	2018	2017	2016	2015	2014	2018	2017	2016	2015	2014
Implementation style															
External active	29.5	29.2	29.7	29.2	27.1	57.6	56.7	57.7	57.2	56.6	63.1	62.6	62.9	63.5	64.2
Fund of funds	1.9	1.5	1.5	1.4	1.0	1.0	1.2	1.2	1.1	1.0	2.9	2.9	2.9	2.9	2.6
External passive	0.0	-0.1	0.1	0.0	0.0	10.1	11.2	11.0	11.8	12.0	19.8	20.3	20.3	19.6	19.1
Internal active	54.7	55.8	54.6	55.6	58.5	18.5	19.2	19.0	19.4	19.9	8.1	8.4	8.3	8.3	8.0
Internal passive	<u>13.9</u>	<u>13.6</u>	<u>14.1</u>	<u>13.9</u>	<u>13.4</u>	<u>12.8</u>	<u>11.7</u>	<u>11.1</u>	<u>10.6</u>	<u>10.4</u>	<u>6.2</u>	<u>5.9</u>	<u>5.7</u>	<u>5.6</u>	<u>6.1</u>
Total	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Actual asset mix															
Stock	51.7	56.0	57.6	57.3	56.8	42.8	44.6	44.4	45.4	47.3	45.5	48.5	47.6	47.9	49.5
Fixed income	20.1	20.9	16.8	17.9	21.3	24.6	24.8	24.5	25.1	25.6	25.9	25.3	25.6	26.6	26.6
Global TAA	1.8	0.9	0.6	0.5	0.0	0.8	0.7	0.6	0.7	0.9	1.3	1.0	1.6	1.4	1.6
Real assets	11.5	10.5	12.9	12.4	10.5	12.8	12.2	13.0	12.1	11.0	10.9	10.3	10.6	9.8	9.0
Hedge funds	2.2	2.1	2.8	2.9	2.8	4.9	4.7	4.7	4.8	3.9	4.8	4.5	4.8	5.3	4.8
Balanced Funds	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Risk Parity	0.0	0.0	0.0	0.0	0.0	0.7	0.7	0.6	0.5	0.3	0.9	1.1	0.5	0.4	0.4
Private credit	1.3	0.5	0.0	0.0	0.0	1.8	1.6	1.4	1.0	0.8	2.0	1.6	1.5	1.2	1.1
Private equity	<u>11.4</u>	<u>9.1</u>	<u>9.3</u>	<u>9.0</u>	<u>8.6</u>	<u>11.7</u>	<u>10.7</u>	<u>10.8</u>	<u>10.4</u>	<u>10.2</u>	<u>8.8</u>	<u>7.7</u>	<u>7.8</u>	<u>7.5</u>	<u>7.0</u>
Total	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Policy asset mix															
Stock	52.0	55.0	57.0	57.0	57.0	44.0	45.2	45.9	46.4	46.3	46.6	47.8	47.9	48.6	48.5
Fixed income	22.0	21.0	19.0	19.0	19.0	23.1	23.4	24.5	24.5	25.2	24.3	25.0	25.3	25.5	26.1
Global TAA	0.0	0.0	0.0	0.0	0.0	0.8	0.7	0.8	0.9	0.9	1.0	0.9	1.5	1.3	1.4
Real assets	10.0	10.0	10.0	10.0	10.0	13.7	13.3	12.8	12.4	12.1	11.9	11.4	11.1	10.4	10.2
Hedge funds	0.0	0.0	0.0	0.0	0.0	4.3	3.7	3.3	3.5	3.1	4.4	4.0	4.2	4.5	4.4
Balanced Funds	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Risk Parity	0.0	0.0	0.0	0.0	0.0	0.7	0.7	0.7	0.7	0.6	0.8	0.9	0.6	0.6	0.5
Private credit	0.0	0.0	0.0	0.0	0.0	2.0	1.8	1.0	0.5	0.5	2.2	1.5	1.4	0.9	0.8
Private equity	<u>16.0</u>	<u>14.0</u>	<u>14.0</u>	<u>14.0</u>	<u>14.0</u>	<u>11.5</u>	<u>11.3</u>	<u>11.2</u>	<u>11.2</u>	<u>11.2</u>	<u>8.8</u>	<u>8.4</u>	<u>8.1</u>	<u>8.2</u>	<u>8.1</u>
Total	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100

1. Trends are based on the 49 U.S. Public and 15 peer funds with 5 or more consecutive years of data ending 2018.

Implementation style by asset class

Implementation style impacts your costs, because external active management tends to be more expensive than internal or passive (or indexed) management and fund-of-funds usage is more expensive than direct fund investment.

Implementation style by asset class - 2018 (as a % of year-end assets)

	Your fund %					Peer average %					U.S. Public average %				
	External			Internal		External			Internal		External			Internal	
	Active	FOFs	Index	Active	Index	Active	FOFs	Index	Active	Index	Active	FOFs	Index	Active	Index
Stock - U.S. Broad/All						21.2		34.5	4.7	39.5	24.8		58.8	1.8	14.7
Stock - U.S. Large Cap	4.9		0.0	46.4	48.7	13.1		24.6	23.6	38.6	29.8		45.3	6.3	18.6
Stock - U.S. Mid Cap						25.6		20.8	31.0	22.6	43.5		23.8	7.7	25.0
Stock - U.S. Small Cap	60.9		0.0	39.1	0.0	68.2		5.5	18.1	8.1	81.9		8.3	6.7	3.2
Stock - EAFE	51.0		0.0	49.0	0.0	57.1		20.8	11.4	10.6	59.3		31.5	4.7	4.5
Stock - Global	0.0		0.0	100.0	0.0	79.0		0.0	18.8	2.1	55.7		17.9	15.0	11.5
Employer Stock						0.0		0.0	0.0	0.0	0.0		0.0	0.0	0.0
Stock - Other						18.2		0.0	1.0	80.8	94.8		1.6	0.1	3.6
Stock - Emerging	29.8		0.0	70.2	0.0	74.2		10.7	8.6	6.5	81.9		11.9	3.2	3.0
Stock - ACWI x U.S.	29.0		0.0	71.0	0.0	67.3		15.0	7.2	10.6	66.8		30.2	1.2	1.8
Stock - Aggregate	24.2		0.0	51.9	23.9	43.9		20.5	13.5	22.0	50.9		33.1	5.6	10.3
Fixed Income - U.S.	0.0		0.0	100.0	0.0	32.3		9.8	53.9	4.1	57.0		18.8	22.8	1.4
Fixed Income - U.S. Gov't						0.0		20.1	10.6	69.4	42.7		38.3	11.9	7.2
Fixed Income - U.S. Credits						100.0		0.0	0.0	0.0	64.6		0.0	35.4	0.0
Fixed Income - EAFE						0.0		0.0	0.0	0.0	100.0		0.0	0.0	0.0
Fixed Income - Global						1.0		0.0	99.0	0.0	66.6		5.5	27.9	0.0
Fixed Income - Other						100.0		0.0	0.0	0.0	96.9		0.0	3.1	0.0
Fixed Income - Long Bonds						7.8		0.0	0.0	92.2	70.7		11.3	0.0	18.0
Fixed Income - Emerging	100.0		0.0	0.0	0.0	100.0		0.0	0.0	0.0	99.1		0.9	0.0	0.0
Fixed Income - Inflation Indexed						34.8		32.2	3.6	29.3	39.3		44.5	1.4	14.9
Fixed Income - High Yield	100.0		0.0	0.0	0.0	97.5		0.0	0.7	1.8	92.8		1.0	5.7	0.4
Fixed Income - Absolute Return Bond						0.0		0.0	0.0	0.0	0.0		0.0	0.0	0.0
Fixed Income - Bundled LDI						0.0		0.0	0.0	0.0	100.0		0.0	0.0	0.0
Fixed Income - Convertibles						100.0		0.0	0.0	0.0	100.0		0.0	0.0	0.0
Cash	0.0			100.0		40.1			59.9		39.0			61.0	
Fixed Income - Aggregate	10.1		0.0	89.9	0.0	40.7		8.5	40.6	10.2	61.2		15.7	20.0	3.2
Commodities						65.7		0.0	2.2	32.1	78.6		9.7	2.3	9.4
Infrastructure	0.0	100.0		0.0		75.0	5.2		15.3		84.8	9.5		3.9	
Natural Resources	70.0	0.0		0.0		85.4	0.1		0.5		94.4	0.0		0.2	
REITs	0.0		0.0	0.0	100.0	63.2		6.9	6.2	23.7	69.4		22.9	1.6	6.1
Real Estate ex-REITs	13.3	0.0		86.7		86.8	0.6		8.4		94.2	0.4		3.8	
Other Real Assets						91.7			8.3		94.6			5.4	
Real Assets	14.8	0.7	0.0	68.8	13.8	84.7	0.6	0.4	7.7	2.3	91.3	0.7	2.1	3.3	0.9
Hedge Funds	100.0	0.0				97.2	2.8				76.1	23.9			
Global TAA	27.6			72.4		62.9			37.1		92.6			7.4	
Risk Parity						62.9			37.1		88.1			11.9	
Private Credit	89.8	0.0		10.2		96.9	0.0		2.1		99.0	0.0		0.7	
Mortgages						61.1			38.9		22.1			77.9	
Diversified Private Equity	71.1	0.0		14.2		88.8	5.1		0.4		74.1	22.6		0.1	
Venture Capital	78.0	22.0		0.0		71.6	20.3		7.0		61.3	33.8		4.3	
LBO	78.4	21.6		0.0		90.4	4.2		0.0		92.4	3.5		0.0	
Other Private Equity						98.7			0.1		98.4			0.7	
Private Equity	76.3	15.9		3.8		88.0	6.0		0.8		77.0	19.5		0.3	
Total Fund - Yr.-End Holdings	28.8	1.9	0.0	54.7	13.9	57.8	0.9	10.8	17.1	12.2	62.9	2.9	19.5	8.6	5.7

Actual mix

Actual asset mix - 2014 to 2018
(as a % of total year-end assets)

	Your fund					Peer average %					U.S. Public average %				
	2018	2017	2016	2015	2014	2018	2017	2016	2015	2014	2018	2017	2016	2015	2014
Stock - U.S. Broad/All						8.0	6.7	6.9	7.2	7.5	6.5	7.1	6.9	6.7	6.6
Stock - U.S. Large Cap	25.4	27.3	28.3	28.2	28.7	9.8	11.5	11.7	12.5	13.0	11.1	12.2	13.6	14.5	15.3
Stock - U.S. Mid Cap						0.8	0.7	0.5	0.6	0.5	1.0	0.8	0.8	0.9	0.8
Stock - U.S. Small Cap	2.4	2.7	2.9	2.7	2.7	1.3	1.5	1.8	2.3	2.4	2.3	2.3	2.5	2.9	3.2
Stock - EAFE	13.8	14.7	15.4	15.8	15.3	10.1	11.0	10.1	10.8	11.1	7.5	7.0	6.5	6.8	7.3
Stock - Global	0.8	0.8	0.7	1.1	1.1	3.4	3.8	4.2	3.9	4.3	6.3	6.7	5.3	4.2	3.8
Employer Stock															
Stock - Other						0.1	0.2	0.3	0.3	0.4	0.9	1.0	1.0	1.2	1.2
Stock - Emerging	4.2	4.5	4.3	3.9	3.9	4.8	5.1	4.5	4.3	4.4	3.8	3.8	3.1	2.9	3.3
Stock - ACWI x U.S.	5.2	5.9	5.9	5.6	5.1	3.0	2.7	3.0	3.5	3.5	5.5	6.6	7.2	7.9	7.7
Stock - Aggregate	51.7	56.0	57.6	57.3	56.8	41.4	43.3	42.9	45.4	47.3	45.0	47.4	46.8	48.0	49.3
Fixed Income - U.S.	16.7	16.7	12.3	13.7	15.1	12.6	12.3	12.8	13.4	13.9	12.7	12.7	13.6	14.5	14.1
Fixed Income - U.S. Gov't						0.6	0.6	0.5	0.6	0.5	1.7	1.4	0.9	0.6	0.3
Fixed Income - U.S. Credits						0.1	0.0	0.0	0.1	0.3	0.3	0.2	0.2	0.3	0.1
Fixed Income - EAFE											0.0	0.1	0.1	0.1	0.1
Fixed Income - Global						1.5	1.5	1.8	2.1	2.3	1.7	1.4	1.7	1.7	1.9
Fixed Income - Other						0.8	0.9	1.5	1.5	1.4	0.7	0.7	0.9	0.9	1.0
Fixed Income - Long Bonds						0.9	0.8	0.8	0.8	0.9	1.5	1.3	0.9	1.0	1.0
Fixed Income - Emerging	1.0	1.0	1.0	1.0	1.2	1.3	1.4	1.3	1.2	1.1	1.3	1.3	1.1	0.9	0.9
Fixed Income - Inflation Indexed						2.0	2.2	2.1	2.2	2.1	1.9	1.9	1.8	1.9	1.8
Fixed Income - High Yield	1.0	1.1	1.1	1.3	1.7	1.7	1.7	1.7	1.5	1.4	2.1	1.7	1.6	1.5	1.6
Fixed Income - Absolute Return Bonds															
Fixed Income - Bundled LDI											0.2				
Fixed Income - Convertibles						0.2	0.2				0.1	0.1			
Cash	1.4	2.2	2.3	1.8	3.4	1.9	2.0	1.7	1.3	1.6	2.3	2.3	2.1	2.0	2.0
Fixed Income - Aggregate	20.1	21.0	16.7	17.9	21.3	23.5	23.7	24.2	24.7	25.4	26.5	25.1	24.8	25.3	24.8
Commodities						0.5	0.6	0.6	0.4	0.6	0.5	0.5	0.7	0.5	0.6
Infrastructure	0.1	0.1	0.2	0.1	0.1	0.4	0.3	0.3	0.2	0.1	0.4	0.6	0.4	0.3	0.3
Natural Resources	0.7	0.9	1.4	1.3	0.5	1.0	1.0	0.8	0.6	0.5	0.8	1.2	0.9	0.6	0.5
REITs	1.6	1.4	1.8	1.6	1.5	0.7	0.7	0.8	0.8	0.7	0.8	0.9	0.8	0.8	0.9
Real Estate ex-REITs	9.1	8.1	9.7	9.3	8.4	9.7	9.3	10.2	9.7	8.8	7.8	6.9	7.8	7.3	6.5
Other Real Assets						0.9	0.9	0.8	0.4	0.3	0.4	0.6	0.7	0.7	0.5
Real Assets	11.5	10.5	12.9	12.4	10.5	13.1	12.7	13.4	12.1	11.0	10.8	10.8	11.2	10.2	9.3
Hedge Funds	2.2	2.1	2.8	2.9	2.8	5.7	5.2	5.1	4.8	3.9	4.8	4.8	5.1	5.5	5.4
Global TAA	1.8	0.9	0.6	0.5		0.7	0.6	0.6	0.7	0.9	1.2	0.9	1.5	1.3	2.1
Risk Parity						1.1	1.1	1.1	0.5	0.3	1.0	1.0	0.7	0.3	0.3
Mortgages						0.2	0.1	0.1	0.2	0.2	0.2	0.1	0.1	0.2	0.2
Private Credit	1.3	0.5				1.8	1.6	1.3	0.8	0.6	1.7	1.4	1.2	1.0	0.7
Diversified Private Equity	3.1	0.1	0.1	0.1	4.7	7.6	6.9	7.4	7.1	7.3	6.3	5.6	6.1	5.5	5.5
Venture Capital	2.1	1.7	1.6	1.6	1.4	0.9	0.9	0.7	0.6	0.5	0.5	0.4	0.4	0.5	0.4
LBO	6.3	4.6	4.5	4.5		2.9	2.7	2.3	2.4	2.2	1.5	1.5	1.4	1.6	1.4
Other Private Equity		2.6	3.1	2.7	2.5	0.2	0.4	0.5	0.3	0.3	0.1	0.2	0.2	0.3	0.2
Private Equity	11.4	9.1	9.3	9.0	8.6	11.7	10.8	11.0	10.4	10.2	8.4	7.7	8.1	7.9	7.6
Derivatives/Overlays Mkt Value	0.0	-0.1	0.1			0.8	0.8	0.4	0.4	0.3	0.4	0.8	0.5	0.4	0.4
Total Fund	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Count	1	1	1	1	1	17	17	16	15	15	56	60	59	64	68
Median Assets (\$ billions)	72.9	78.3	71.7	70.8	73.5	82.5	79.2	78.4	79.7	78.4	22.5	19.9	17.1	16.6	16.4

Policy mix

Policy asset mix - 2014 to 2018
(as a % of total assets)

	Your fund %					Peer average %					U.S. Public average %				
	2018	2017	2016	2015	2014	2018	2017	2016	2015	2014	2018	2017	2016	2015	2014
Stock - U.S. Broad/All						11.0	11.0	12.4	13.2	10.4	9.5	9.8	9.9	10.2	9.5
Stock - U.S. Large Cap	28.0	30.0	31.0	31.0	31.0	3.8	4.1	5.2	4.9	7.2	7.8	8.5	9.7	9.9	11.1
Stock - U.S. Mid Cap						0.2				0.2	0.7	0.5	0.4	0.4	0.3
Stock - U.S. Small Cap						0.3	0.5	0.3	0.3	0.5	1.4	1.3	1.5	1.6	1.6
Stock - EAFE	19.2	20.0	20.8	20.8	20.8	6.6	6.8	7.3	7.2	7.4	5.9	4.7	5.1	5.1	5.9
Stock - Global						13.0	13.6	11.7	13.0	13.0	10.7	10.9	9.1	9.0	7.8
Employer Stock															
Stock - Other						0.1	0.1	0.3	0.5	0.5	0.8	0.9	0.8	0.9	0.7
Stock - Emerging	4.8	5.0	5.2	5.2	5.2	3.1	3.1	2.8	2.7	2.4	2.9	2.5	2.3	2.2	2.2
Stock - ACWI x U.S.						3.9	4.0	4.2	4.7	4.8	6.4	7.4	7.9	8.8	8.9
Stock - Aggregate	52.0	55.0	57.0	57.0	57.0	42.0	43.4	44.2	46.4	46.3	46.1	46.5	46.7	48.2	48.0
Fixed Income - U.S.	21.0	20.0	18.0	18.0	18.0	15.0	15.0	15.7	16.7	15.3	14.2	14.7	15.0	15.8	15.7
Fixed Income - U.S. Gov't						0.2	0.2	0.1	0.0		1.4	1.1	0.7	0.5	0.4
Fixed Income - U.S. Credits						0.0					0.4	0.3	0.3	0.2	
Fixed Income - EAFE											0.0	0.1	0.1	0.1	0.1
Fixed Income - Global						1.5	1.5	1.8	2.0	3.1	1.5	1.4	1.5	1.5	1.9
Fixed Income - Other						0.1	0.2	1.0	0.8	0.8	0.4	0.6	0.6	0.5	0.6
Fixed Income - Long Bonds						1.0	0.8	0.9	0.7	0.7	2.1	2.1	1.7	1.5	1.5
Fixed Income - Emerging						1.0	1.0	0.9	0.9	0.7	1.2	1.2	0.9	0.9	0.9
Fixed Income - Inflation Indexed						3.0	2.9	2.9	1.8	2.3	2.9	2.8	2.7	2.6	2.6
Fixed Income - High Yield						1.9	2.3	1.9	1.3	1.6	1.9	2.0	2.0	1.8	1.8
Fixed Income - Absolute Return Bonds															
Fixed Income - Bundled LDI											0.2				
Fixed Income - Convertibles						0.2	0.2				0.1	0.1			
Cash	1.0	1.0	1.0	1.0	1.0	-0.7	-0.9	-1.0	0.1	0.7	-1.2	-1.0	-1.0	-0.9	-0.7
Fixed Income - Aggregate	22.0	21.0	19.0	19.0	19.0	23.1	23.1	24.1	24.5	25.2	25.2	25.3	24.6	24.5	24.7
Commodities						0.8	0.8	1.1	0.7	0.7	1.0	0.9	1.2	1.0	1.1
Infrastructure						0.4	0.4	0.3	0.1	0.1	0.6	0.7	0.6	0.3	0.4
Natural Resources						1.0	1.1	0.7	0.6	0.6	0.7	1.1	1.0	0.7	0.5
REITs		1.5	1.5	1.5	1.5	0.6	0.6	0.5	0.6	1.0	0.7	0.8	0.6	0.6	0.6
Real Estate ex-REITs	10.0	8.5	8.5	8.5	8.5	10.4	10.2	10.0	9.8	9.3	8.1	7.7	7.6	7.4	7.5
Other Real Assets						1.2	1.0	1.0	0.6	0.4	0.7	0.6	1.0	0.8	0.7
Real Assets	10.0	10.0	10.0	10.0	10.0	14.3	14.1	13.6	12.4	12.1	11.8	11.9	12.0	10.9	10.8
Hedge Funds						5.3	4.6	3.7	3.5	3.1	4.5	4.5	4.6	4.9	5.1
Global TAA						0.7	0.6	0.7	0.9	0.9	1.2	1.0	1.5	1.4	1.7
Risk Parity						1.1	1.2	1.2	0.7	0.6	0.8	0.9	0.6	0.4	0.4
Mortgages						0.3	0.1	0.4	0.1	0.1	0.1	0.0	0.1	0.1	0.0
Private Credit						1.7	1.7	0.7	0.4	0.4	1.9	1.5	1.2	0.9	0.7
Diversified Private Equity					14.0	8.6	9.2	8.2	8.6	10.1	6.6	7.1	7.0	7.0	7.4
Venture Capital						0.6	0.4	0.5	0.3	0.3	0.3	0.3	0.3	0.2	0.3
LBO	16.0	14.0	14.0	14.0		2.2	1.6	2.2	2.4	0.8	1.3	0.9	1.2	1.5	0.9
Other Private Equity						0.1	0.1	0.4	0.0	0.0	0.1	0.1	0.2	0.1	0.1
Private Equity	16.0	14.0	14.0	14.0	14.0	11.6	11.3	11.3	11.2	11.2	8.4	8.5	8.7	8.8	8.7
Total Fund	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Count	1	1	1	1	1	17	17	16	15	15	56	60	59	64	68

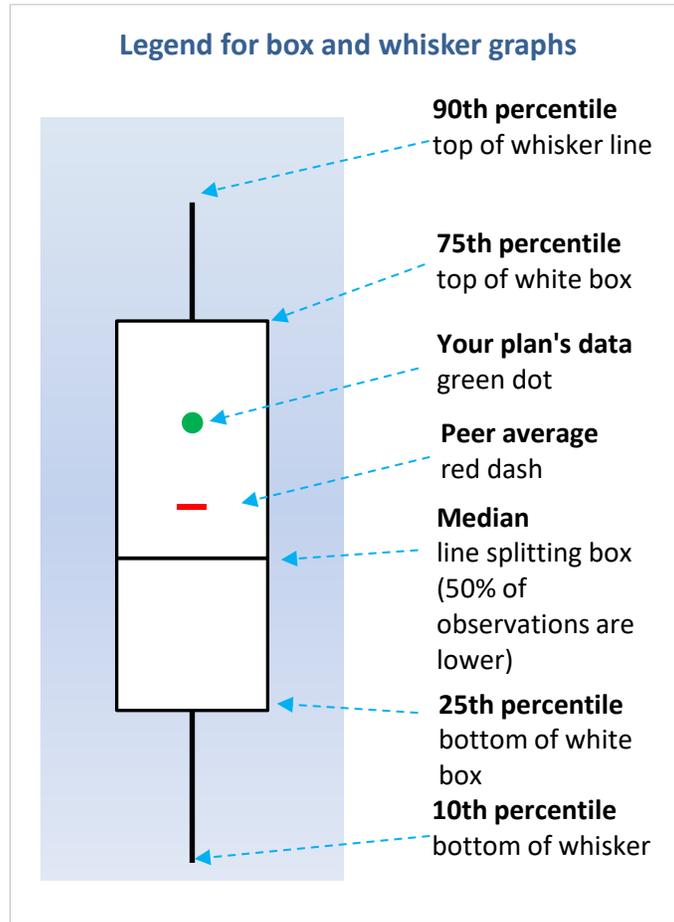
3

Returns, Benchmarks and Value Added

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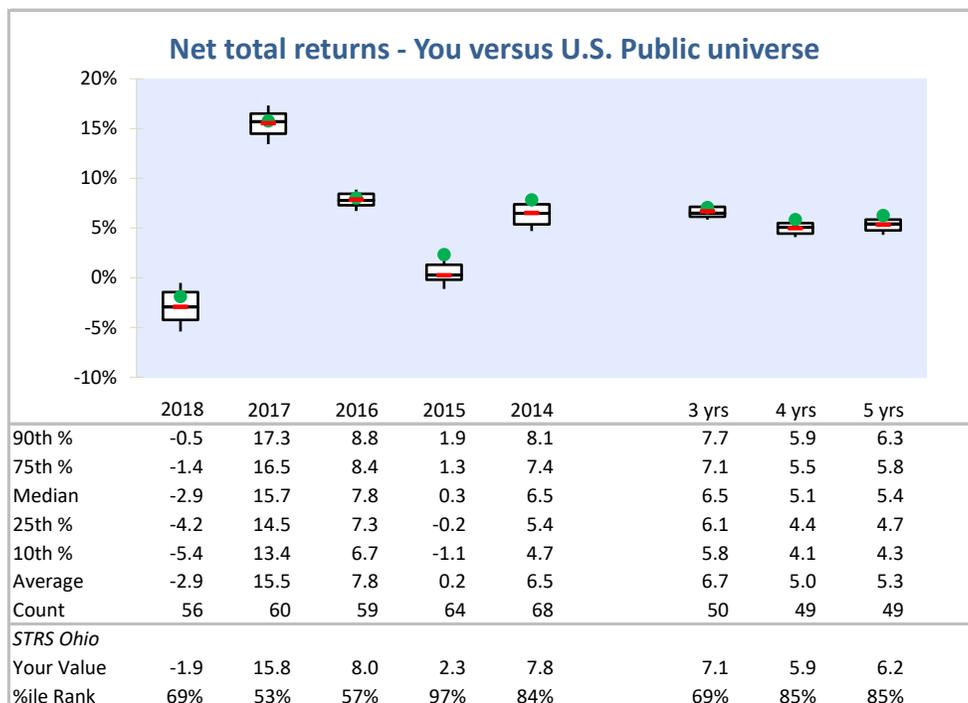
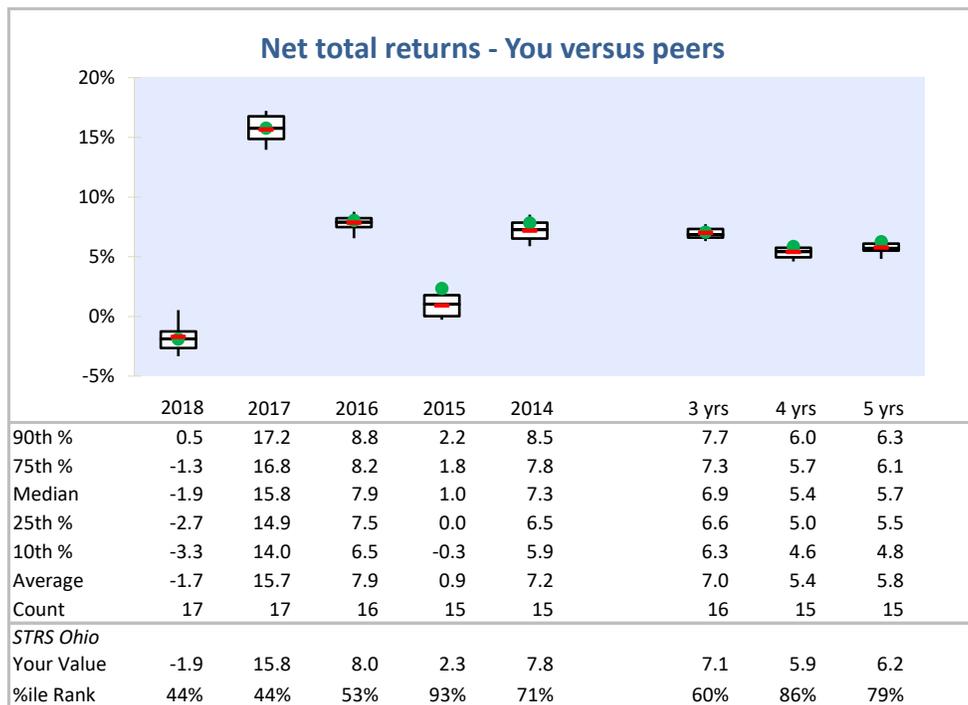
Interpreting box and whisker graphs

Box and whisker graphs are used extensively in this report because they show visually where you rank relative to all observations. At a glance you can see which quartile your data falls in.



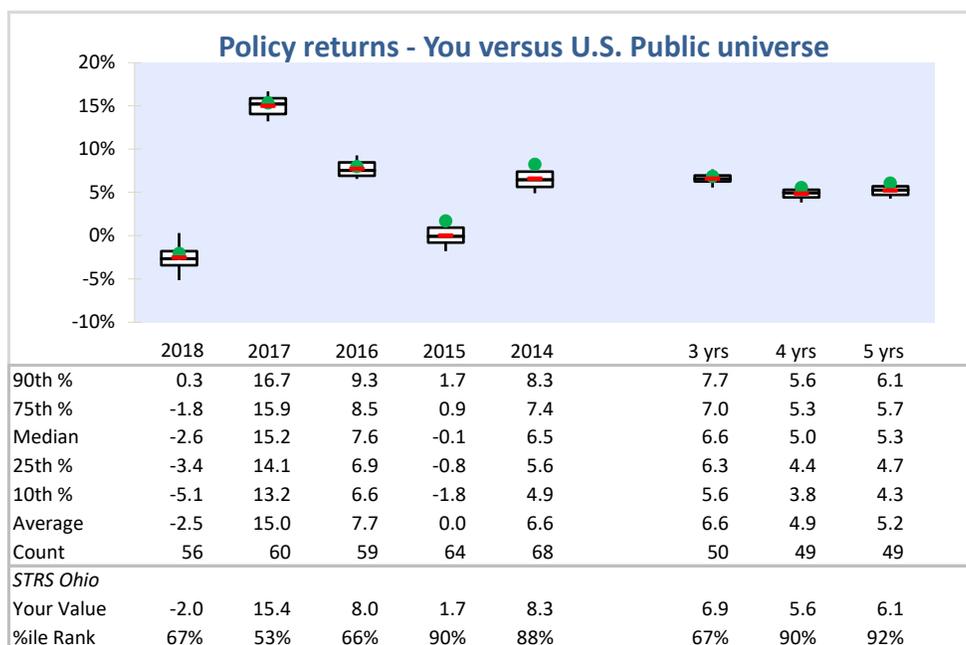
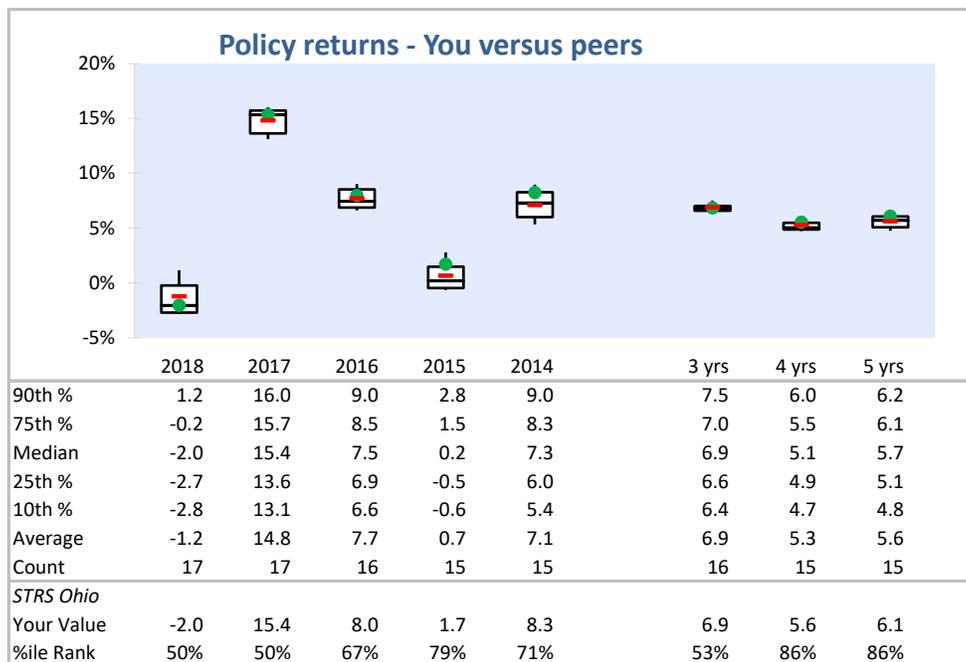
Net total returns

Your 5-year net total return of 6.2% was among the highest in your peer group and among the highest in the U.S. Public universe. Comparisons of total return do not help you understand the reasons behind relative performance. To understand the relative contributions from policy asset mix decisions and implementation decisions we separate total return into its more meaningful components - policy return and implementation value added.



Policy returns

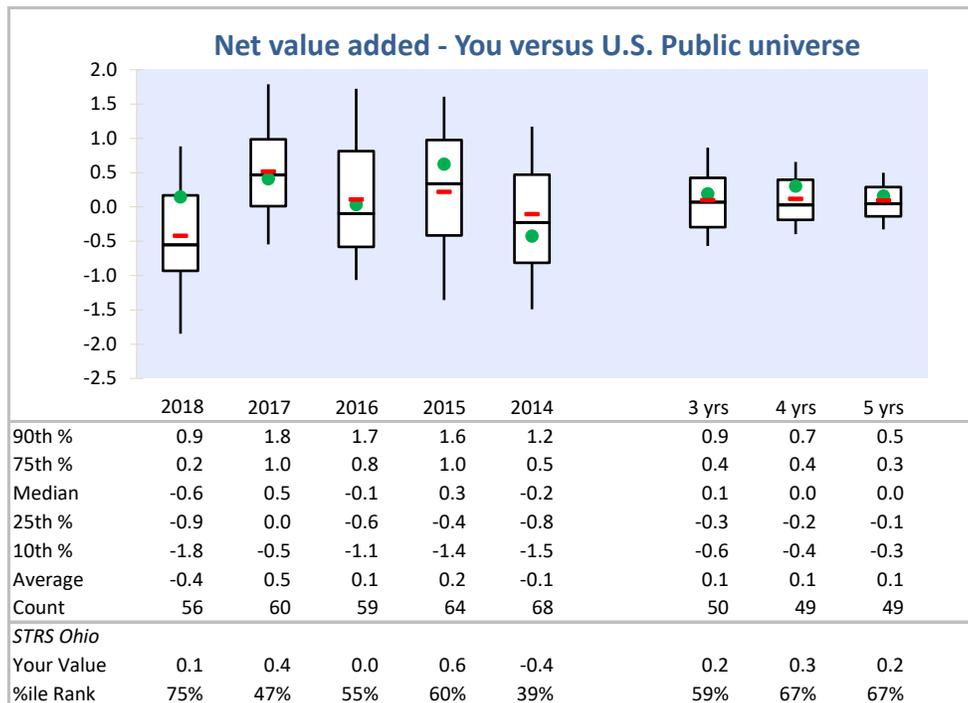
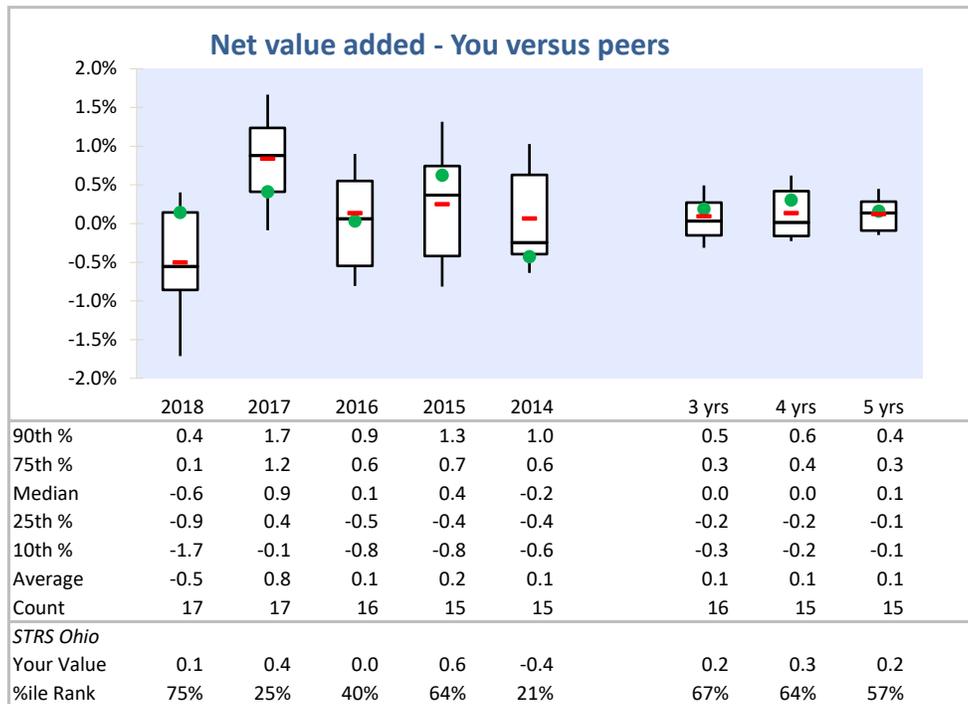
Your 5-year policy return of 6.1% was among the highest in your peer group and among the highest in the U.S. Public universe. Policy return is the return you would have earned had you passively implemented your policy asset mix decision through your benchmark portfolios.



To enable fairer comparisons, the policy returns of all participants except your fund were adjusted to reflect private equity benchmarks based on lagged, investable, public-market indices. If CEM used this same adjustment for your fund, your 5-year policy return would be 6.8%, 0.7% higher than your actual 5-year policy return of 6.1%. Mirroring this, your 5-year total fund net value added would be 0.7% lower. Refer to the appendix of this section for details.

Net value added

Your 5-year net value added of 0.2% was above the peer median and above the median of the U.S. Public universe. Net value added is the difference between your net total return and your policy return.



Net returns by asset class

Asset class	Your fund %						Peer average %						U.S. Public average %					
	2018	2017	2016	2015	2014	5-yr ¹	2018	2017	2016	2015	2014	5-yr ¹	2018	2017	2016	2015	2014	5-yr ¹
Stock - U.S. Broad/All							-4.9	21.9	11.1	-0.3	10.1	7.0	-5.3	20.2	11.1	-0.4	11.0	7.0
Stock - U.S. Large Cap	-4.8	22.1	10.6	1.0	12.4	7.8	-4.7	21.8	11.7	1.3	12.9	8.2	-4.7	22.2	11.2	0.9	12.7	8.0
Stock - U.S. Mid Cap							-9.8	17.7	12.6	-1.9	9.0	5.2	-9.0	19.0	13.0	-2.7	8.7	5.7
Stock - U.S. Small Cap	-9.8	19.6	17.2	-2.2	4.3	5.2	-10.8	15.3	18.7	-2.6	5.9	4.8	-10.8	15.6	18.4	-3.7	5.0	4.7
Stock - EAFE	-11.8	21.9	4.8	3.5	1.1	3.4	-13.9	26.6	3.1	-0.2	-2.2	1.8	-13.9	25.7	2.9	0.0	-3.5	1.6
Stock - Global	-9.7	24.0	8.8	-1.3	3.7	4.5	-8.6	37.0	7.5	-0.6	5.5	5.2	-9.0	29.5	7.3	-0.9	3.7	5.0
Employer Stock																		
Stock - Other							-8.2	14.2	12.7	-5.4	0.8	1.1	-12.6	14.8	10.3	-6.2	3.9	0.3
Stock - Emerging	-12.6	31.6	13.6	-12.0	-1.7	2.5	-15.1	36.5	10.5	-14.2	-1.1	1.8	-15.5	36.6	10.6	-13.6	-1.3	1.6
Stock - ACWI x U.S.	-12.0	23.8	7.5	-0.9	0.5	3.1	-13.3	28.5	4.3	-2.1	-2.7	2.0	-14.5	28.3	3.6	-2.7	-3.7	1.2
Stock - Aggregate	-8.4	22.9	9.2	0.4	6.9	5.7	-9.8	25.4	8.9	-1.5	5.0	5.0	-10.0	24.6	9.0	-1.7	5.2	4.9
Fixed Income - U.S.	0.2	3.4	2.7	1.0	5.5	2.6	-0.3	4.7	3.6	0.5	6.7	3.0	-0.1	4.3	3.8	0.2	5.8	2.7
Fixed Income - U.S. Gov't							-0.8	5.8	-0.3	0.7	1.0	0.5	-0.3	4.5	1.2	1.0	4.5	0.5
Fixed Income - U.S. Credits							1.5	5.1	6.0	-1.8	4.4	2.7	-0.1	4.5	4.4	-2.2	6.5	2.7
Fixed Income - EAFE													-0.4	9.6	3.8	-8.1	-1.3	0.0
Fixed Income - Global							-4.8	30.5	4.7	-0.9	3.9	5.3	-2.2	13.1	5.8	-2.0	3.7	3.8
Fixed Income - Other							1.1	5.4	6.5	-0.5	4.7	4.3	0.9	26.7	15.4	0.3	5.6	3.7
Fixed Income - Long Bonds							-2.9	8.3	0.7	-1.6	25.4	6.0	-3.6	9.8	3.4	-3.8	22.3	6.5
Fixed Income - Emerging	-4.5	10.4	15.4	0.6	1.5	4.4	-5.1	12.0	10.9	-3.5	-0.3	2.8	-5.9	12.3	10.7	-5.3	-0.8	2.2
Fixed Income - Inflation Indexed							-1.0	3.7	4.6	-1.9	4.2	1.7	-1.2	3.6	5.7	-1.7	4.6	2.2
Fixed Income - High Yield	-2.8	7.3	16.9	-4.5	2.1	3.5	-1.0	7.2	12.3	-2.5	4.4	4.1	-1.5	7.1	12.5	-3.2	3.3	3.5
Fixed Income - Absolute Return Bonds																		
Fixed Income - Bundled LDI																		
Fixed Income - Convertibles							-0.7	12.5					-0.7	10.9				
Cash	2.0	0.7	0.5	0.1	0.1	0.7	-4.7	0.1	2.9	-0.8	0.8	-2.4	-0.2	0.9	1.3	0.0	0.4	-0.2
Fixed Income - Aggregate	0.2	4.0	4.8	0.6	5.0	2.9	-1.0	5.3	4.7	-0.4	6.1	2.8	-0.7	5.0	4.7	-0.6	5.3	2.7
Commodities							-12.3	11.0	13.9	-31.7	-14.5	-9.7	-11.4	6.8	12.5	-26.5	-16.6	-9.3
Infrastructure	-3.2	1.9	3.6	3.2	15.8	4.1	7.5	13.0	8.8	5.7	22.2	11.5	7.6	12.2	9.0	4.3	15.8	9.9
Natural Resources	11.5	-34.5	-4.1	2.0	7.7	-5.1	5.1	2.4	3.9	-7.7	10.1	2.4	3.0	6.9	6.4	-5.4	11.7	4.5
REITs	-4.6	5.2	8.8	3.2	30.5	8.0	-4.5	9.2	5.2	3.1	19.4	6.4	-4.7	8.7	4.8	2.2	20.2	6.3
Real Estate ex-REITs	8.4	6.1	9.3	12.2	14.8	10.1	8.7	10.2	9.9	13.9	13.9	11.3	7.5	8.4	8.2	12.8	12.6	9.8
Other Real Assets							0.0	3.9	12.1	-8.6	2.5	0.8	-1.1	3.4	12.5	-12.3	3.9	-1.8
Real Assets	6.7	2.8	7.7	9.8	15.7	8.5	6.6	9.3	9.3	9.4	12.6	9.5	4.5	7.9	8.1	7.3	11.3	7.9
Hedge Funds	0.6	5.6	3.4	-0.6	3.3	2.4	-2.2	4.9	1.0	-0.7	3.3	1.3	-1.4	5.8	1.5	-0.5	4.2	1.7
Global TAA	-7.3	10.5	8.1	-2.6			-6.8	14.4	7.3	-2.3	6.1	3.6	-5.8	12.6	7.3	-3.5	5.3	3.0
Risk Parity							-7.8	15.5	13.4	-10.4	8.7	3.9	-7.5	13.7	12.2	-9.3	8.1	3.4
Mortgages							3.1	7.4	1.8	4.2	8.4	5.7	2.6	5.7	2.6	3.7	7.5	4.9
Private Credit	4.1	5.9					5.3	7.8	7.6	2.7	6.7	5.3	6.6	8.7	7.6	3.6	9.0	6.0
Diversified Private Equity	17.7	19.3	6.7	9.9	18.9	14.4	15.5	18.0	8.9	8.4	16.0	13.2	15.8	16.9	8.9	8.3	15.6	12.9
Venture Capital	18.4	13.2	3.1	11.8	17.9	12.7	20.2	10.9	5.1	12.5	23.5	13.6	19.8	11.4	4.4	14.3	18.7	13.1
LBO	19.8	19.3	6.7	9.9			15.0	18.7	9.3	6.6	14.7	12.7	16.7	19.8	14.2	10.2	14.7	13.3
Other Private Equity		7.3	4.2	5.0	13.5		22.2	10.2	8.7	9.2	11.5	15.0	24.8	8.8	9.1	8.3	16.4	15.7
Private Equity	19.0	14.7	5.3	8.7	17.2	12.9	16.8	18.0	9.1	8.7	16.7	13.6	16.8	17.3	9.2	9.2	15.7	13.4
Total Fund Return	-1.9	15.8	8.0	2.3	7.8	6.2	-1.7	15.7	7.9	0.9	7.2	5.8	-2.9	15.5	7.8	0.2	6.5	5.3

You were not able to provide full year returns for all of the components of returns of asset classes with values shown in italics. The composite calculation only uses those components with a full year return.

1. The 5-year return number only includes funds with continuous data over the last 5 years.

Benchmark returns by asset class

Asset class	Your fund %						Peer average %						U.S. Public average %					
	2018	2017	2016	2015	2014	5-yr ¹	2018	2017	2016	2015	2014	5-yr ¹	2018	2017	2016	2015	2014	5-yr ¹
Stock - U.S. Broad/All							-5.1	21.9	12.4	0.5	12.6	8.0	-5.2	21.8	12.4	0.7	12.7	8.0
Stock - U.S. Large Cap	-5.2	21.1	12.7	0.5	12.6	7.9	-4.7	21.4	12.2	1.0	13.2	8.2	-4.6	21.5	12.4	1.0	13.2	8.3
Stock - U.S. Mid Cap							-7.7	18.2	13.1	-2.4	12.1	6.5	-8.0	18.8	12.5	-2.0	10.8	6.0
Stock - U.S. Small Cap	-11.0	14.7	21.3	-4.4	4.9	4.4	-9.7	15.8	19.7	-3.9	5.6	4.8	-9.9	15.2	20.1	-3.4	6.0	5.0
Stock - EAFE	-11.5	20.1	5.0	0.4	0.8	2.5	-13.8	24.5	2.5	-1.2	-3.7	0.9	-13.8	25.0	2.3	-1.1	-4.2	0.8
Stock - Global	-9.4	24.6	7.9	-2.4	4.2	4.4	-9.6	23.9	7.9	-1.5	4.6	4.6	-9.8	24.2	7.9	-1.7	3.4	4.2
Employer Stock																		
Stock - Other							-9.7	19.1	13.1	-5.4	2.4	3.4	-10.5	16.3	8.6	-7.3	1.3	0.3
Stock - Emerging	-14.6	37.3	11.2	-14.9	-2.2	1.6	-14.8	37.1	11.1	-14.8	-2.0	1.6	-14.5	37.2	10.9	-14.5	-1.9	1.7
Stock - ACWI x U.S.	-12.1	23.4	6.4	-2.8	0.2	2.4	-14.0	26.8	5.2	-4.3	-3.2	1.2	-13.6	27.5	4.5	-4.8	-3.7	1.0
Stock - Aggregate	-8.4	22.2	9.8	-1.0	6.9	5.4	-9.4	24.0	9.2	-2.0	5.0	4.8	-9.3	23.8	9.4	-2.0	5.1	4.8
Fixed Income - U.S.	0.1	3.9	3.9	0.4	5.6	2.7	-0.2	4.4	2.7	0.4	6.4	2.7	-0.1	3.8	2.8	0.4	6.1	2.6
Fixed Income - U.S. Gov't							-0.8	6.1	-0.2	0.7	0.8	0.6	-0.4	4.3	0.8	0.8	4.5	0.6
Fixed Income - U.S. Credits							-0.5	3.7	3.7	0.2	5.8	2.5	-1.6	3.6	3.2	-0.7	6.3	2.5
Fixed Income - EAFE													-2.2	8.4	6.1	-6.0	-3.0	-0.1
Fixed Income - Global							-0.6	6.2	5.3	-0.7	3.2	2.3	-0.8	5.1	4.9	-0.9	3.7	2.3
Fixed Income - Other							0.3	4.3	6.8	0.0	5.9	3.6	0.3	4.5	7.2	0.4	5.8	3.0
Fixed Income - Long Bonds							-1.9	8.7	1.4	-1.2	25.1	5.9	-3.3	8.9	3.2	-1.9	20.1	5.6
Fixed Income - Emerging	-2.5	8.2	9.9	1.3	4.8	4.2	-4.4	11.3	9.6	-0.3	1.5	3.4	-5.0	11.4	9.8	-4.9	0.2	2.3
Fixed Income - Inflation Indexed							-0.7	3.1	4.9	-2.1	4.0	1.7	-1.4	3.2	5.6	-1.7	4.7	2.0
Fixed Income - High Yield	-2.1	7.5	17.1	-4.5	2.5	3.8	-1.5	6.9	15.0	-3.2	2.6	3.7	-1.7	6.9	15.4	-3.9	2.3	3.6
Fixed Income - Absolute Return Bonds																		
Fixed Income - Bundled LDI													-3.3					
Fixed Income - Convertibles							0.3	14.7					0.3	17.1				
Cash	1.9	0.9	0.3	0.1	0.0	0.6	1.8	1.0	0.3	0.1	0.0	0.6	1.6	1.0	0.4	0.1	0.2	0.7
Fixed Income - Aggregate	0.1	3.9	3.9	0.4	5.6	2.8	-0.8	5.2	4.9	-0.2	6.5	2.9	-1.3	5.2	4.9	-0.3	7.2	3.2
Commodities							-9.1	3.8	10.8	-22.8	-17.5	-8.1	-10.7	3.0	10.9	-22.8	-16.6	-9.0
Infrastructure	11.8	12.2	5.3	6.1	13.5	9.7	5.2	8.4	6.9	4.8	8.1	6.8	4.5	9.1	6.9	5.0	6.4	6.7
Natural Resources	11.8	12.2	5.3	6.1	13.5	9.7	4.0	8.2	5.2	-1.7	8.5	4.9	1.5	6.5	6.8	-0.5	7.0	4.1
REITs	-4.6	5.2	8.5	3.2	30.1	7.9	-4.6	8.7	6.1	3.1	21.4	6.1	-4.2	8.2	6.7	2.9	21.1	6.8
Real Estate ex-REITs	6.7	7.0	8.0	13.3	11.8	9.3	7.6	7.1	8.6	13.8	11.6	9.8	6.9	6.6	8.5	13.7	11.8	9.6
Other Real Assets							-0.2	3.5	10.2	4.6	6.3	5.3	-0.7	1.5	12.5	-8.7	4.7	1.7
Real Assets	6.7	6.7	8.1	11.8	14.6	9.5	5.4	7.3	8.7	9.6	10.3	8.4	3.9	6.2	8.8	7.5	9.1	7.2
Hedge Funds	11.8	12.2	5.3	6.1	13.5	9.7	1.1	5.9	2.9	0.7	4.2	2.8	0.0	6.7	3.1	1.3	4.0	2.7
Global TAA	11.8	12.2	5.3	6.1			-2.1	13.4	6.1	1.2	4.1	3.6	-3.9	12.6	5.9	1.3	5.0	3.7
Risk Parity							-8.2	13.7	10.5	-2.2	7.6	3.6	-5.8	14.4	9.8	-3.7	6.3	3.5
Mortgages							1.0	4.0	3.3	1.7	4.4	2.8	0.7	2.9	2.9	2.0	4.4	2.6
Private Credit	11.8	12.2					2.3	6.4	8.5	0.0	4.5	3.9	3.1	7.3	11.2	-0.6	4.3	4.2
Diversified Private Equity	11.8	12.2	5.3	6.1	13.5	9.7	20.7	17.6	8.6	4.4	15.7	13.0	20.5	18.9	8.5	3.9	16.3	13.2
Venture Capital	11.8	12.2	5.3	6.1	13.5	9.7	19.0	17.8	9.7	3.9	13.0	12.3	18.6	19.6	7.1	4.5	15.3	12.7
LBO	11.8	12.2	5.3	6.1			18.8	17.7	9.2	3.9	12.7	12.5	18.5	19.5	7.3	4.6	15.4	12.7
Other Private Equity		12.2	5.3	6.1	13.5		23.3	15.4	9.5	4.4	13.9	13.3	18.1	20.4	6.7	4.4	13.1	11.8
Private Equity	11.8	12.2	5.3	6.1	13.5	9.7	20.3	17.6	8.6	4.4	15.7	13.0	20.4	19.1	8.3	4.0	16.3	13.2
Total Policy Return	-2.0	15.4	8.0	1.7	8.3	6.1	-1.2	14.8	7.7	0.7	7.1	5.6	-2.5	15.0	7.7	0.0	6.6	5.2

1. The 5-year return number only includes funds with continuous data over the last 5 years.

2. To enable fairer comparisons, the policy returns of all participants except your fund were adjusted to reflect private equity benchmarks based on lagged, investable, public-market indices. If CEM used this same adjustment for your fund, your 5-year policy return would be 6.8%, 0.7% higher than your actual 5-year policy return of 6.1%. Mirroring this, your 5-year total fund net value added would be 0.7% lower. Refer to the appendix of this section for details.

Net value added by asset class

Asset class	Your fund %						Peer average %						U.S. Public average %					
	2018	2017	2016	2015	2014	5-yr ¹	2018	2017	2016	2015	2014	5-yr ¹	2018	2017	2016	2015	2014	5-yr ¹
Stock - U.S. Broad/All							0.3	-0.1	-1.1	-0.8	-2.5	-1.0	-0.2	-1.7	-1.2	-1.2	-1.7	-1.0
Stock - U.S. Large Cap	0.4	1.0	-2.1	0.5	-0.2	-0.1	0.0	0.4	-0.5	0.2	-0.3	0.0	-0.1	0.7	-1.2	-0.1	-0.5	-0.3
Stock - U.S. Mid Cap							-2.1	-0.6	-0.5	0.5	-3.1	-1.2	-1.0	0.2	0.5	-0.7	-2.2	-0.7
Stock - U.S. Small Cap	1.2	5.0	-4.1	2.2	-0.6	0.8	-1.1	-0.5	-1.0	1.2	0.3	0.0	-0.5	0.4	-1.6	-0.3	-1.0	-0.2
Stock - EAFE	-0.3	1.8	-0.2	3.2	0.3	0.9	-0.1	2.1	0.6	0.9	0.4	0.8	-0.1	0.6	0.5	1.3	0.3	0.7
Stock - Global	-0.3	-0.6	0.9	1.1	-0.5	0.1	1.0	13.0	-0.4	0.9	0.9	0.7	0.8	5.1	-0.4	0.6	0.5	0.8
Employer Stock																		
Stock - Other							1.5	-4.9	-0.5	0.0	-1.4	-1.0	-0.7	-1.5	1.2	1.1	2.8	1.0
Stock - Emerging	1.9	-5.7	2.4	3.0	0.5	0.8	-0.3	-0.7	-0.6	0.6	0.9	0.2	-1.0	-0.5	-0.6	0.8	0.6	-0.1
Stock - ACWI x U.S.	0.1	0.4	1.1	1.9	0.2	0.7	0.9	1.3	-0.8	2.6	0.3	0.8	-0.8	0.7	-0.9	2.2	0.0	0.2
Stock - Aggregate	0.1	0.6	-0.5	1.4	0.0	0.3	-0.4	1.4	-0.3	0.5	0.0	0.2	-0.6	0.8	-0.4	0.3	0.1	0.0
Fixed Income - U.S.	0.1	-0.4	-1.2	0.6	0.0	-0.2	-0.1	0.4	0.9	0.0	0.3	0.3	0.0	0.5	1.0	-0.2	-0.3	0.2
Fixed Income - U.S. Gov't							0.0	-0.3	-0.2	-0.1	0.2	-0.2	0.1	0.3	-0.1	0.2	0.0	-0.2
Fixed Income - U.S. Credits							1.9	1.4	2.3	-2.0	-1.4	0.2	1.5	0.9	1.3	-1.4	0.2	0.2
Fixed Income - EAFE													1.8	1.2	-2.3	-2.1	1.7	0.1
Fixed Income - Global							-4.3	24.3	-0.6	-0.2	0.7	3.1	-1.6	8.0	0.9	-1.2	-0.3	1.5
Fixed Income - Other							0.9	1.1	-0.3	-0.4	-1.2	1.0	0.7	22.2	8.8	-0.8	0.2	0.8
Fixed Income - Long Bonds							-1.0	-0.4	-0.6	-0.3	0.3	0.1	-0.3	0.9	-0.6	-1.8	3.3	0.9
Fixed Income - Emerging	-2.0	2.2	5.5	-0.6	-3.2	0.2	-0.7	0.7	1.3	-2.2	-1.8	-0.6	-1.1	0.9	0.9	-0.1	-1.0	0.0
Fixed Income - Inflation Indexed							-0.3	0.6	-0.3	0.4	-0.5	-0.1	0.1	0.4	0.1	0.0	-0.3	0.1
Fixed Income - High Yield	-0.7	-0.2	-0.3	0.0	-0.4	-0.3	0.5	0.3	-2.7	0.5	1.9	0.4	0.3	0.1	-3.1	0.9	0.7	-0.2
Fixed Income - Absolute Return Bonds																		
Fixed Income - Bundled LDI							-1.1	-2.2					-1.1	-6.1				
Fixed Income - Convertibles																		
Cash	0.1	-0.1	0.1	0.0	0.0	0.0	-6.5	-0.9	2.6	-0.9	0.8	-3.1	-1.9	-0.2	0.9	0.0	0.1	-0.9
Fixed Income - Aggregate	0.1	0.1	0.9	0.2	-0.5	0.1	-0.1	0.2	-0.1	-0.2	-0.4	0.0	0.6	-0.2	-0.2	-0.4	-1.9	-0.4
Commodities							-3.2	6.8	3.4	-9.3	3.9	-1.6	-0.9	3.5	1.2	-3.5	1.5	-0.1
Infrastructure	-15.0	-10.3	-1.7	-2.9	2.3	-5.7	2.3	4.6	1.9	0.9	14.1	4.7	2.3	3.1	2.1	-0.7	8.7	3.2
Natural Resources	-0.3	-46.7	-9.4	-4.1	-5.8	-14.8	1.2	-6.2	-1.3	-6.0	1.6	-2.5	1.6	0.5	-0.5	-4.5	4.7	0.5
REITs	0.0	0.0	0.3	0.0	0.3	0.1	0.1	0.5	-0.7	0.1	-2.0	0.2	-0.5	0.5	-1.8	-0.8	-1.0	-0.5
Real Estate ex-REITs	1.7	-0.9	1.3	-1.2	3.0	0.8	1.1	3.1	1.3	0.1	2.3	1.6	0.5	1.8	-0.3	-0.8	0.8	0.2
Other Real Assets							0.2	0.4	2.0	-13.2	-3.8	-4.5	-0.4	1.9	-0.4	-3.6	-0.3	-1.8
Real Assets	0.0	-3.9	-0.3	-2.0	1.1	-1.0	1.2	2.1	0.8	-0.5	2.3	1.2	0.6	1.7	-0.7	-0.2	2.3	0.8
Hedge Funds	-11.2	-6.7	-1.9	-6.7	-10.3	-7.3	-2.9	-1.0	-1.7	-1.4	-0.9	-1.2	-1.2	-0.8	-1.6	-1.8	0.0	-0.9
Global TAA	-19.1	-1.7	2.8	-8.7			-4.8	1.0	1.2	-3.6	2.0	0.0	-2.4	-0.3	1.4	-4.9	0.3	-0.7
Risk Parity							0.4	1.8	2.9	-13.7	1.1	0.3	-1.7	-0.6	2.8	-6.9	0.7	0.0
Mortgages							2.1	1.3	-1.5	2.6	4.1	2.2	2.0	1.5	-0.5	1.7	3.4	1.9
Private Credit	-7.7	-6.3					2.9	1.4	-1.3	3.9	2.2	2.1	3.4	1.2	-3.3	4.6	4.3	2.2
Diversified Private Equity	5.9	7.1	1.4	3.8	5.4	4.6	-5.2	0.7	0.2	4.0	0.2	0.2	-4.5	-2.0	0.7	4.1	-0.8	-0.3
Venture Capital	6.6	1.0	-2.2	5.7	4.4	3.0	1.2	-6.9	-4.5	8.6	10.5	1.3	1.6	-8.5	-2.4	9.0	4.1	0.7
LBO	8.0	7.1	1.4	3.8			-3.8	1.0	0.0	2.7	2.0	0.2	-1.4	0.1	7.9	5.0	-0.1	1.0
Other Private Equity		-4.9	-1.1	-1.1	0.0		-1.1	-5.2	-1.0	4.6	-2.4	1.7	6.7	-11.7	2.6	3.8	4.0	3.8
Private Equity	7.2	2.5	0.0	2.6	3.7	3.1	-3.5	0.4	0.5	4.3	0.9	0.6	-3.4	-1.9	1.0	5.0	-0.7	0.3
Total Fund Return	0.1	0.4	0.0	0.6	-0.4	0.2	-0.5	0.8	0.1	0.2	0.1	0.1	-0.4	0.5	0.1	0.2	-0.1	0.1

Total net value add is determined by both actual and policy allocation. It is the outcome of total net return (page 6) minus total benchmark return (page 7). Aggregate net returns are an asset weighted average of all categories that the fund has an actual allocation to. Aggregate benchmark returns are a policy weighted average and includes only those categories that are part of your policy fund's mix.

You were not able to provide full year returns for all of the components of returns of asset classes with values shown in italics. The composite calculation only uses those components with a full year return.

1. The 5-year return number only includes funds with continuous data over the last 5 years.

2. To enable fairer comparisons, the policy returns of all participants except your fund were adjusted to reflect private equity benchmarks based on lagged, investable, public-market indices. If CEM used this same adjustment for your fund, your 5-year policy return would be 6.8%, 0.7% higher than your actual 5-year policy return of 6.1%. Mirroring this, your 5-year total fund net value added would be 0.7% lower. Refer to the appendix of this section for details.

Your policy return and value added calculation - 2018

2018 Policy Return and Value Added

Asset class	Policy weight	Benchmark Description	Return	Net return	Value added
Stock - U.S. Large Cap	28.0%	Russell 1000 (Russell 3000 for total Dom Equity)	-5.2%	-4.8%	0.4%
Stock - U.S. Small Cap		Russell 2000	-11.0%	-9.8%	1.2%
Stock - EAFE	19.2%	MSCI World xUS 50% Hedged Net	-11.5%	-11.8%	-0.3%
Stock - Global		MSCI ACWI net	-9.4%	-9.7%	-0.3%
Stock - Emerging	4.8%	MSCI Emerging Market net	-14.6%	-12.6%	1.9%
Stock - ACWI x U.S.		International Blended Benchmark	-12.1%	-12.0%	0.1%
Fixed Income - U.S.	21.0%	Fixed Income Blended (Jul 1 2017)	0.1%	0.2%	0.1%
Fixed Income - Emerging		Barclays Emerging Market	-2.5%	-4.5%	-2.0%
Fixed Income - High Yield		Barclays US Corp High Yield	-2.1%	-2.8%	-0.7%
Cash	1.0%	US 90 day T bill	1.9%	2.0%	0.1%
Infrastructure		Custom (Alternative Investment Actual Return)	11.8%	-3.2%	-15.0%
Natural Resources		Custom (Alternative Investment Actual Return)	11.8%	11.5%	-0.3%
REITs		Your REIT benchmark	-4.6%	-4.6%	0.0%
Real Estate ex-REITs	10.0%	NCREIF NPI	6.7%	8.4%	1.7%
Hedge Funds		Custom (Alternative Investment Actual Return)	11.8%	0.6%	-11.2%
Global TAA		Custom (Alternative Investment Actual Return)	11.8%	-7.3%	-19.1%
Private Credit		Custom (Alternative Investment Actual Return)	11.8%	4.1%	-7.7%
Diversified Private Equity		Custom (Alternative Investment Actual Return)	11.8%	17.7%	5.9%
Venture Capital		Custom (Alternative Investment Actual Return)	11.8%	18.4%	6.6%
LBO	16.0%	Custom (Alternative Investment Actual Return)	11.8%	19.8%	8.0%
Total	100.0%				
Net Actual Return (reported by you)					-1.9%
Calculated Policy Return = sum of (policy weights X benchmark returns)				-1.8%	
Adjustment to reflect rebalancing and overlay impacts				<u>-0.3%</u>	
Policy Return (reported by you)					<u>-2.0%</u>
Net Value Added (Net Return - Policy Return)					0.1%

Your policy return and value added calculations - 2014 to 2017

2017 Policy Return and Value Added

Asset class	Policy weight	Benchmark Description	Benchmark Return	Net return	Value added
Stock - U.S. Large Cap	30.0%	Russell 1000 (Ru	21.1%	22.1%	1.0%
Stock - U.S. Small Cap		Russell 2000	14.7%	19.6%	5.0%
Stock - EAFE	20.0%	MSCI World xUS	20.1%	21.9%	1.8%
Stock - Global		MSCI ACWI net	24.6%	24.0%	-0.6%
Stock - Emerging	5.0%	MSCI Emerging I	37.3%	31.6%	-5.7%
Stock - ACWI x U.S.		International Bl	23.4%	23.8%	0.4%
Fixed Income - U.S.	20.0%	Fixed Income Bl	3.9%	3.4%	-0.4%
Fixed Income - Emerging		Barclays Emergi	8.2%	10.4%	2.2%
Fixed Income - High Yield		Barclays US Corj	7.5%	7.3%	-0.2%
Cash	1.0%	US 90 day T bill	0.9%	0.7%	-0.1%
Infrastructure		Custom (Altern	12.2%	1.9%	-10.3%
Natural Resources		Custom (Altern	12.2%	-34.5%	-46.7%
REITs	1.5%	Your REIT bench	5.2%	5.2%	0.0%
Real Estate ex-REITs	8.5%	NCREIF NPI	7.0%	6.1%	-0.9%
Hedge Funds		Custom (Altern	12.2%	5.6%	-6.7%
Global TAA		Custom (Altern	12.2%	10.5%	-1.7%
Private Credit		Custom (Altern	12.2%	5.9%	-6.3%
Diversified Private Equity		Custom (Altern	12.2%	19.3%	7.1%
Venture Capital		Custom (Altern	12.2%	13.2%	1.0%
LBO	14.0%	Custom (Altern	12.2%	19.3%	7.1%
Other Private Equity		Custom (Altern	12.2%	7.3%	-4.9%
Total	100.0%				
Net Return (reported by you)					15.8%
Calculated policy return (sum: Policy weights x benchmarks)				15.4%	
Adjustment to reflect rebalancing and overlay impacts				0.0%	
Policy return (reported by you)					15.4%
Net Value Added (Net Return - Policy Return)					0.4%

2015 Policy Return and Value Added

Asset class	Policy weight	Benchmark Description	Benchmark Return	Net return	Value added
Stock - U.S. Large Cap	31.0%	Russell 1000 (Ru	0.5%	1.0%	0.5%
Stock - U.S. Small Cap		Russell 2000	-4.4%	-2.2%	2.2%
Stock - EAFE	20.8%	MSCI World xUS	0.4%	3.5%	3.2%
Stock - Global		MSCI ACWI net	-2.4%	-1.3%	1.1%
Stock - Emerging	5.2%	MSCI Emerging I	-14.9%	-12.0%	3.0%
Stock - ACWI x U.S.		International Bl	-2.8%	-0.9%	1.9%
Fixed Income - U.S.	18.0%	Barclays Univers	0.4%	1.0%	0.6%
Fixed Income - Emerging		Barclays Emergi	1.3%	0.6%	-0.6%
Fixed Income - High Yield		Barclays US Corj	-4.5%	-4.5%	0.0%
Cash	1.0%	US 90 day T bill	0.1%	0.1%	0.0%
Infrastructure		Custom (Altern	6.1%	3.2%	-2.9%
Natural Resources		Custom (Altern	6.1%	2.0%	-4.1%
REITs	1.5%	Your REIT bench	3.2%	3.2%	0.0%
Real Estate ex-REITs	8.5%	NCREIF NPI	13.3%	12.2%	-1.2%
Hedge Funds		Custom (Altern	6.1%	-1.1%	-7.2%
Global TAA		Custom (Altern	6.1%	-2.6%	-8.7%
Diversified Private Equity		Custom (Altern	6.1%	9.9%	3.8%
Venture Capital		Custom (Altern	6.1%	11.8%	5.7%
LBO	14.0%	Custom (Altern	6.1%	9.9%	3.8%
Other Private Equity		Custom (Altern	6.1%	5.0%	-1.1%
Total	100.0%				
Net Return (reported by you)					2.3%
Calculated policy return (sum: Policy weights x benchmarks)				1.6%	
Adjustment to reflect rebalancing and overlay impacts				0.1%	
Policy return (reported by you)					1.7%
Net Value Added (Net Return - Policy Return)					0.6%

2016 Policy Return and Value Added

Asset class	Policy weight	Benchmark Description	Benchmark Return	Net return	Value added
Stock - U.S. Large Cap	31.0%	Russell 1000 (Ru	12.7%	10.6%	-2.1%
Stock - U.S. Small Cap		Russell 2000	21.3%	17.2%	-4.1%
Stock - EAFE	20.8%	MSCI World xUS	5.0%	4.8%	-0.2%
Stock - Global		MSCI ACWI net	7.9%	8.8%	0.9%
Stock - Emerging	5.2%	MSCI Emerging I	11.2%	13.6%	2.4%
Stock - ACWI x U.S.		International Bl	6.4%	7.5%	1.1%
Fixed Income - U.S.	18.0%	Barclays Univers	3.9%	2.7%	-1.2%
Fixed Income - Emerging		Barclays Emergi	9.9%	15.4%	5.5%
Fixed Income - High Yield		Barclays US Corj	17.1%	16.9%	-0.3%
Cash	1.0%	US 90 day T bill	0.3%	0.5%	0.1%
Infrastructure		Custom (Altern	5.3%	3.6%	-1.7%
Natural Resources		Custom (Altern	5.3%	-4.1%	-9.4%
REITs	1.5%	Your REIT bench	8.5%	8.5%	0.3%
Real Estate ex-REITs	8.5%	NCREIF NPI	8.0%	9.3%	1.3%
Hedge Funds		Custom (Altern	5.3%	2.3%	-3.0%
Global TAA		Custom (Altern	5.3%	8.1%	2.8%
Private Credit					
Diversified Private Equity		Custom (Altern	5.3%	6.7%	1.4%
Venture Capital		Custom (Altern	5.3%	3.1%	-2.2%
LBO	14.0%	Custom (Altern	5.3%	6.7%	1.4%
Other Private Equity		Custom (Altern	5.3%	4.2%	-1.1%
Total	100.0%				
Net Return (reported by you)					8.0%
Calculated policy return (sum: Policy weights x benchmarks)				7.8%	
Adjustment to reflect rebalancing and overlay impacts				0.2%	
Policy return (reported by you)					8.0%
Net Value Added (Net Return - Policy Return)					0.0%

2014 Policy Return and Value Added

Asset class	Policy weight	Benchmark Description	Benchmark Return	Net return	Value added
Stock - U.S. Large Cap	31.0%	Russell 1000 (Ru	12.6%	12.4%	-0.2%
Stock - U.S. Small Cap		Russell 2000	4.9%	4.3%	-0.6%
Stock - EAFE	20.8%	MSCI World xUS	0.8%	1.1%	0.3%
Stock - Global		MSCI ACWI Net	4.2%	3.7%	-0.5%
Stock - Emerging	5.2%	MSCI Emerging I	-2.2%	-1.7%	0.5%
Stock - ACWI x U.S.		International Bl	0.2%	0.5%	0.2%
Fixed Income - U.S.	18.0%	Barclays Univers	5.6%	5.5%	0.0%
Fixed Income - Emerging		Barclays Emergi	4.8%	1.5%	-3.2%
Fixed Income - High Yield		Barclays US Corj	2.5%	2.1%	-0.4%
Cash	1.0%	US 90 day T bill	0.0%	0.1%	0.0%
Infrastructure		Custom (Altern	13.5%	15.8%	2.3%
Natural Resources		Custom (Altern	13.5%	7.7%	-5.8%
REITs	1.5%	Your REIT bench	30.1%	30.5%	0.3%
Real Estate ex-REITs	8.5%	NCREIF NPI	11.8%	14.8%	3.0%
Hedge Funds		Custom (Altern	13.5%	2.0%	-11.5%
Global TAA					
Diversified Private Equity	14.0%	Custom (Altern	13.5%	18.9%	5.4%
Venture Capital		Custom (Altern	13.5%	17.9%	4.4%
LBO					
Other Private Equity		Custom (Altern	13.5%	13.5%	0.0%
Total	100.0%				
Net Return (reported by you)					7.8%
Calculated policy return (sum: Policy weights x benchmarks)				8.3%	
Adjustment to reflect rebalancing and overlay impacts				0.0%	
Policy return (reported by you)					8.3%
Net Value Added (Net Return - Policy Return)					-0.4%

Profit/Loss on overlay programs

Overlay type	Your fund		Peer median				U.S. Public median			
	2018	2017	2018		2017		2018		2017	
	bps	bps	bps	#	bps	#	bps	#	bps	#
Int. Discretionary Currency			-3.4	1	-4.8	1	-3.4	1	-4.8	1
Ext. Discretionary Currency			-0.3	2	0.0	2	0.3	3	0.0	2
Internal Global TAA					0.0	1			0.0	1
External Global TAA										
Internal PolicyTilt TAA										
External PolicyTilt TAA										
Internal Commodities										
External Commodities							-1.9	1	0.1	1
Internal Long/Short										
External Long/Short										
Internal Other			0.0	1	0.0	1	0.0	1	0.0	1
External Other			-7.1	1	18.1	1	-7.1	3	20.3	4

Profit/loss in basis points was calculated using total fund average holdings. This was done to measure the impact of the program at the total fund level.

[REDACTED]

[REDACTED]

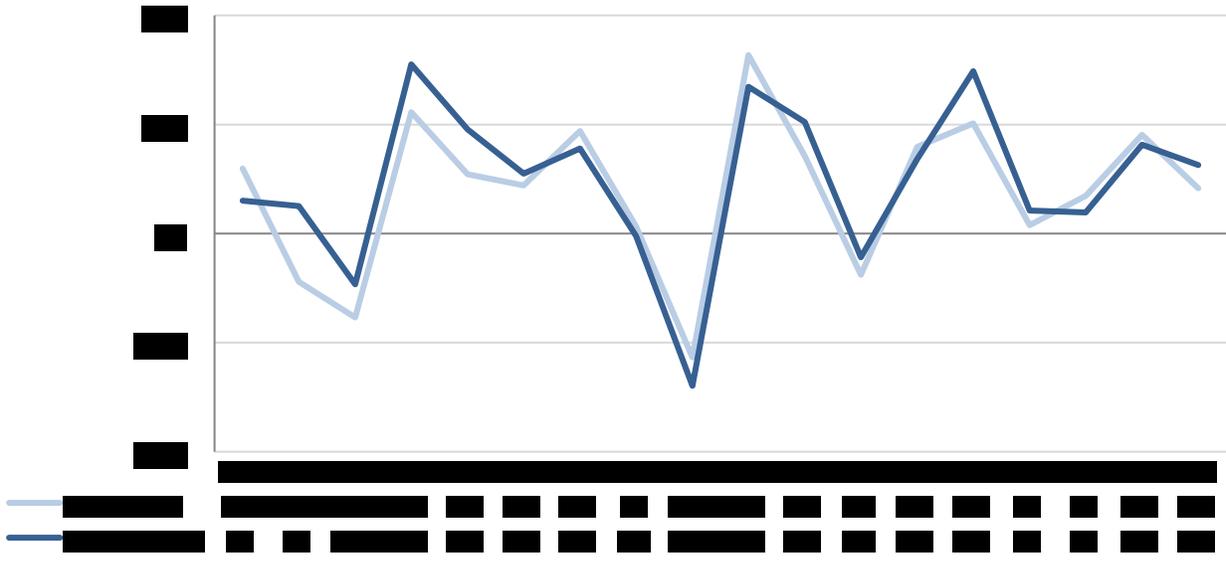
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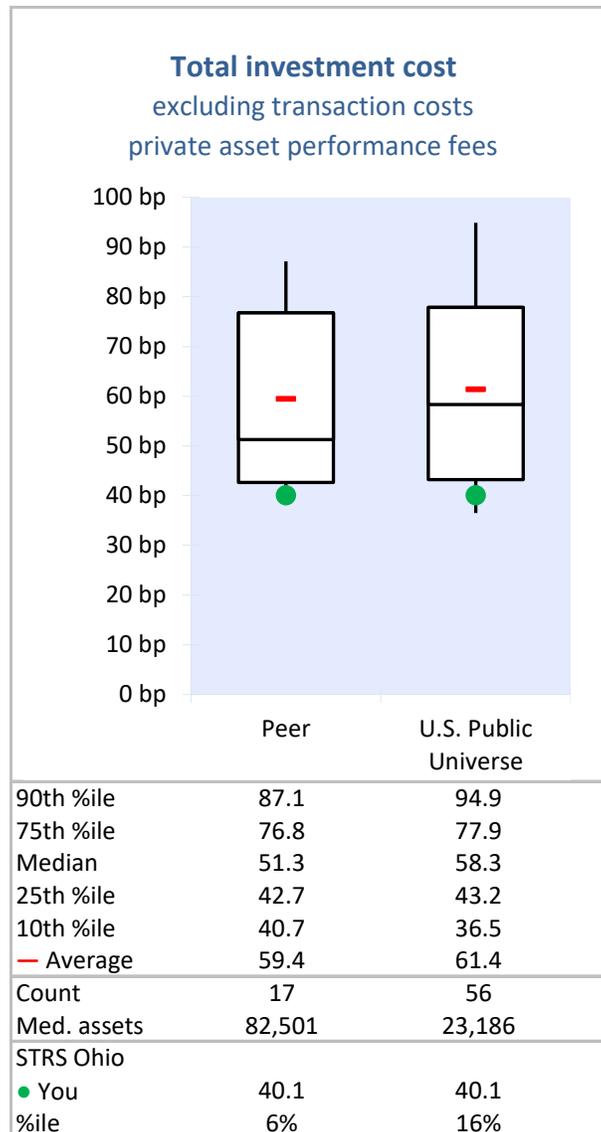
Total cost and benchmark cost

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Comparisons of total investment cost

Your total investment cost, excluding transaction costs and private asset performance fees, of 40.1 bps was below the peer median of 51.3 bps.

Differences in total investment cost are often caused by two factors that are usually outside of management's control: asset mix and fund size. Therefore, to assess whether your fund's total investment cost is high or low given your unique asset mix and size, CEM calculates a benchmark cost for your fund. Benchmark cost analysis begins on page 7 of this section.

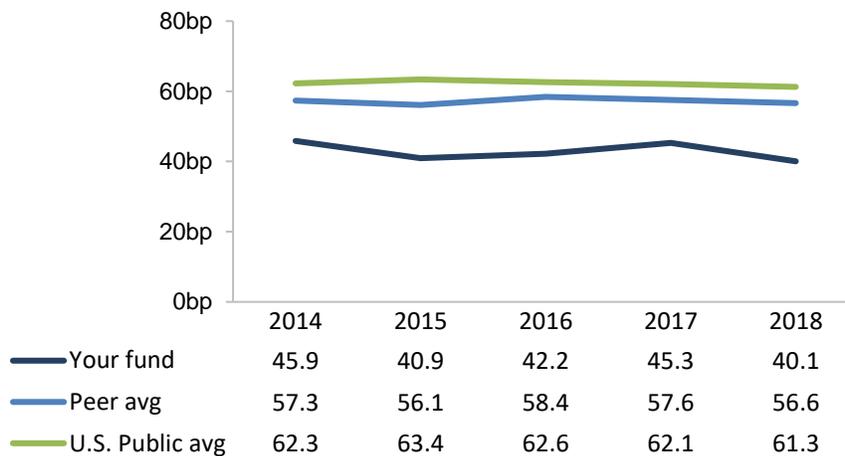


Trend in total investment cost

Your total investment cost, excluding transaction costs and private asset performance fees, decreased from 45.9 bps in 2014 to 40.1 bps in 2018.

Trend in total investment cost

(excluding transaction costs and private asset performance fees)



Trend analysis is based on 49 U.S. Public funds and 15 peer funds with 5 or more consecutive years of data.

Types of costs included in your total investment cost

The table below outlines the types of costs included in your total investment cost.

Asset class	Internal		External			
	In-house total cost	Transaction costs	Manager base fees	Monitoring & other costs	Perform. fees (active only)	Transaction costs
<u>Public</u> (Stock, Fixed income, commodities, REITs)	✓	✗	✓	✓	✓	✗
Derivatives/Overlays	✓	✗	✓	✓	✓	✗
<u>Hedge funds & Global TAA</u>						
Hedge Funds	n/a	n/a	✓	✓	✓	✗
Global TAA	✓	✗	✓	✓	✓	✗
<u>Private real assets</u> (Infrastructure, natural resources, real estate ex-REITs, other real assets)	✓	✗	✓	✓	✗	✗
<u>Private equity</u> (Diversified private equity, venture capital, LBO, other private equity)	✓	✗	✓*	✓	✗	✗

*External manager base fees represent gross contractual management fees.

- ✓ indicates cost is included.
- ✗ indicates cost is excluded.
- CEM currently excludes external private asset performance fees and all transaction costs from your total cost because only a limited number of participants are currently able to provide complete data.

Detailed breakdown of your total investment cost

Your 2018 total investment cost, excluding transaction costs and private asset performance fees, was 40.1 bp or \$302.8 million.

Your investment costs

	Internal		External Passive		External Active			Total ¹		
	Passive	Active	Fees	& Other	Base Fees	Perform. Fees	Monitor. & Other	\$000s	bps	% of Total
Asset management										
Stock - U.S. Large Cap	73	12,688			2,310		211	15,281		5%
Stock - U.S. Small Cap		323			9,437		105	9,866		3%
Stock - EAFE		2,968			19,126		206	22,300		7%
Stock - Emerging		3,184			5,778		252	9,214		3%
Stock - Global		488						488		0%
Stock - ACWI x U.S.		468			5,474		20	5,962		2%
Fixed Income - U.S.		3,466						3,466		1%
Fixed Income - Emerging					3,476		143	3,619		1%
Fixed Income - High Yield					3,161		144	3,305		1%
Cash		299						299		0%
REITs	106							106		0%
Real Estate ex-REITs ¹²		17,796						17,796		6%
Real Estate ex-REITs - LP ¹²					14,030	5,526	481	14,511		5%
Infrastructure - FoFs ¹²					370	506	9	379		0%
Underlying FoF Fees ¹²					348	506		348		0%
Natural Resources ¹²										
Natural Resources - LP ¹²					5,691	2,090	57	5,748		2%
Natural Resources - Co-Invest. ¹					0		24	24		0%
Hedge Funds					26,479	12,406	255	39,140		13%
Global TAA		1,667			2,306		96	4,069		1%
Diversified Private Equity - LP ¹²		320			25,682	26,113	512	26,513		9%
Diversified Private Equity - Co-Invest. ¹					0		88	88		0%
LBO - LP ¹²					58,116	66,236	1,068	59,184		20%
LBO - FoFs ¹²					6,314	3,703	183	6,497		2%
Underlying FoF Fees ¹²					10,167	18,608		10,167		3%
Venture Capital - LP ¹²					16,328	15,264	406	16,734		6%
Venture Capital - FoFs ¹²					1,492	888	61	1,554		1%
Underlying FoF Fees ¹²					4,721	4,320		4,721		2%
Other Private Equity - LP ¹										
Other Private Equity - Co-Invest. ¹										
Private Credit ¹²		74						74		0%
Private Credit - LP ¹²					12,745	5,139	190	12,935		4%
Derivatives/Overlays	326			163				488		0%
Total asset management costs excluding private asset performance fees								294,877	39.0bp	97%
Oversight, custodial & other asset related costs										
Oversight of the Fund								4,965		2%
Trustee & Custodial								2,293		1%
Audit								168		0%
Other								511		0%
Total oversight, custodial & other costs								7,937	1.0bp	3%
Total investment costs excluding transaction costs and private asset performance fees								302,813	40.1bp	100%

1. Total cost excludes carry/performance fees for real estate, infrastructure, natural resources and private equity. Performance fees are included for the public market asset classes and hedge funds.

2. Default costs added. Refer to Appendix A.

Changes in your investment costs

The table below shows how your investment costs have changed from year to year by asset class.

Change in your investment costs (2018 - 2014)

	Investment costs (\$000s)					Change (\$000s)				Change (%)			
	2018	2017	2016	2015	2014	2018	2017	2016	2015	2018	2017	2016	2015
Asset management													
Stock - U.S. Large Cap	15,281	15,356	13,728	14,183	12,886	-75	1,628	-455	1,297	0%	12%	-3%	10%
Stock - U.S. Small Cap	9,866	10,064	9,173	9,392	9,742	-198	891	-219	-350	-2%	10%	-2%	-4%
Stock - EAFE	22,300	23,709	22,089	23,022	22,179	-1,409	1,620	-933	843	-6%	7%	-4%	4%
Stock - Emerging	9,214	9,362	8,662	8,177	8,780	-148	699	486	-604	-2%	8%	6%	-7%
Stock - Global	488	495	452	457	423	-7	43	-5	34	-1%	9%	-1%	8%
Stock - ACWI x U.S.	5,962	6,617	5,898	5,480	2,416	-655	719	418	3,064	-10%	12%	8%	127%
Fixed Income - U.S.	3,466	3,305	2,466	2,552	2,539	161	839	-86	13	5%	34%	-3%	1%
Fixed Income - Emerging	3,619	3,592	3,311	3,717	3,856	27	281	-406	-139	1%	8%	-11%	-4%
Fixed Income - High Yield	3,305	3,312	3,821	4,606	4,336	-7	-510	-785	270	0%	-13%	-17%	6%
Cash	299	286	266	269	266	13	20	-3	3	5%	7%	-1%	1%
REITs	106	94	89	226	16	12	5	-137	210	13%	6%	-61%	1273%
Real Estate ex-REITs ¹²	17,796	17,182	16,632	16,561	14,192	613	550	71	2,370	4%	3%	0%	17%
Real Estate ex-REITs - LP ¹²	14,511	18,114	17,879	18,382	25,031	-3,603	235	-502	-6,649	-20%	1%	-3%	-27%
Infrastructure - FoFs ¹²	379	473	508	514	518	-94	-36	-6	-3	-20%	-7%	-1%	-1%
Underlying FoF Fees ¹²	348	767	1,321	1,946	1,249	-419	-554	-625	697	-55%	-42%	-32%	56%
Natural Resources ¹²	0	0	298	169	0		-298	129	169	-100%		77%	
Natural Resources - LP ¹²	5,748	6,901	6,505	7,716	5,055	-1,153	396	-1,211	2,661	-17%	6%	-16%	53%
Natural Resources - Co-Invest. ¹	24	40				-15				-39%			
Hedge Funds	39,140	50,047	54,886	45,603	55,312	-10,907	-4,839	9,283	-9,709	-22%	-9%	20%	-18%
Global TAA	4,069	1,372	1,218	690		2,698	154	528		197%	13%	76%	
Diversified Private Equity - LP ¹²	26,513	3,943	2,743	1,442	95,549	22,570	1,200	1,301	-94,107	572%	44%	90%	-98%
Diversified Private Equity - Co-Invest. ¹	88												
LBO - LP ¹²	59,184	71,537	53,243	51,636		-12,353	18,294	1,607		-17%	34%	3%	
LBO - FoFs ¹²	6,497	7,500	7,355	6,569		-1,003	146	785		-13%	2%	12%	
Underlying FoF Fees ¹²	10,167	10,952	8,311	11,206		-785	2,641	-2,896		-7%	32%	-26%	
Venture Capital - LP ¹²	16,734	25,474	20,414	28,163	35,444	-8,740	5,060	-7,749	-7,281	-34%	25%	-28%	-21%
Venture Capital - FoFs ¹²	1,554	1,282	1,750	1,617	1,161	272	-468	133	456	21%	-27%	8%	39%
Underlying FoF Fees ¹²	4,721	4,794	4,392	3,665	2,824	-73	402	727	841	-2%	9%	20%	30%
Other Private Equity - LP ¹		24,065	25,635	19,766	10,947		-1,570	5,869	8,819		-6%	30%	81%
Other Private Equity - Co-Invest. ¹		193	34	9			160	25			473%	289%	
Private Credit ¹²	74												
Private Credit - LP ¹²	12,935	10,159				2,776				27%			
Derivatives/Overlays	488	495	452	457	367	-7	43	-5	90	-1%	9%	-1%	25%
Total excl. private asset perf. fees	294,877	331,483	293,532	288,193	328,574	-36,606	37,951	5,340	-40,381	-11%	13%	2%	-12%
Oversight, custodial & other asset related costs													
Oversight of the Fund	4,965	4,812	4,578	4,539	3,804	153	234	39	735	3%	5%	1%	19%
Trustee & Custodial	2,293	2,412	2,090	2,150	1,673	-119	322	-60	477	-5%	15%	-3%	29%
Audit	168	168	166	158	136	0	2	8	22	0%	1%	5%	16%
Other	511	477	418	375	339	33	59	43	36	7%	14%	12%	11%
Total oversight, custodial & other	7,937	7,870	7,252	7,222	5,952	67	618	30	1,270	1%	9%	0%	21%
Total investment costs ¹	302,813	339,353	300,785	295,415	334,526	-36,540	38,569	5,370	-39,111	-11%	13%	2%	-12%
Total in basis points	40.1bp	45.3bp	42.2bp	40.9bp	45.9bp								

1. Total cost excludes carry/performance fees for real estate, infrastructure, natural resources and private equity. Performance fees are included for the public market asset classes and hedge funds.

2. Default costs added. Refer to Appendix A.

Total cost versus benchmark cost

Your fund's total investment cost, excluding transaction costs and private asset performance fees, was 14.5 bps below your benchmark cost of 54.5 bps. This implies that your fund was low cost by 14.5 bps compared to the peer median, after adjusting for your fund's asset mix.

Your cost versus benchmark

	\$000s	bps
Your fund's total investment costs excluding transaction costs and private asset performance fees	302,813	40.1 bp
- Your fund's benchmark	412,071	54.5 bp
= Your fund's cost savings	-109,258	-14.5 bp

Your benchmark cost is an estimate of your total costs assuming that you paid the peer median cost for each of your investment mandates and fund oversight. The calculation of your benchmark cost is shown on the following page.

The reasons why your fund's total cost was below your benchmark are summarized in the table below. Details of each of the impacts below are provided on pages 9 to 11.

Reasons why your fund was low cost

	Cost/-Savings impact	
	\$000s	bps
<u>Differences in implementation style:</u>		
Less passive	20,188	2.7 bp
More int. active % of total active	-74,593	-9.9 bp
Less evergreen % of external	9,797	1.3 bp
Mix of fund of funds	-1,396	-0.2 bp
Less co-investment	3,433	0.5 bp
Less overlays and unfunded strategies	-1,601	-0.2 bp
Total style impact	-44,173	-5.8 bp
<u>Paying more/-less for similar services:</u>		
External investment management	-66,820	-8.8 bp
Internal investment management	1,735	0.2 bp
Oversight, custodial and other	0	0.0 bp
Total impact of paying more /-less	-65,085	-8.6 bp
Total savings	-109,258	-14.5 bp

Benchmark cost calculation

Your 2018 benchmark cost was 54.5 basis points or 412.1 million. It equals your holdings for each asset class multiplied by the peer median cost for the asset class. The peer median cost is the style weighted average for all implementation styles (i.e., internal passive, internal active, external passive, external active).

Asset class	Your average assets	Weighted peer median cost ¹	Benchmark \$000s
	(A)	(B)	(A X B)
Asset management costs			
Stock - U.S. Large Cap	19,942	6.1 bp	12,071
Stock - U.S. Small Cap	1,929	42.0 bp	8,109
Stock - EAFE	10,790	22.0 bp	23,720
Stock - Emerging	3,279	46.2 bp	15,134
Stock - Global	591	36.3 bp	2,145
Stock - ACWI x U.S.	4,220	28.7 bp	12,098
Fixed Income - U.S.	12,627	7.6 bp	9,591
Fixed Income - Emerging	782	35.5 bp	2,777
Fixed Income - High Yield	789	34.7 bp	2,740
Cash	1,351	2.2 bp	299
REITs	1,137	24.9 bp	2,834
Real Estate ex-REITs	6,967	82.8 bp	57,702
Infrastructure	55	105.9 bp	585
Natural Resources	674	94.0 bp	6,341
Hedge Funds	1,638	120.9 bp	19,796
Perf. fees (on NAV)	1,638	45.2 bp	7,396
Global TAA	1,033	85.1 bp	8,792
Diversified Private Equity	3,431	152.0 bp	52,152
Venture Capital	1,956	179.3 bp	35,081
LBO	6,888	160.7 bp	110,677
Private Credit	1,204	99.7 bp	12,005
Overlay Programs ²	75,596	0.3 bp	2,089
Benchmark for asset management	75,596	53.5 bp	404,134
Oversight, custody and other costs³			
Oversight	75,596	0.4 bp	
Trustee & Custodial	75,596	0.4 bp	
Consulting	75,596	0.0 bp	
Audit	75,596	0.0 bp	
Other	75,596	0.1 bp	
Benchmark for oversight, custody & other	75,596	1.0 bp	7,937
Total benchmark cost		54.5 bp	412,071

1. The weighted peer median cost for asset management is the style-weighted average of the peer median costs for all implementation styles (i.e., internal passive, internal active, external passive, external active, fund of fund). The style weights by asset class for your fund and the peers are shown on page 15 of this section.

2. Total fund average holdings is used as the base when calculating the relative cost impact of the overlay programs.

3. Benchmarks for oversight total and individual lines are based on peer medians. Sum of the lines may be different from the total.

[Redacted]

Differences in implementation style (passive vs. active, internal vs. external, etc.) relative to your peers saved you 5.8 bps.

[Redacted]	[Redacted]	Peer benchmark cost			Style 1 % Peer average More/-Less			[Redacted]	[Redacted]
		[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]		
[Redacted]	Total	[Redacted]	[Redacted]	[Redacted]	Passive % of total assets	[Redacted]	[Redacted]	[Redacted]	[Redacted]
[Redacted]	Passive assets	Internal passive	External passive	[Redacted]	Internal passive % of passive	[Redacted]	[Redacted]	[Redacted]	[Redacted]
[Redacted]	Active assets	Internal active	External active	[Redacted]	Internal active % of active	[Redacted]	[Redacted]	[Redacted]	[Redacted]
[Redacted]	External assets	Ever-green	LP/Co & FoF	[Redacted]	Evergreen fund % of external	[Redacted]	[Redacted]	[Redacted]	[Redacted]
[Redacted]	LP/Co & Fund of F.	LP/Co	Fund of funds	[Redacted]	LP/Co % of LP/Co & Fund of F.	[Redacted]	[Redacted]	[Redacted]	[Redacted]
[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	Co-invest % of LP/Co	[Redacted]	[Redacted]	[Redacted]	[Redacted]
[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]
[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]

Cost impact of overlays

As summarized on the previous page, the style impact of overlays saved you 0.2 bps. If you use more overlays than your peers, or more expensive types of overlays, then it increases your relative cost.

	Your average total holdings (mils)	Cost as % of total holdings		Cost/-Savings Impact (000s)
		You	Peer avg.	
	(A)	(B)	(C)	A X (B - C)
Internal Overlays				
[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]
[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]
[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]
[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]
[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]
[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]
External Overlays				
[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]
[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]
[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]
[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]
Total impact in 000s				-1,601
Total impact in basis points				-0.2 bp

Summary of why you are high or low cost by asset class

The table below summarizes where you are high and low cost by asset class. It also quantifies how much is due to differences in implementation style (i.e., differences in the mix of external active, external passive, internal active, internal passive and fund of fund usage) and how much is due to paying more or less for similar services (i.e., same asset class and style).

	Your cost ¹	Benchmark = peer weighted median cost ¹	More/-less	Your average assets (or fee basis)	More/-less in \$000s		
					Total More/-less	Due to Impl. style	Due to paying more/less
Asset management costs	(A)	(B)	(C = A - B)	(D)	(C X D)		
Stock - U.S. Large Cap	7.7 bp	6.1 bp	1.6 bp	19,942	3,210	-2,671	5,881
Stock - U.S. Small Cap	51.1 bp	42.0 bp	9.1 bp	1,929	1,757	-668	2,425
Stock - EAFE	20.7 bp	22.0 bp	-1.3 bp	10,790	-1,420	244	-1,664
Stock - Emerging	28.1 bp	46.2 bp	-18.1 bp	3,279	-5,920	-5,887	-33
Stock - Global	8.3 bp	36.3 bp	-28.1 bp	591	-1,657	-1,657	0
Stock - ACWI x U.S.	14.1 bp	28.7 bp	-14.5 bp	4,220	-6,135	-4,101	-2,035
Fixed Income - U.S.	2.7 bp	7.6 bp	-4.9 bp	12,627	-6,125	-5,343	-782
Fixed Income - Emerging	46.3 bp	35.5 bp	10.8 bp	782	841	0	841
Fixed Income - High Yield	41.9 bp	34.7 bp	7.2 bp	789	565	60	505
Cash	2.2 bp	2.2 bp	0.0 bp	1,351	0	0	0
REITs	0.9 bp	24.9 bp	-24.0 bp	1,137	-2,728	-2,672	-56
Real Estate ex-REITs	46.4 bp	82.8 bp	-36.5 bp	6,967	-25,395	-22,019	-3,376
Infrastructure	131.6 bp	105.9 bp	25.7 bp	55	142	409	-267
Natural Resources	85.6 bp	94.0 bp	-8.4 bp	674	-569	688	-1,257
Hedge Funds	163.2 bp	120.9 bp	42.4 bp	1,638	6,938	-696	7,634
Perf. fees (on NAV)	75.8 bp	45.2 bp	30.6 bp	1,638	5,010	-574	5,584
Global TAA	39.4 bp	85.1 bp	-45.7 bp	1,033	-4,723	567	-5,290
Diversified Private Equity	77.5 bp	152.0 bp	-74.5 bp	3,431	-25,551	-8,004	-17,547
Venture Capital	117.6 bp	179.3 bp	-61.7 bp	1,956	-12,072	2,630	-14,702
LBO	110.1 bp	160.7 bp	-50.6 bp	6,888	-34,829	3,392	-38,221
Private Credit	108.0 bp	99.7 bp	8.3 bp	1,204	1,004	3,732	-2,728
Overlay Programs ²	0.1 bp	0.3 bp	-0.2 bp	75,596	-1,601	-1,601	0
Total asset management	39.0 bp	53.5 bp	-14.5 bp	75,596	-109,258	-44,173	-65,085
Oversight, custody and other costs³							
Oversight of the Fund	█	█	0.2 bp				
Trustee & Custodial	█	█	-0.1 bp				
Consulting	█	█	0.0 bp				
Audit	█	█	0.0 bp				
Other	█	█	0.0 bp				
Total oversight, custody & other	1.0 bp	1.0 bp	0.0 bp	75,596	0	n/a	0
Total	40.1 bp	54.5 bp	-14.5 bp	75,596	-109,258	-44,173	-65,085

1. The weighted peer median cost for asset management is the style-weighted average of the peer median costs for all implementation styles (i.e., internal passive, internal active, external passive, external active, fund of fund). It excludes performance fees on private assets. The style weights by asset class for your fund and the peers are shown on page 15 of this section.

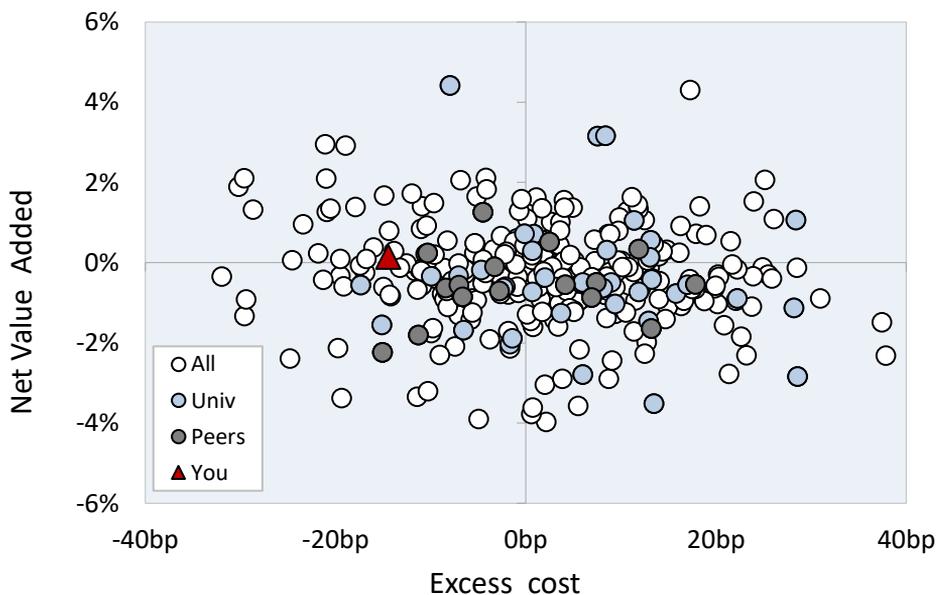
2. Total fund average holdings is used as the base when calculating the relative cost impact of the overlay programs.

3. Benchmarks for oversight total and individual lines are based on peer medians. Sum of the lines may be different from the total.

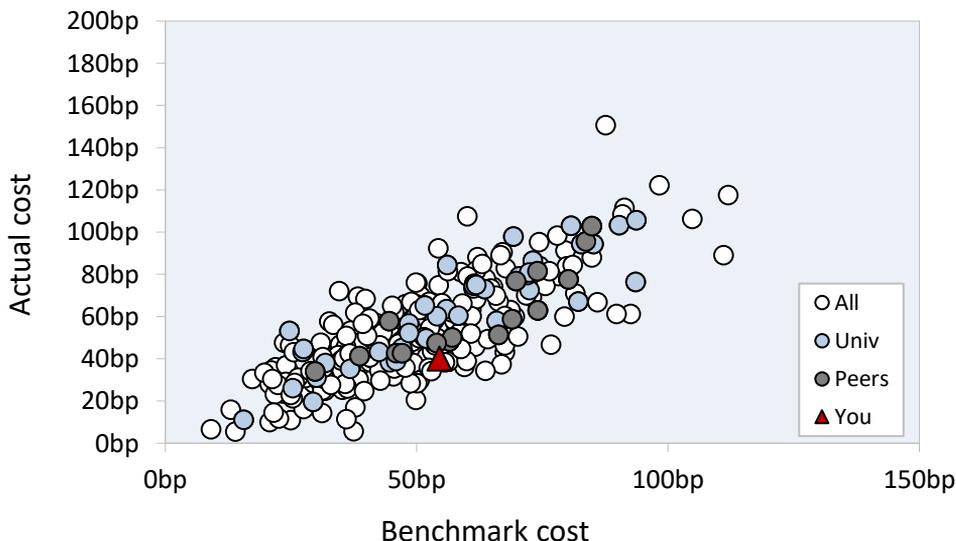
Your cost effectiveness ranking

Being high or low cost is neither good nor bad. More important is whether you are receiving sufficient value for your excess cost. At the total fund level, we provide insight into this question by combining your value added and excess cost to create a snapshot of your cost effectiveness performance relative to that of the global universe. In 2018, your fund ranked in the positive value added, low cost quadrant.

Your 2018 Net value added 0.1%, Excess cost -14 bps



Your 2018 Actual cost 40.1 bps, Benchmark cost 54.5 bps



For all funds except your fund, benchmark cost equals the sum of group median costs x fund's average holdings by asset class plus group median cost of derivatives/overlays plus group median cost of oversight/support. Group is peer if the fund is in the peer group, universe - if the fund is part of the universe, and global/database otherwise. Your fund's benchmark cost is calculated using peer-based methodology per page 7 of this section.

5

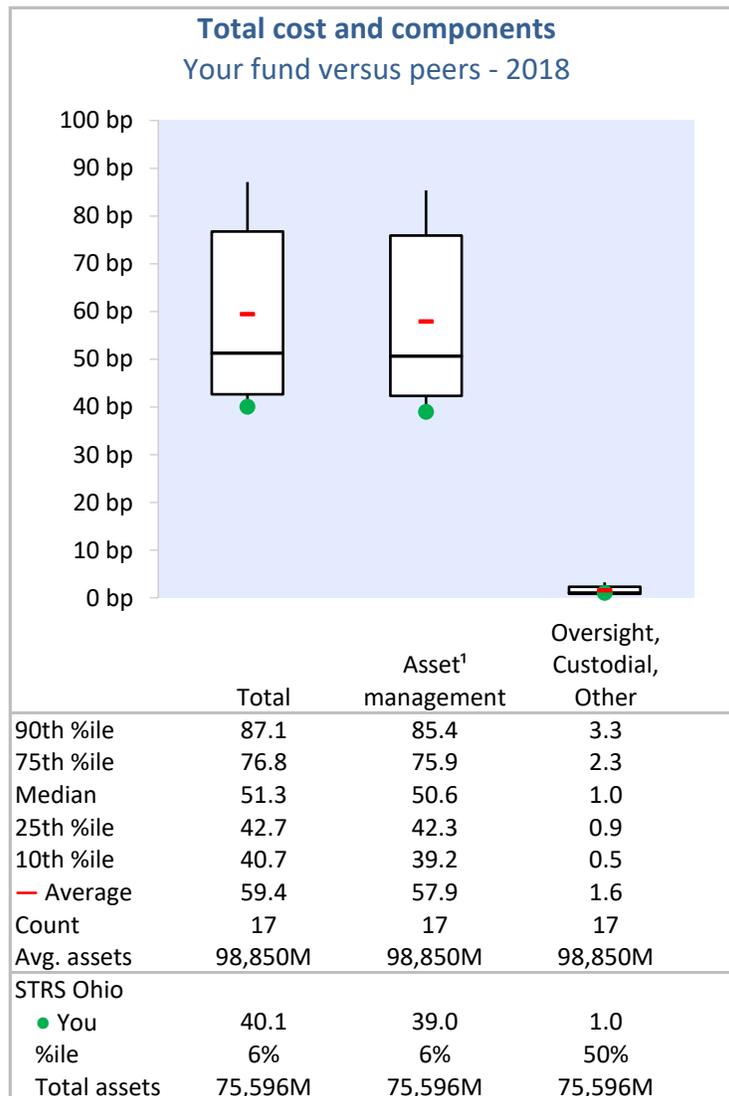
Cost comparisons

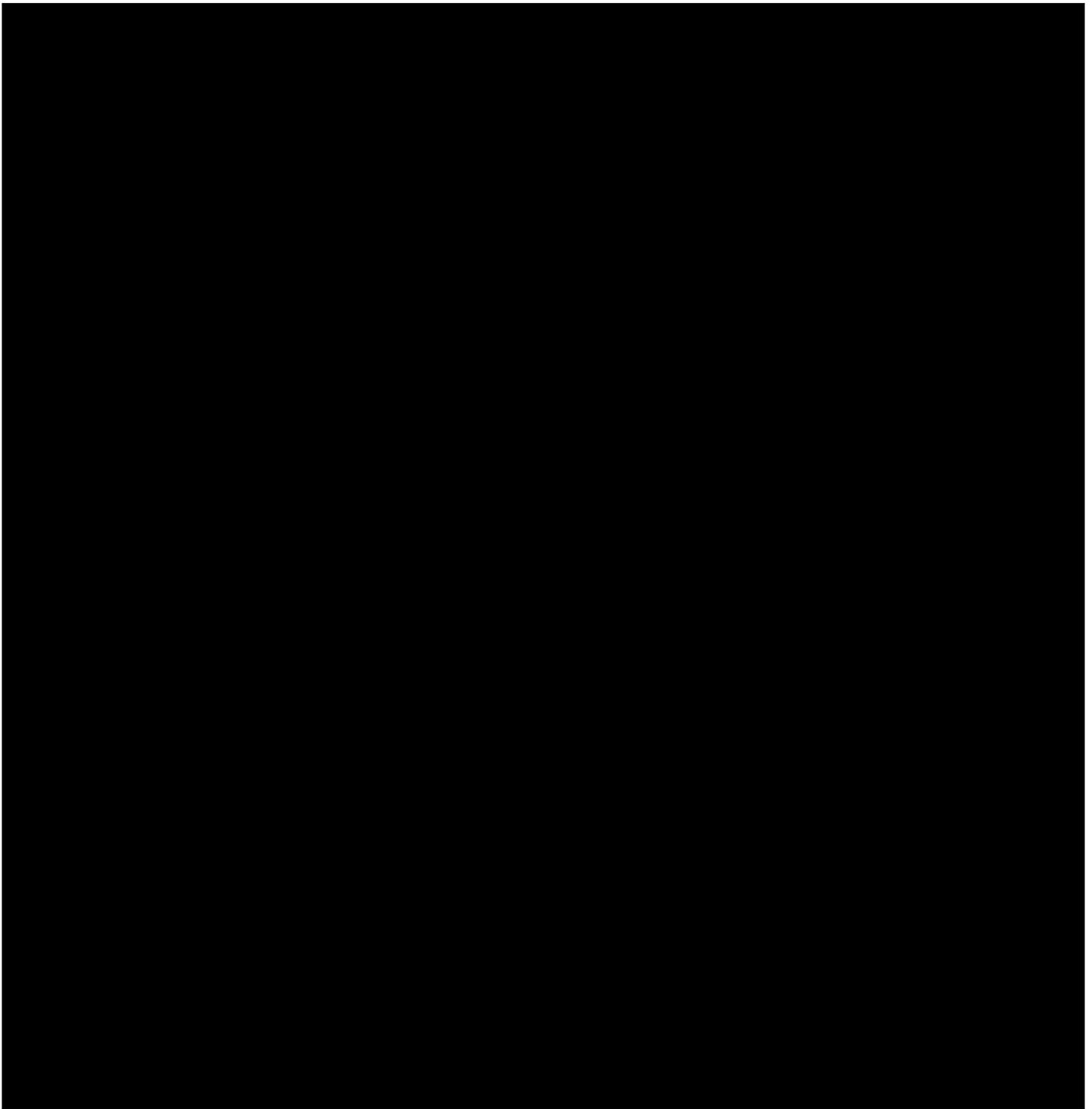
Total fund cost	2
Governance, operations & support	3
Public asset classes	
- Stock	4
- Fixed Income	14
- Commodities	28
- REITs	29
Real asset classes	
- Real estate ex-REITs	30
- Infrastructure	31
- Natural resources	32
- Other real assets	33
Private equity	
- Diversified private equity	34
- LBO	35
- Venture capital	36
- Private credit	37
- Other private equity	39
Global TAA	40
RiskParity	41
Hedge Funds	42
Overlays	43

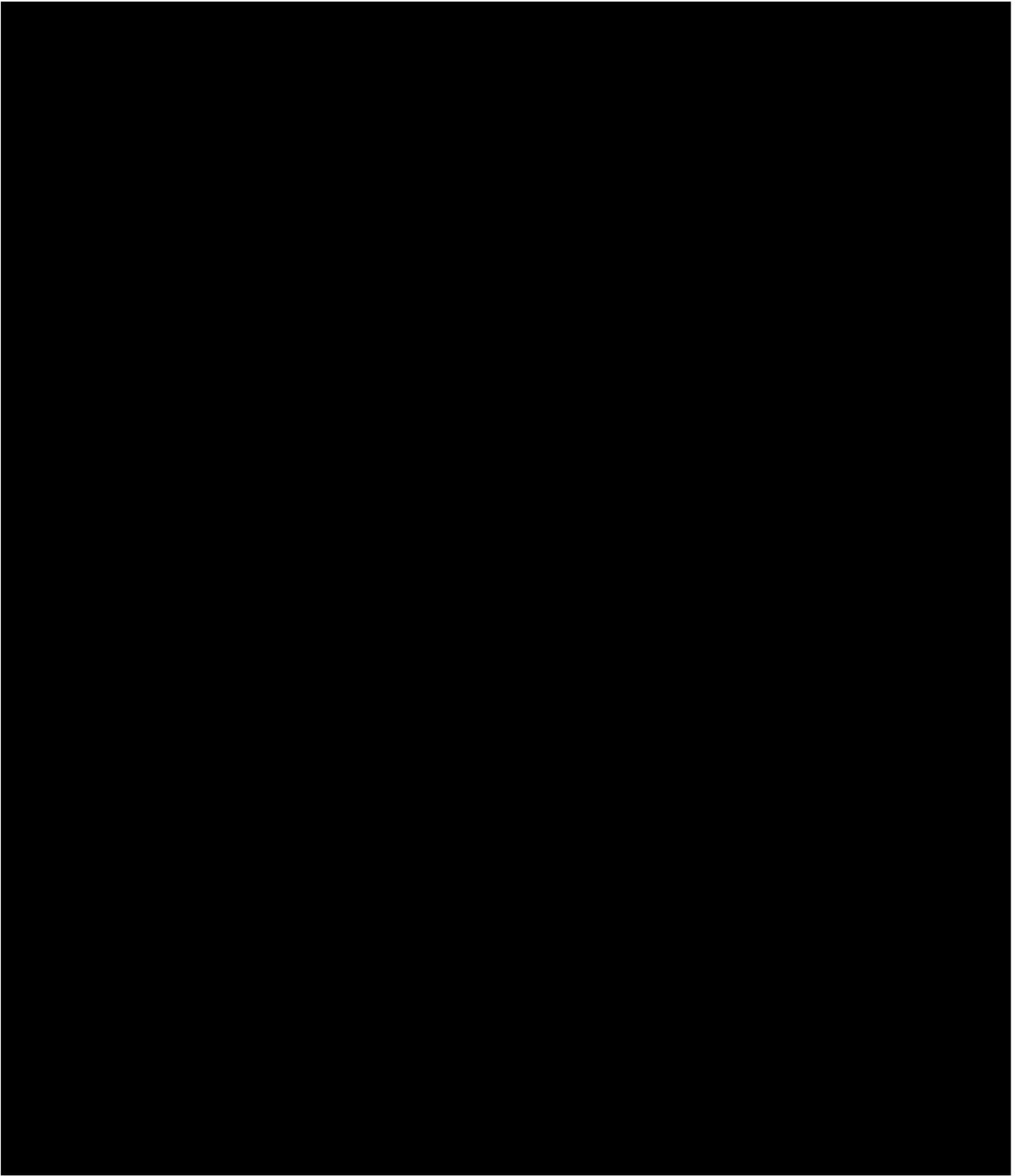
Total fund cost

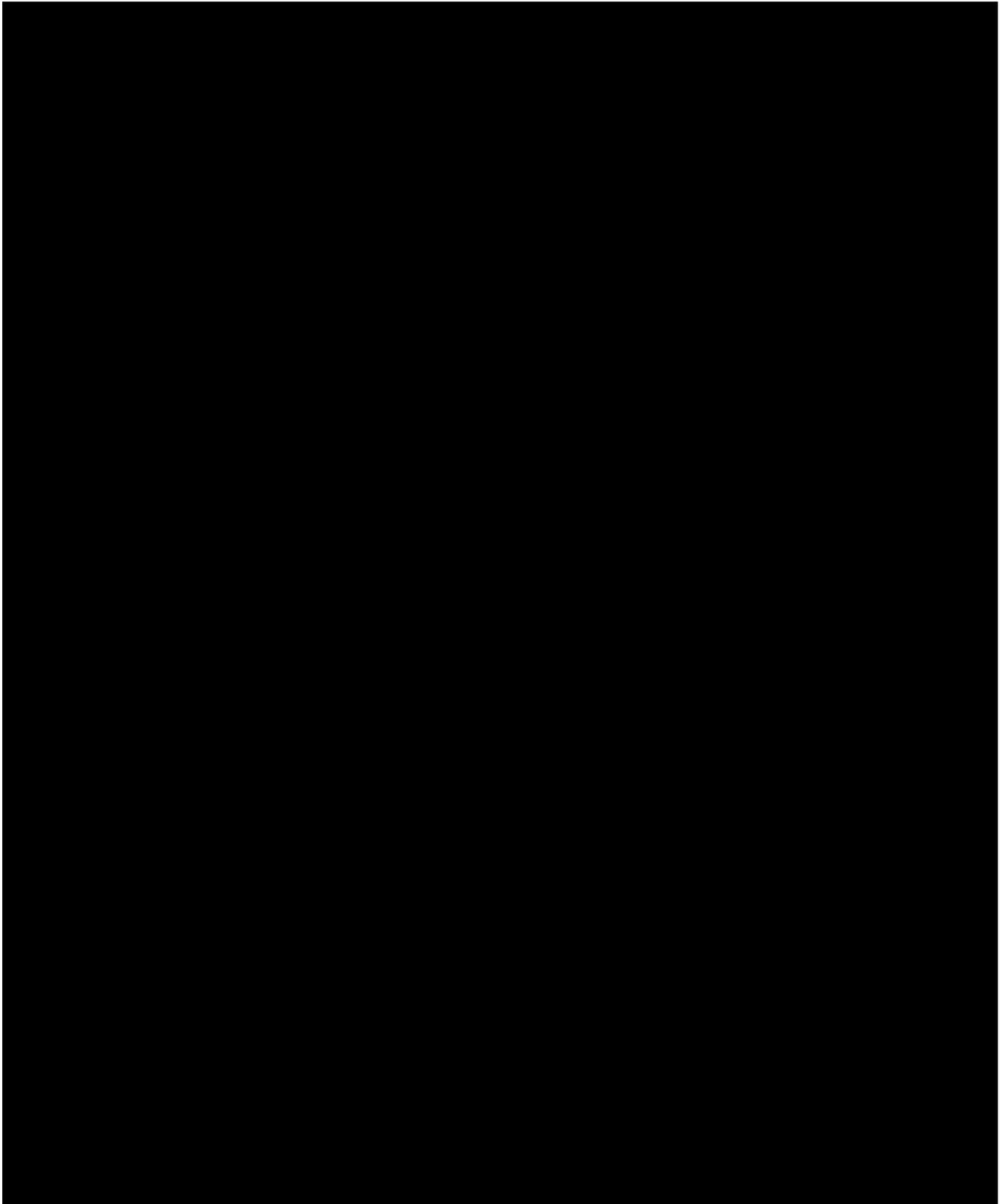
Total costs are benchmarked in the previous section. In this section, your fund's costs are compared on a line-item basis to your peers. This enables you to understand better why you may be a high or low cost fund and it also identifies and quantifies major cost differences that may warrant further investigation.

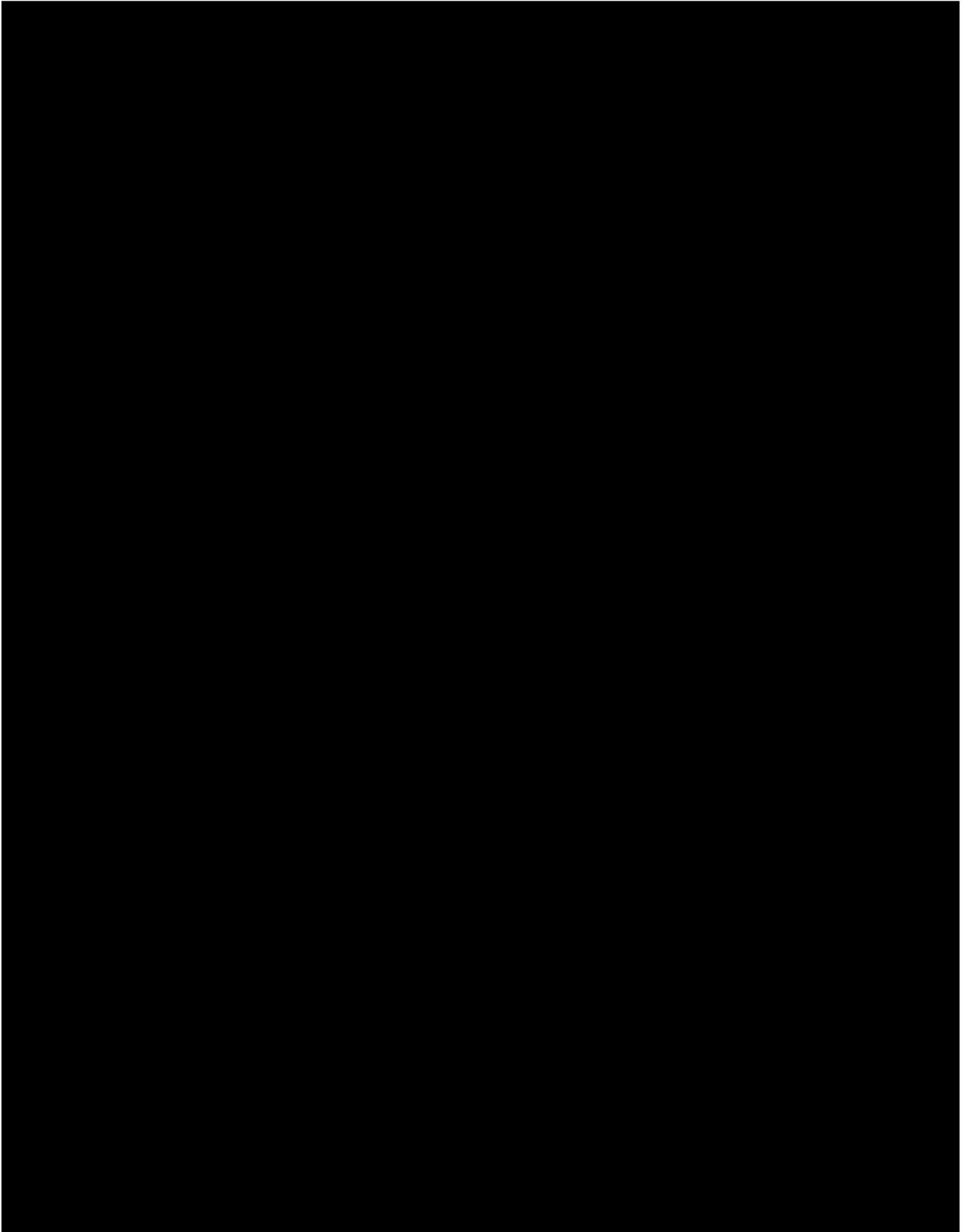
The 25th to 75th percentile range is the most relevant since higher and lower values may include outliers caused by unusual circumstances, such as performance-based fees. Count refers to the number of funds in your peer group that have costs in this category. It enables you to gauge the statistical significance.

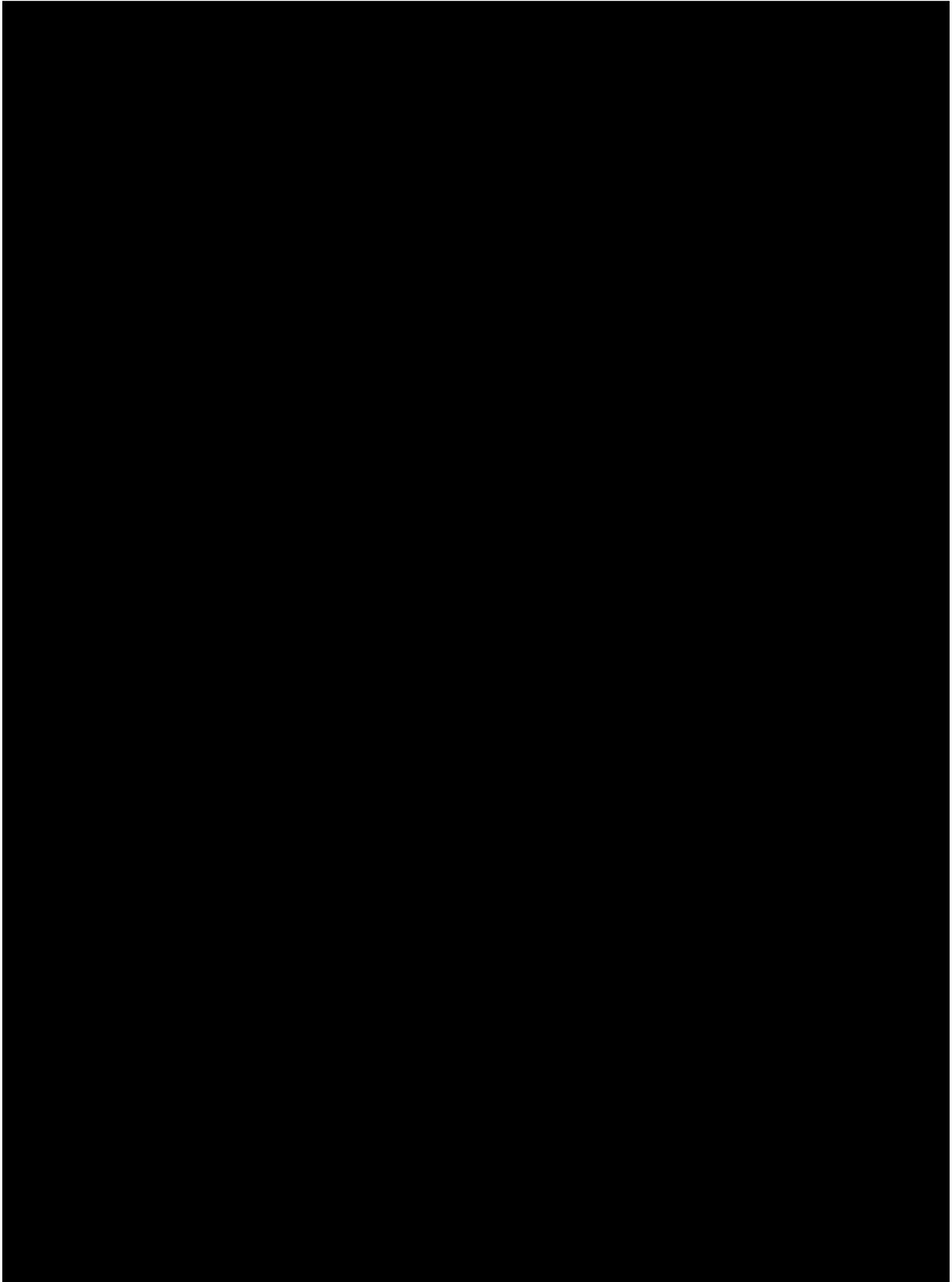


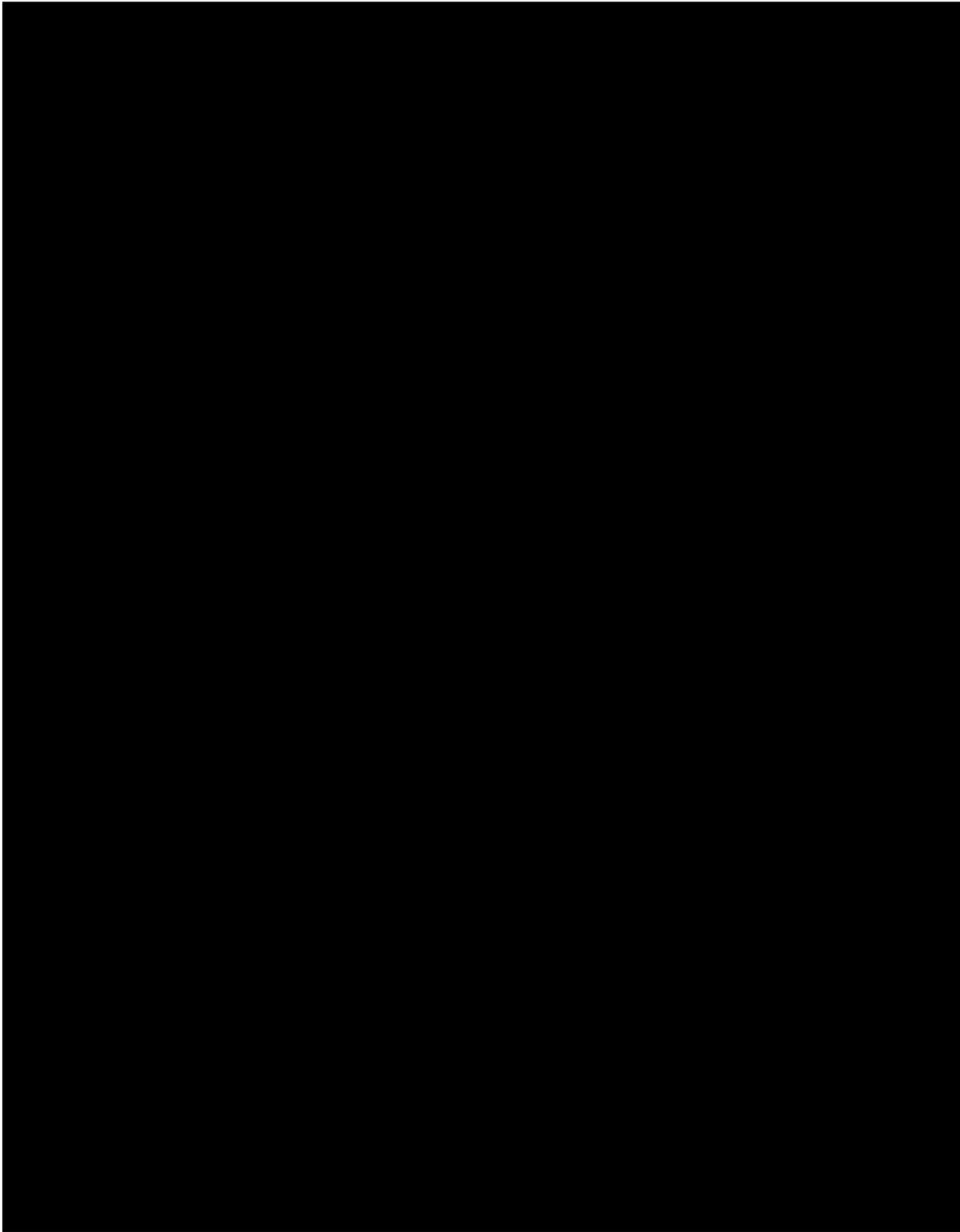


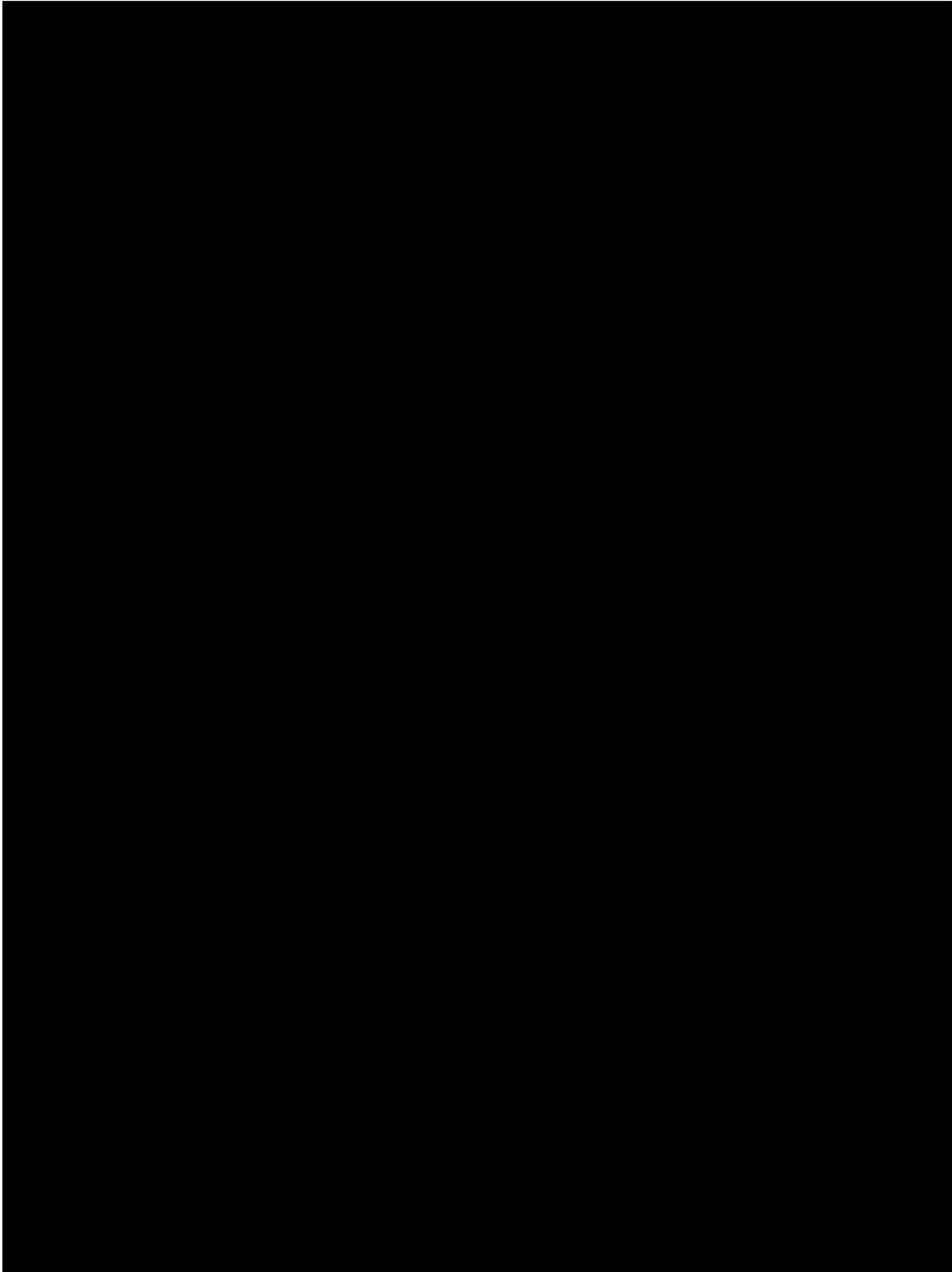


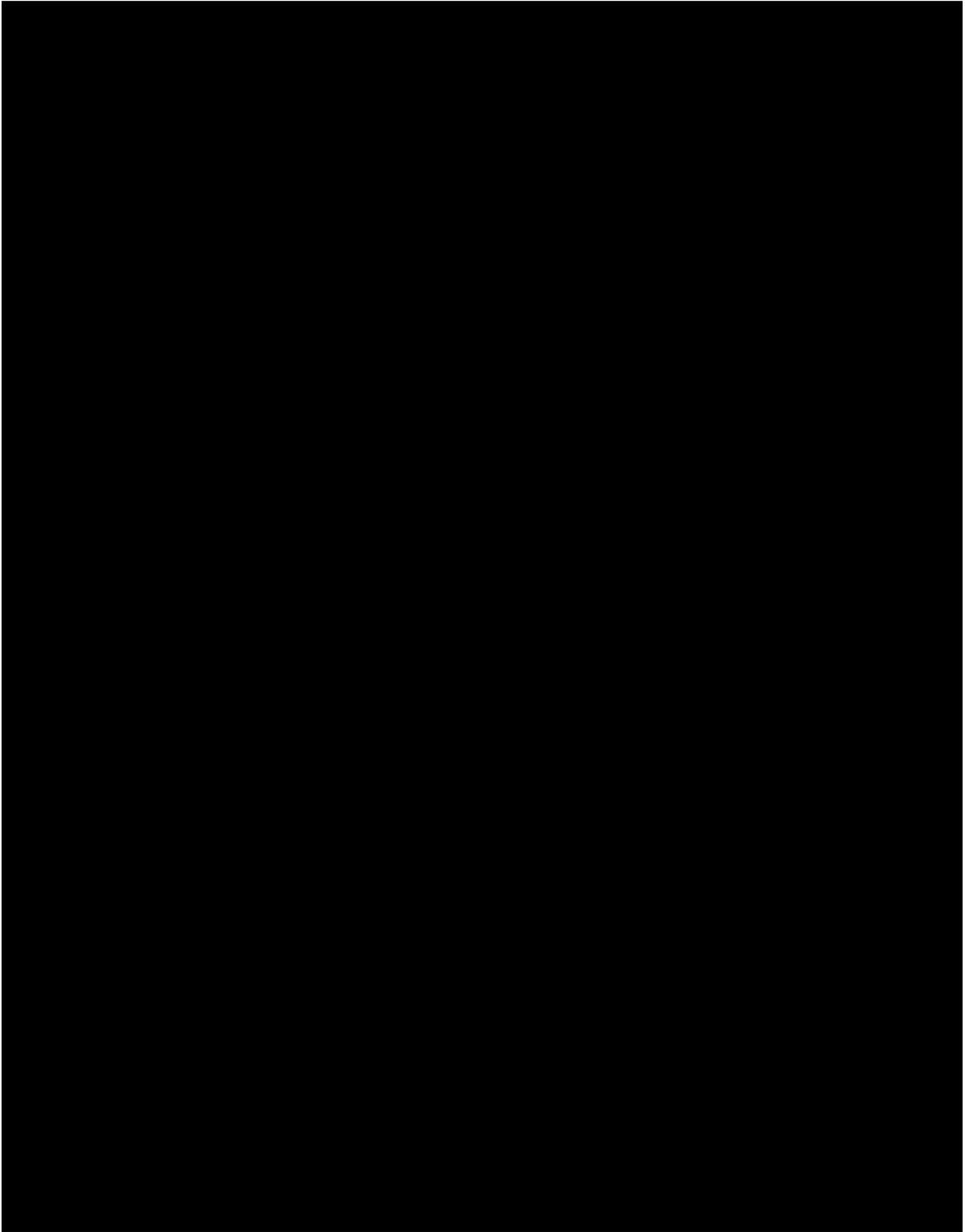


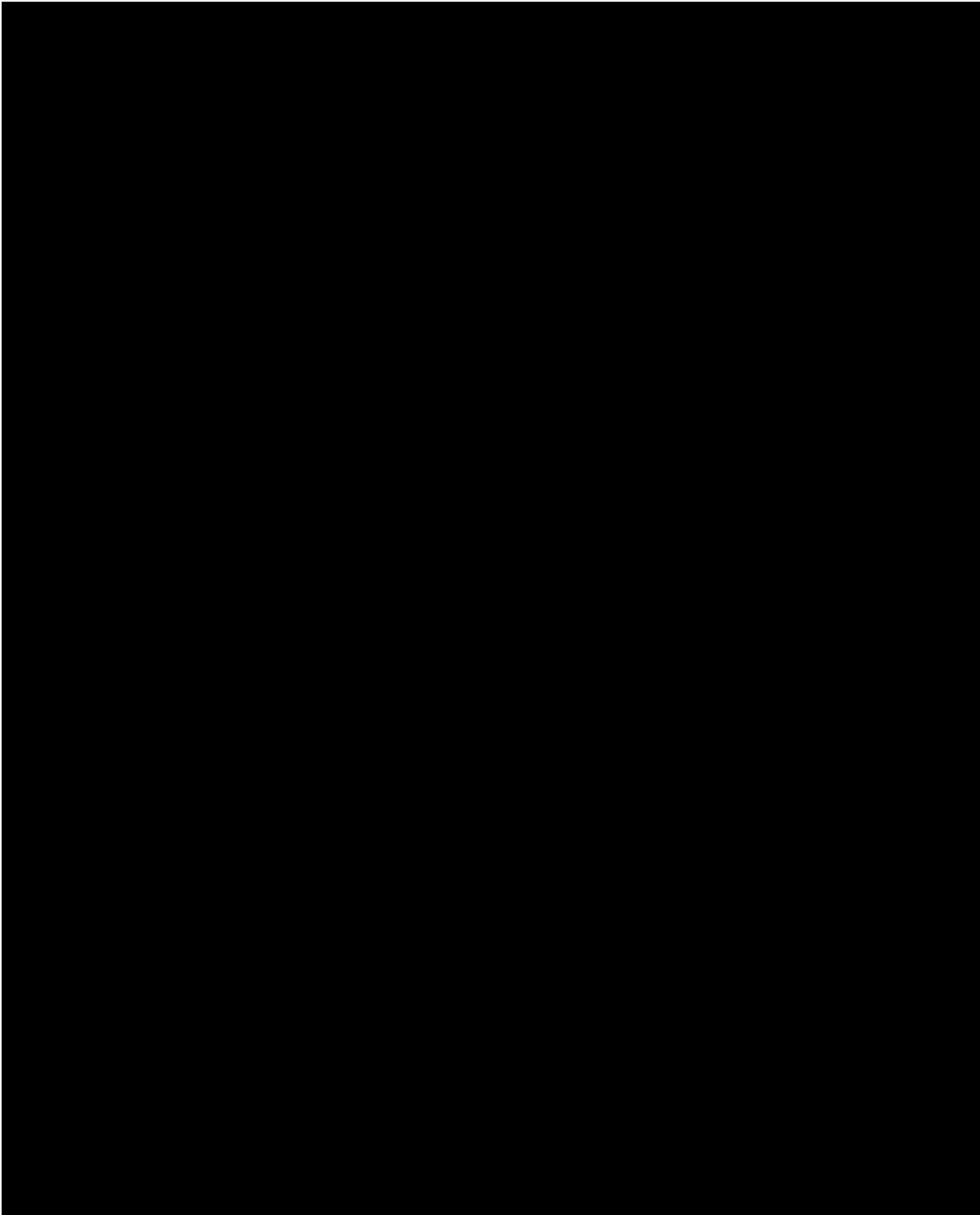


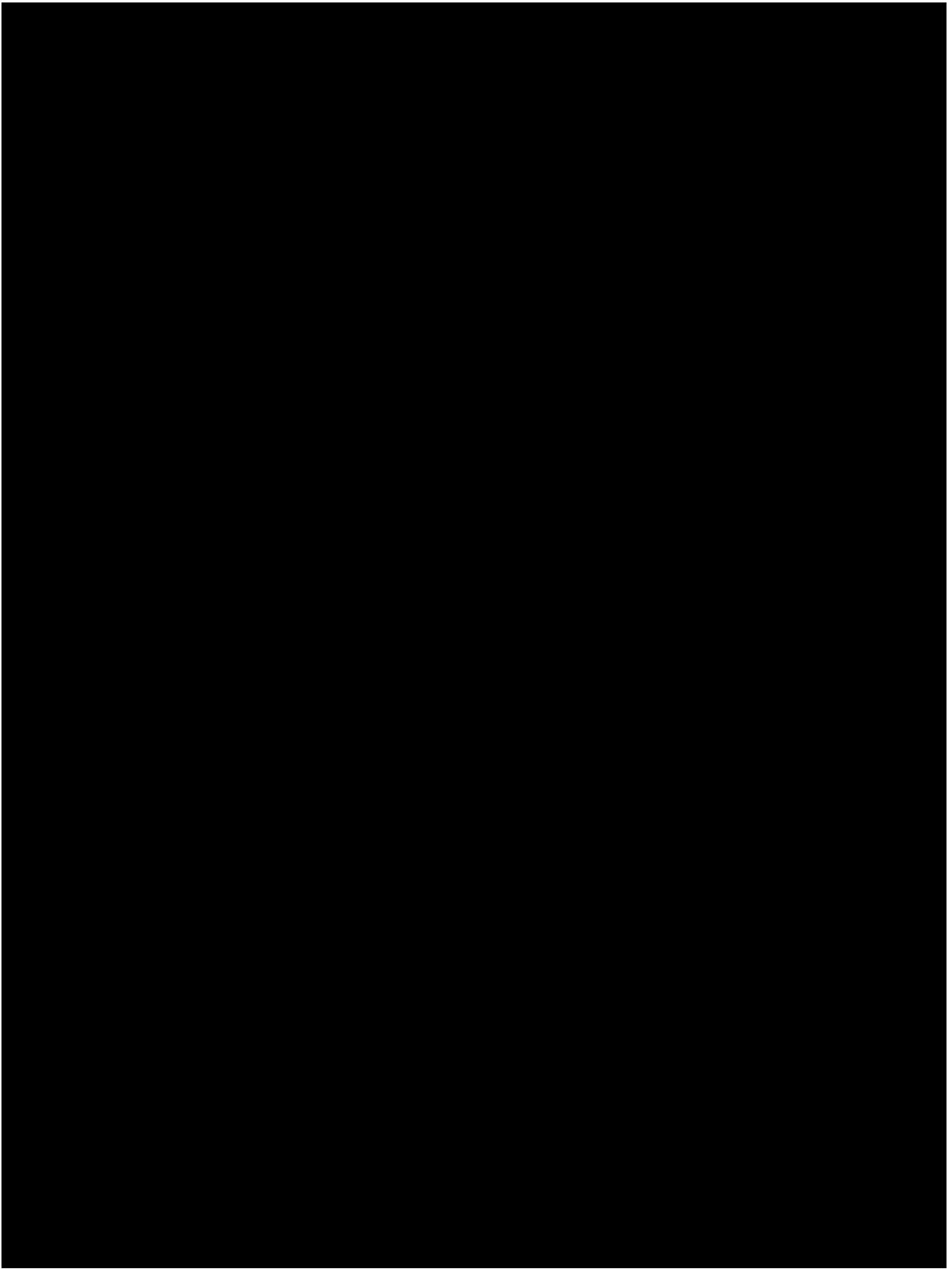


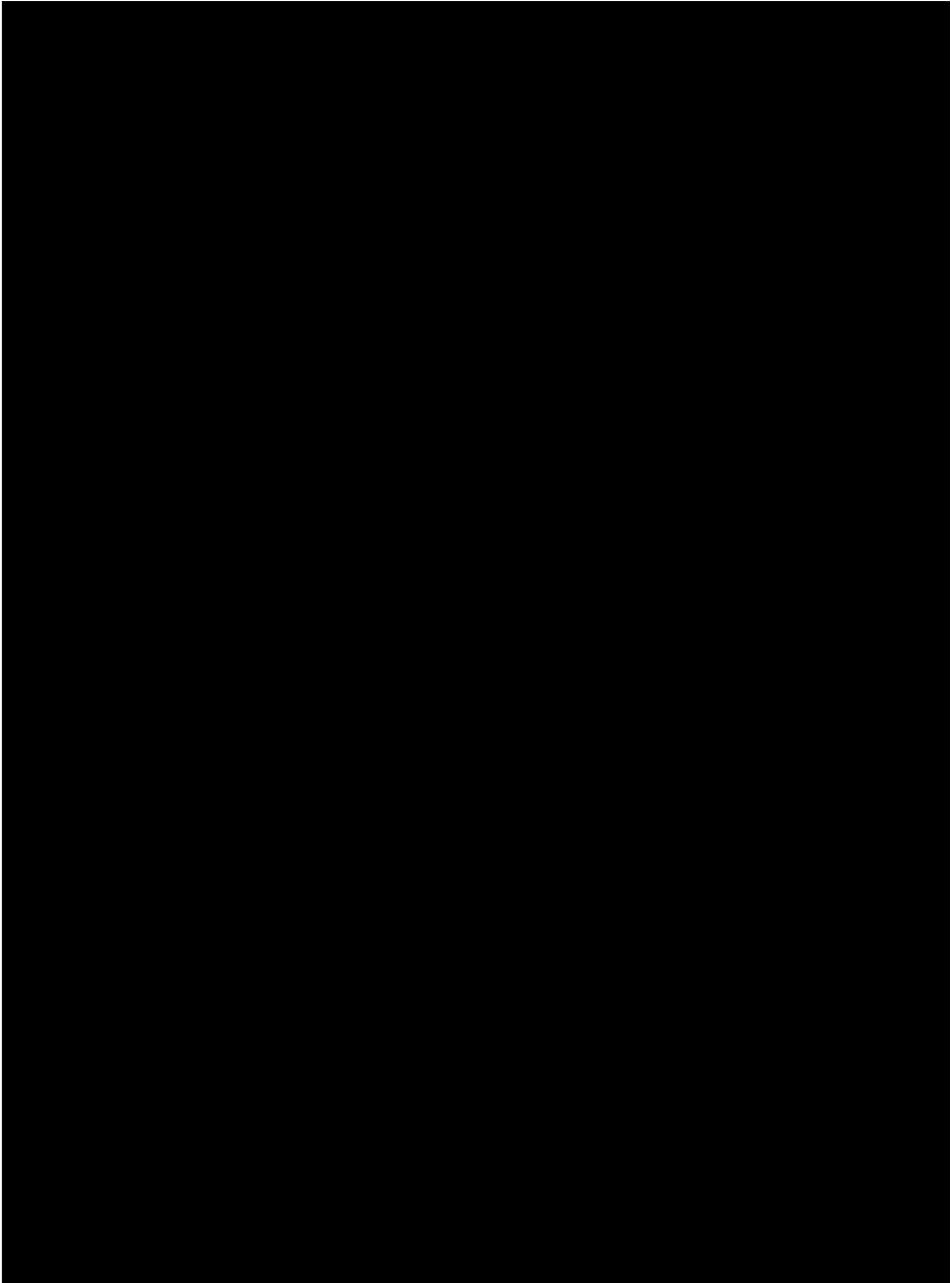


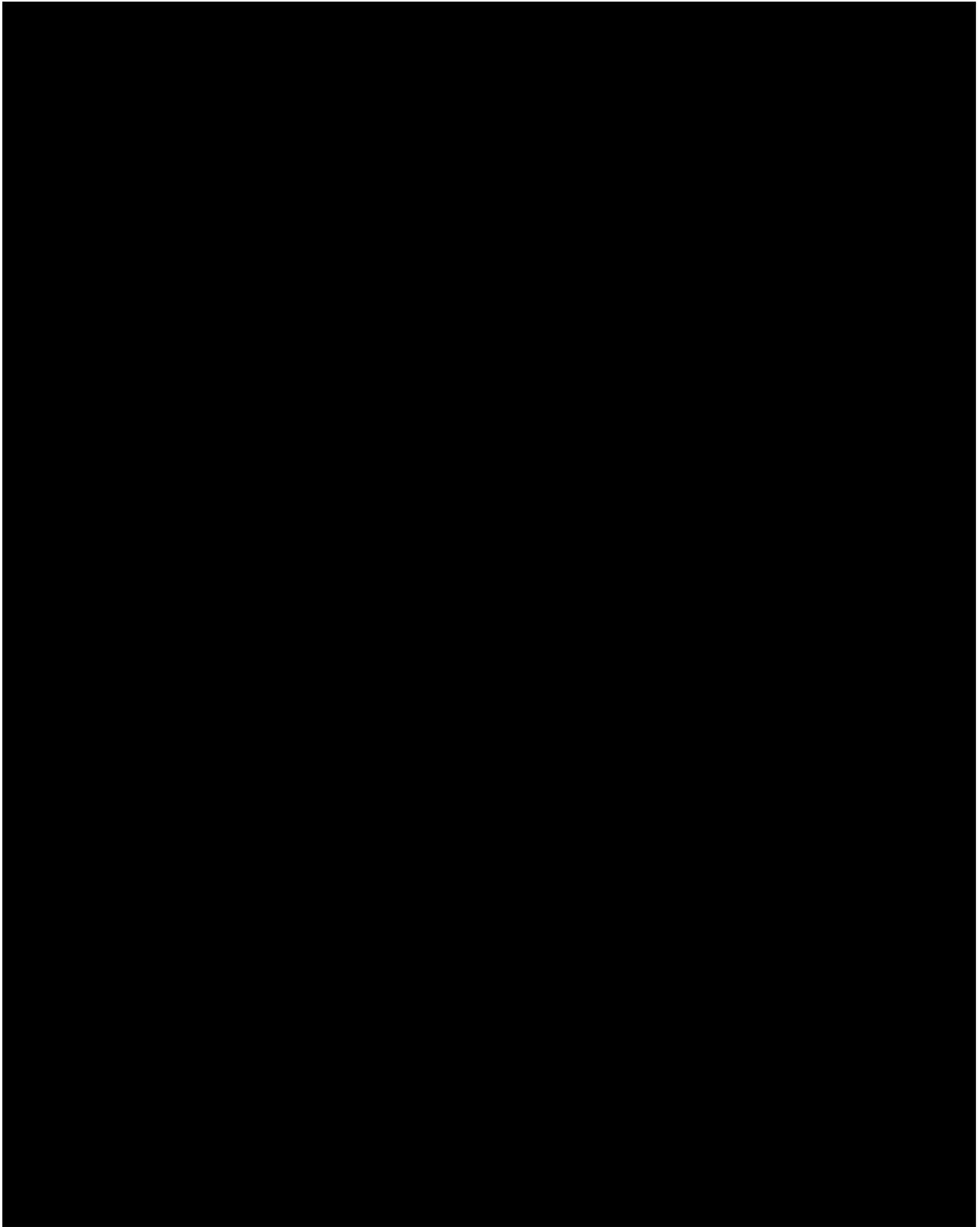


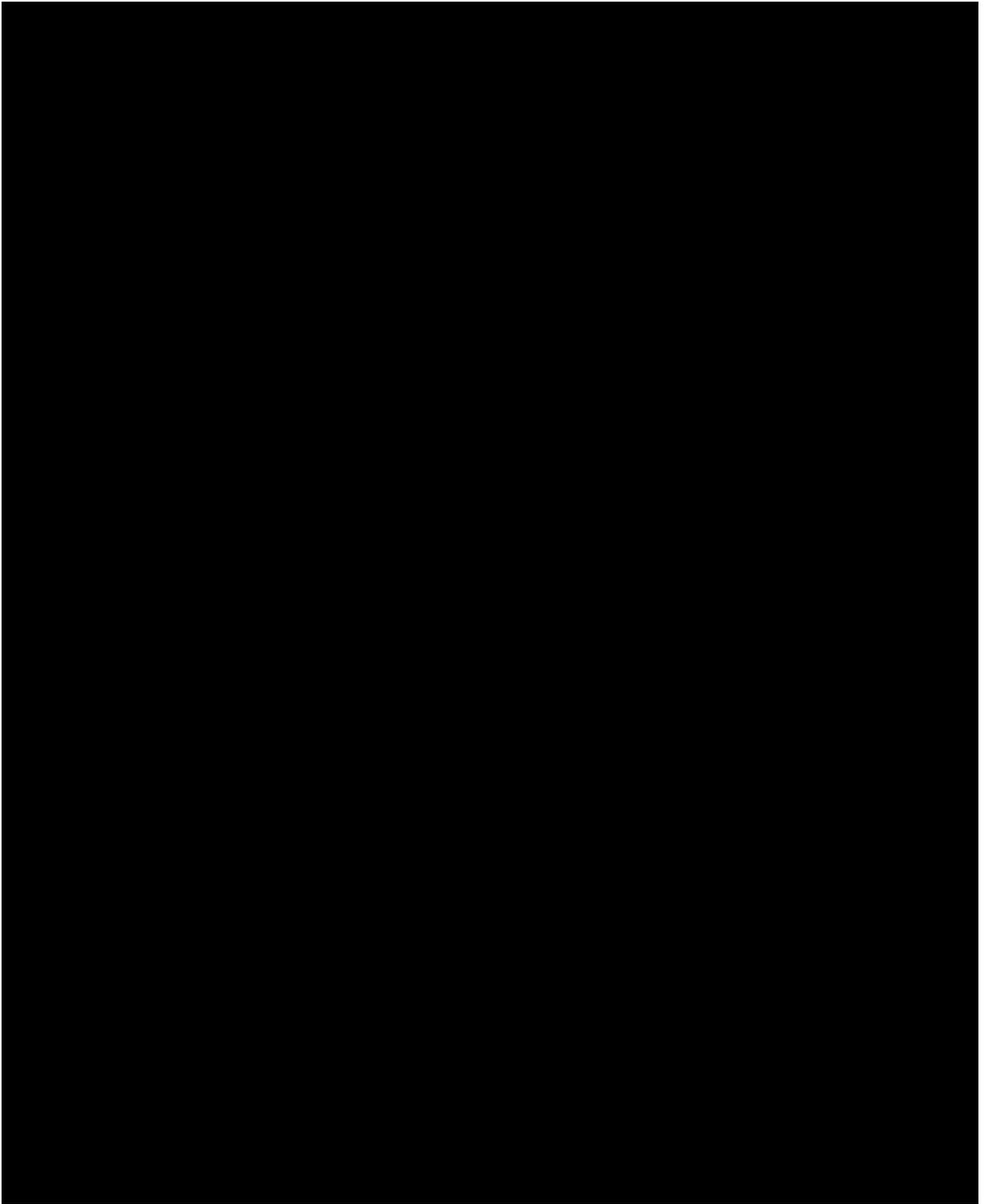


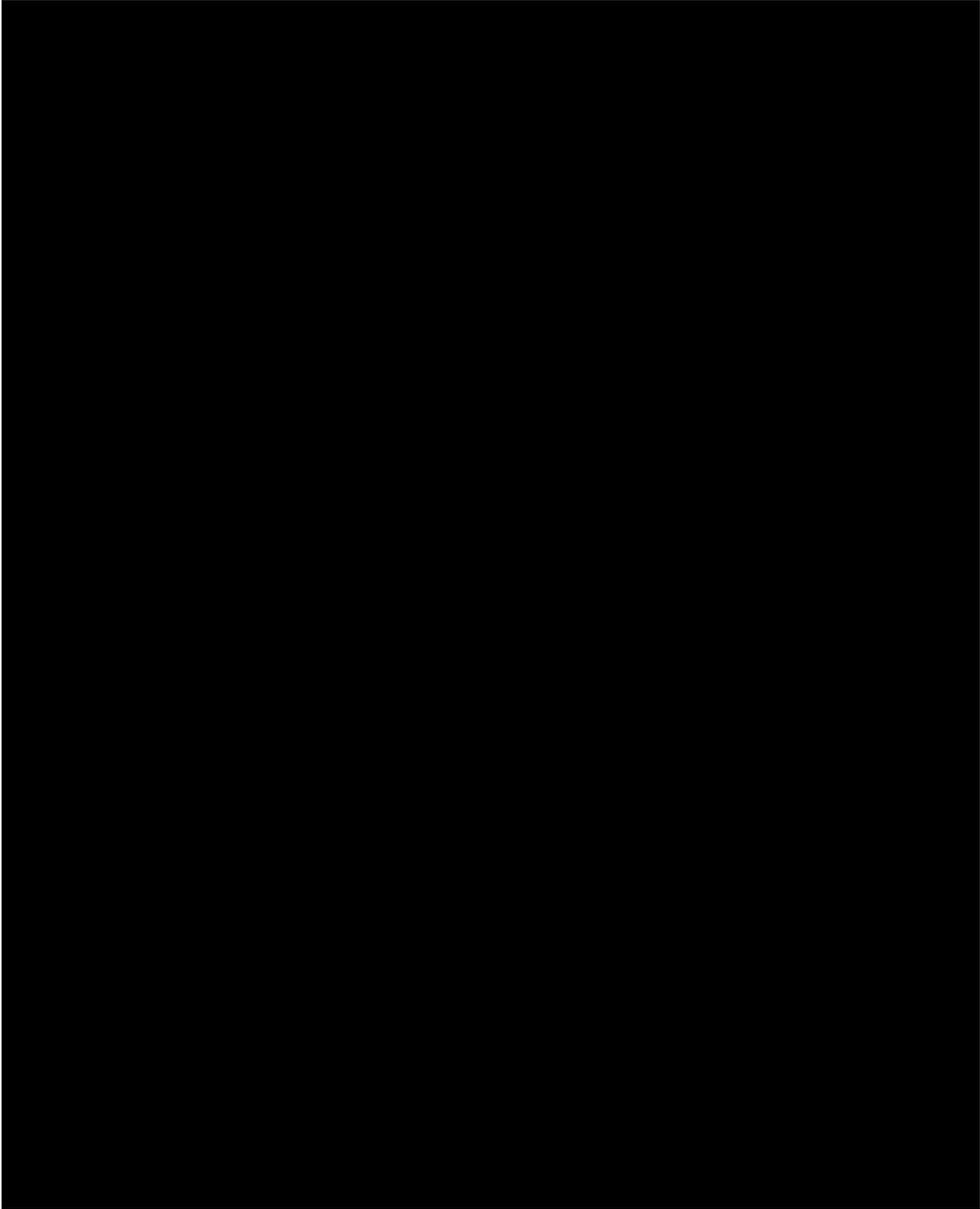


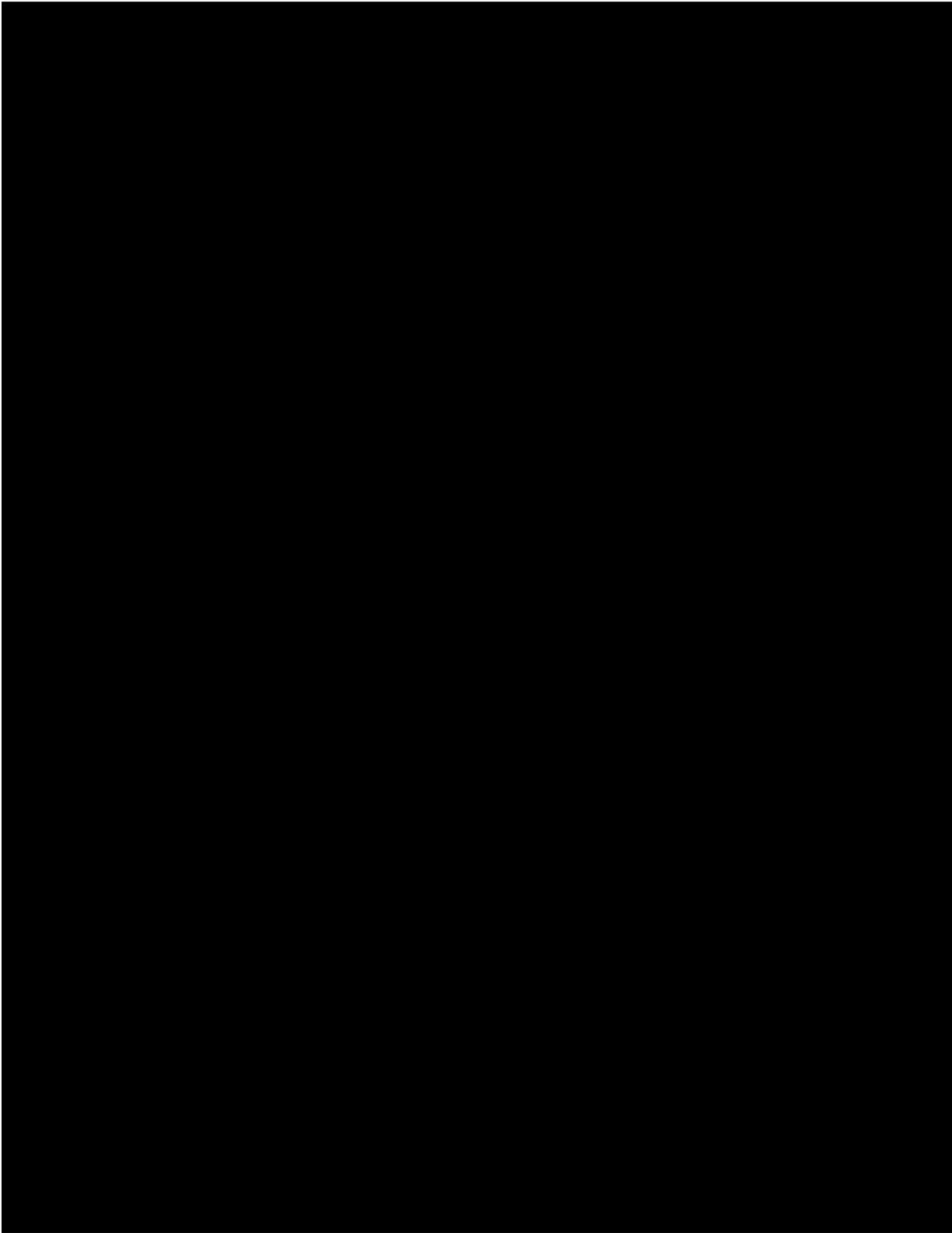


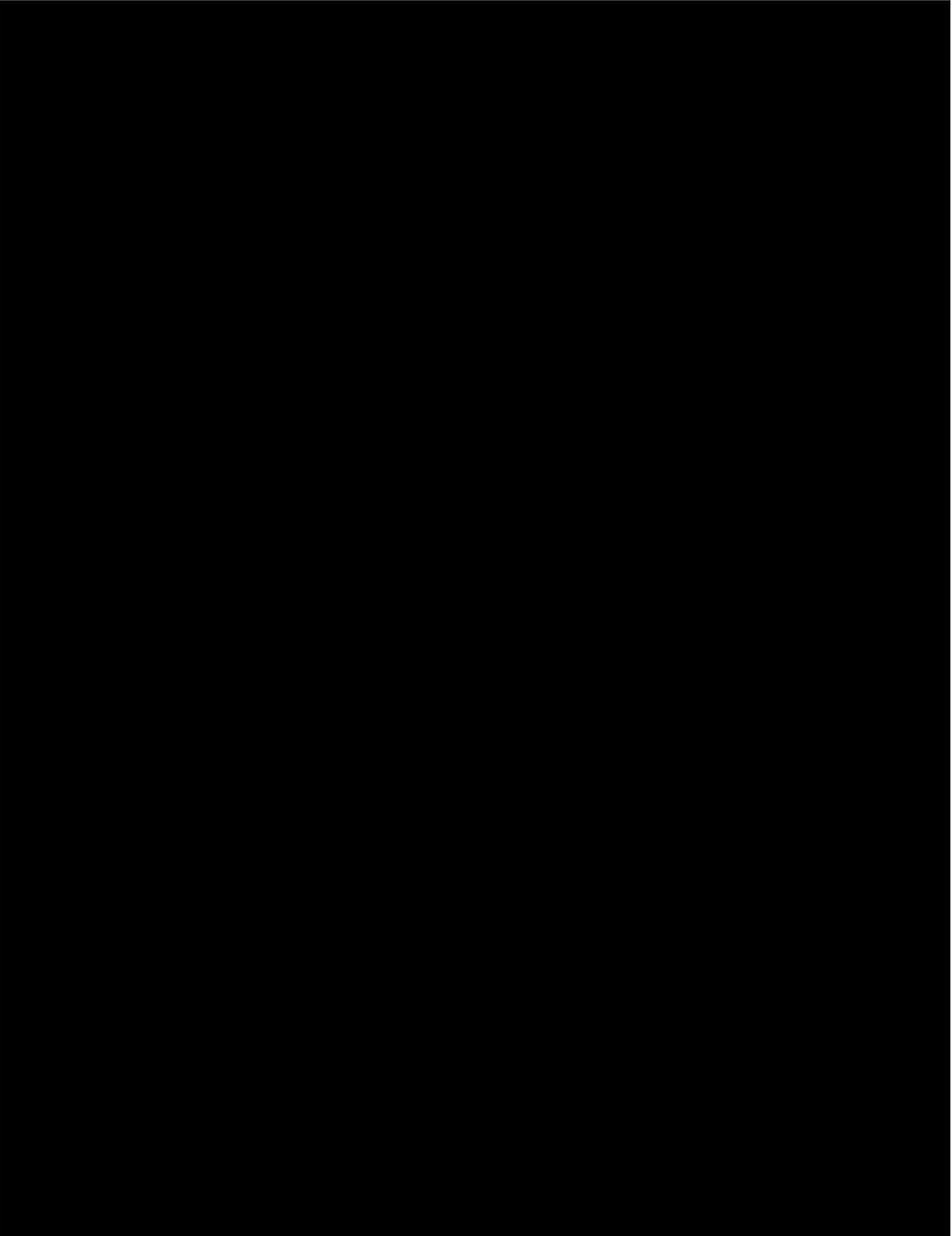


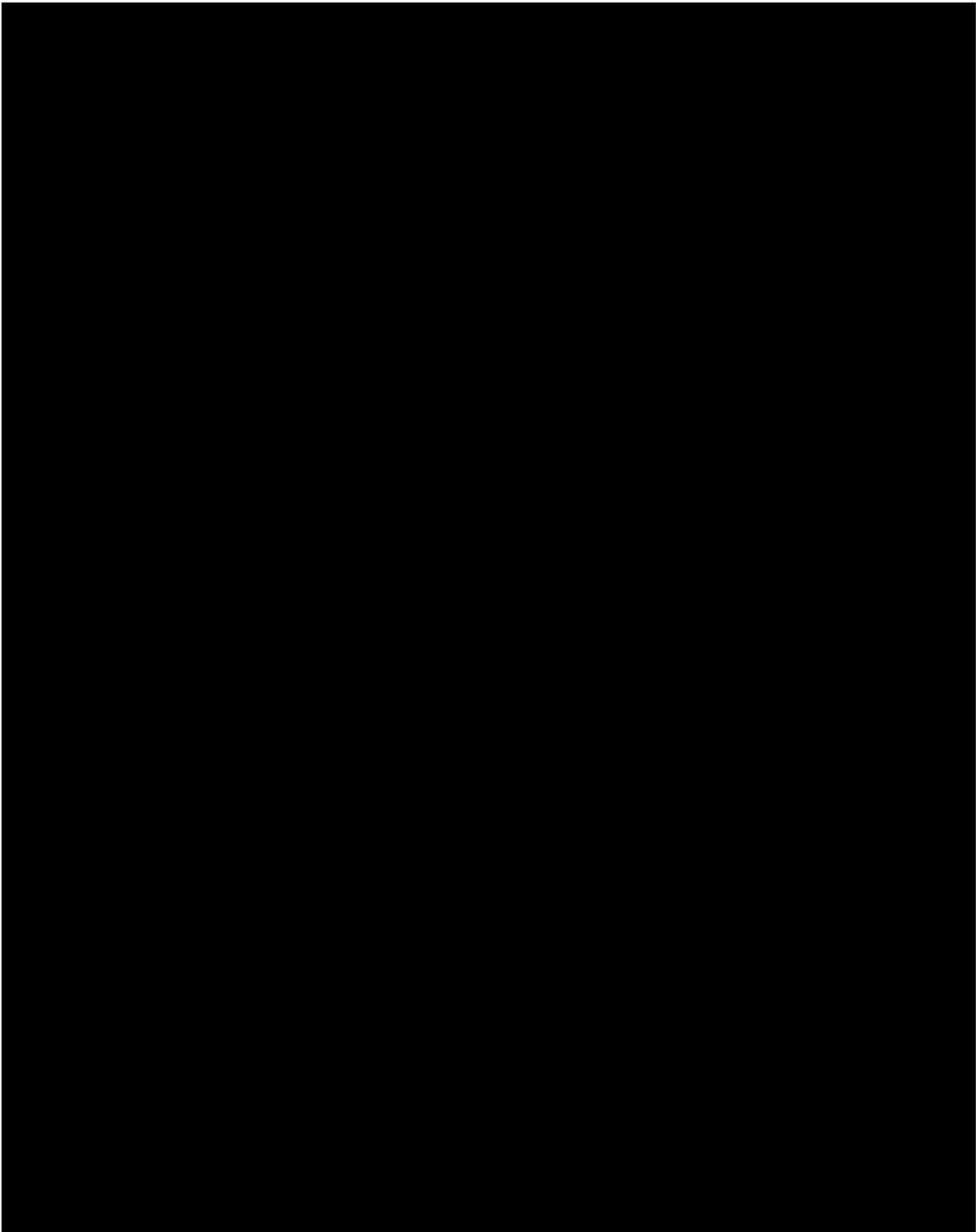


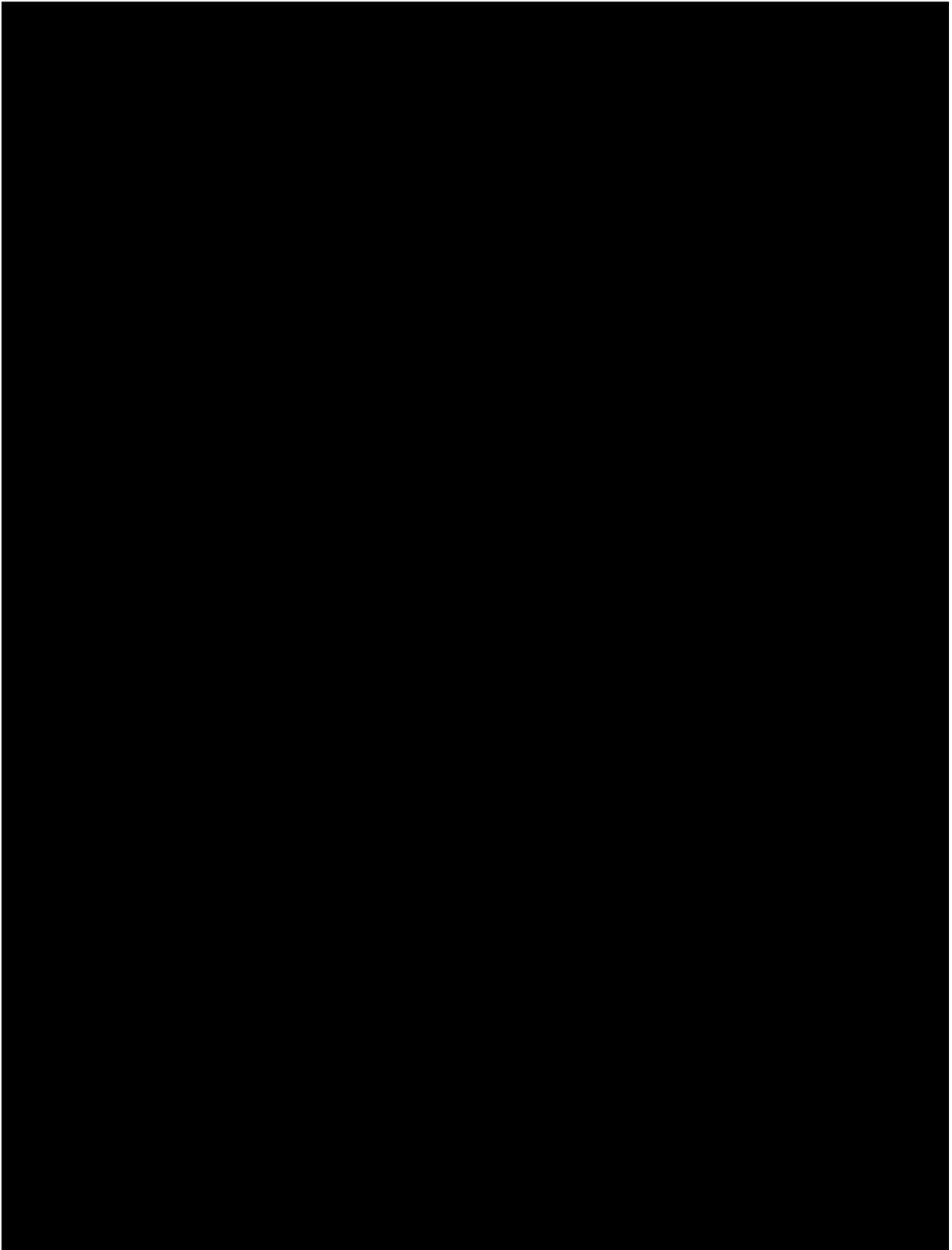


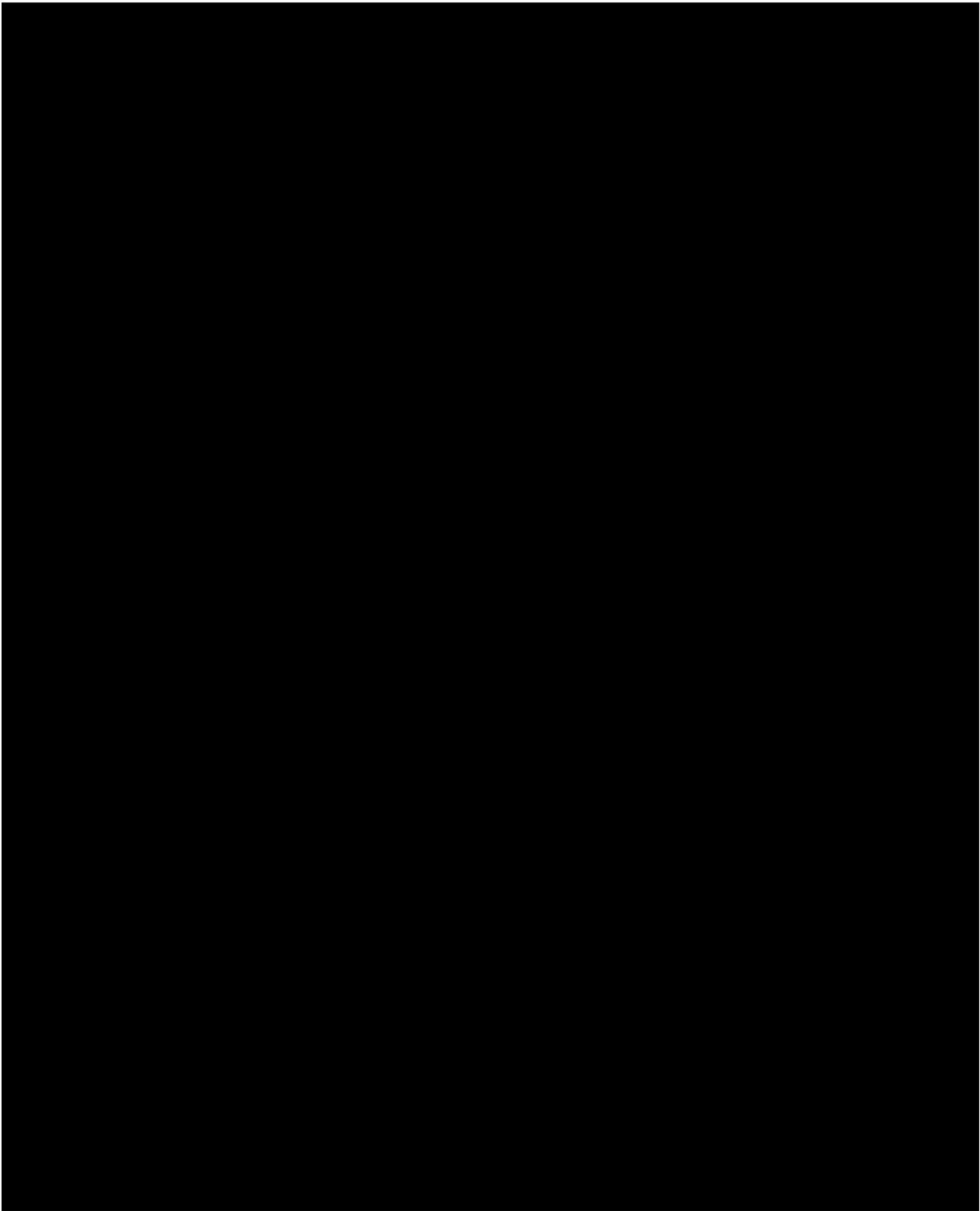


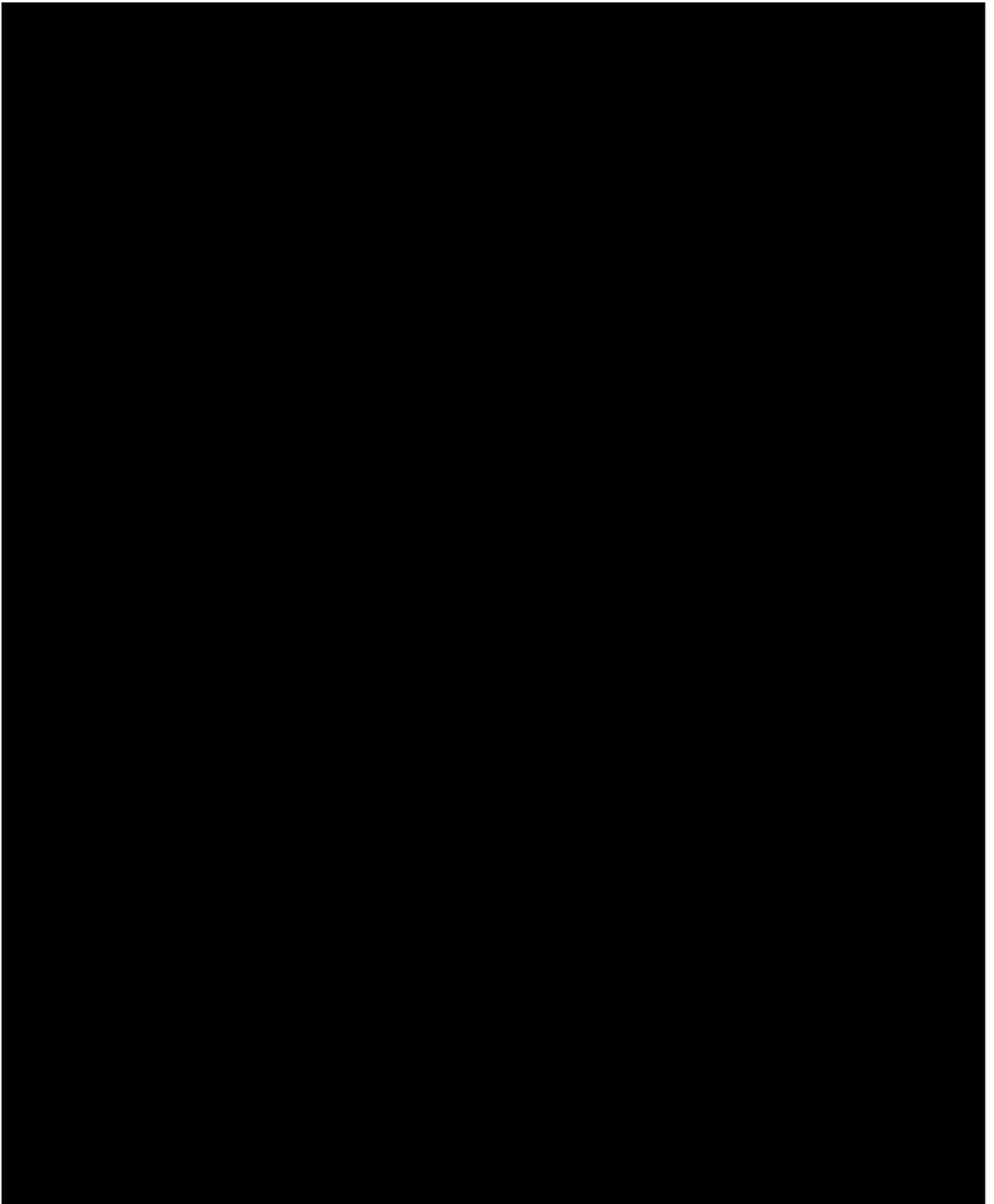


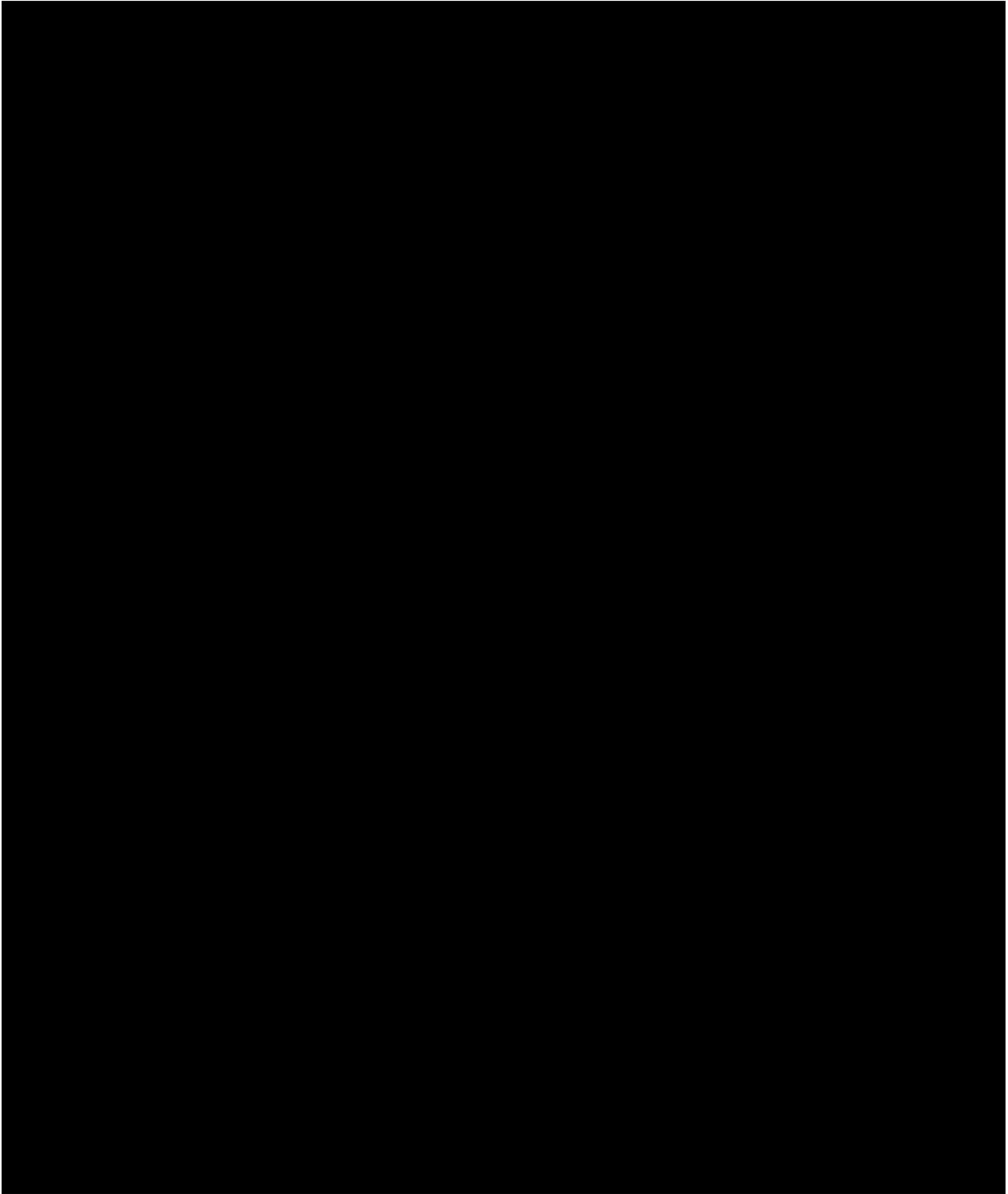


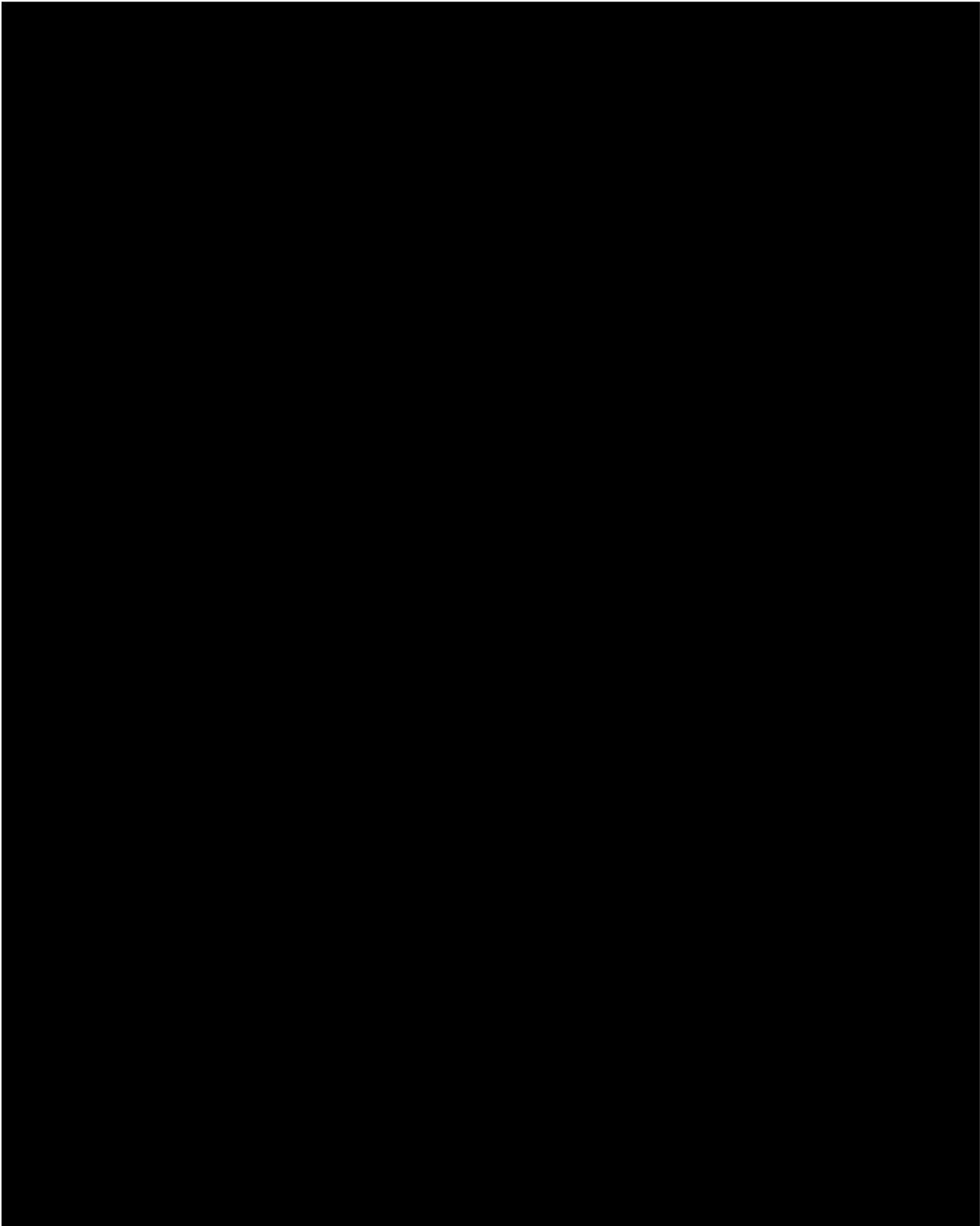


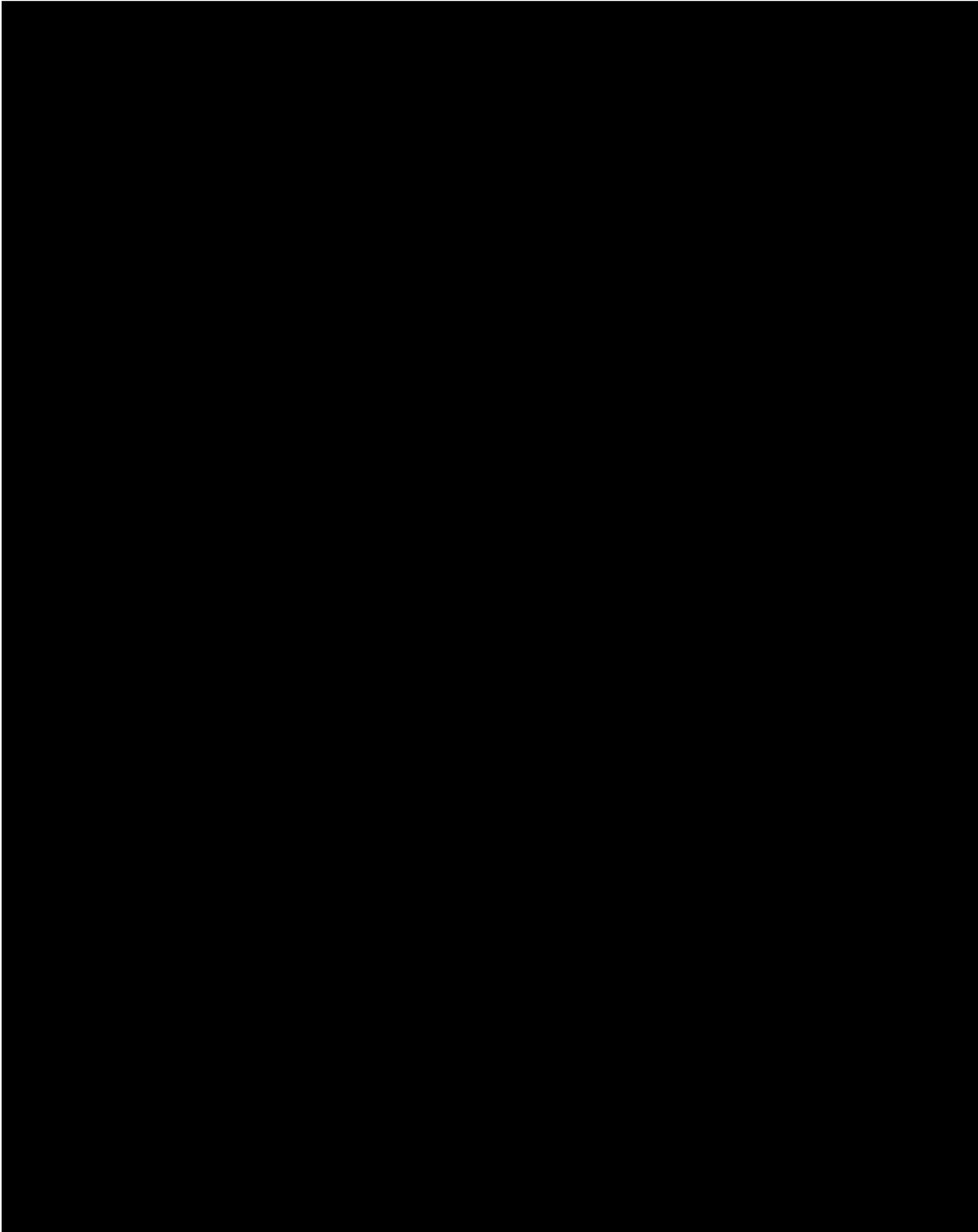




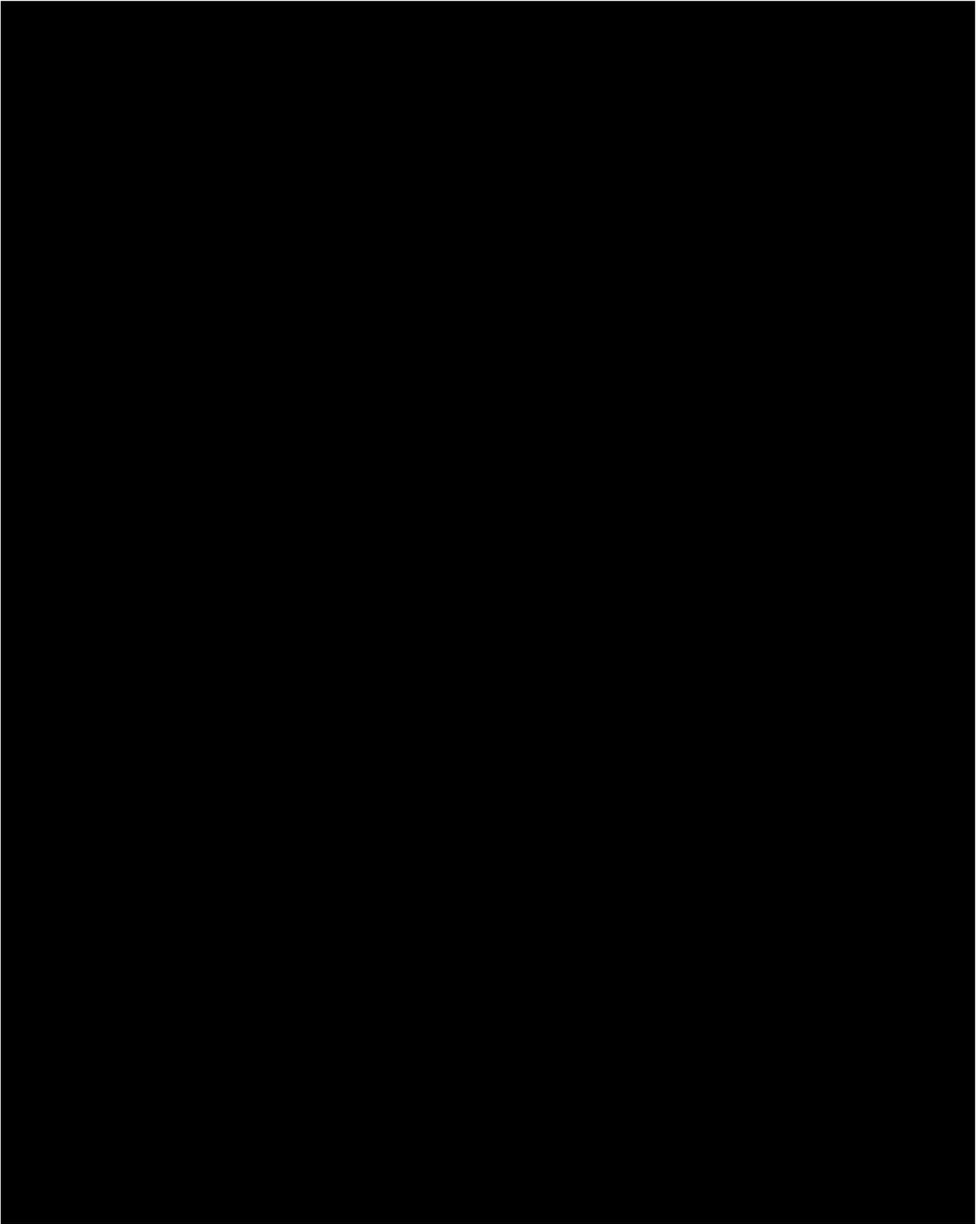


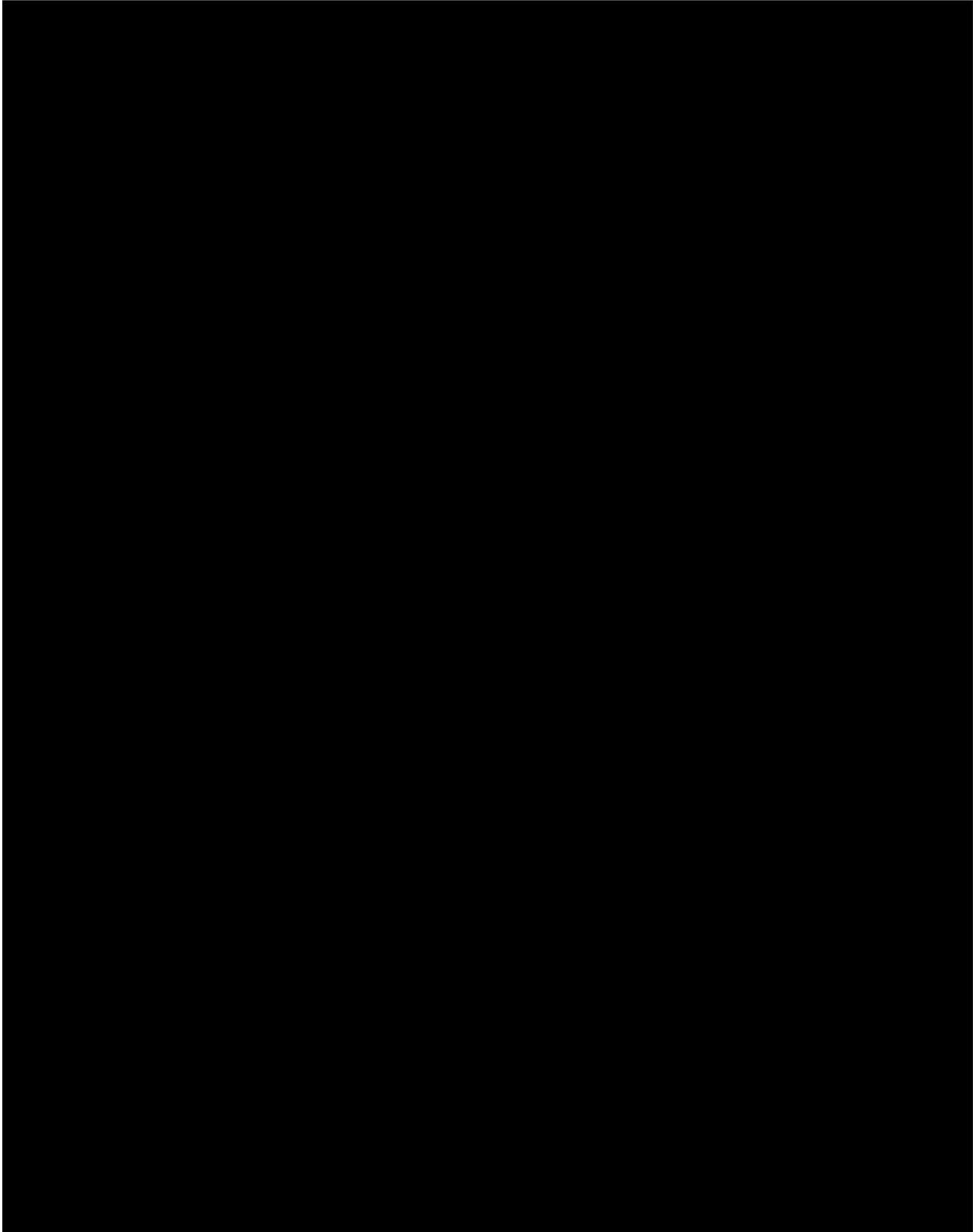


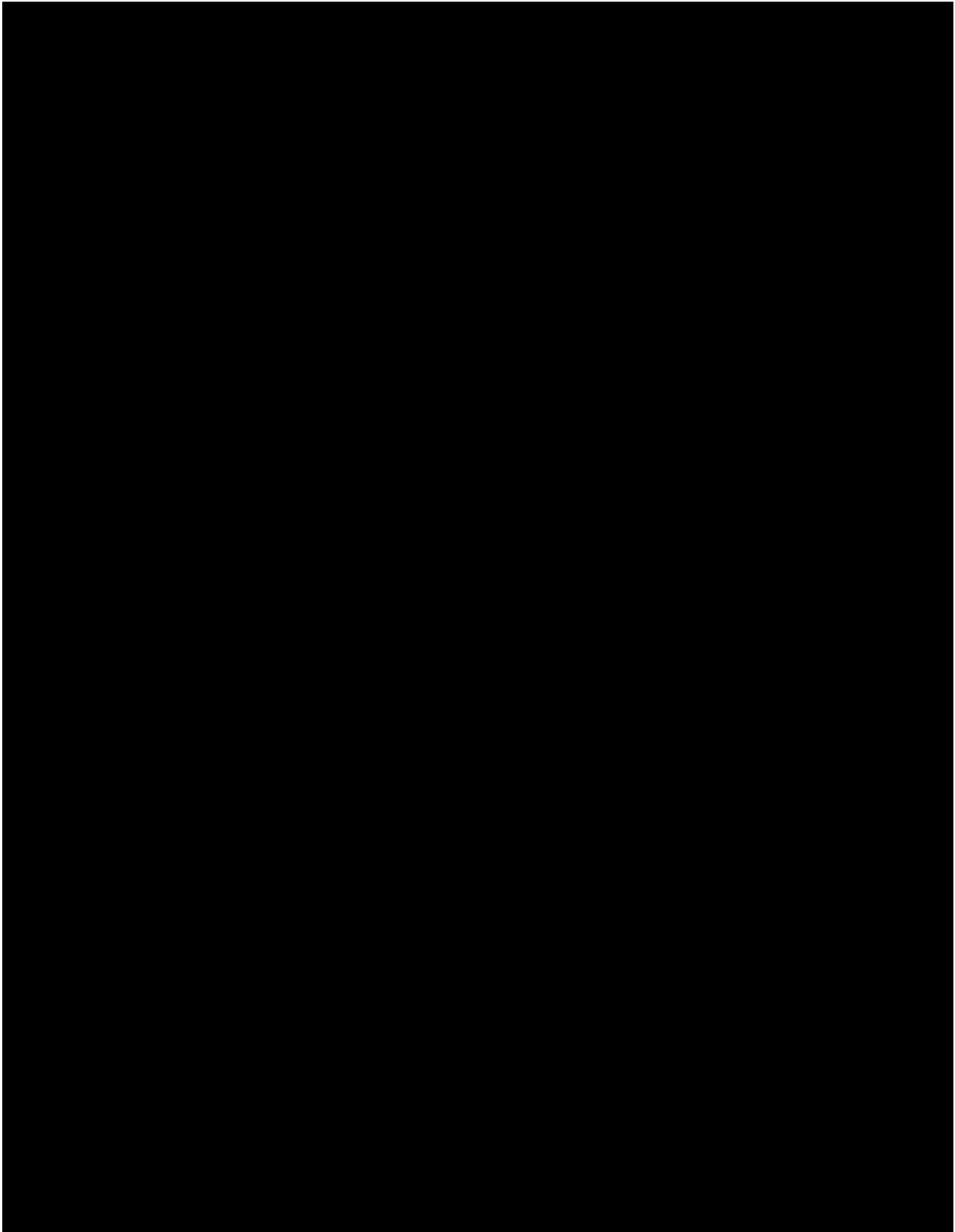


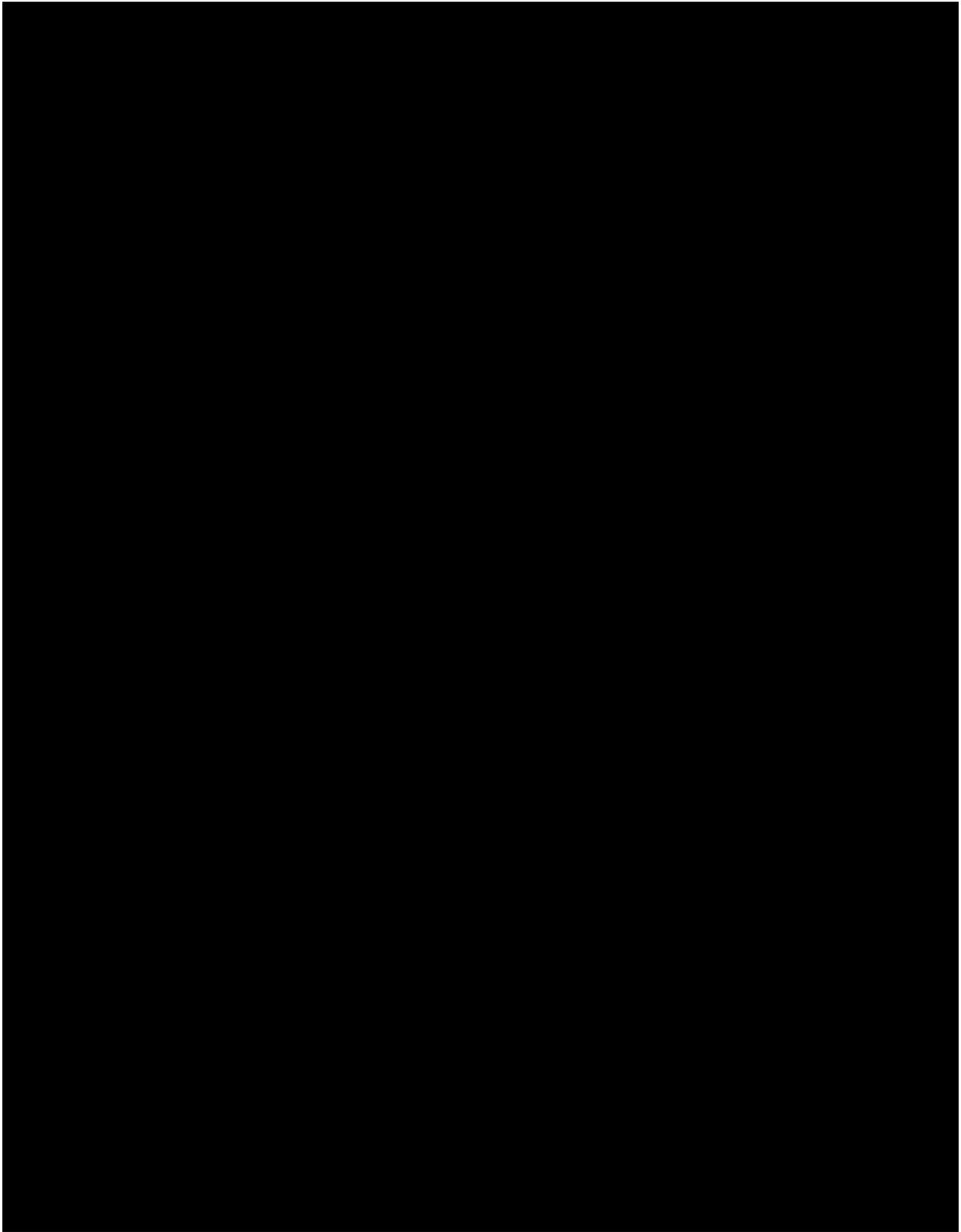


No funds reported a performance fee.

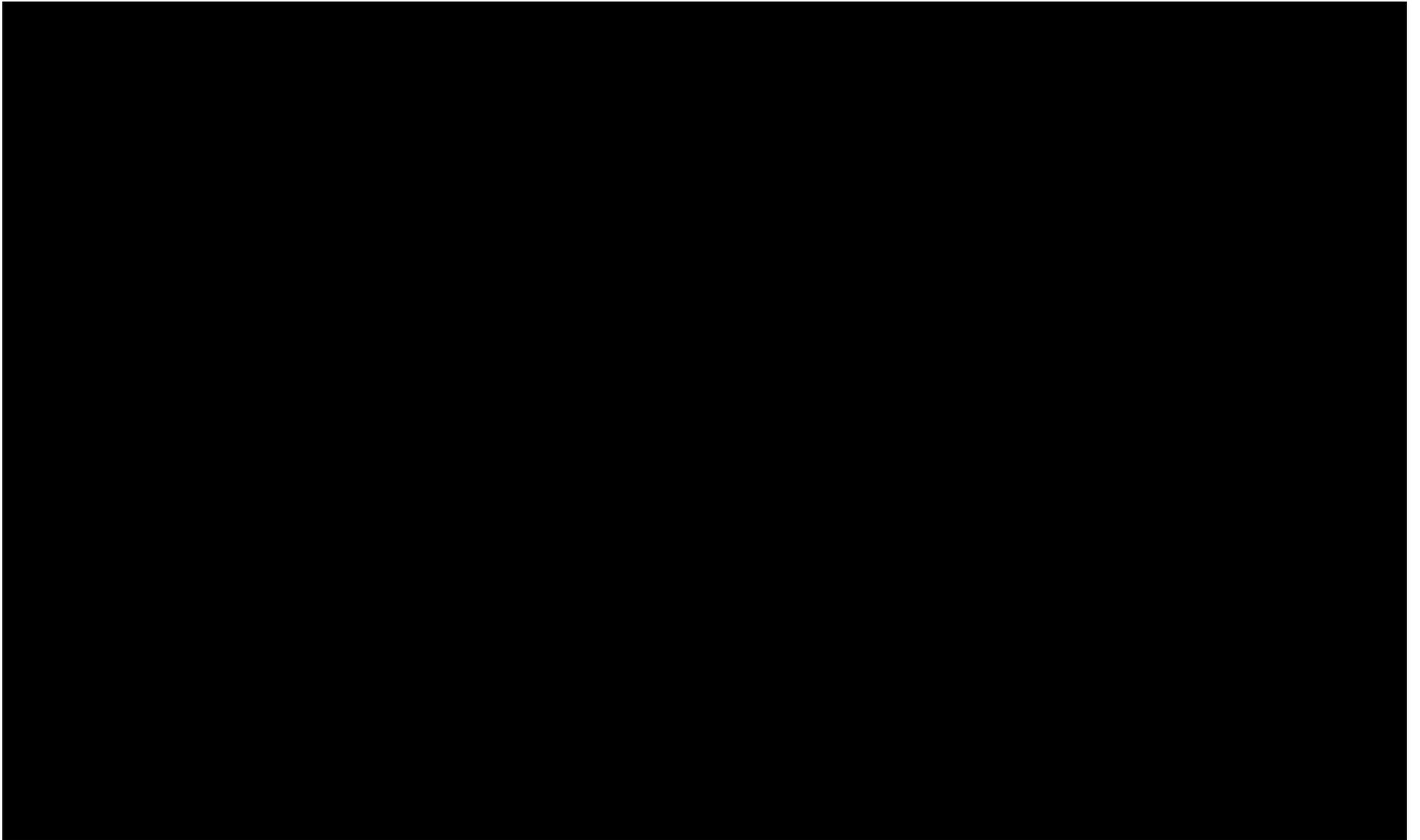


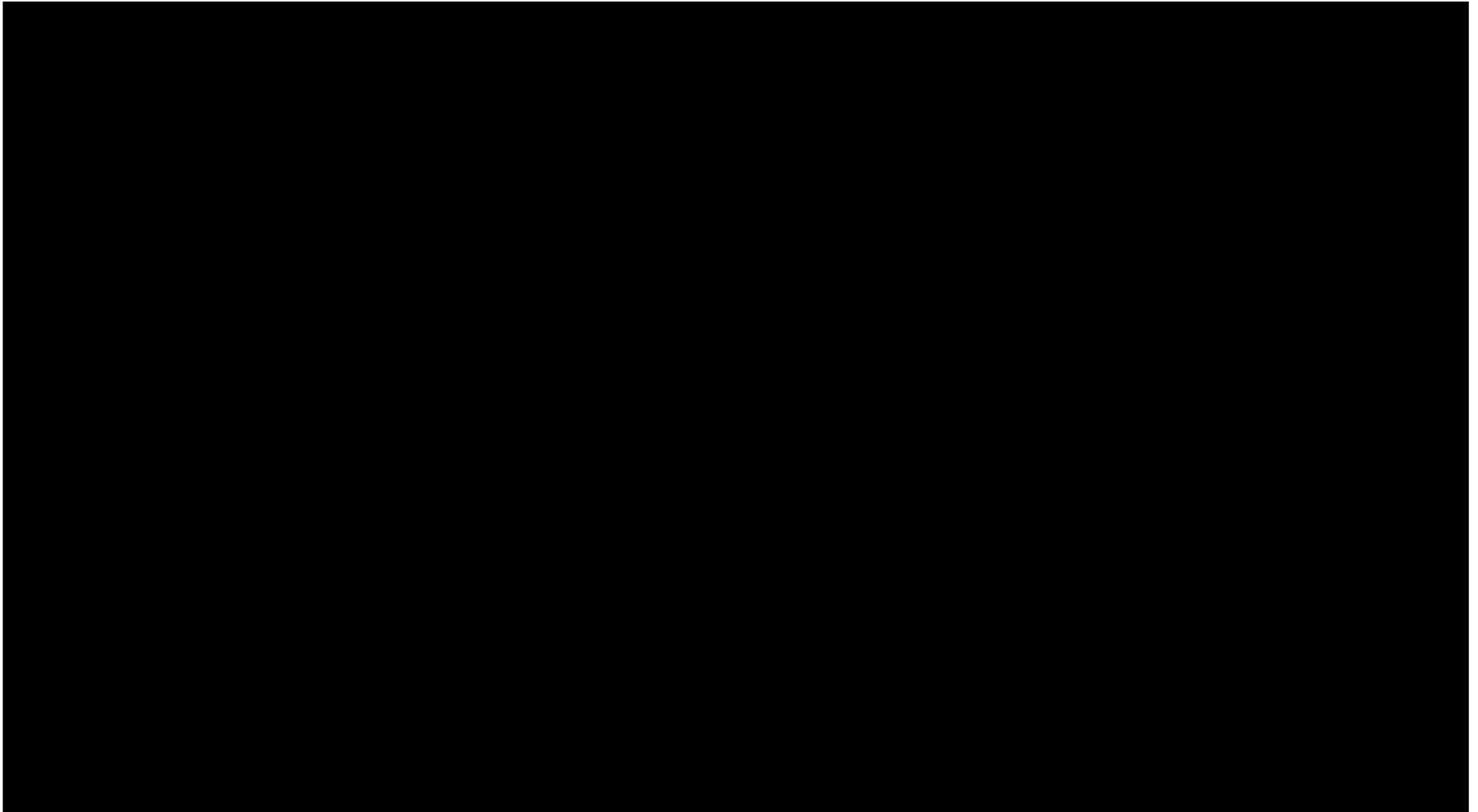


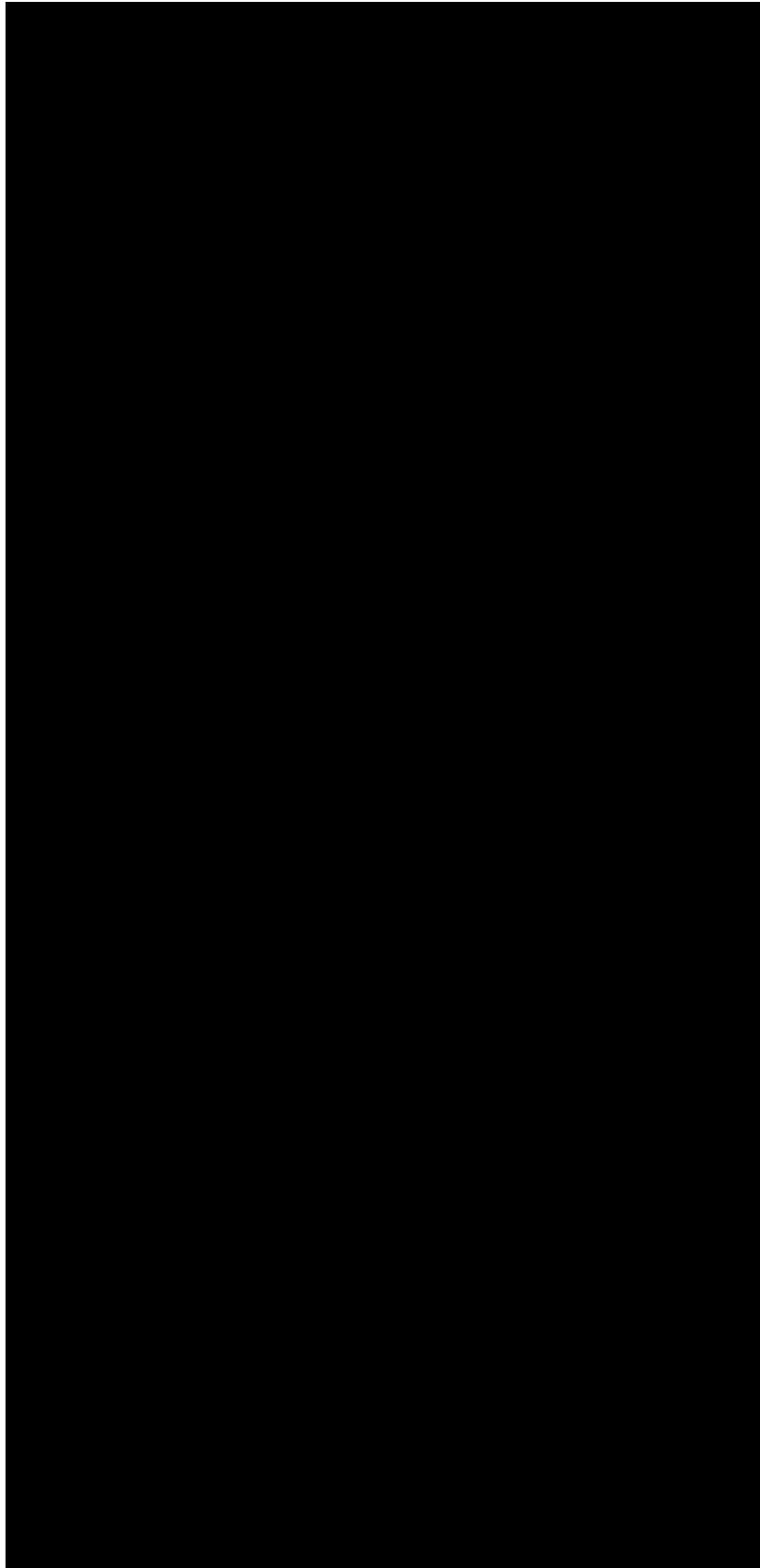


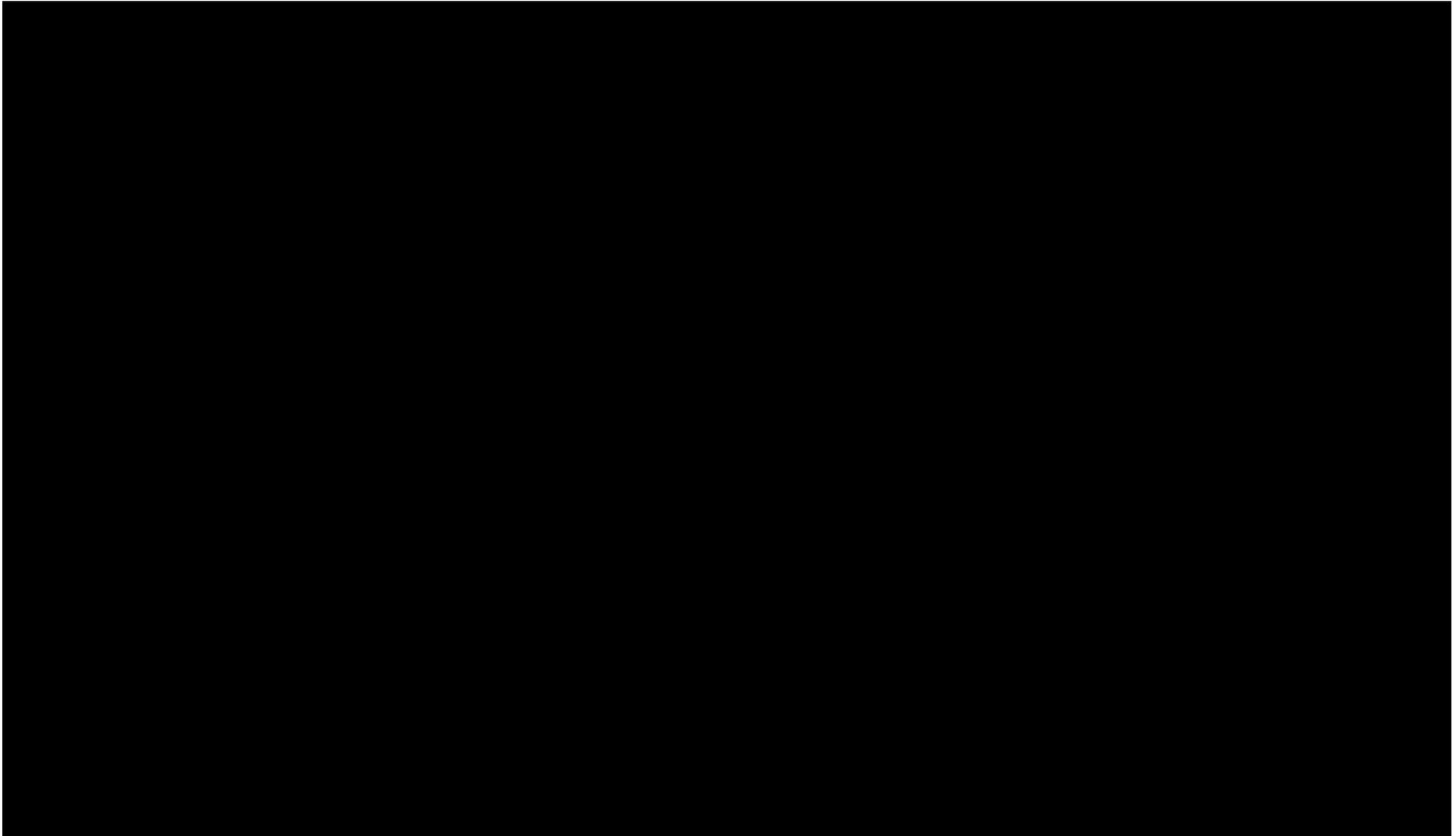


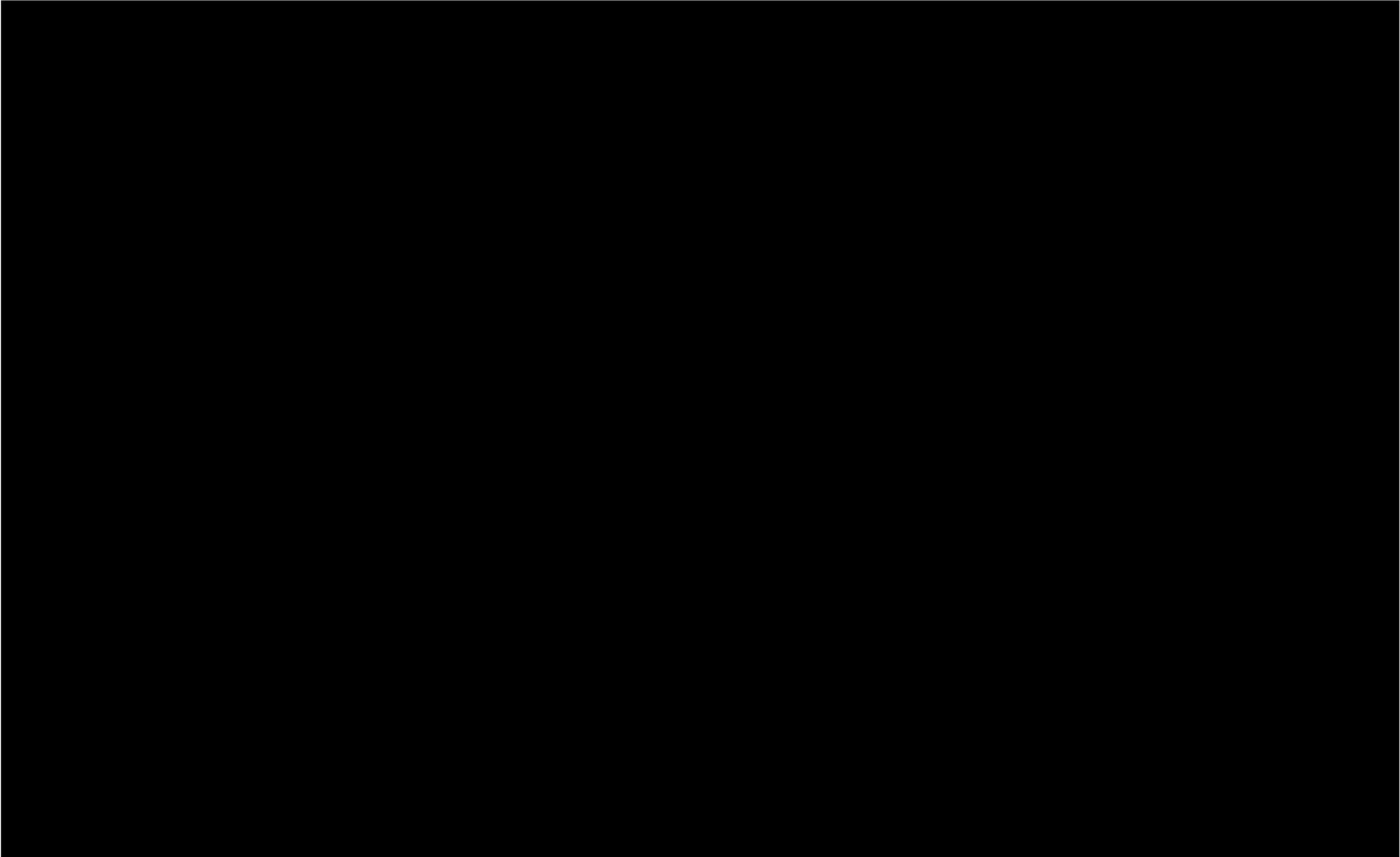


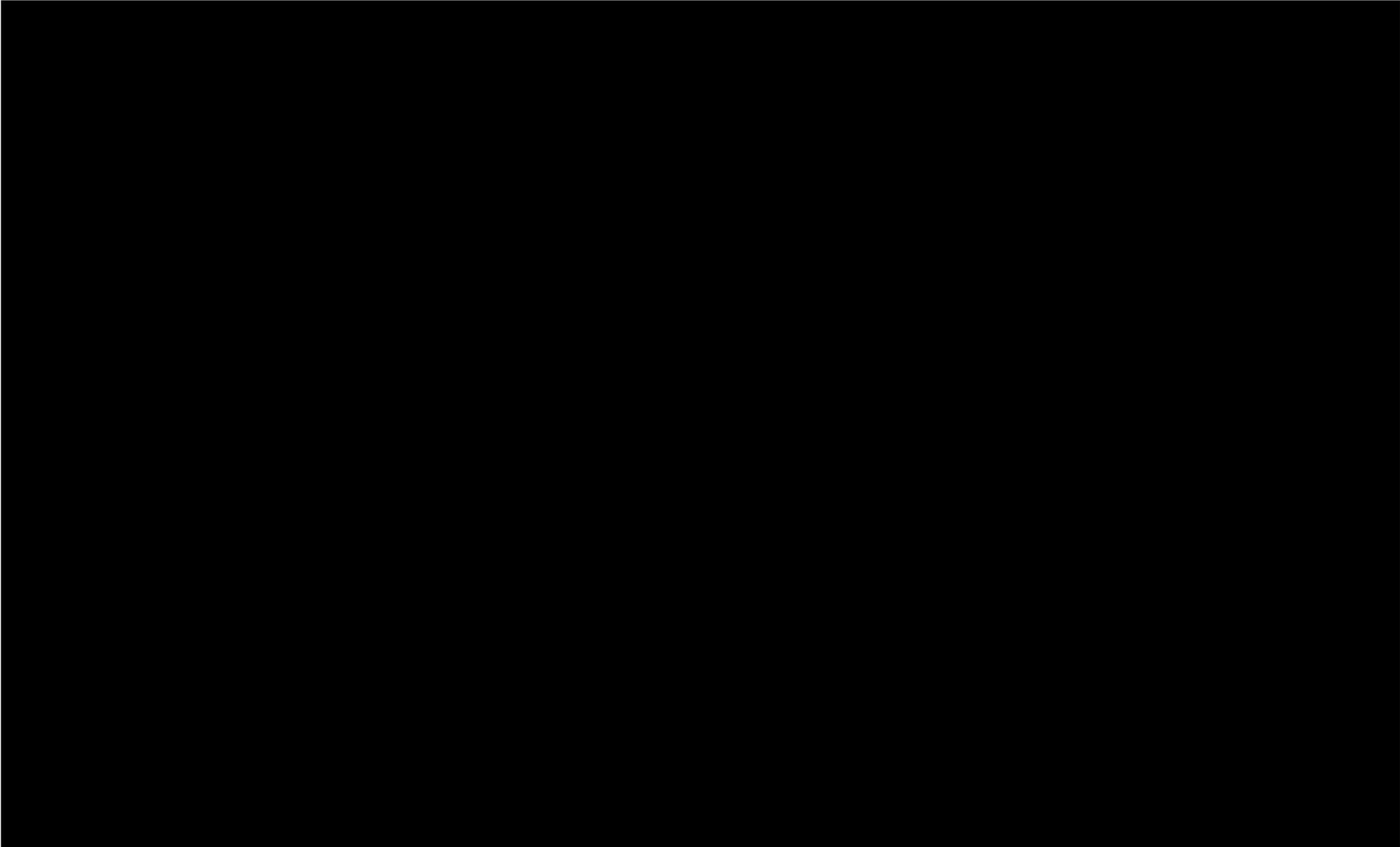


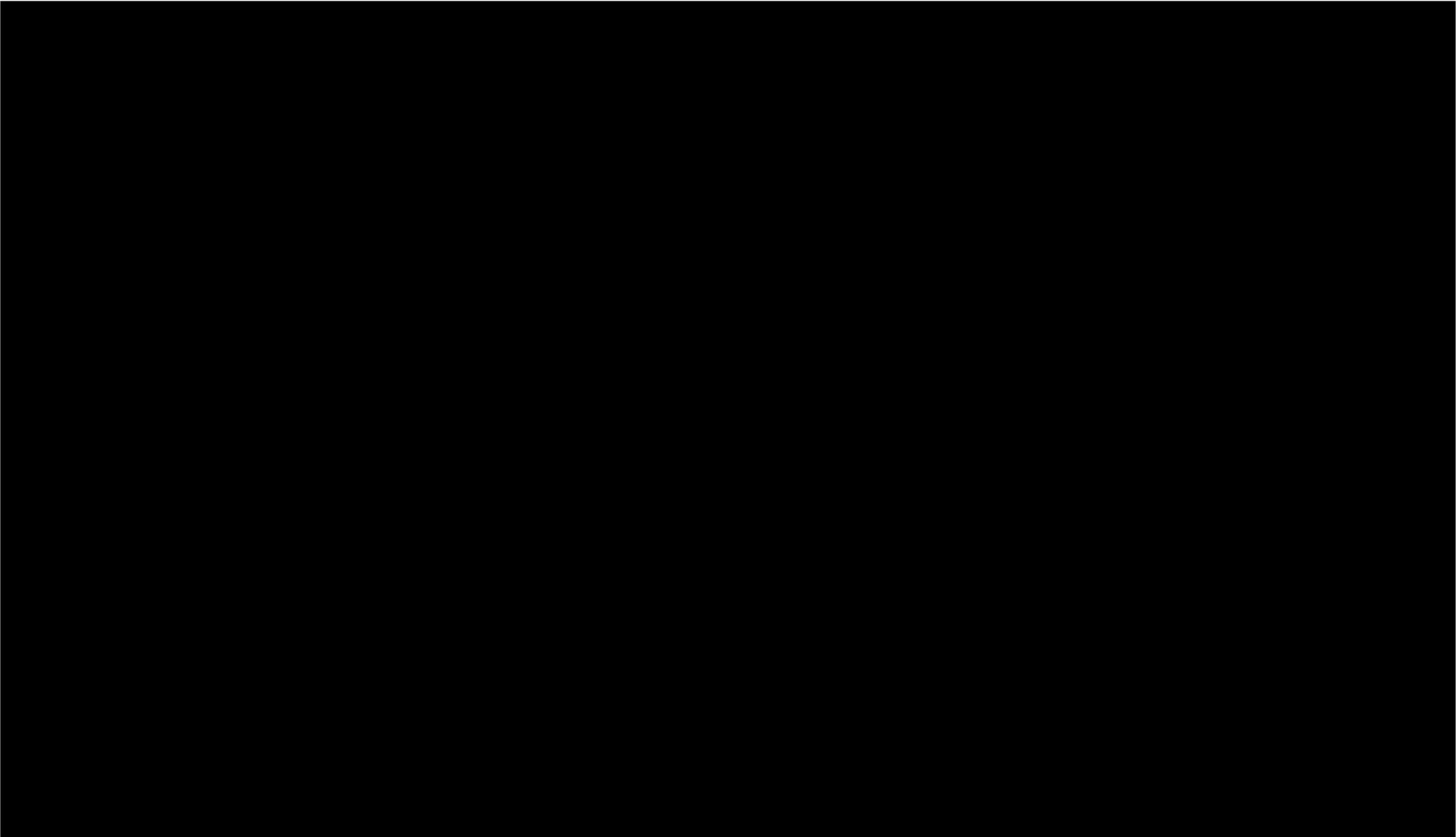


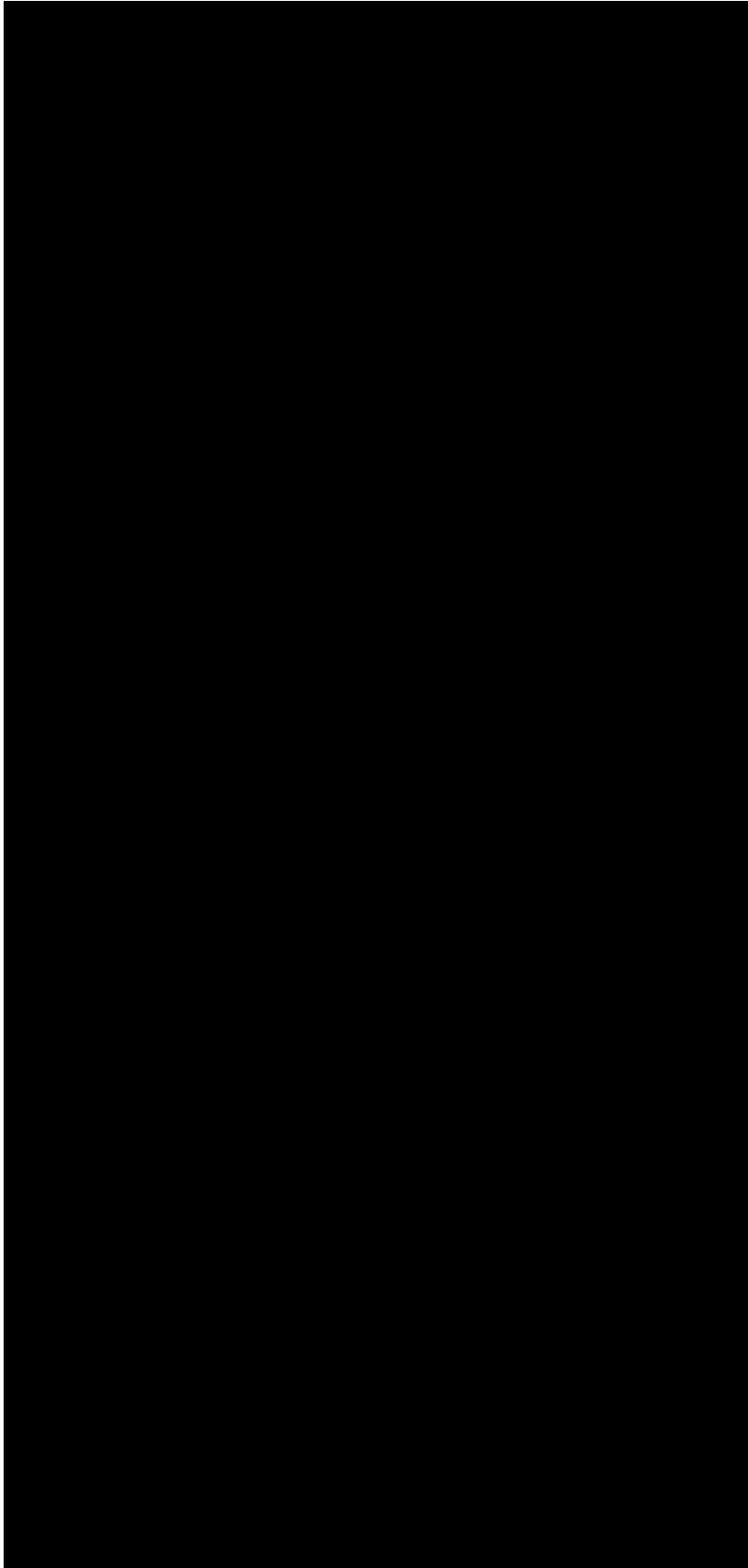


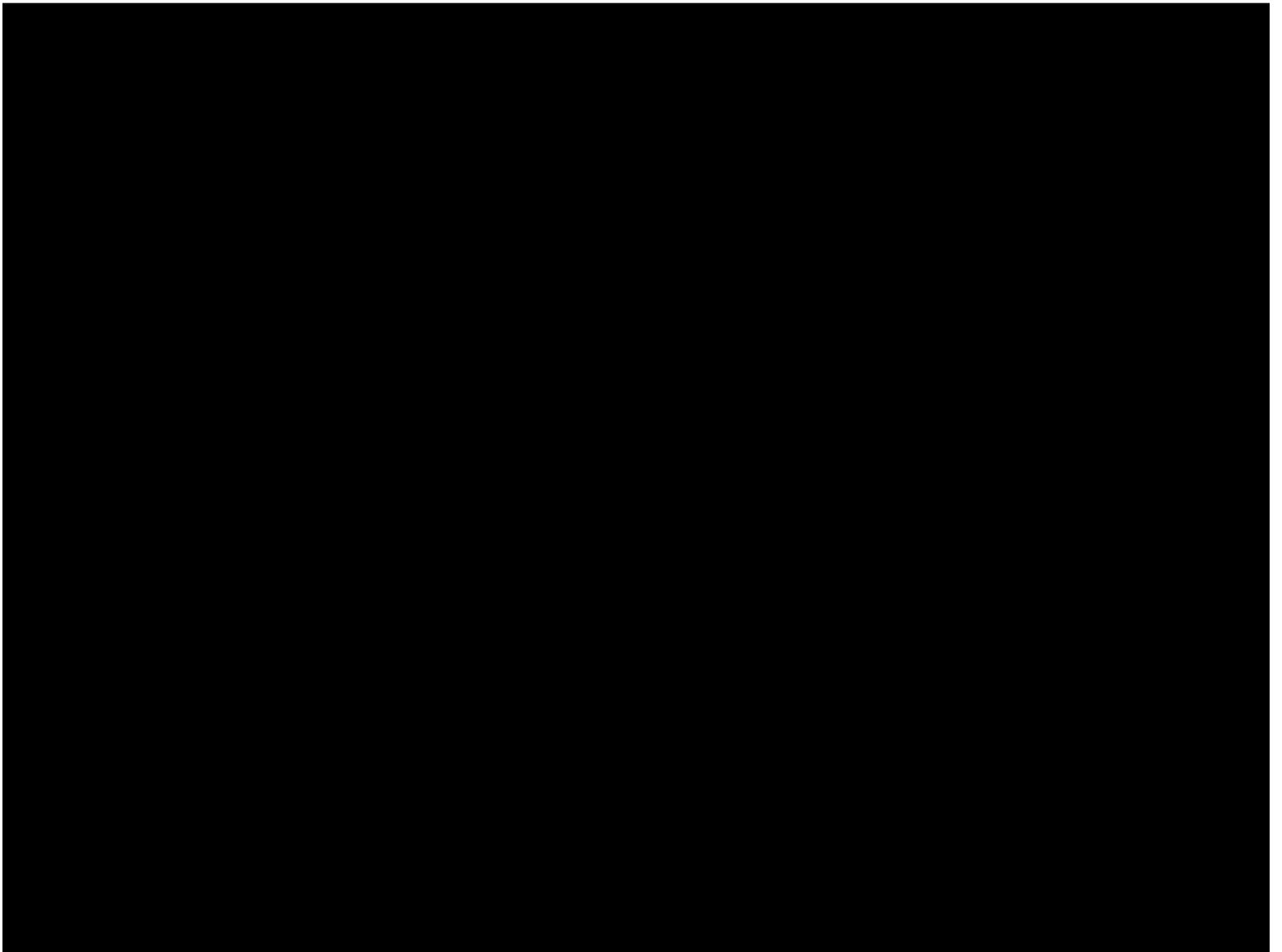


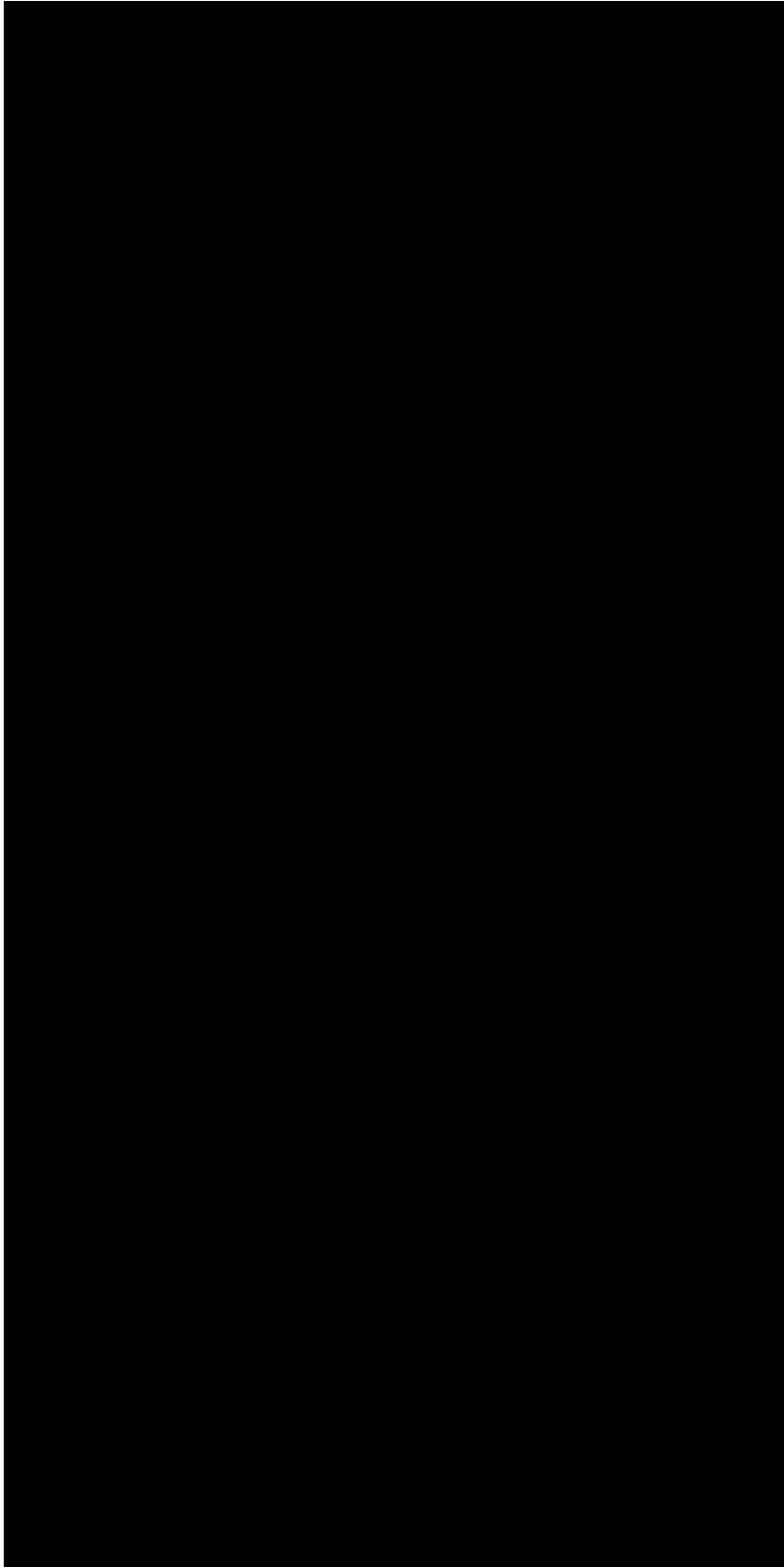


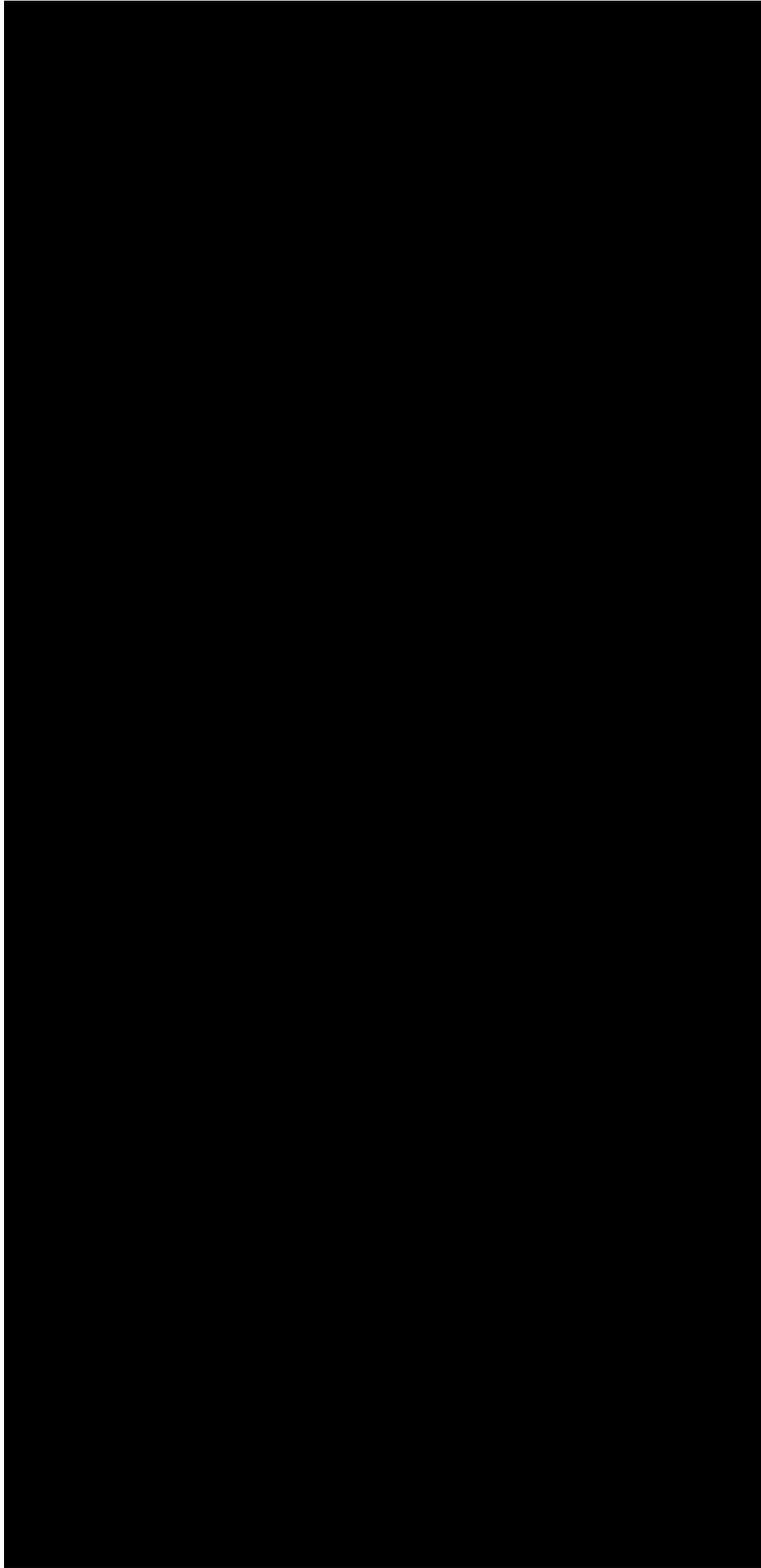




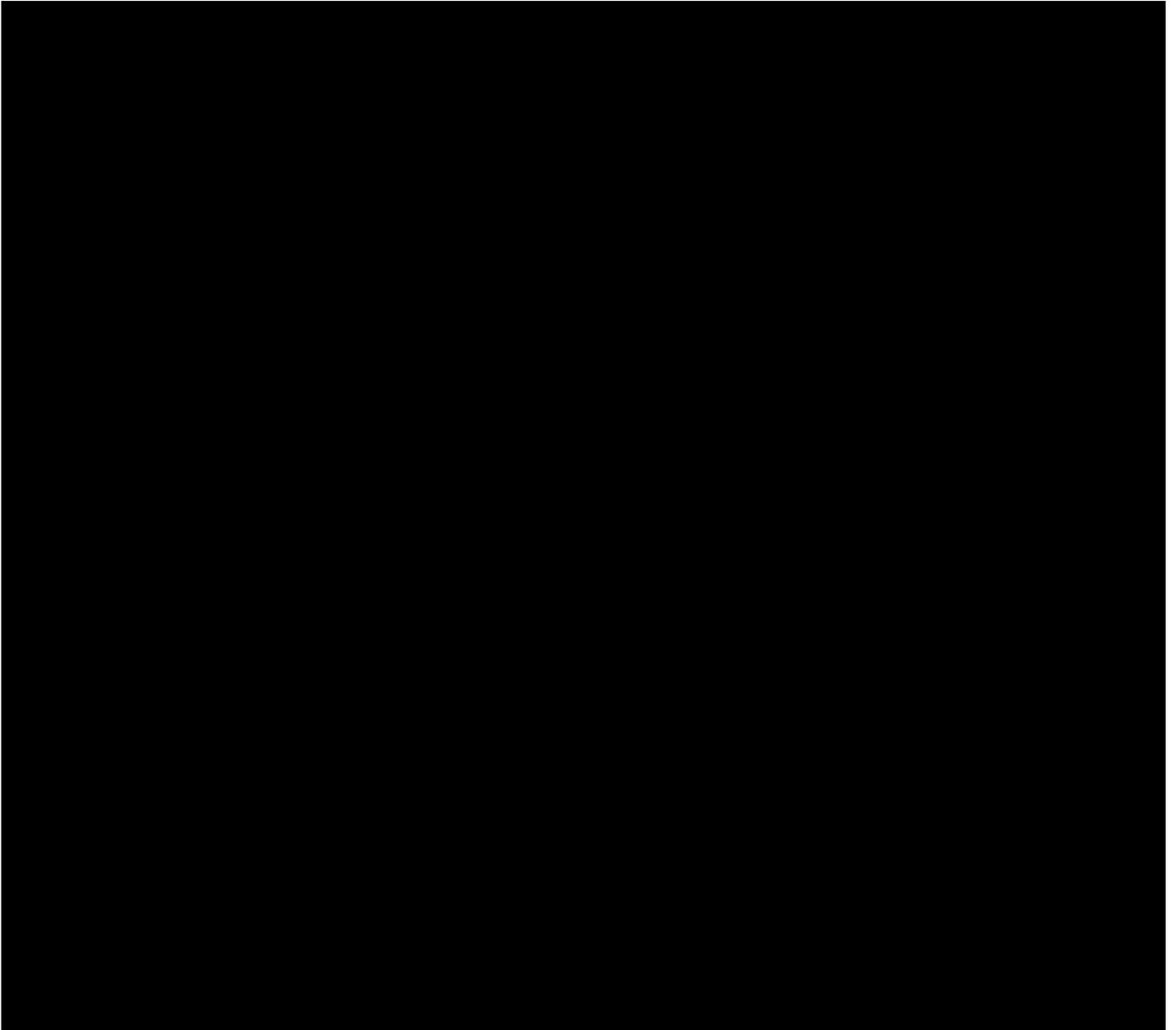


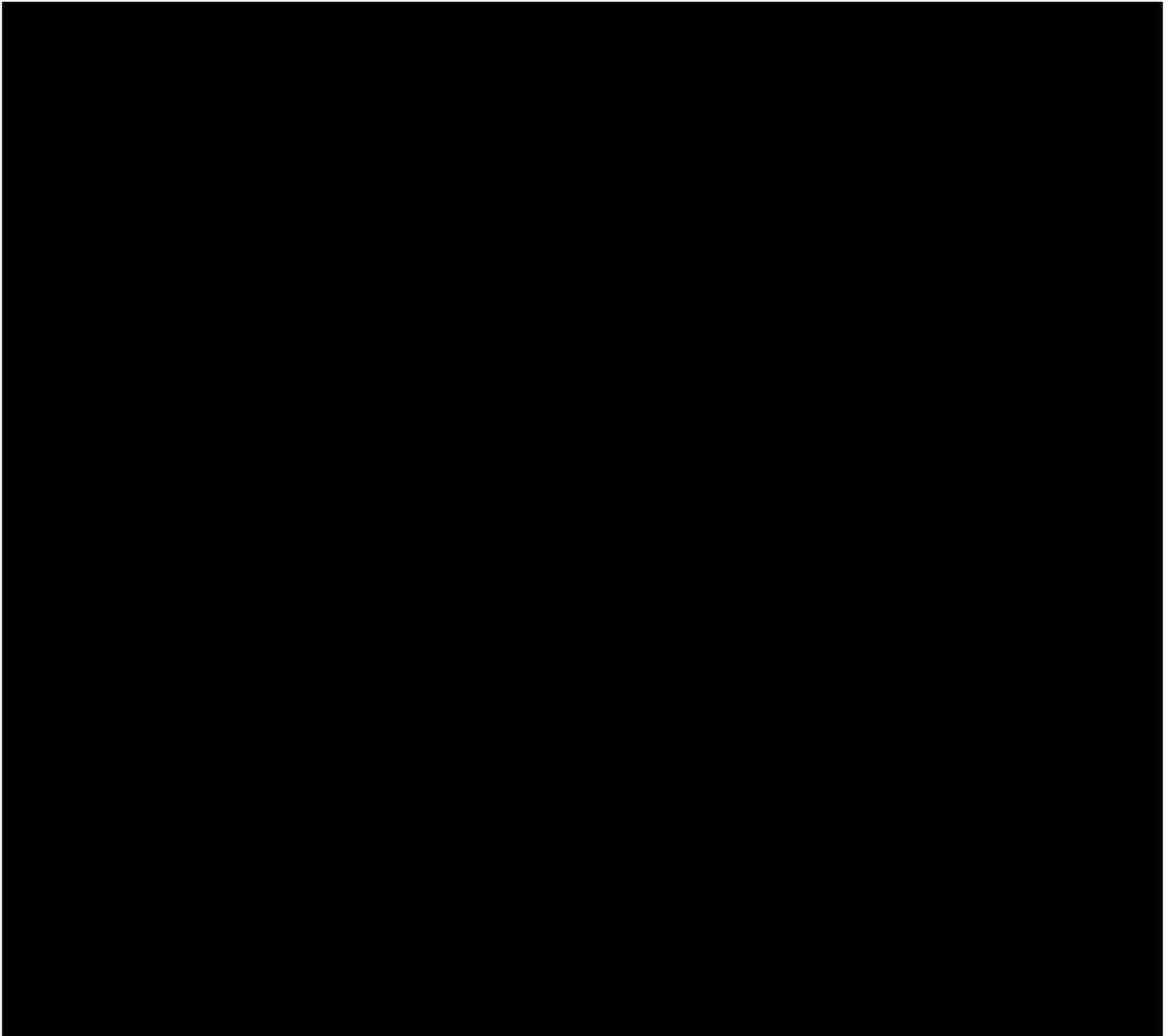












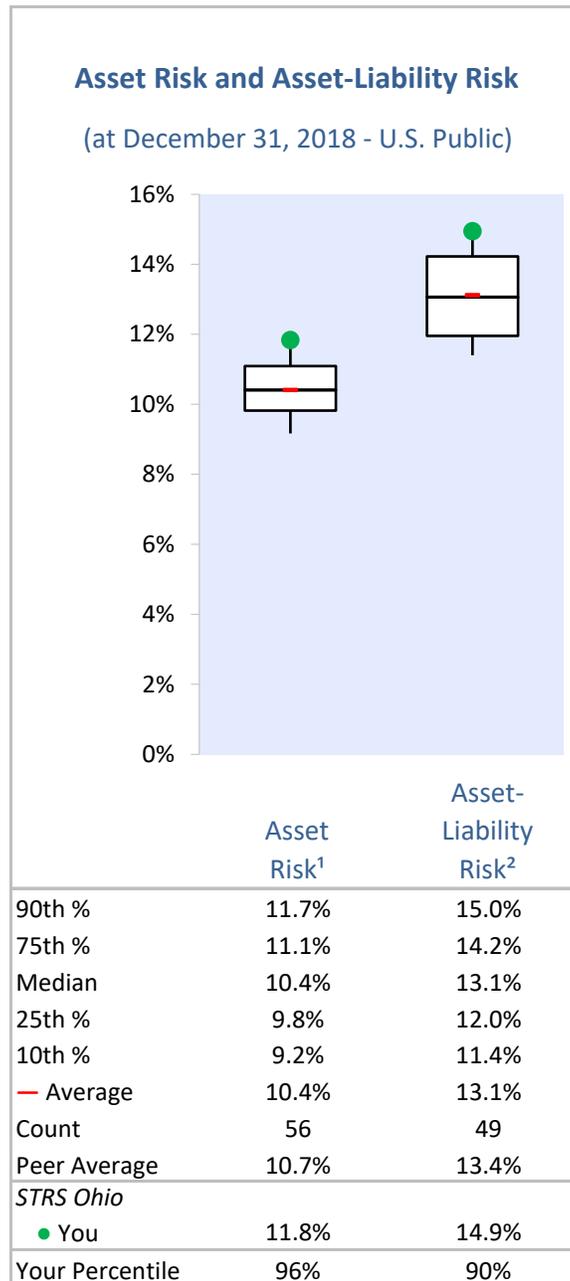


6

Risk

Comparison of your risk levels to the U.S. Public universe	2
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Liability risk	7
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Comparison of your risk levels to the U.S. Public universe



1. Asset risk is the expected volatility of your policy return. It is based on the historical variance of, and covariance between, the asset classes in your asset mix policy. It is expressed as an annual standard deviation.

2. Asset-liability risk is the expected volatility of surplus returns. Surplus returns are the changes in a plan's marked-to-market funded status caused by market factors. Asset liability risk is a function of the volatility of policy returns (asset risk), the volatility of surplus returns (surplus risk) and the correlation between policy returns and surplus returns.

Calculation of asset risk

Before considering the benefit of diversification, the weighted average risk of the asset classes in your asset mix policy was 14.1%.

Calculation of your weighted asset class risk

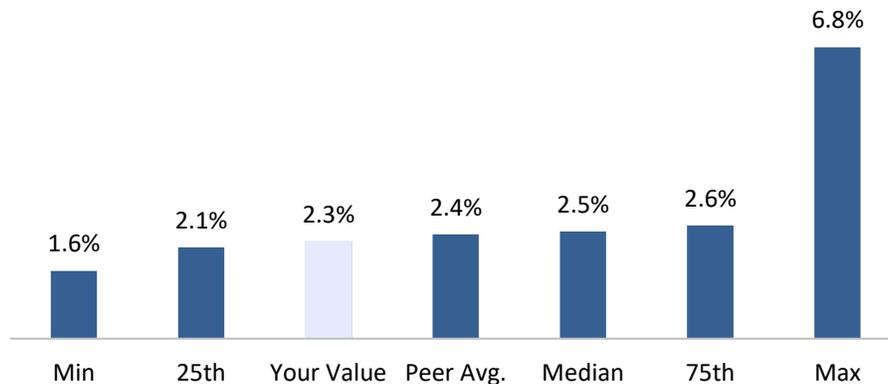
Asset Class	Policy weight (A)	Risk ¹ (B)	Weighted risk (A X B)
Stock: U.S. Large Cap	28.0%	14%	3.9%
Stock: EAFE	19.2%	17%	3.2%
Stock: Emerging	4.8%	22%	1.1%
Bonds: U.S.	21.0%	5%	1.1%
Bonds: Cash	1.0%	1%	0.0%
Real Estate ex-REITs	10.0%	9%	0.9%
LBO	16.0%	24%	3.8%
Weighted Total			14.1%

1. Risk is the standard deviation of returns for the asset class based on standard benchmarks used by CEM.

Reduction in asset risk due to diversification

Your asset risk is less than your weighted asset risk because of the benefit of diversification. Diversification reduces risk because when one asset class has a negative return, it might be offset by another asset class with a positive return. The lower the correlation between your policy asset classes, the greater the diversification benefit. The correlation between your policy asset classes is shown on page 15 of this section.

Diversification benefit: U.S. Public universe



The benefit of diversification equals weighted asset risk minus asset risk.

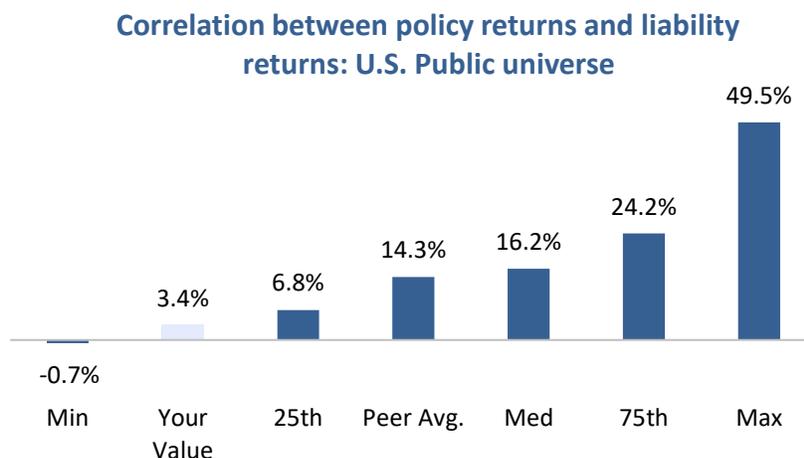
Components of asset risk

	You	Peer median*	Peer average	U.S. Public median*	U.S. Public average
Weighted asset risk	14.1%	13.1%	13.1%	12.8%	12.9%
Benefit of diversification	2.3%	2.6%	2.4%	2.5%	2.5%
Asset risk	11.8%	10.9%	10.7%	10.4%	10.4%

* Comparisons of components of asset risk should be interpreted with caution because it is not always possible to separate the diversification benefit from the weighted asset risk. For example, global stock as an asset class includes the diversification benefit of its geographic components within its asset risk.

Asset-liability risk

Your plan would not have any asset-liability risk if your assets perfectly matched your liabilities. If they matched, then the correlation between asset returns and liability returns would be 100%. If liabilities increased, assets would increase by a like amount (and vice versa). Thus higher correlation between your asset returns and liability returns reduces your asset-liability risk.



In addition to the correlation between asset returns and liability returns, asset-liability risk is also a function of the volatility of asset returns (asset risk) and the volatility of liability returns¹ (liability risk = $\sqrt{R_A^2 + R_L^2 - 2\rho_{AL}R_AR_L}$).

Components of asset-liability risk

	You	Peer median	Peer average	U.S. Public median	U.S. Public average
Asset risk (R_A)	11.8%	10.9%	10.7%	10.4%	10.4%
Liability risk (R_L)	9.5%	9.9%	9.7%	9.7%	9.6%
Correlation between policy returns and liability returns (ρ_{AL})	3.4%	9.8%	14.3%	16.2%	15.9%
Asset-liability risk	14.9%	13.6%	13.4%	13.1%	13.1%

1. Liability returns equal the changes in your marked-to-market liabilities caused by market factors. These are assumed to equal the return on your liability proxy portfolio (see next page).

Liability proxy portfolio

Your liability proxy portfolio is the portfolio of nominal and inflation-indexed bonds that best matches the sensitivity of your liabilities to changes in real and nominal interest rates.

Comparisons of liability proxy portfolio

	Your fund		Peer average		U.S. Public	
	Duration	% of Assets	Duration	% of Assets	Duration	% of Assets
Inflation Indexed Bonds	10.0	24%	11.6	46%	12.2	57%
Nominal Bonds	11.3	76%	13.3	54%	13.2	43%
Total		100%		100%		100%

Your liability proxy portfolio is a tool that:

- Helps you understand how the unsmoothed market value of your liabilities responds to changes in real and nominal interest rates.
- Helps you make better asset mix policy decisions by providing an understanding of which assets will decrease your asset-liability risk (i.e., assets that behave similarly to the neutral asset mix) and which assets will increase your risk.
- Helps you understand how your liabilities are different from your peers. Differences in liabilities mean that the same asset will have different risk / reward characteristics for different funds. For example, the risk of a nominal bond for a fund with 100% inflation sensitivity is much higher than it is for a fund with less than 100% inflation sensitivity.

Asset-liability risk could theoretically be eliminated if your actual asset mix matched the liability proxy portfolio. However, we recognize that this is neither an option nor a goal for most funds because:

- The supply of inflation-indexed assets is limited. These assets are required to match the obligations of pension liabilities.
- This low-risk strategy also has a lower expected return, implying either higher future funding costs or lower future benefits.

The methodology and formula used to determine your liability proxy portfolio are provided on pages 11-13 of this section.

Liability risk

Differences in liability risk are due to differences in inflation sensitivity and member demographics.

A plan's inflation sensitivity depends on:

a) The type of plan

Final and highest average plans have more inflation sensitivity than career average plans. Conversely, career average plans have more inflation sensitivity than flat benefit plans. Your plan type is final average.

Plan type	# of plans	% of Total
Flat Benefit	0	0%
Career Average	0	0%
Final/Highest/Best Avg	51	88%
Other	7	12%
Total	58	100%

b) Contractual inflation protection for retired members

Your retired members get 0% contractual inflation protection. Your retiree inflation protection is subject to a cap of 0%.

Retiree inflation protection	# of plans		
	Corporate	Public	Other
0%	0	27	0
>0% and <50%	0	0	0
50%	0	2	0
>50% and <100%	0	5	0
100%	0	20	0
Total	0	54	0

c) Member demographics

Member demographics impacts both inflation sensitivity and the duration of plan liabilities. The survey asks for your plan's percentage of liabilities that relate to retired members from your actuarial reports. If you did not provide this number, then it is estimated (see page 12 of this section). Your percentage of liabilities that relate to retired members was 72%.

	Your fund	Peer Average	U.S. Public Average
Active Members	55%	58%	55%
Retired Members	45%	42%	45%
Total	100%	100%	100%

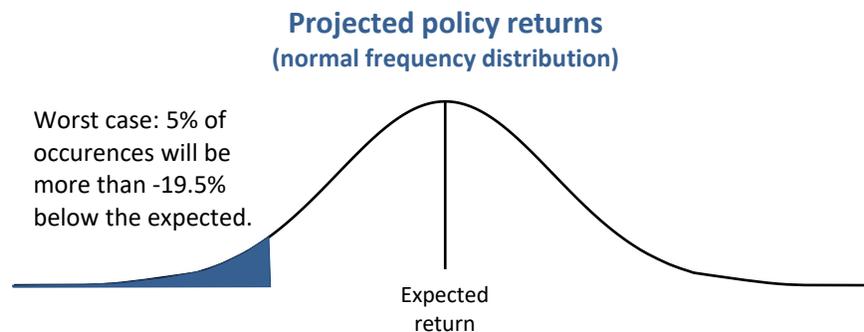
Projected worst case scenarios

We can convert your asset risk and asset-liability risk into worst case outcomes for policy returns and funded status if we make the following simplifying assumptions:

- Returns are normally distributed.
- Historic return volatility and correlations will continue in the future.
- No change in your policy asset mix or liabilities.

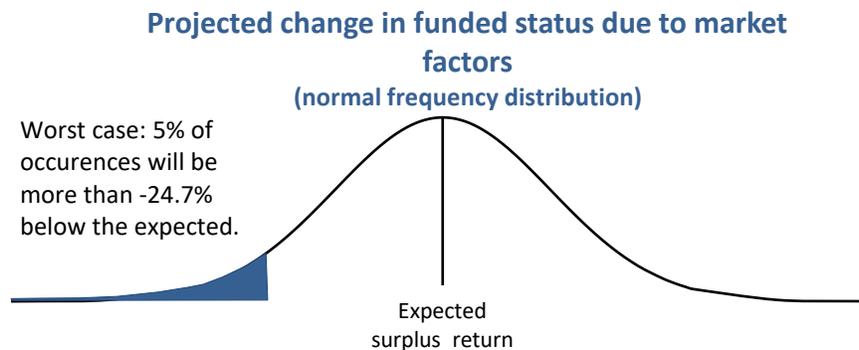
a) Worst case policy returns

Every year there is a 5% probability that your policy return will be worse than your expected policy return by more than -19.5% (-19.5% equals -1.65 X your asset risk of 11.8%). -19.5% is the starting point of worst case outcomes. They could be much worse.



b) Worst case impact on funded status

Every year, there is a 5% probability that changes in your mark-to-market funded status caused by market factors ("Surplus Returns") will be worse than expected by more than -24.7%. (-24.7% equals -1.65 X your asset-liability risk of 14.9%). -24.7% is the starting point of worst case outcomes. They could be much worse.



Historic worst case scenarios during the past 5 years

a) Historic worst case policy returns

During the past 5 years, your lowest policy return was -2.0% in 2018.

Historic policy returns - U.S. Public universe

	2018	2017	2016	2015	2014
90th %	0.3%	16.7%	9.3%	1.7%	8.3%
75th %	-1.8%	15.9%	8.5%	0.9%	7.4%
Median	-2.6%	15.2%	7.6%	-0.1%	6.5%
25th %	-3.4%	14.1%	6.9%	-0.8%	5.6%
10th %	-5.1%	13.2%	6.6%	-1.8%	4.9%
Average	-2.5%	15.0%	7.7%	0.0%	6.6%
Count	56	60	59	64	68
Peer Avg	-1.2%	14.8%	7.7%	0.7%	7.1%
Your Value	-2.0%	15.4%	8.0%	1.7%	8.3%

b) Historic worst case changes in funded status

During the past 5 years, your worst change in marked-to-market funded status caused by market factors ("Surplus Returns") was -6.1% in 2014.

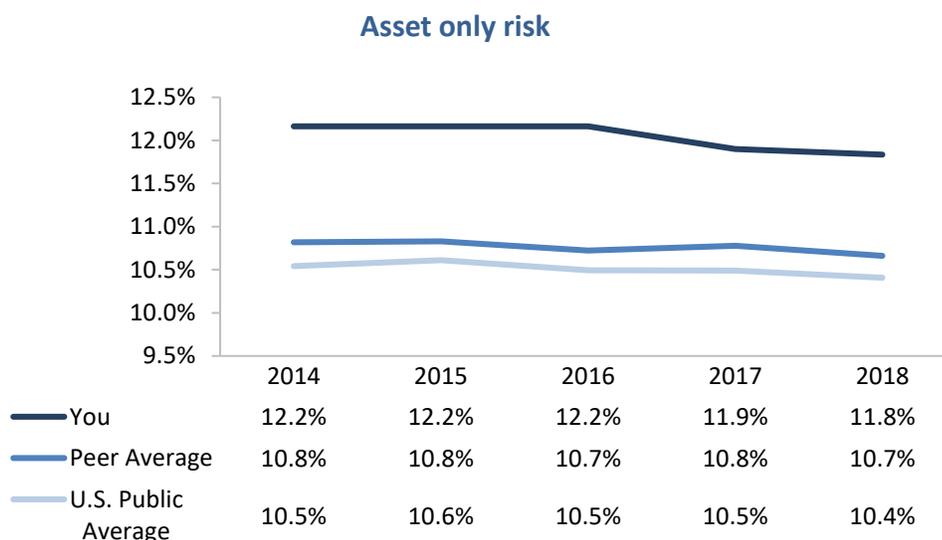
Historic changes in funded status caused by market factors - U.S. Public universe

	2018	2017	2016	2015	2014
90th %	2.9%	8.7%	4.9%	4.6%	-5.0%
75th %	0.9%	8.0%	4.4%	3.5%	-6.2%
Median	-0.2%	6.7%	2.8%	2.1%	-8.0%
25th %	-1.9%	5.1%	1.4%	0.8%	-9.8%
10th %	-3.5%	3.1%	0.1%	-0.5%	-11.3%
Average	-0.4%	6.4%	2.8%	2.1%	-8.1%
Count	50	54	55	59	63
Peer Avg	0.8%	6.2%	3.2%	2.6%	-7.3%
Your Value	-1.0%	6.7%	5.1%	1.8%	-6.1%

Risk Trends - 2014 to 2018

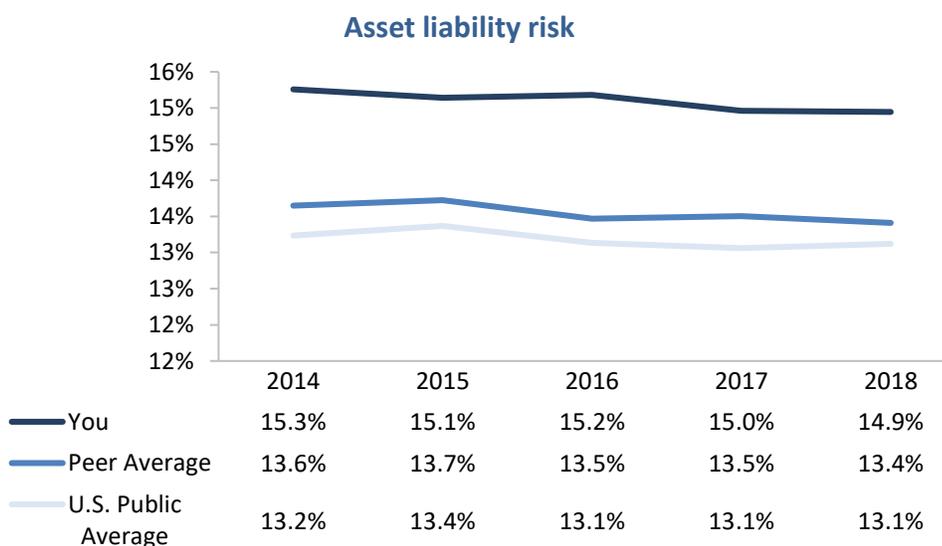
a) Asset risk trends

Asset risk will only change if policy asset mix changes. Between 2014 and 2018 the asset risk for your fund decreased from 12.2% to 11.8%.



b) Asset-liability risk trends

Asset-liability risk will change if policy asset mix changes, or if the nature of your liabilities changes. Between 2014 and 2018 the asset-liability risk for your fund decreased from 15.3% to 14.9%.



[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED] determine your liabilities' inflation sensitivity. The degree of total inflation sensitivity determines the proportion of inflation-indexed bonds versus nominal bonds that belong in your liability proxy portfolio.

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

Appendix B - Methodology used to calculate asset and asset-liability risk

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

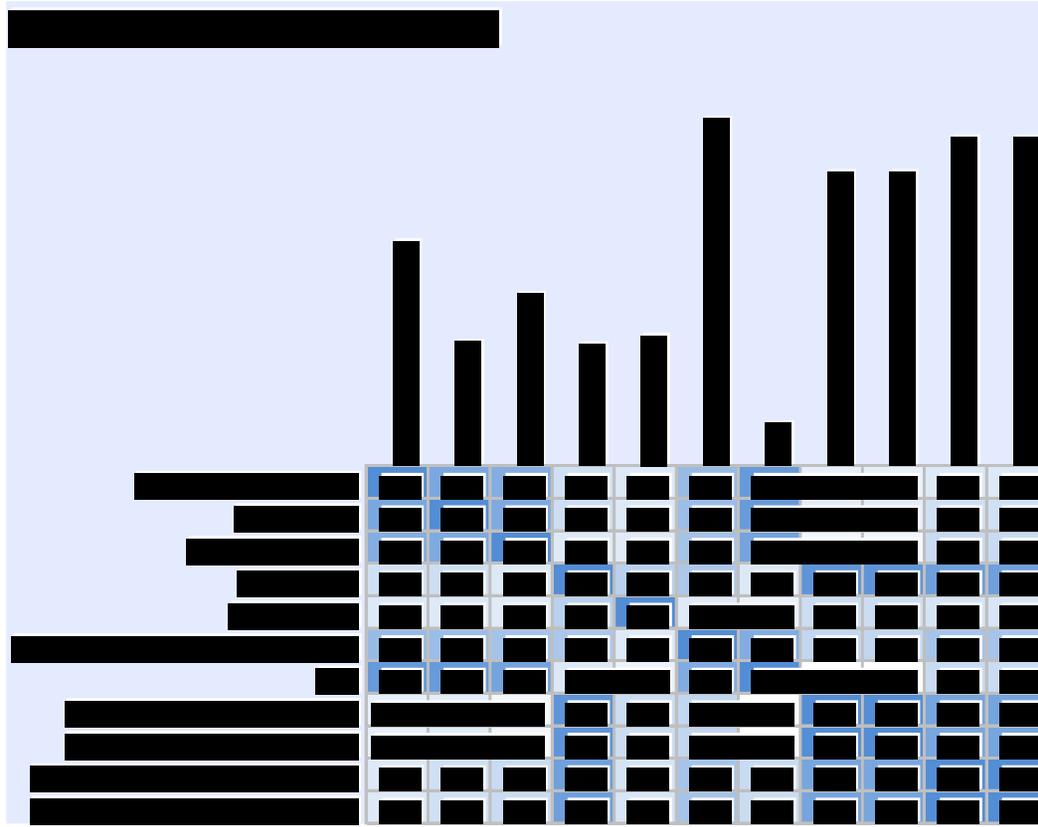
[REDACTED]

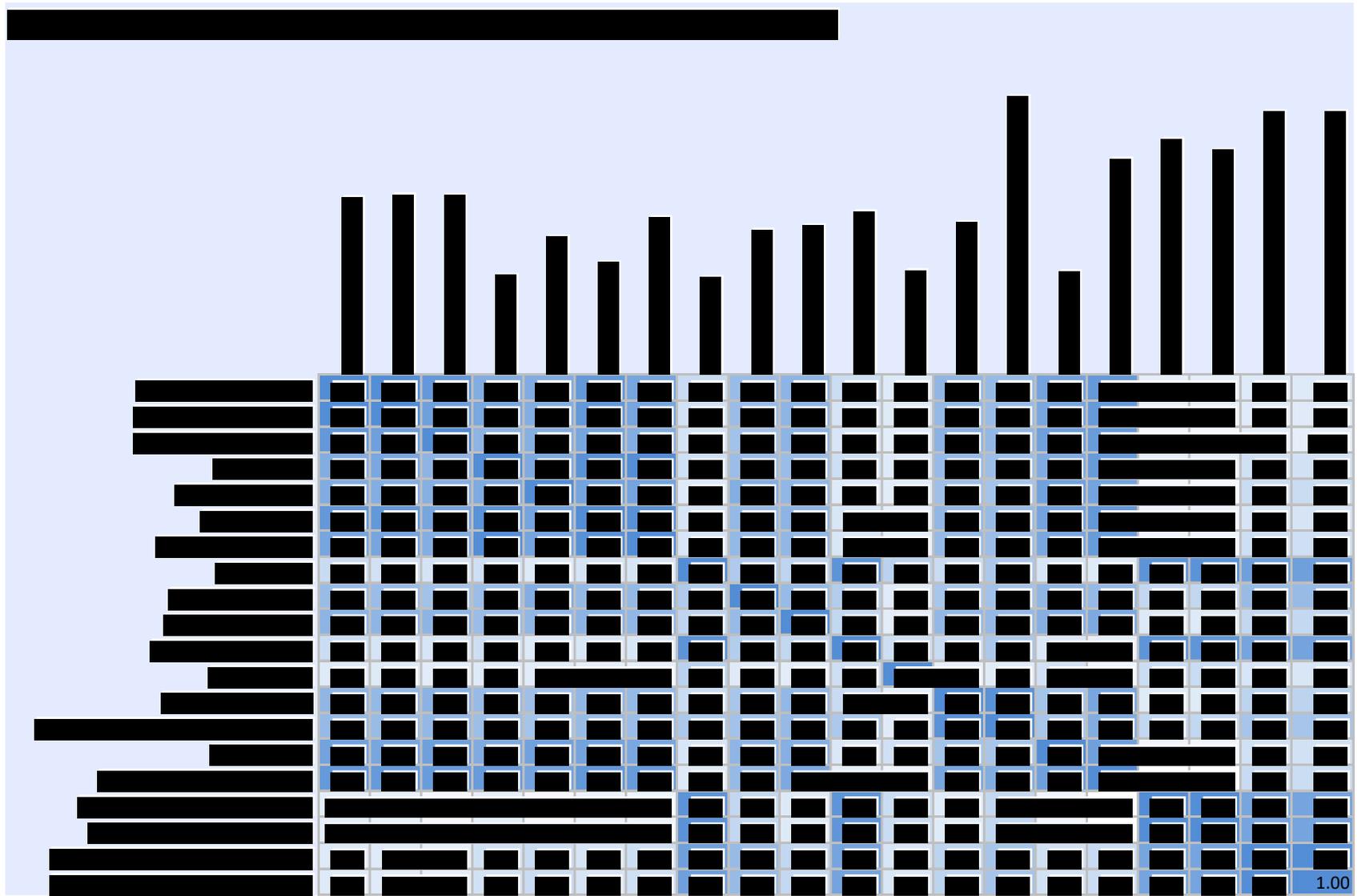
[REDACTED]

[REDACTED] the total weight divided proportionately between them.

[REDACTED]

[REDACTED]





7

Appendices

Appendix A - Data Summary

Appendix A2 - Enhanced survey data & mapping to regular survey

Appendix B - Data quality

Appendix C - Glossary of terms

Appendix A - Data Summary

STRS Ohio

Plan Info	2018	2017	2016	2015	2014
Contact	Lynn Hoover				
Type of fund (corporate, public, other)	Public	Public	Public	Public	Public
Total fund size (mils) as at December 31	72,888.7	78,304.0	71,661.0	70,756.0	73,655.0
Asset-class level holdings provided on survey are: year end or average?	Year End				
Total return for year ended	-1.89%	15.76%	8.03%	2.33%	7.83%
Is the return net or gross?	Net of all investment costs				
Total fund policy or benchmark return	-2.04%	15.35%	8.00%	1.71%	8.26%

Ancillary Data	2018	2017	2016	2015	2014
What is your hedging policy for: Foreign Holdings	50%	50%	50%	50%	50%
What were your actuarial fees in 000s?	219	513	266	247	244
How many plan members/beneficiaries do you have:					
Active?	192,365	193,141	195,440	189,731	194,451
Active (no-accrual)?	138,075	139,533	135,738	135,215	134,844
Retired?	157,422	158,039	157,938	158,116	152,208
Other?	18,416	18,403	17,627	17,453	17,036
What type of plan(s) do you have?	Final Average				
To what extent are your retired members' benefits indexed to inflation?					
Contractual %	0%	0%	0%	0%	0%
If the indexation is subject to a cap, describe the cap	0%	0%	2% per year,	2% per year,	2% per year,
What % of the plan's liabilities pertain to retired members?	72%	73%	74%	75%	72%
Actuarial valuation assumptions for funding purposes:					
Liability discount rate	7.5%	7.5%	7.8%	7.8%	7.8%
Salary progression rate	3.0%	3.0%	3.5%	3.5%	3.5%
What was your actuarial assumption for expected rate of return?	7.5%	7.5%	7.8%	7.8%	7.8%

Appendix A - Data Summary: Policy Weights and Benchmarks
STRS Ohio

Asset Class	Year	Policy Weight	Benchmark	
			Description	Return
Stock - U.S. Large Cap	2018	28.0	Russell 1000 (Russell 3000 for total Dom Equity)	-5.2
	2017	30.0	Russell 1000 (Russell 3000 for total Dom Equity)	21.1
	2016	31.0	Russell 1000 (Russell 3000 for total Dom Equity)	12.7
	2015	31.0	Russell 1000 (Russell 3000 for total Dom Equity)	0.5
	2014	31.0	Russell 1000 (Russell 3000 for total Dom Equity)	12.6
Stock - U.S. Small Cap	2018		Russell 2000	-11.0
	2017		Russell 2000	14.7
	2016		Russell 2000	21.3
	2015		Russell 2000	-4.4
	2014		Russell 2000	4.9
Stock - EAFE	2018	19.2	MSCI World xUS 50% Hedged Net	-11.5
	2017	20.0	MSCI World xUS 50% Hedged Net	20.1
	2016	20.8	MSCI World xUS 50% Hedged Net	5.0
	2015	20.8	MSCI World xUS 50% Hedged Net	0.4
	2014	20.8	MSCI World xUS 50% Hedged Net	0.8
Stock - Emerging	2018	4.8	MSCI Emerging Market net	-14.6
	2017	5.0	MSCI Emerging Market Net	37.3
	2016	5.2	MSCI Emerging Market net	11.2
	2015	5.2	MSCI Emerging Market net	-14.9
	2014	5.2	MSCI Emerging Market Net	-2.2
Stock - ACWI x U.S.	2018		International Blended Benchmark	-12.1
	2017		International Blended Benchmark	23.4
	2016		International Blended Benchmark	6.4
	2015		International Blended Benchmark	-2.8
	2014		International Blended Benchmark	0.2
Stock - Global	2018		MSCI ACWI net	-9.4
	2017		MSCI ACWI net	24.6
	2016		MSCI ACWI net	7.9
	2015		MSCI ACWI net	-2.4
	2014		MSCI ACWI Net	4.2
Fixed Income - U.S.	2018	21.0	Fixed Income Blended (Jul 1 2017)	0.1
	2017	20.0	Fixed Income Blended (Jul 1 2017)	3.9
	2016	18.0	Barclays Universal for total FI (Barclays Aggregate Index not appropriate for US FI segment)	3.9
	2015	18.0	Barclays Universal for total FI (Barclays Aggregate Index not appropriate for US FI segment)	0.4
	2014	18.0	Barclays Universal for total FI (Barclays Aggregate Index not appropriate for US FI segment)	5.6
Fixed Income - Emerging	2018		Barclays Emerging Market	-2.5
	2017		Barclays Emerging Market	8.2
	2016		Barclays Emerging Market	9.9
	2015		Barclays Emerging Market	1.3
	2014		Barclays Emerging Market	4.8
Fixed Income - High Yield	2018		Barclays US Corp High Yield	-2.1
	2017		Barclays US Corp High Yield	7.5
	2016		Barclays US Corp High Yield	17.1
	2015		Barclays US Corp High Yield	-4.5
	2014		Barclays US Corp High Yield	2.5
Cash	2018	1.0	US 90 day T bill	1.9
	2017	1.0	US 90 day T bill	0.9
	2016	1.0	US 90 day T bill	0.3
	2015	1.0	US 90 day T bill	0.1
	2014	1.0	US 90 day T bill	0.0
Global TAA	2018		Custom (Alternative Investment Actual Return)	11.8
	2017		Custom (Alternative Investment Actual Return)	12.2
	2016		Custom (Alternative Investment Actual Return)	5.3
	2015		Custom (Alternative Investment Actual Return)	6.1
	2014		Custom (Alternative Investment Actual Return)	6.1
Hedge Funds	2018		Custom (Alternative Investment Actual Return)	11.8
	2017		Custom (Alternative Investment Actual Return)	12.2
	2016		Custom (Alternative Investment Actual Return)	5.3
	2015		Custom (Alternative Investment Actual Return)	6.1
	2014		Custom (Alternative Investment Actual Return)	13.5
REITs	2018		Your REIT benchmark	-4.6
	2017	1.5	Your REIT benchmark	5.2
	2016	1.5	Your REIT benchmark	8.5
	2015	1.5	Your REIT benchmark	3.2
	2014	1.5	Your REIT benchmark	30.1
Infrastructure	2018		Custom (Alternative Investment Actual Return)	11.8
	2017		Custom (Alternative Investment Actual Return)	12.2
	2016		Custom (Alternative Investment Actual Return)	5.3
	2015		Custom (Alternative Investment Actual Return)	6.1
	2014		Custom (Alternative Investment Actual Return)	13.5
Real Estate ex-REITs	2018	10.0	NCREIF NPI	6.7
	2017	8.5	NCREIF NPI	7.0
	2016	8.5	NCREIF NPI	8.0
	2015	8.5	NCREIF NPI	13.3
	2014	8.5	NCREIF NPI	11.8
Natural Resources	2018		Custom (Alternative Investment Actual Return)	11.8
	2017		Custom (Alternative Investment Actual Return)	12.2
	2016		Custom (Alternative Investment Actual Return)	5.3
	2015		Custom (Alternative Investment Actual Return)	6.1
	2014		Custom (Alternative Investment Actual Return)	13.5
Private Credit	2018		Custom (Alternative Investment Actual Return)	11.8
	2017		Custom (Alternative Investment Actual Return)	12.2
	2016			
	2015			
	2014			
Diversified Private	2018		Custom (Alternative Investment Actual Return)	11.8
	2017		Custom (Alternative Investment Actual Return)	12.2
	2016		Custom (Alternative Investment Actual Return)	5.3
	2015		Custom (Alternative Investment Actual Return)	6.1
	2014	14.0	Custom (Alternative Investment Actual Return)	13.5
LBO	2018	16.0	Custom (Alternative Investment Actual Return)	11.8
	2017	14.0	Custom (Alternative Investment Actual Return)	12.2
	2016	14.0	Custom (Alternative Investment Actual Return)	5.3
	2015	14.0	Custom (Alternative Investment Actual Return)	6.1
	2014			
Venture Capital	2018		Custom (Alternative Investment Actual Return)	11.8
	2017		Custom (Alternative Investment Actual Return)	12.2
	2016		Custom (Alternative Investment Actual Return)	5.3
	2015		Custom (Alternative Investment Actual Return)	6.1
	2014		Custom (Alternative Investment Actual Return)	13.5
Other Private Equity	2018		Custom (Alternative Investment Actual Return)	11.8
	2017		Custom (Alternative Investment Actual Return)	12.2
	2016		Custom (Alternative Investment Actual Return)	5.3
	2015		Custom (Alternative Investment Actual Return)	6.1
	2014		Custom (Alternative Investment Actual Return)	13.5

Appendix A Data Summary - Assets, Returns and Costs: Public Market

STRS Ohio

(Default costs are highlighted with blue shading. See page 7 for more details)

Asset Class	Year	Asset (\$millions)	Return %	Cost (\$000)					
				Internal & Other	Base Fees	Perf Fees	Total	Bps	
Stock - U.S. Large Cap	Internal Active	2018	8,586.9	-6.09	12,687.9			12,687.9	13.2
		2017	10,622.7	21.38	12,590.5			12,590.5	12.0
		2016	10,342.4	10.22	11,243.9			11,243.9	10.9
		2015	10,308.3	-0.14	11,794.0			11,794.0	10.9
		2014	11,364.0	11.74	10,645.4			10,645.4	9.5
	Internal Passive	2018	9,004.0	-3.08	72.8			72.8	0.1
		2017	9,544.3	22.97	72.1			72.1	0.1
		2016	8,868.0	11.34	64.0			64.0	0.1
		2015	8,672.3	2.36	40.6			40.6	0.0
		2014	8,757.0	13.28	38.5			38.5	0.0
	External Active	2018	905.6	-7.20	210.7	2,309.6		2,520.3	23.7
		2017	1,220.9	23.29	226.9	2,466.3		2,693.2	23.8
		2016	1,046.3	9.78	186.0	2,233.7		2,419.7	23.6
		2015	1,003.0	2.45	179.9	2,168.3		2,348.3	23.7
		2014	981.0	13.11	147.0	2,055.0		2,202.0	23.8
Stock - U.S. Small Cap	Internal Active	2018	684.6	-10.05	323.5			323.5	4.2
		2017	842.2	13.70	346.3			346.3	4.2
		2016	824.9	22.03	257.6			257.6	3.2
		2015	778.8	-2.44	293.3			293.3	3.6
		2014	844.0	6.45	155.0			155.0	2.1
	External Active	2018	1,068.3	-8.82	104.9	9,437.5		9,542.4	81.9
		2017	1,262.6	24.33	74.6	9,642.9		9,717.5	77.3
		2016	1,252.0	14.77	54.0	8,861.7		8,915.7	75.8
		2015	1,101.3	-1.24	203.3	8,895.4		9,098.7	81.2
		2014	1,140.0	3.79	200.8	9,386.0		9,586.8	75.8
Stock - EAFE	Internal Active	2018	4,915.3	-11.91	2,968.2			2,968.2	5.6
		2017	5,663.8	20.07	3,597.2			3,597.2	6.4
		2016	5,589.9	4.49	3,292.2			3,292.2	5.9
		2015	5,658.2	1.84	2,892.7			2,892.7	5.2
		2014	5,523.7	1.01	2,429.2			2,429.2	4.3
	External Active	2018	5,120.4	-11.31	205.8	19,125.7		19,331.5	35.1
		2017	5,881.0	24.11	241.7	19,869.7		20,111.5	35.5
		2016	5,463.5	5.58	214.5	18,582.3		18,796.8	34.2
		2015	5,529.7	5.63	194.7	19,934.8		20,129.5	35.7
		2014	5,761.7	1.59	162.2	19,588.0		19,750.2	34.9
Stock - Emerging	Internal Active	2018	2,131.9	-11.13	3,183.9			3,183.9	14.1
		2017	2,382.3	32.16	2,696.7			2,696.7	12.1
		2016	2,061.8	14.55	2,571.8			2,571.8	13.1
		2015	1,856.3	-10.54	2,578.4			2,578.4	14.1
		2014	1,810.0	-2.42	2,261.3			2,261.3	12.9
	External Active	2018	903.8	-15.07	252.2	5,777.8		6,029.9	59.0
		2017	1,139.1	31.36	263.3	6,401.6		6,664.9	61.4
		2016	1,030.7	12.63	256.1	5,834.4		6,090.6	62.4
		2015	920.4	-13.75	280.4	5,317.9		5,598.3	56.2
		2014	1,073.0	0.39	274.1	6,245.0		6,519.1	61.2
Stock - ACWI x U.S.	Internal Active	2018	2,704.6	-10.91	468.3			468.3	1.6
		2017	3,211.2	24.22	475.0			475.0	1.5
		2016	2,988.9	9.11	433.9			433.9	1.5
		2015	2,730.5	-1.78	439.9			439.9	1.6
		2014	2,775.0	0.47	415.2			415.2	1.5

Appendix A Data Summary - Assets, Returns and Costs: Public Market

STRS Ohio

(Default costs are highlighted with blue shading. See page 7 for more details)

Asset Class		Year	Asset (\$millions)	Return %	Cost (\$000)				
					Internal & Other	Base Fees	Perf Fees	Total	Bps
Stock - Global	External Active	2018	1,106.3	-14.01	20.0	5,474.0		5,494.0	43.5
		2017	1,418.8	23.41	20.4	6,121.7		6,142.1	46.1
		2016	1,243.3	4.09	18.6	5,445.3		5,463.8	44.6
		2015	1,206.1	1.97	17.5	5,022.1		5,039.7	45.9
		2014	990.0		7.7	1,993.0		2,000.7	38.5
Fixed Income - U.S.	Internal Active	2018	546.9	-9.63	488.3			488.3	8.3
		2017	634.2	24.07	495.3			495.3	8.5
		2016	536.0	8.83	452.5			452.5	6.9
		2015	778.8	-1.24	457.4			457.4	5.8
		2014	788.0	3.71	422.9			422.9	5.5
Fixed Income - Emerging	Internal Active	2018	12,171.5	0.27	3,465.9			3,465.9	2.7
		2017	13,081.7	3.46	3,304.9			3,304.9	3.0
		2016	8,787.2	2.71	2,465.8			2,465.8	2.7
		2015	9,726.0	1.01	2,552.2			2,552.2	2.5
		2014	11,082.0	5.55	2,538.8			2,538.8	2.2
Fixed Income - High Yield	External Active	2018	750.1	-4.04	143.1	3,475.7		3,618.7	46.3
		2017	813.7	10.82	156.3	3,435.7		3,592.0	46.3
		2016	737.3	15.81	130.4	3,180.6		3,311.0	45.1
		2015	731.4	1.11	130.5	3,586.6		3,717.1	46.6
		2014	864.0	2.01	113.8	3,742.0		3,855.8	48.7
Cash	External Active	2018	728.2	-2.33	144.3	3,160.8		3,305.1	41.9
		2017	849.1	7.74	165.3	3,146.4		3,311.7	40.4
		2016	792.0	17.30	155.0	3,666.2		3,821.3	43.8
		2015	953.9	-4.03	178.5	4,427.6		4,606.1	42.2
		2014	1,229.0	2.49	150.8	4,185.0		4,335.8	41.3
Global TAA	Internal Active	2018	1,002.8	1.98	299.0			299.0	2.2
		2017	1,699.9	0.77	285.8			285.8	1.7
		2016	1,679.5	0.48	266.0			266.0	1.8
		2015	1,274.8	0.08	268.6			268.6	1.4
		2014	2,480.0	0.09	265.9			265.9	0.9
REITs	Internal Passive	2018	958.1	-7.17	1,666.5			1,666.5	64.0
		2017	365.3	-7.17	96.2	2,306.4		2,402.6	31.1
		2016	741.8	10.52	36.8	1,334.7		1,371.5	23.8
		2015	412.0	8.44	26.5	1,191.4	-	1,217.9	30.6
		2014	383.8	-2.20	12.0	678.1	-	690.1	36.0
REITs	Internal Passive	2018	1,156.5	-4.60	106.4			106.4	0.9
		2017	1,117.2	5.21	94.3			94.3	0.8
		2016	1,262.4	8.78	89.1			89.1	0.7
		2015	1,166.2	3.21	226.4			226.4	2.0
		2014	1,098.0	30.47	16.5			16.5	0.3

Appendix A Data Summary - Assets, Returns and Costs: Private Market and Hedge Fund

STRS Ohio

(Default costs are highlighted with blue shading. See page 5 for more details)

Asset Class	Year	NAV (\$mils)	Fee Basis (\$mils)	Return	Cost (\$000)								
					Internal & Other	Base Fees	Perf. Fees	Underlying Base Fees	Underlying Perf Fees	Total	Total bps		
Infrastructure Fund of Funds	2018	58.2	13.2	-3.1	8.6	370.4	506.2	347.6	506.2	726.7	131.6		
	2017	68.4	97.2	1.9	12.9	459.7	351.7	766.8	1,626.6	1,239.5	137.8		
	2016	107.5	82.7	5.3	12.5	495.9	426.0	1,320.8	1,267.2	1,829.2	220.1		
	2015	105.5	83.6	5.6	12.9	501.4	637.0	1,945.9	821.9	2,460.3	268.0		
	2014	100.0	100.0	17.7	11.7	506.0	252.0	1,249.0	414.0	1,766.7	176.7		
Natural Resources	Internal Active	2018											
		2017											
		2016	375.8	375.8	-3.4	298.4					298.4	7.2	
	Co-Investment	2015	455.9	455.9	3.0	169.0					169.0	3.8	
		2018	154.8	154.8	11.5	24.3					24.3	1.6	
	LP	2017	149.4	149.4	-34.4	39.7					39.7	5.3	
		2018	360.4	510.0	11.5	56.9	5,691.0	2,090.3			5,747.9	110.1	
		2017	549.4	652.7	-34.4	69.4	6,832.0	2,885.0			6,901.4	111.1	
		2016	604.6	589.4	-3.4	66.1	6,439.0	4,926.2			6,505.1	114.7	
		2015	478.1	544.8	3.0	56.7	7,659.5	2,238.5			7,716.2	149.0	
2014	351.0	491.0	9.2	40.8	5,014.0	1,687.5			5,054.8	112.7			
Real Estate ex-REITs	Internal Active	2018	5,764.4	5,764.4	7.9	17,795.5					17,795.5	32.1	
		2017	5,315.0	5,315.0	5.9	17,182.4					17,182.4	30.9	
		2016	5,794.6	5,794.6	9.1	16,632.4					16,632.4	29.3	
		2015	5,554.9	5,554.9	13.0	16,561.4					16,561.4	30.9	
		2014	5,177.0	5,177.0	14.8	14,191.5					14,191.5	28.7	
	LP	2018	882.5	1,419.8	13.2	481.0	14,030.0	5,525.9			14,511.0	101.7	
		2017	990.6	1,434.8	8.6	464.1	17,650.0	5,940.9			18,114.1	122.3	
		2016	1,131.1	1,526.4	13.5	447.4	17,431.8	6,098.0			17,879.2	114.4	
		2015	1,008.5	1,599.0	11.0	443.5	17,938.0	10,592.0			18,381.5	122.5	
		2014	1,009.0	1,401.0	18.0	378.9	24,652.0	9,546.5			25,030.9	163.0	
Diversified Private Equity	Internal Active	2018	318.5	318.5	19.9	319.6					319.6	8.0	
		2018	328.7	328.7	4.7	88.1					88.1	3.0	
	Fund of Funds	LP	2018										
			2017										
			2016										
			2015										
		2014	527.0	1,123.0	18.9	155.0	5,367.0	3,718.5	7,965.0	6,633.0	13,487.0	124.2	
		2018	1,591.4	3,653.5	19.9	511.7	25,682.0	26,112.8			26,193.7	95.7	
		2017	100.6	240.3	19.3	39.7	3,903.4	1,807.9			3,943.1	158.6	
		2016	97.0	257.0	6.8	27.7	2,715.0	1,258.3			2,742.7	165.1	
2015	60.3	75.3	9.9	11.8	1,429.9	892.7			1,441.6	191.5			
2014	2,893.0	6,288.0	18.9	783.7	94,765.2	38,002.8			95,548.9	158.3			
Hedge Funds	External Active	2018	1,636.3	1,636.3	0.6	255.1	26,478.9	12,406.2			39,140.1	239.0	
		2017	1,638.9	1,638.9	5.6	290.8	26,980.9	22,775.2			50,046.9	274.8	
		2016	2,003.9	2,003.9	5.0	336.8	32,054.3	22,495.0			54,886.1	271.5	
		2015	2,039.1	2,039.1	1.2	319.6	35,310.0	9,973.0			45,602.6	223.0	
		2014	2,050.0	2,050.0	5.1	234.7	32,279.0	22,798.0			55,311.7	305.9	
Private Credit	Internal Active	2018	94.8	94.8	-0.2	73.7					73.7	7.8	
		LP	2018	837.3	1,286.2	4.7	190.2	12,745.0	5,138.6			12,935.2	116.6
			2017	417.3	791.1	6.0	113.7	10,045.7	4,712.1			10,159.4	128.4
LBO	Fund of Funds	2018	991.2	1,015.8	19.9	183.0	6,314.4	3,703.1	10,166.8	18,608.2	16,664.2	141.8	

Appendix A Data Summary - Assets, Returns and Costs: Private Market and Hedge Fund

STRS Ohio

(Default costs are highlighted with blue shading. See page 5 for more details)

Asset Class	Year	NAV (\$mils)	Fee Basis (\$mils)	Return	Cost (\$000)							
					Internal & Other	Base Fees	Perf. Fees	Underlying Base Fees	Underlying Perf Fees	Total	Total bps	
Venture Capital	2017	860.4	1,334.1	19.3	793.8	6,706.6	3,151.1	10,951.9	16,464.3	18,452.4	148.5	
	2016	715.2	1,151.7	6.8	653.0	6,701.6	2,754.0	8,310.5	13,632.1	15,665.1	159.9	
	2015	661.8	808.1	9.9	603.7	5,965.6	2,377.6	11,206.1	10,520.9	17,775.4	184.1	
	LP	2018	3,589.2	5,672.8	19.9	1,068.0	58,116.0	66,235.5			59,184.0	103.6
	2017	2,778.2	5,382.0	19.3	791.4	70,745.7	55,268.1			71,537.1	158.8	
	2016	2,510.6	3,630.2	6.8	638.4	52,604.7	50,104.9			53,243.2	152.8	
	2015	2,550.5	3,337.4	9.9	573.9	51,062.2	47,243.1			51,636.1	154.7	
	Fund of Funds	2018	329.8	341.4	18.5	61.3	1,492.4	887.6	4,721.3	4,319.6	6,275.0	191.4
	2017	262.0	314.2	13.3	75.3	1,206.9	739.8	4,794.2	2,934.7	6,076.4	206.3	
	2016	231.3	275.0	3.1	72.6	1,677.4	655.2	4,391.9	2,686.3	6,141.9	225.4	
	2015	205.5	270.0	11.9	55.0	1,562.2	506.3	3,664.6	3,611.6	5,281.8	240.1	
	2014	132.0	170.0	17.9	35.3	1,126.0	312.0	2,824.0	2,090.4	3,985.3	234.4	
	LP	2018	1,166.9	1,908.8	18.5	405.9	16,328.0	15,264.3			16,733.9	102.8
	2017	1,052.4	1,486.4	13.3	251.7	25,222.7	11,703.3			25,474.4	193.9	
2016	914.5	1,141.0	3.1	234.6	20,179.8	11,281.4			20,414.4	174.0		
2015	919.9	1,205.5	11.9	278.2	27,885.1	19,258.5			28,163.3	189.9		
2014	880.0	1,761.0	17.9	274.0	35,170.0	17,085.0			35,444.0	201.6		
Other Private Equity	Internal Active	2018										
2017	229.5	229.5	19.3	168.4						168.4	8.3	
2016	178.3	178.3	6.8	25.9						25.9	1.4	
2015	192.4	192.4	9.9	50.0						50.0	0.7	
2014	1,145.0	1,145.0	13.5	142.9						142.9	1.3	
Co-Investment	2018											
2017	605.3	605.3	6.0	193.3						193.3	2.9	
2016	705.2	705.2	4.0	33.7						33.7	0.5	
2015	648.6	648.6	2.4	8.7						8.7	0.3	
LP	2018											
2017	1,239.7	2,474.6	6.0	347.9	23,549.0	12,341.8				23,896.9	131.6	
2016	1,323.7	1,948.1	4.0	344.1	25,265.0	11,853.2				25,609.1	148.8	
2015	1,095.3	1,494.6	2.4	345.1	19,370.8	11,448.9				19,715.9	107.2	
2014	722.0	2,185.0	13.5	293.3	10,511.0	7,458.0				10,804.3	57.4	

Appendix A - Data Summary: Oversight, Custodial and Other Costs

STRS Ohio

Oversight, Custodial and Other Costs			
		000s	bps
Oversight of the fund assets ¹	2018	4,964.8	0.7bp
	2017	4,812.2	0.6bp
	2016	4,578.3	0.6bp
	2015	4,539.4	0.6bp
	2014	3,804.1	0.5bp
Custodial total	2018	2,292.9	0.3bp
	2017	2,412.3	0.3bp
	2016	2,090.0	0.3bp
	2015	2,149.9	0.3bp
	2014	1,673.0	0.2bp
Audit	2018	168.5	0.0bp
	2017	168.3	0.0bp
	2016	165.9	0.0bp
	2015	158.3	0.0bp
	2014	136.0	0.0bp
Other (legal etc)	2018	510.6	0.1bp
	2017	477.4	0.1bp
	2016	418.1	0.1bp
	2015	374.8	0.1bp
	2014	339.0	0.0bp
Total	2018	7,936.8	1.0bp
	2017	7,870.1	1.0bp
	2016	7,252.3	1.0bp
	2015	7,222.4	1.0bp
	2014	5,952.1	0.8bp

Summary of All Asset Management Costs			
		000s	bps
Investment Management Costs	2018	294,876.6	39.0bp
	2017	331,483.1	44.2bp
	2016	293,532.4	41.2bp
	2015	288,192.6	39.9bp
	2014	328,574.0	45.0bp
Oversight, Custodial & Other Costs	2018	7,936.8	1.0bp
	2017	7,870.1	1.0bp
	2016	7,252.3	1.0bp
	2015	7,222.4	1.0bp
	2014	5,952.1	0.8bp
Total	2018	302,813.4	40.1bp
	2017	339,353.2	45.3bp
	2016	300,784.7	42.2bp
	2015	295,415.0	40.9bp
	2014	334,526.2	45.9bp

1. Oversight includes the salaries and benefits of executives and their staff responsible for overseeing the entire fund or multiple asset classes and the fees / salaries of the board or investment committee. All costs associated with the above including fees / salaries, travel, director's insurance and attributed overhead should be included.

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED] fee because you did not provide support for the unusually low cost of 99 bps (44.8 million).

[REDACTED]

[Redacted text block]

Appendix A - Data Summary - Enhanced Survey Data and Mapping to Regular Survey - Mapped Data

Data after the mapping process from enhanced survey to regular is shown below. The below data is used through the rest of this report.

Investment Costs by Asset Class and Style (\$000s)											
	Internal		External Passive		Base Fees	External Active		Monitoring & Other	Total		
	Passive	Active	Fees	Monitoring & Other		Perform. Fees			000s	% of Total	
Stock - U.S. Large Cap	73	12,688			2,310			211	15,281	5%	
Stock - U.S. Small Cap		323			9,437			105	9,866	3%	
Stock - EAFE		2,968			19,126			206	22,300	7%	
Stock - Emerging		3,184			5,778			252	9,214	3%	
Stock - ACWI x U.S.		468			5,474			20	5,962	2%	
Stock - Global		488							488	0%	
Fixed Income - U.S.		3,466							3,466	1%	
Fixed Income - Emerging					3,476			143	3,619	1%	
Fixed Income - High Yield					3,161			144	3,305	1%	
Cash		299							299	0%	
Infrastructure - FoFs					370		506	9	379	0%	
REITs	106								106	0%	
Real Estate ex-REITs		17,796							17,796	6%	
Real Estate ex-REITs - LP					14,030		5,526	481	14,511	5%	
Natural Resources - LP					5,691		2,090	57	5,748	2%	
Hedge Funds					26,479		12,406	255	26,734	9%	
Global TAA		1,667			2,306			96	4,069	1%	
Private Credit		74			12,745		5,139	190	13,009	4%	
Diversified Private Equity		320			25,682		26,113	512	26,513	9%	
LBO					58,116		66,236	1,068	59,184	20%	
LBO - FoFs					6,314		3,703	183	6,497	2%	
LBO - FoFs					10,167		18,608		10,167	3%	
Venture Capital					16,328		15,264	406	16,734	6%	
Venture Capital - FoFs					1,492		888	61	1,554	1%	
Venture Capital - FoFs					4,721		4,320		4,721	2%	
Overlay Programs	326			163					488	0%	
Total investment management costs - Internal & Monitoring									48,807	16%	
Total investment management fees (excluding performance in private assets)									233,204	77%	
Total investment management costs									39.0bp	294,877	97%

Oversight, Custodial & Other Asset Related Costs (\$000s)						
Oversight of the Fund			4,965	2%		
Trustee & Custodial			2,293	1%		
Audit			168	0%		
Other			511	0%		
Total oversight, custodial & other costs				1.0bp	7,937	3%

Total cost for STRS Ohio				40.1bp	302,813	100%
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* Default cost used. Refer to Appendix A.

Costs in blue come from the following page.

Costs in purple are from a two-step process shown over the next two pages.

Appendix A - Data Summary - Enhanced Survey Mapping to Regular Survey

Activity	Cost per Enhanced Survey	# of FTE	Step 1: Attribution of Oper. & Support	Cost with Attribution
Front Office				
Currency hedge (from internal developed)	349	1.0	139	488
external alternative investments	2,367	3.9	544	2,911
internal active large & mid cap	9,274	26.0	3,625	12,899
internal active small cap	150	2.0	279	428
internal alternative investments	111	2.3	321	432
internal developed	2,094	7.8	1,080	3,174
internal emerging	2,704	5.3	732	3,436
internal fixed income	2,777	7.0	976	3,753
internal Global ex US (ACWI ex US)	349	1.0	139	488
internal global quant	349	1.0	139	488
Internal liquidity reserves	160	1.0	139	299
internal passive domestic equity	45	0.2	28	73
internal real estate (directly held)	12,219	40.0	5,576	17,796
internal real estate indirect	342	1.0	139	481
internal reit	79	0.2	28	106
internal TAA	1,653	0.1	14	1,667
Total front office	35,020	99.7	13,899	48,919
Governance, Operations and Support				
Board, CEO & assistants re: investments (A)	1,051	2.0	279	1,329
CIO, Investment strategy, asset allocation (B)	2,659	7.0	976	3,635
Oversight of the fund per regular CEM survey (A + B)				4,965
Custodial fees	2,293		n/a	2,293
Internal audit	168	1.0	n/a	168
Legal services	511	2.0	n/a	511
Risk management	269	0.4	-269	0
Performance reporting and data management	2,495	3.0	-2,495	0
Investment operations, exc. private markets	615	4.0	-615	0
Investment operations, private markets	154	1.0	-154	0
Compliance	180	1.0	-180	0
Information technology	7,683	41.0	-7,683	0
Public relations & internal communication	275	2.0	-275	0
Finance, external reporting & tax	794	3.0	-794	0
Human resources	383	3.0	-383	0
Building, utilities & office services	2,248	16.0	-2,248	0
Other investment and support	59	8.0	-59	0
Total cost excluding external manager fees	56,856	194.1	0	56,856

How CEM mapped the above costs to the regular survey

CEM attributed both front office and back office costs to the CEM asset classes by style using the following methodology:

Step 1 - CEM attributed operations and support costs to front office & oversight pro rata based on FTE.

Step 2 - CEM attributes the fully loaded cost (shown in green) to all of the CEM asset classes that the team manages (see next page). The attribution preserves the relative cost ratios versus the CEM universe for each of the asset classes that the team manages.

Appendix A - Data Summary - Enhanced Survey Mapping of Internal Teams

Front Office	Cost with Attribution from Step 1	Responsibilities by CEM asset class	Step 2 Attribution to Asset Classes
Currency hedge (from internal develop	488	Passive Derivatives/Overlays - Currency	326
		Monitoring Passive Derivatives/Overlays - Currency	163
external alternative investments	2,911	Infrastructure	9
		Monitoring LP Natural Resources	57
		Monitoring Hedge Funds	255
		Monitoring Global TAA	96
		Monitoring LP Diversified Private Equity	512
		Venture Capital	61
		Monitoring LP Venture Capital	406
		LBO	183
		Monitoring LP LBO	1,068
		Private Credit	74
		Monitoring LP Private Credit	190
internal active large & mid cap	12,899	Stock - U.S. Large Cap	12,688
		Monitoring Stock - U.S. Large Cap	211
internal active small cap	428	Stock - U.S. Small Cap	323
		Monitoring Stock - U.S. Small Cap	105
internal alternative investments	432	Natural Resources	24
		Diversified Private Equity	88
		Diversified Private Equity	320
internal developed	3,174	Stock - EAFE	2,968
		Monitoring Stock - EAFE	206
internal emerging	3,436	Stock - Emerging	3,184
		Monitoring Stock - Emerging	252
internal fixed income	3,753	Fixed Income - U.S.	3,466
		Monitoring Fixed Income - Emerging	143
		Monitoring Fixed Income - High Yield	144
internal Global ex US (ACWI ex US)	488	Stock - ACWI x U.S.	468
		Monitoring Stock - ACWI x U.S.	20
internal global quant	488	Stock - Global	488
Internal liquidity reserves	299	Cash	299
internal passive domestic equity	73	Passive Stock - U.S. Large Cap	73
internal real estate (directly held)	17,796	Real Estate ex-REITs	17,796
internal real estate indirect	481	Monitoring LP Real Estate ex-REITs	481
internal reit	106	Passive REITs	106
internal TAA	1,667	Global TAA	1,667
Total Front Office	48,919		48,919

Front Office team costs, including allocated operations and support costs (see prior page), are attributed to the asset classes managed or overseen by the team. These attributions, shown in purple, are then inserted back into the regular survey.

Appendix A - Data Summary - Enhanced Survey Definitions

Costs - Attribute 100% of costs excluding manager fees and transaction costs including:

- (i) **Salaries and benefits** of FTE
- (ii) **General & administrative**: travel, supplies, staff education, publications and reference materials, etc.
- (iii) **Consulting** and other third party fees

FTE - Includes full time permanent salaried employees, include the FTE of long and short term contract individuals dedicated to your organization that are working onsite or working full-time for your fund on a project or in a role supervised by your staff. Do not include FTE at external consultants or service providers if they are not being supervised by your staff, even if they are dedicated to serving your organization.

Activity Definitions

1. **Front Office** consists of investment-decision making staff, including traders, analysts, portfolio managers and staff selecting and monitoring external managers, their immediate assistants and their management below the CIO level. Include third party fees for advice at the asset-class or security level such as manager search consultants, private equity consultants, and investment specific legal and due diligence fees that are not treated as transaction costs.

Does NOT include:

- (i) External manager fees. These are collected separately on the holdings tabs.
- (ii) Costs that relate to activities defined as Governance, Operations and Support in the table such as: board consultants, CIO, asset allocation and risk policy consultants, or other services (such as building, utilities and office services, information technology and human resources).

a. Board, CEO & assistants re: investments: Include only the proportion of the costs (fees paid to Board directors, travel, director insurance, CEO and CEO's direct assistants) equal to their proportion of time spent on investments and investment governance support. Exclude time spent on non-investment activities such as benefit administration, sales, marketing, new product development.

b. CIO, Investment strategy, asset allocation: Include 100% of CIO FTE and costs including his/her direct assistants, total fund asset allocation strategy, tactical deviations from the mix, economic political or other research, etc.

c. Risk management: Developing and implementing risk controls for operational and investment risk including surplus risk, factor exposures, credit, counterparty, etc. Excludes the cost of IT/IS risk systems. These belong in IT/IS.

d. Internal Audit: Independent review of business processes. Excludes external auditor fees. These belong in Finance, external reporting & tax.

e. Responsible investing, corporate governance: Policy setting and coordination across asset classes for sustainable, socially and/or environmentally responsible investing, and for corporate governance.

f. Client account management: Client service & reporting related to investing client assets, including client Board meetings, strategic client advice (ALM, risk, client portfolio construction).

g. Custodial fees: should be reported gross before any reductions relating to securities lending or other revenues credited against fees.

h. Data, valuation & performance analytics: Valuation and performance measurement of securities, funds, portfolios, risk, compliance, client reporting and other analysis and reporting. Include costs of data, dealing with data vendors and cleaning data.

Appendix A - Data Summary - Enhanced Survey Definitions (page 2)

i. Investment operations: Listed security operations including trade settlement, custodial bank monitoring and reconciliation, cash management and corporate actions, private asset class, derivatives and swap administration, COO. If the COO or CFO is responsible for multiple activities (i.e., Valuations and performance analytics, investment operation and finance) then split their FTE between the activities based on time spent.

j. Compliance: Monitoring, training on and dealing with regulatory infractions. Includes securities and pension regulation. Excludes compliance related to benefit administration.

k. IT/IS systems: IT management and strategy, architecture, data center, database and application management and maintenance, development, user services, network, telecommunications, etc. Also include the costs of purchasing and maintaining the following systems/software applications: portfolio management, risk management, trade processing/order execution management, compliance monitoring, performance analytics, fund accounting system. Exclude the pro rata portion that relates to non-investment activities such as benefit administration, sales, marketing, new product development.

l. Public relations and internal communication: External communication with entities such as regulators and media. Internal communication to staff. Excludes member and employer communication, marketing and sales.

m. Finance, external reporting & tax: Financial statements, external auditor fees, general accounting, budgeting, tax reporting, procurement and accounts payable. CFO. If the CFO or COO is responsible for multiple activities (i.e., finance and IT) then split their FTE between the activities based on time spent.

n. Legal services: General counsel, corporate secretary, legal counsel of any kind, even those specializing in real estate or private equity, paralegals, legal assistants and all FTE involved in legal analysis and advice. Investment related legal fees and costs, such as the legal fees to close private equity transactions, should be included under 'Front Office' if not treated as a transaction cost. Exclude amounts that pertain to non-investment activities such as benefit administration.

o. Human resources: Human resources staff and consulting, including recruitment, training, career development, induction, disciplinary action, developing HR policies and procedures, etc.
Exclude: Amounts that relate to non investment activities such as benefit administration and both severance and recruitment fees and activity specific training (these should be included in the Front Office Cost Centers table).

p. Building, utilities and office services: Building occupancy costs including rent, lease, amortization of leaseholds and depreciation of buildings, office services such as reception, mailroom, cleaning and maintenance, building insurance, utilities. Include satellite offices. Exclude the pro rata portion that relates to non-investment activities such as benefit administration, sales, marketing, new product development.

Appendix B - Data quality

The value of the information contained in these reports is only as good as the quality of the data received. CEM's procedures for checking and improving the data include the following.

Improved survey clarity

Twenty years of feedback from survey participants has led to improved definitions and survey clarity. In addition to immediate feedback from participants, CEM has hosted user workshops to solicit additional feedback and to resolve issues, such as trade-offs between more information and effort on the part of participants.

Computer and desktop verification

Survey responses are compared to norms for the survey universe and to each sponsor's prior year data when available. This typically results in questions generated by our online survey engine as well as additional follow-up to clarify responses or with additional questions.

In addition to these procedures, data quality continues to improve for the following reasons:

Learning curve

This is CEM's 28th year of gathering this data and experience is teaching the firm and the participants how to do a better job.

Growing universe

As our universe of respondents continues to increase in size, so does our confidence in the results as unbiased errors tend to average themselves out.

Any suggestions on how to further improve data quality are welcome.

Currency Conversions

For reports where either the peer group or report universe includes funds from multiple countries, we have converted the returns back to the base currency of the fund we prepared the report for. For example, for a Euro zone fund with peers from the U.S. we converted U.S. returns to Euro based on the currency return for the year using December 31 spot rates.

Appendix C - Glossary of terms

Average cost

- Calculated by dividing actual annual costs by the average of beginning and end-of-year holdings. If beginning-of-year holdings are not available, they are estimated using end-of-year holdings before the effect of this year's return on investment.

Benchmark return

- Rate of return on a portfolio of investable assets (such as the S&P500) designated as the benchmark portfolio against which the fund measures its own performance for that asset class.

F statistics

- Measure of the statistical significance of the regression coefficients taken as a group. Generally, regression equations with 5 coefficients and sample sizes greater than 20 are statistically significant if its F statistic is greater than 3.

Global TAA

- Fully funded segregated asset pool dedicated to active asset allocation.

Impact coefficient

- Estimate of the impact on the dependent variable in a regression of a change in the value of a given explanatory variable

Level of significance

- Degree to which sample data explains the universe from which they are extracted.

N-year peers

- Subset of peer group that have participated in our study for at least the consecutive n years.

Oversight of the fund

- Resources devoted to the oversight of the fund.

Overlay

- Derivative based program (unfunded other than margin requirements), designed to enhance total portfolio return (such as a tactical asset allocation program) or to achieve some specific mandate such as currency hedging.

Passive proportion

- Proportion of assets managed passively, i.e., indexed to broad capital market benchmarks or dedicated to replicate market benchmarks.

Policy mix

- Reflects long-term policy or target asset weights. Policy asset mix is often established by a fund's investment committee or board and is determined by such long term considerations as liability structure, risk tolerance and long term capital markets prospects.

Policy return

- The return you would have earned if you had passively implemented your policy mix decision through your benchmark portfolios. Your policy return equals the sum of your policy weights multiplied by your asset class benchmarks for each asset class.

R squared (coefficient of determination)

- The percentage of the differences in the dependent variable explained by the regression equation. For example, an R squared of 1 means 100% of the differences are explained and an R squared of 0 means that none of the differences are explained.

Value added

- the difference between your total actual return and your policy return. It is a measure of actual value produced over what could have been earned passively.

Investment
Cost Effectiveness Analysis
(for the 5-year period ending December 31, 2019)

STRS Ohio



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Prepared February 19, 2021. Although the information in this report has been based upon and obtained from sources we believe to be reliable, CEM Benchmarking Inc. ("CEM") does not guarantee its accuracy or completeness. The information contained herein is proprietary and confidential and may not be disclosed to third parties without the express written mutual consent of both CEM and STRS Ohio.

Key Takeaways

Returns

- Your 5-year net total return of 8.2% was in the top decile and above both the U.S. Public median of 7.4% and the peer median of 7.5%.
- Your 5-year policy return was 8.0%. This was above both the U.S. Public median of 7.3% and the peer median of 7.5%.

Value added

- Your 5-year net value added was 0.2%. This was above the U.S. Public median of 0.0% and equal to the peer median of 0.2%.

Cost

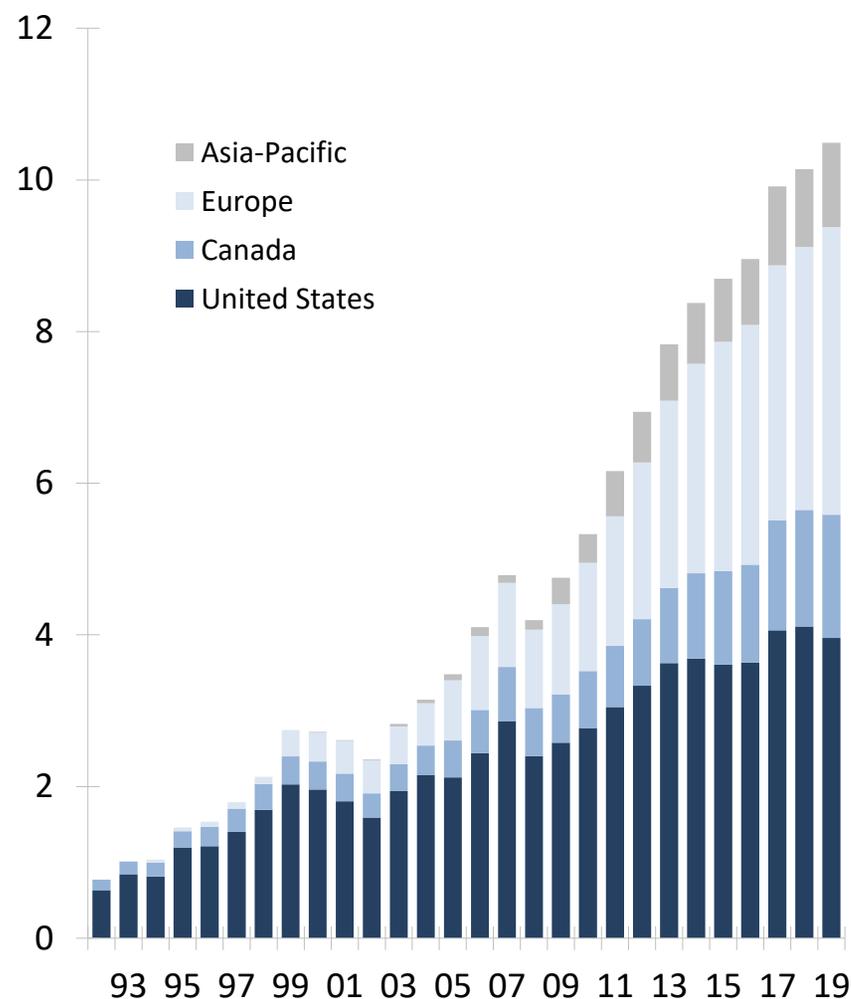
- Your investment cost of 41.4 bps was below your benchmark cost of 55.4 bps. This suggests that your fund was low cost compared to your peers.
- Your fund was low cost because you paid less than peers for similar services and you had a lower cost implementation style.

This benchmarking report compares your cost and return performance to the 314 funds in CEM's extensive pension database.

- 153 U.S. pension funds participate. The median U.S. fund had assets of \$11.4 billion and the average U.S. fund had assets of \$25.9 billion. Total participating U.S. assets were \$4.0 trillion.
- 69 Canadian funds participate with assets totaling \$1.6 trillion.
- 79 European funds participate with aggregate assets of \$3.8 trillion. Included are funds from the Netherlands, Norway, Sweden, Finland, Ireland, Denmark and the U.K.
- 6 Asia-Pacific funds participate with aggregate assets of \$1.1 trillion. Included are funds from Australia, New Zealand, China and South Korea.

The most meaningful comparisons for your returns and value added are to the U.S. Public universe, which consists of 51 funds.

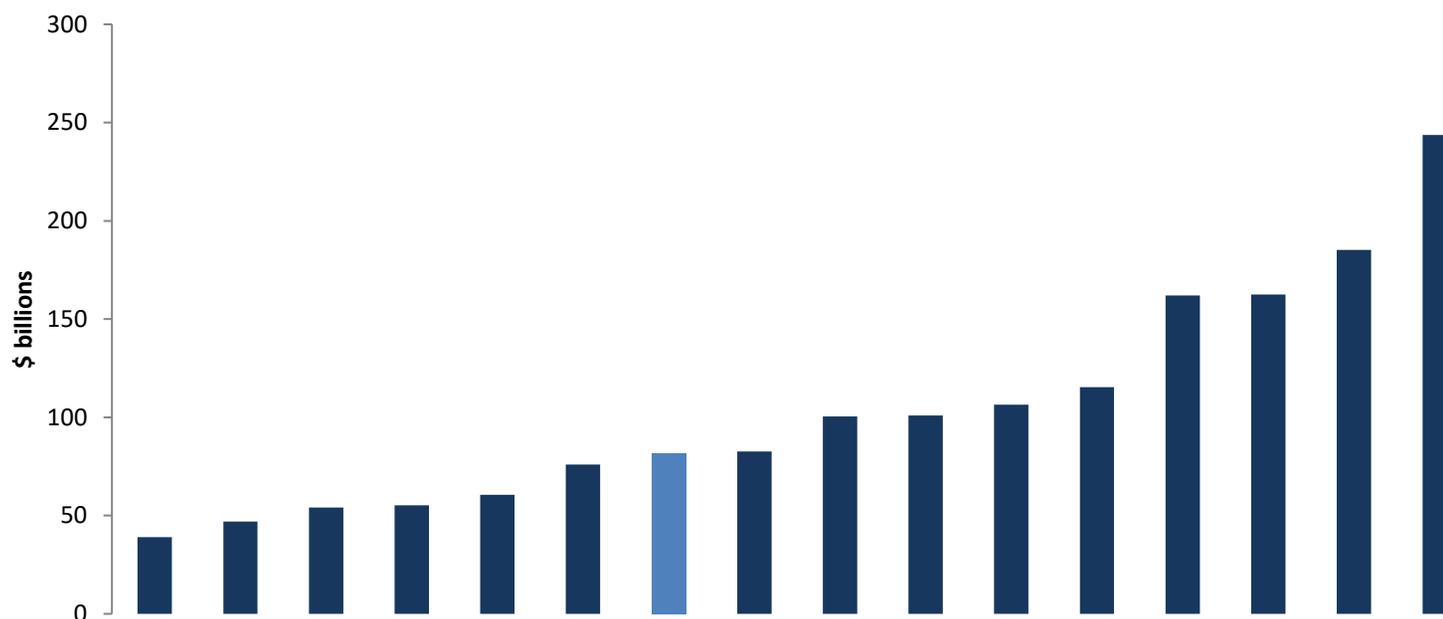
Participating assets (\$ trillions)



The most valuable comparisons for cost performance are to your custom peer group because size impacts costs.

Peer group for STRS Ohio

- 16 U.S. Public public sponsors from \$39 billion to \$244 billion
- Median size of \$92 billion versus your \$82 billion



To preserve client confidentiality, given potential access to documents as permitted by the Freedom of Information Act, we do not disclose your peers' names in this document.

Your 5-year net total return of 8.2% was above the peer median of 7.4%

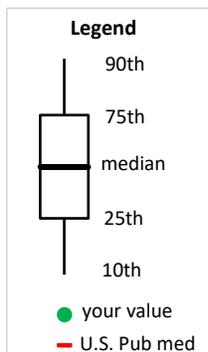
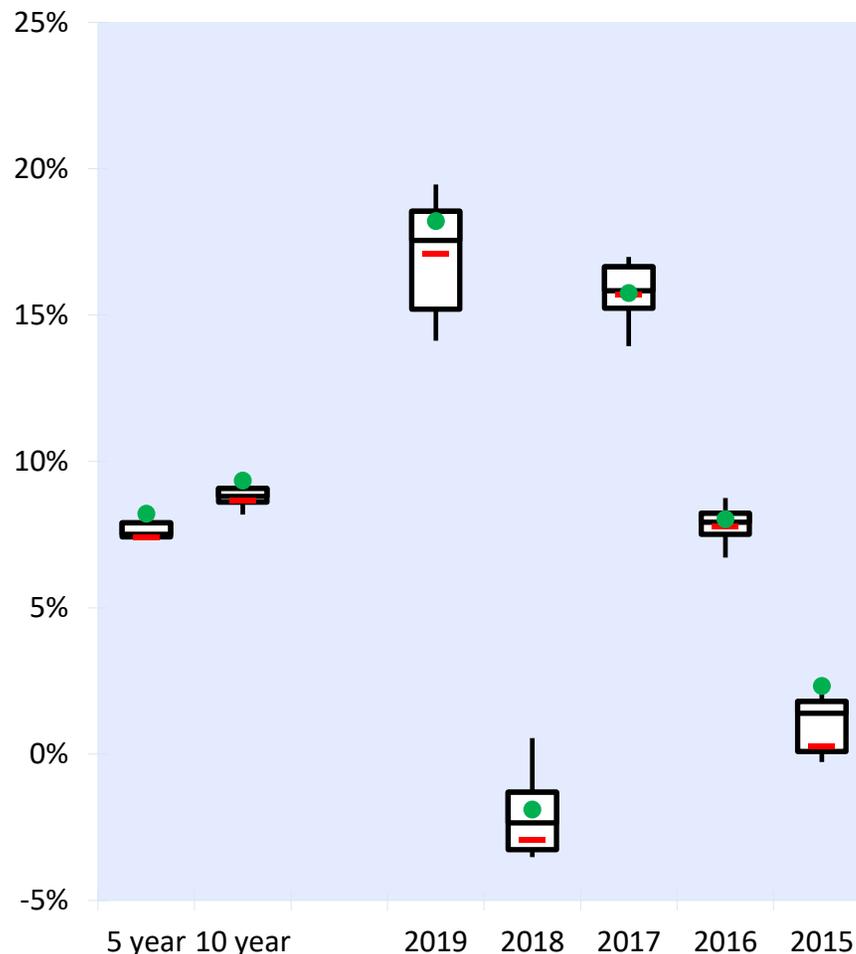
Total returns, by themselves, provide little insight into the reasons behind relative performance. Therefore, we separate total return into its more meaningful components: policy return and value added.

	Your 5-year
Net total fund return	8.2%
- Policy return	8.0%
= Net value added	0.2%

This approach enables you to understand the contribution from both policy mix decisions (which tend to be the board's responsibility) and implementation decisions (which tend to be management's responsibility).

The median 5-year net total return for the U.S. public universe was 7.4%.

Peer net total returns - quartile rankings



Your 5-year policy return of 8.0% was above the peer median of 7.5%.

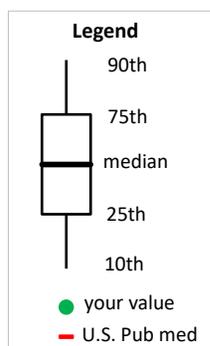
Your policy return is the return you could have earned passively by indexing your investments according to your policy mix.

Having a higher or lower relative policy return is not necessarily good or bad. Your policy return reflects your investment policy, which should reflect your:

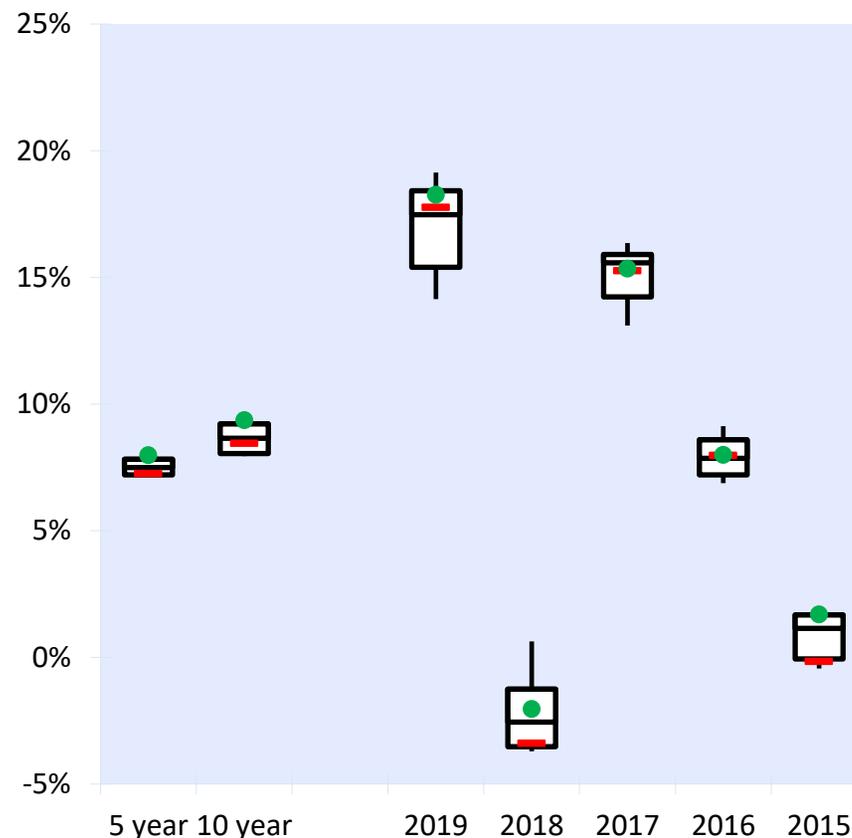
- Long term capital market expectations
- Liabilities
- Appetite for risk

Each of these three factors is different across funds. Therefore, it is not surprising that policy returns often vary widely between funds.

The median 5-year policy return for the U.S. public universe was 7.3%.



Peer policy returns - quartile rankings



Your 5-year policy return of 8.0% was above the peer median of 7.5% primarily because of:

- The positive impact of your higher weight in one of the better performing asset classes of the past 5 years: U.S. Stock.
- The positive impact of your lower weight in one of the weaker performing asset classes of the past 5 years: Fixed Income.

5-year average policy mix¹

	Your Fund	Peer Avg.	U.S. Pub Avg.
Stock - U.S.	30%	20%	21%
Stock - Global	0%	13%	11%
Stock - Non-U.S.	25%	16%	18%
Total Stock	54%	49%	49%
Fixed Income - U.S.	20%	18%	17%
Cash	1%	0%	-1%
Other Fixed Income ²	0%	8%	11%
Total Fixed Income	21%	26%	27%
Real Estate incl. REITs	10%	10%	8%
Total Alternatives³	15%	13%	13%
Total	100%	100%	100%

1. 5-year weights are based only on plans with 5 years of continuous data.

2. Other fixed income includes TIPS, long bonds, high yield, emerging and global bonds.

3. Total Alternatives includes hedge funds, risk parity, commodities, infrastructure, natural resources and private equity.

Net value added is the component of total return from active management. Your 5-year net value added was 0.2%.

Net value added equals total net return minus policy return.

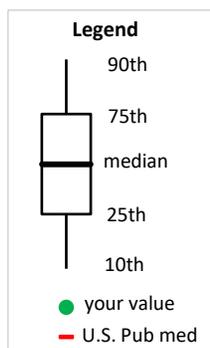
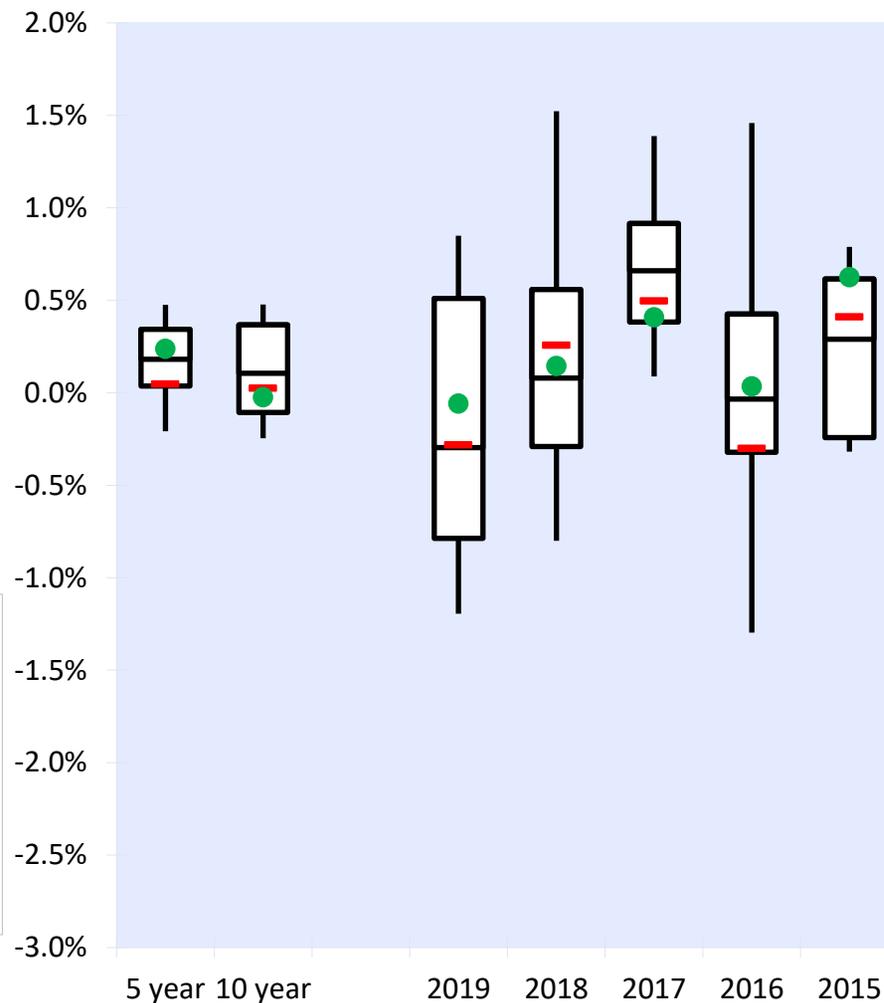
Value added for STRS Ohio

Year	Net Return	Policy Return	Net Value Added
2019	18.2%	18.3%	-0.1%
2018	-1.9%	-2.0%	0.1%
2017	15.8%	15.4%	0.4%
2016	8.0%	8.0%	0.0%
2015	2.3%	1.7%	0.6%
5-Year	8.2%	8.0%	0.2%

Your 5-year net value added of 0.2% compares to a median of 0.2% for your peers and 0.0% for the U.S. Public universe.

Your 0.2% 5-year value added translates into approximately \$0.9 billion of cumulative value added over 5 years, or \$0.7 billion more than if you had earned the U.S. Public median of 0.0%.

Peer net value added - quartile rankings



Your investment costs were \$290.4 million or 37.5 basis points in 2019.

Asset management costs by asset class and style (\$000s)	Internal Management			External Active base fees	Total
	Passive	Active	Overseeing of external		
Stock - U.S. Large Cap	77	13,352	215	2,369	16,012
Stock - U.S. Small Cap		337	121	9,549	10,007
Stock - EAFE		3,444	247	19,222	22,913
Stock - Emerging		3,448	225	4,574	8,247
Stock - Global		511			511
Stock - ACWI x U.S.		490	21	5,594	6,105
Fixed Income - U.S.		3,260			3,260
Fixed Income - Emerging			147	3,325	3,472
Fixed Income - High Yield			118	2,860	2,978
Cash		313			313
REITs	106				106
Global TAA			38	5,547	5,586
Hedge Funds - External Active			176	19,879	20,055
Real Estate ex-REITs ¹		17,277			17,277
Real Estate ex-REITs - LP ¹			465	13,478	13,943
Infrastructure - FoFs ¹			3	505	508
Natural Resources - LP ¹			36	5,006	5,042
Natural Resources - Co-Invest. ¹			33		33
Diversified Private Equity - LP ¹		421	498	33,037	33,956
Diversified Private Equity - Co-Invest. ¹			179	0	179
LBO - LP ¹			825	54,060	54,886
LBO - FoFs ¹			138	19,726	19,865
Venture Capital - LP ¹			369	17,375	17,745
Venture Capital - FoFs ¹			50	5,904	5,954
Private Credit - Internal		92			92
Private Credit - LP ¹			147	13,709	13,856
Private Credit - Co-Invest. ¹			51		51
Derivatives/Overlays	341		170		511
Total excluding private asset performance fees					283,463 36.6bp
Oversight, custodial and other costs ²					
Oversight & consulting					4,580
Trustee & custodial					1,782
Audit					153
Other					436
Total oversight, custodial & other costs					6,950 0.9bp
Total investment costs (excl. private asset performance fees)					290,414 37.5bp

*Internal investment costs were 6.2 bps while external investment costs were 30.4 bps. Of the total investment management costs of 37.5 bps, external manager fees for alternative and real estate investments were 24.3 bps; other investment costs for internal assets, external equity and external fixed income investments that were used to arrive at the net of fee Total Fund return were 13.2 bps.

Footnotes

1. Total cost excludes carry/performance fees for hedge funds, real estate, infrastructure, natural resources and private equity. For alternative investments & real estate, the returns (shown throughout the report) are net of all external investment management fees and costs, including carried interest and other fund expenses.
2. Excludes non-investment costs, such as benefit insurance premiums and preparing cheques for retirees.

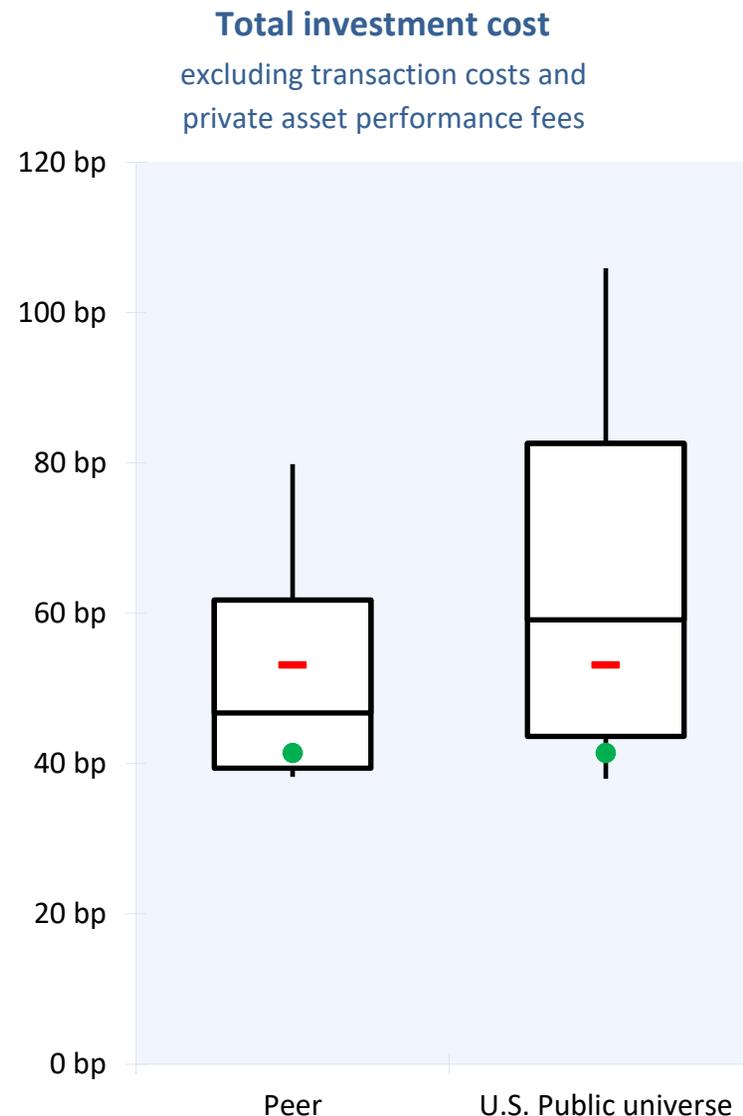
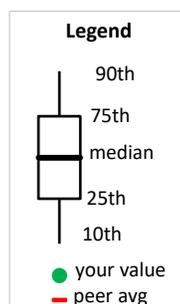
Your total investment cost of 41.4 bps was below the peer median of 46.7 bps.

For the comparison to the peer group, CEM has included your 37.5 bps in costs from page 8 and added hedge fund performance fees and private equity management fee offsets.

Differences in total investment cost are often caused by two factors that are often outside of management's control:

- Asset mix, particularly holdings of the highest cost asset classes: real estate (excl. REITs), infrastructure, hedge funds and private equity. These high cost assets equaled 23% of your funds assets at the end of 2019 versus a peer average of 28%.
- Fund size. Bigger funds have advantages of scale.

Therefore, to assess whether your costs are high or low given your unique asset mix and size, CEM calculates a benchmark cost for your fund. This analysis is shown on the following page.



Benchmark cost analysis suggests that, after adjusting for fund size and asset mix, your fund was low cost by 14.0 basis points in 2019.

Your benchmark cost is an estimate of what your cost would be given your actual asset mix and the median costs that your peers pay for similar services. It represents the cost your peers would incur if they had your actual asset mix.

Your total cost of 41.4 bp was below your benchmark cost of 55.4 bp. Thus, your cost savings were 14.0 bp.

Your cost versus benchmark

	\$000s	basis points
Your total investment cost	320,628	41.4 bp
Your benchmark cost	429,354	55.4 bp
Your excess cost	(108,726)	(14.0) bp

Your fund was low cost because you paid less than peers for similar services and you had a lower cost implementation style.

Reasons for your low cost status

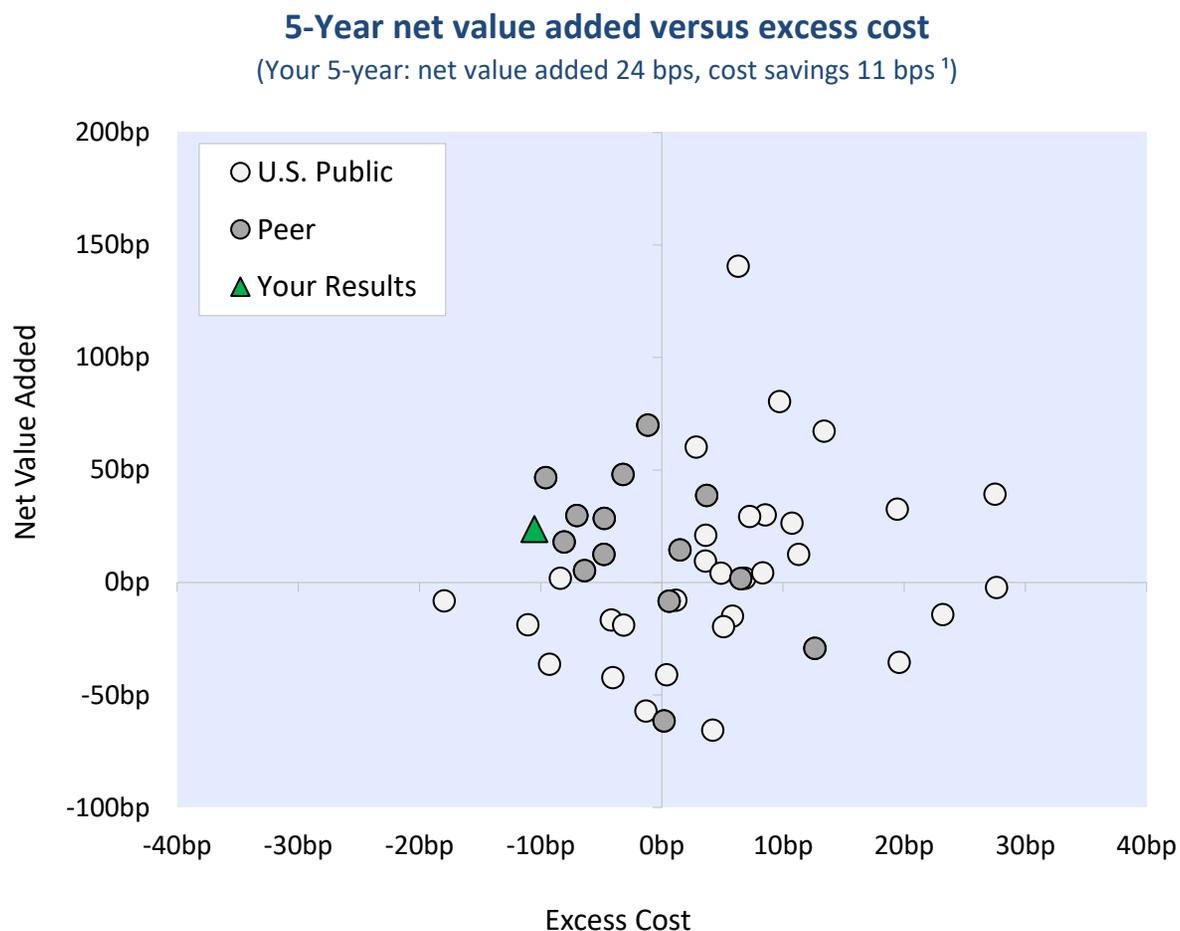
	Excess Cost/ (Savings)	
	\$000s	bps
1. Lower cost implementation style		
• More active management, less lower cost passive	24,338	3.1
• Less external management, more lower cost internal	(73,894)	(9.5)
• More partnerships as a percentage of external	10,941	1.4
• Use of fund of funds	(2,102)	(0.3)
• Less co-investment as a percentage of partnerships/Co	3,377	0.4
• Less overlays	(1,000)	(0.1)
	<u>(38,341)</u>	<u>(5.0)</u>
2. Paying less than peers for similar services		
• External investment management costs	(72,614)	(9.4)
• Internal investment management costs	3,360	0.4
• Oversight, custodial & other costs	(1,131)	(0.1)
	<u>(70,386)</u>	<u>(9.1)</u>
Total savings	(108,726)	(14.0)

If your internally managed assets were managed externally and you paid the peer median costs, your costs would have been higher by approximately \$115 million.

Additional external investment management costs: assuming STRS Ohio no longer had internal holdings and paid peer median external costs

	Style	STRS Ohio		Peer median external cost	Difference	
		Avg holdings in \$mils	Internal cost		in bps	(savings) \$000s
Stock - U.S. Large Cap	passive	8,800	0.1	0.6	(0.5)	(477)
Stock - U.S. Large Cap	active	9,794	13.6	24.6	(11.0)	(10,757)
Stock - U.S. Small Cap	active	719	4.9	62.1	(57.1)	(4,107)
Stock - EAFE	active	5,110	6.7	38.0	(31.3)	(15,977)
Stock - Emerging	active	2,222	15.4	57.2	(41.8)	(9,300)
Stock - Global	active	586	8.7	34.0	(25.3)	(1,484)
Stock - ACWI x U.S.	active	2,905	1.7	42.9	(41.2)	(11,984)
Fixed Income - U.S.	active	13,405	2.5	13.4	(10.9)	(14,578)
Cash	active	1,300	2.4	n/a	--	--
REITs	passive	1,156	0.9	6.8	(5.9)	(682)
Natural Resources	co	131	2.5	138.4	(135.9)	(1,773)
Real Estate ex-REITs	active	5,643	30.6	81.5	(50.9)	(28,717)
Diversified Private Equity	co	375	4.8	155.4	(150.6)	(5,654)
Diversified Private Equity	active	332	12.7	155.4	(142.7)	(4,737)
Private Credit	co	273	2.0	137.6	(135.6)	(3,699)
Private Credit	active	159	4.9	56.2	(51.3)	(815)
Total					(14.8)	(114,743)

Your 5-year performance placed in the positive value added, low cost quadrant of the cost effectiveness chart.



1. Your 5-year cost savings of 11 basis points is the average of your cost savings for the past 5 years.

	2019	2018	2017	2016	2015	5-year
Net value added	(6) bp	15bp	41bp	3bp	63bp	24bp
Excess Cost	(14) bp	(14) bp	(10) bp	(8) bp	(7) bp	(11) bp

Summary of key takeaways

Returns

- Your 5-year net total return of 8.2% was in the top decile and above both the U.S. Public median of 7.4% and the peer median of 7.5%.
- Your 5-year policy return was 8.0%. This was above both the U.S. Public median of 7.3% and the peer median of 7.5%.

Value added

- Your 5-year net value added was 0.2%. This was above the U.S. Public median of 0.0% and equal to the peer median of 0.2%.

Cost and cost effectiveness

- Your investment cost of 41.4 bps was below your benchmark cost of 55.4 bps. This suggests that your fund was low cost compared to your peers.
- Your fund was low cost because you paid less than peers for similar services and you had a lower cost implementation style.

2

Description of peer group and universe

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- by universe subset	5
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Peer group

Your peer group is comprised of 16 U.S. Public funds, with assets ranging from \$39.0 billion to \$243.6 billion versus your \$82.0 billion. The median size is \$91.5 billion.

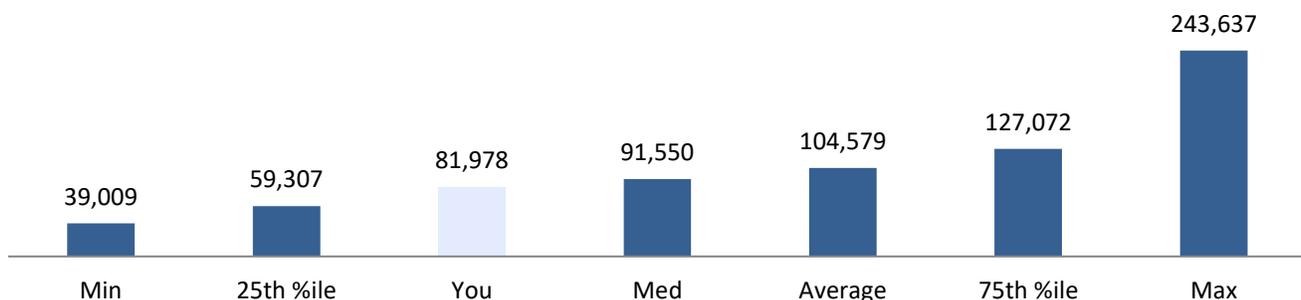
In order to preserve client confidentiality, we do not disclose your peers' names in this document due to the Freedom of Information Act. Your peer group consist of plans with the following characteristics:

Peer Group Characteristics - 2019

	Your Plan	Peers	U.S. Public
<u>Plan Assets (\$ billions)</u>			
Range	82.0	39.0 - 243.6	0.7 - 367.3
Median		91.5	21.1
<u># of Plans</u>			
Corporate		0	0
Public	1	16	51
Other		0	0
Total		16	51
<u>Implementation style</u>			
% External active	31.4	53.0	65.5
% External passive	0.0	15.6	20.4
% Internal active	56.8	19.0	8.5
% Internal passive	11.8	12.4	5.6
<u>Asset mix</u>			
% Stock	51.5	43.4	44.2
% Fixed Income	22.0	24.8	25.3
% Real Assets	9.9	12.3	11.2
% Private Equity	11.0	11.1	9.1
% Hedge Funds & Other	3.6	6.3	7.6

Your peer group is selected such that your fund size is usually close to the median of your peer group. Size is the primary criteria for choosing your peer group, because size greatly impacts how much you pay for services. Generally, the larger your fund, the smaller your unit operating costs (i.e., the economies of scale impact).

Total fund assets (\$ millions) - you versus peers

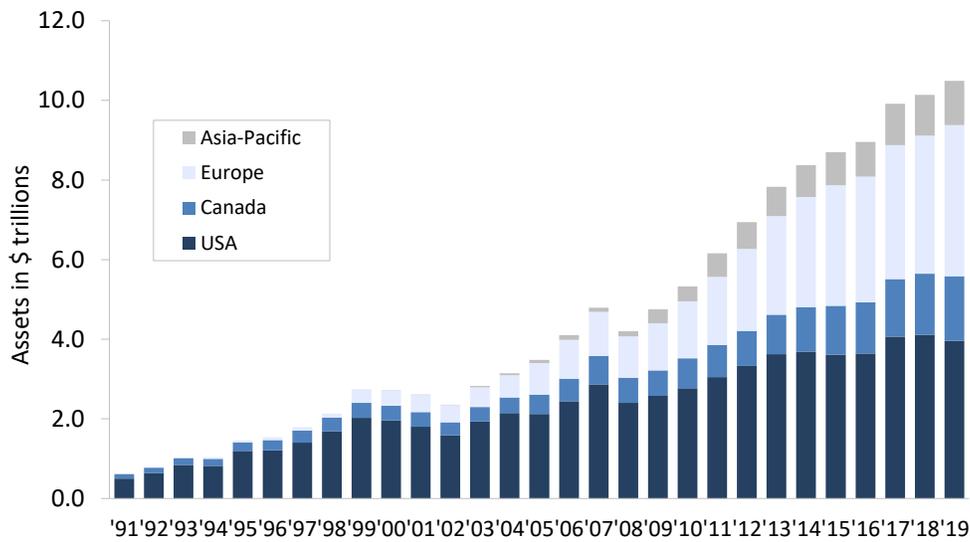


CEM global universe

CEM has been providing investment benchmarking solutions since 1991. The 2019 survey universe is comprised of 314 funds representing \$10.6 trillion in assets. The breakdown by region is as follows:

- 153 U.S. pension funds with aggregate assets of \$4.0 trillion.
- 69 Canadian pension funds with aggregate assets of \$1.6 trillion.
- 79 European pension funds with aggregate assets of \$3.8 trillion. Included are funds from the Netherlands, Norway, Sweden, Finland, Denmark, UK, and Ireland.
- 6 Asia-Pacific pension funds with aggregate assets of \$1.1 trillion.

CEM global universe



Universe subsets

CEM's global survey universe is comprised of 314 funds with total assets of \$10.6 trillion. Your fund's returns and costs are compared to the following two subsets of the global universe:

- Peers - Your peer group is comprised of 16 U.S. Public funds ranging in size from \$39.0 - \$243.6 billion. The peer median of \$91.5 billion compares to your \$82.0 billion.
- U.S. Public - The U.S. Public universe is comprised of 51 funds ranging in size from \$0.7 - \$367.3 billion. The median fund is \$21.1 billion.

Universe subsets by number of funds and assets

	Peer group ¹	U.S. by type				Global by Country				
		Corp.	Public	Other	Total	U.S.	Canada	Europe	Asia-Pacific	Total
# of funds										
2019	16	92	51	10	153	153	69	79	13	314
2018	16	101	59	10	170	170	81	78	13	342
2017	16	97	60	10	167	167	82	91	15	355
2016	16	101	59	10	170	170	83	83	14	350
2015	15	102	64	10	176	176	83	92	15	366
# of funds with uninterrupted data for:										
1 yr	16	92	51	10	153	153	69	79	13	314
2 yrs	16	87	50	9	146	146	66	76	11	299
3 yrs	16	80	48	8	136	136	59	74	11	280
4 yrs	16	77	47	8	132	132	56	71	11	270
5 yrs	15	73	46	7	126	126	50	68	11	255
Total assets (\$ billions)										
2019	1,673	1,131	2,599	230	3,960	3,960	1,625	3,794	1,252	10,630
2018	1,584	1,045	2,863	201	4,109	4,109	1,536	3,472	1,141	10,259
2017	1,570	1,008	2,866	186	4,061	4,061	1,449	3,362	1,363	10,235
2016	1,410	1,020	2,460	158	3,638	3,638	1,288	3,163	1,128	9,216
2015	1,331	968	2,509	132	3,609	3,609	1,232	3,026	1,203	9,069
2019 asset distribution (\$ billions)										
Avg	104.6	12.3	51.0	23.0	25.9	25.9	23.6	48.0	96.3	33.9
Max	243.6	57.9	367.3	73.4	367.3	367.3	326.3	1,312.5	633.8	1,312.5
75th %ile	127.1	15.9	68.3	30.6	26.3	26.3	14.3	29.6	71.6	26.3
Median	91.5	6.7	21.1	18.6	11.4	11.4	4.9	10.0	28.9	9.0
25th %ile	59.3	3.2	8.2	5.3	3.4	3.4	2.0	3.5	3.0	3.0
Min	39.0	0.3	0.7	2.7	0.3	0.3	0.1	0.6	0.6	0.1

1. Peer group statistics are for your 2019 peer group only as your peer group may have included different funds in prior years.

Implementation style, actual mix and policy mix by universe subset

Implementation style, actual mix and policy mix - 2019
(as a % of year-end assets)

	Your fund	Peer group	U.S. by type				Global by Country				
			Corp.	Public	Other	Total	U.S.	Canada	Europe	Asia-Pacific	Total
Implementation style											
External Active	29.6	51.8	76.3	63.0	67.2	71.3	71.3	60.5	50.8	56.9	63.2
Fund of funds	1.8	1.2	2.3	2.6	2.7	2.4	2.4	1.6	3.8	2.1	2.6
External passive	0.0	15.6	15.7	20.4	23.8	17.8	17.8	12.3	24.7	10.5	18.0
Internal Active	56.8	19.0	3.9	8.5	4.2	5.5	5.5	20.6	16.8	20.2	12.2
Internal Passive	<u>11.8</u>	<u>12.4</u>	<u>1.9</u>	<u>5.6</u>	<u>2.1</u>	<u>3.1</u>	<u>3.1</u>	<u>5.0</u>	<u>3.9</u>	<u>10.3</u>	<u>4.0</u>
Total	100	100	100	100	100	100	100	100	100	100	100
Actual asset mix											
Stock	51.5	43.4	31.8	44.2	46.8	36.9	36.9	38.6	40.9	46.3	38.7
Fixed Income	21.9	25.2	52.1	26.0	23.9	41.5	41.5	36.2	36.3	28.9	38.5
Global TAA	2.0	0.6	1.0	1.5	0.5	1.1	1.1	0.7	0.8	1.0	0.9
Real Assets	9.9	12.3	4.6	11.2	10.4	7.2	7.2	15.6	11.0	8.7	10.1
Hedge Funds	1.7	3.9	4.3	4.6	4.5	4.4	4.4	1.9	1.9	4.4	3.2
Balanced Funds	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.9	0.0	0.5
Risk Parity	0.0	1.3	0.7	0.9	2.5	0.9	0.9	0.2	0.1	3.0	0.6
Private Debt	2.0	2.2	0.8	2.5	3.7	1.6	1.6	2.6	3.3	1.4	2.2
Private Equity	<u>11.0</u>	<u>11.1</u>	<u>4.6</u>	<u>9.1</u>	<u>7.7</u>	<u>6.3</u>	<u>6.3</u>	<u>4.2</u>	<u>3.8</u>	<u>6.4</u>	<u>5.2</u>
Total	100	100	100	100	100	100	100	100	100	100	100
Policy asset mix											
Stock	51.0	43.9	32.3	43.9	47.3	37.2	37.2	38.9	41.3	48.5	39.1
Fixed Income	22.0	24.6	51.8	25.3	25.8	41.3	41.3	37.2	35.9	29.6	38.5
Global TAA	0.0	0.4	0.9	1.3	0.5	1.0	1.0	0.8	0.7	0.8	0.9
Real Assets	10.0	14.0	4.8	12.7	11.7	7.9	7.9	15.3	12.1	8.2	10.6
Hedge funds	0.0	2.9	4.0	4.0	2.7	3.9	3.9	1.6	1.8	3.5	2.8
Balanced Funds	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.0	0.2
Risk Parity	0.0	1.3	0.6	0.8	2.7	0.8	0.8	0.2	0.1	1.9	0.5
Private Debt	0.0	1.7	0.7	2.5	1.8	1.4	1.4	2.3	3.8	2.0	2.2
Private Equity	<u>17.0</u>	<u>11.2</u>	<u>4.8</u>	<u>9.6</u>	<u>7.6</u>	<u>6.5</u>	<u>6.5</u>	<u>3.6</u>	<u>3.8</u>	<u>5.3</u>	<u>5.2</u>
Total	100	100	100	100	100	100	100	100	100	100	100

Implementation style, actual mix and policy mix trends

Implementation style, actual mix and policy mix - 2015 to 2019
(as a % of year-end assets)

	Your fund					Peer average ¹					U.S. Public average ¹				
	2019	2018	2017	2016	2015	2019	2018	2017	2016	2015	2019	2018	2017	2016	2015
Implementation style															
External active	29.6	29.5	29.2	29.7	29.2	50.5	51.0	50.2	51.1	50.6	60.8	61.8	61.1	61.3	61.8
Fund of funds	1.8	1.9	1.5	1.5	1.4	1.3	1.1	1.3	1.3	1.2	2.6	2.6	2.9	2.8	2.9
External passive	0.0	0.0	-0.1	0.1	0.0	16.6	16.6	17.6	17.4	18.2	21.8	21.1	21.5	21.7	21.3
Internal active	56.8	54.7	55.8	54.6	55.6	19.4	18.5	19.2	19.0	19.4	8.9	8.7	9.0	8.9	8.7
Internal passive	<u>11.8</u>	<u>13.9</u>	<u>13.6</u>	<u>14.1</u>	<u>13.9</u>	<u>12.1</u>	<u>12.8</u>	<u>11.7</u>	<u>11.1</u>	<u>10.6</u>	<u>5.8</u>	<u>5.8</u>	<u>5.5</u>	<u>5.3</u>	<u>5.2</u>
Total	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Actual asset mix															
Stock	51.5	51.7	56.0	57.6	57.3	45.0	45.4	48.0	47.9	49.0	45.9	45.2	48.1	47.4	48.1
Fixed income	21.9	20.1	20.9	16.8	17.9	25.7	25.6	25.6	25.3	25.8	25.8	26.0	25.4	25.9	26.5
Global TAA	2.0	1.8	0.9	0.6	0.5	0.6	0.6	0.5	0.4	0.4	1.2	1.3	1.0	1.6	1.4
Real assets	9.9	11.5	10.5	12.9	12.4	11.8	11.8	11.1	11.8	10.9	10.8	11.0	10.5	10.6	9.8
Hedge funds	1.7	2.2	2.1	2.8	2.9	3.4	3.7	3.3	3.3	3.2	4.3	4.6	4.4	4.7	5.0
Balanced Funds	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Risk Parity	0.0	0.0	0.0	0.0	0.0	0.9	0.7	0.7	0.6	0.5	0.8	0.9	1.2	0.5	0.5
Private credit	2.0	1.3	0.5	0.0	0.0	1.7	1.6	1.3	1.0	0.7	2.3	2.2	1.7	1.5	1.1
Private equity	<u>11.0</u>	<u>11.4</u>	<u>9.1</u>	<u>9.3</u>	<u>9.0</u>	<u>11.0</u>	<u>10.6</u>	<u>9.6</u>	<u>9.8</u>	<u>9.5</u>	<u>9.0</u>	<u>8.8</u>	<u>7.7</u>	<u>7.8</u>	<u>7.5</u>
Total	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Policy asset mix															
Stock	51.0	52.0	55.0	57.0	57.0	45.8	46.8	47.9	48.7	48.9	45.8	46.5	47.6	47.5	48.6
Fixed income	22.0	22.0	21.0	19.0	19.0	24.3	24.3	24.7	25.3	25.5	24.7	24.7	25.2	25.4	25.5
Global TAA	0.0	0.0	0.0	0.0	0.0	0.5	0.5	0.4	0.3	0.4	1.0	1.0	0.9	1.5	1.3
Real assets	10.0	10.0	10.0	10.0	10.0	13.3	12.6	12.1	11.6	11.2	12.2	11.7	11.5	11.3	10.4
Hedge funds	0.0	0.0	0.0	0.0	0.0	2.4	2.7	2.2	1.9	2.1	3.6	4.1	3.8	4.0	4.4
Balanced Funds	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Risk Parity	0.0	0.0	0.0	0.0	0.0	0.9	0.7	0.7	0.7	0.7	0.6	0.8	1.0	0.6	0.6
Private credit	0.0	0.0	0.0	0.0	0.0	1.7	1.8	1.6	1.0	0.5	2.5	2.4	1.7	1.7	1.0
Private equity	<u>17.0</u>	<u>16.0</u>	<u>14.0</u>	<u>14.0</u>	<u>14.0</u>	<u>11.1</u>	<u>10.7</u>	<u>10.4</u>	<u>10.5</u>	<u>10.7</u>	<u>9.5</u>	<u>8.7</u>	<u>8.2</u>	<u>8.1</u>	<u>8.3</u>
Total	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100

1. Trends are based on the 46 U.S. Public and 15 peer funds with 5 or more consecutive years of data ending 2019.

Implementation style by asset class

Implementation style impacts your costs, because external active management tends to be more expensive than internal or passive (or indexed) management and fund-of-funds usage is more expensive than direct fund investment.

Implementation style by asset class - 2019 (as a % of year-end assets)

	Your fund %				Peer average %				U.S. Public average %						
	External		Internal		External		Internal		External		Internal				
	Active	FOFs	Index	Active	Index	Active	Index	Active	Index	Active	Index				
Stock - U.S. Broad/All					19.8	28.6	5.8	45.8	30.4	53.0	1.9	14.7			
Stock - U.S. Large Cap	5.7		0.0	52.9	41.3	10.4	39.2	18.7	31.7	23.3	53.0	7.0	16.7		
Stock - U.S. Mid Cap						31.0	0.0	35.9	33.1	45.7	19.3	12.3	22.7		
Stock - U.S. Small Cap	64.4		0.0	35.6	0.0	70.3	2.9	18.5	8.3	79.3	12.2	5.0	3.5		
Stock - EAFE	52.5		0.0	47.5	0.0	56.2	13.1	16.0	14.7	64.6	23.2	6.3	5.9		
Stock - Global	0.0		0.0	100.0	0.0	64.8	18.4	14.6	2.1	46.5	32.1	4.6	16.8		
Employer Stock						0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Stock - Other						76.5	0.0	0.0	23.5	95.2	1.3	0.0	3.5		
Stock - Emerging	24.6		0.0	75.4	0.0	67.0	8.6	14.8	9.6	80.2	11.8	4.7	3.3		
Stock - ACWI x U.S.	30.1		0.0	69.9	0.0	55.1	32.8	4.8	7.2	63.7	33.5	1.1	1.7		
Stock - Aggregate	24.9		0.0	54.7	20.4	38.0	25.2	13.9	22.8	48.4	36.2	4.6	10.8		
Fixed Income - U.S.	0.0		0.0	100.0	0.0	26.9	16.4	52.3	4.4	56.9	16.4	25.0	1.8		
Fixed Income - U.S. Gov't						0.0	75.8	4.9	19.4	53.0	31.1	10.0	5.9		
Fixed Income - U.S. Credits						0.0	0.0	0.0	0.0	76.4	0.0	23.6	0.0		
Fixed Income - EAFE						0.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0		
Fixed Income - Global						1.3	0.0	98.7	0.0	69.0	5.9	25.1	0.0		
Fixed Income - Other						100.0	0.0	0.0	0.0	96.4	0.6	3.0	0.0		
Fixed Income - Long Bonds						6.6	0.0	68.4	25.0	58.1	14.4	20.2	7.4		
Fixed Income - Emerging	100.0		0.0	0.0	0.0	97.9	0.0	2.1	0.0	98.5	1.0	0.4	0.0		
Fixed Income - Inflation Indexed						18.9	32.0	6.5	42.6	40.9	49.5	1.3	8.3		
Fixed Income - High Yield	100.0		0.0	0.0	0.0	94.0	0.0	6.0	0.0	94.2	1.2	4.5	0.0		
Fixed Income - Absolute Return Bond						0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Fixed Income - Bundled LDI						0.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0		
Fixed Income - Convertibles						100.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0		
Cash	0.0			100.0		17.4		82.6		20.5		79.5			
Fixed Income - Aggregate	10.0		0.0	90.0	0.0	30.3	17.5	44.9	7.3	60.8	15.2	21.7	2.3		
Commodities						65.2	0.0	3.8	31.0	80.2	9.6	1.2	9.0		
Infrastructure	0.0	100.0		0.0		87.2	3.4	9.4		93.0	4.4	2.6			
Natural Resources	100.0	0.0		0.0		98.6	0.1	1.3		99.5	0.0	0.4			
REITs	0.0		0.0	0.0	100.0	50.9	5.2	10.3	33.6	72.5	18.2	2.2	7.1		
Real Estate ex-REITs	14.6	0.0		85.4		90.2	0.6	9.2		95.6	0.4	4.0			
Other Real Assets						87.4		12.6		94.8		5.2			
Real Assets - Aggregate	17.0	0.5	0.0	68.2	14.3	88.1	0.6	0.2	8.6	2.5	93.5	0.7	1.6	3.4	0.9
Hedge Funds	100.0	0.0				95.7	4.3			76.9	23.1				
Global TAA	28.6			71.4		49.3		50.7		89.2		10.8			
Risk Parity						53.7		46.3		77.8		22.2			
Private Credit	86.7	0.0		13.3		97.6	0.0	2.4		96.2	0.0	3.8			
Mortgages						62.8		37.2		22.0		78.0			
Diversified Private Equity	87.0	0.0		13.0		90.9	8.0	1.0		82.3	17.4	0.4			
Venture Capital	80.4	19.6		0.0		72.8	26.1	1.1		62.0	37.5	0.5			
LBO	76.8	23.2		0.0		93.1	6.9	0.0		95.9	4.1	0.0			
Other Private Equity						99.9	0.0	0.1		100.0	0.0	0.0			
Private Equity - Aggregate	80.5	15.6		3.8		90.4	8.8	0.8		83.9	15.8	0.3			
Total Fund - Yr.-End Holdings	29.6	1.8	0.0	56.8	11.8	51.8	1.2	15.6	19.0	12.4	63.0	2.6	20.4	8.5	5.6

Actual mix

Actual asset mix - 2015 to 2019
(as a % of total year-end assets)

	Your fund					Peer average %					U.S. Public average %				
	2019	2018	2017	2016	2015	2019	2018	2017	2016	2015	2019	2018	2017	2016	2015
Stock - U.S. Broad/All						7.0	6.9	6.5	6.4	6.5	6.8	6.0	6.4	6.2	6.0
Stock - U.S. Large Cap	25.4	25.4	27.3	28.3	28.2	13.4	13.7	15.0	15.3	16.6	11.2	11.5	12.8	14.3	15.2
Stock - U.S. Mid Cap						0.7	0.7	0.7	0.6	0.6	0.7	1.0	0.8	0.8	0.9
Stock - U.S. Small Cap	2.6	2.4	2.7	2.9	2.7	1.6	1.6	1.9	2.3	2.8	1.8	2.2	2.3	2.5	2.9
Stock - EAFE	13.6	13.8	14.7	15.4	15.8	8.0	8.9	10.9	10.6	11.5	6.3	7.0	7.0	6.5	6.8
Stock - Global	0.8	0.8	0.8	0.7	1.1	3.7	2.8	2.8	2.7	3.1	6.2	6.3	6.5	5.1	4.2
Employer Stock															
Stock - Other						0.5	0.2	0.3	0.3	0.3	1.1	0.9	1.0	1.0	1.2
Stock - Emerging	3.7	4.2	4.5	4.3	3.9	3.5	3.8	4.2	3.9	4.0	3.5	3.8	3.8	3.1	2.9
Stock - ACWI x U.S.	5.4	5.2	5.9	5.9	5.6	4.9	5.0	4.0	4.0	3.5	6.5	5.9	6.8	7.4	7.9
Stock - Aggregate	51.5	51.7	56.0	57.6	57.3	43.4	43.8	46.2	46.1	49.0	44.2	44.6	47.4	46.8	48.0
Fixed Income - U.S.	17.9	16.7	16.7	12.3	13.7	13.8	13.5	12.9	13.0	14.2	11.9	12.7	12.6	13.5	14.5
Fixed Income - U.S. Gov't						2.3	2.2	2.3	2.3	2.4	2.4	1.8	1.4	0.9	0.6
Fixed Income - U.S. Credits											0.6	0.4	0.2	0.2	0.3
Fixed Income - EAFE											0.0	0.0	0.1	0.1	0.1
Fixed Income - Global						1.2	1.6	1.6	1.7	1.9	1.6	1.7	1.4	1.7	1.7
Fixed Income - Other						1.0	1.0	1.1	1.6	1.4	0.7	0.7	0.8	1.0	0.9
Fixed Income - Long Bonds						1.2	1.0	0.8	0.8	0.8	1.3	1.4	1.3	0.9	1.0
Fixed Income - Emerging	1.3	1.0	1.0	1.0	1.0	0.8	0.8	0.9	0.8	0.8	1.3	1.3	1.3	1.1	0.9
Fixed Income - Inflation Indexed						1.0	1.1	1.4	1.4	1.4	1.7	1.8	1.9	1.8	1.9
Fixed Income - High Yield	0.9	1.0	1.1	1.1	1.3	1.1	1.1	1.1	1.2	1.3	1.8	1.9	1.6	1.5	1.5
Fixed Income - Absolute Return Bonds															
Fixed Income - Bundled LDI											0.2	0.2			
Fixed Income - Convertibles						0.3	0.2	0.3			0.1	0.1	0.1		
Cash	1.9	1.4	2.2	2.3	1.8	1.9	1.7	1.8	1.5	1.1	1.7	2.4	2.3	2.1	2.0
Fixed Income - Aggregate	22.0	20.1	21.0	16.7	17.9	24.8	24.3	24.3	24.3	25.4	25.3	26.4	24.9	24.6	25.3
Commodities						0.5	0.5	0.5	0.5	0.3	0.5	0.5	0.5	0.7	0.5
Infrastructure	0.1	0.1	0.1	0.2	0.1	0.6	0.6	0.3	0.3	0.2	1.0	0.5	0.6	0.4	0.3
Natural Resources	0.5	0.7	0.9	1.4	1.3	1.0	0.9	0.7	0.7	0.6	0.9	0.9	1.2	0.9	0.6
REITs	1.4	1.6	1.4	1.8	1.6	0.5	0.5	0.5	0.7	0.7	0.7	0.8	0.9	0.8	0.8
Real Estate ex-REITs	7.9	9.1	8.1	9.7	9.3	9.1	9.2	8.7	9.4	8.9	7.6	7.8	6.9	7.8	7.3
Other Real Assets						0.6	0.6	0.9	0.7	0.3	0.5	0.4	0.6	0.7	0.7
Real Assets - Aggregate	9.9	11.5	10.5	12.9	12.4	12.3	12.3	11.7	12.3	10.9	11.2	10.9	10.8	11.2	10.2
Hedge Funds	1.7	2.2	2.1	2.8	2.9	3.9	4.2	3.8	3.8	3.2	4.6	4.8	4.8	5.2	5.5
Global TAA	2.0	1.8	0.9	0.6	0.5	0.6	0.6	0.4	0.4	0.4	1.5	1.1	0.9	1.5	1.3
Risk Parity						1.3	1.2	1.2	1.1	0.5	0.9	1.0	1.1	0.7	0.4
Mortgages						0.2	0.2	0.1	0.1	0.2	0.2	0.1	0.1	0.1	0.2
Private Credit	2.0	1.3	0.5			2.0	1.9	1.7	1.3	0.5	2.3	2.0	1.6	1.3	1.0
Diversified Private Equity	3.3	3.1	0.1	0.1	0.1	8.1	7.9	7.0	7.2	6.8	7.0	6.5	5.6	6.1	5.5
Venture Capital	2.2	2.1	1.7	1.6	1.6	0.7	0.7	0.6	0.6	0.5	0.4	0.4	0.4	0.4	0.5
LBO	5.6	6.3	4.6	4.5	4.5	2.0	2.0	1.7	1.7	1.8	1.5	1.6	1.5	1.4	1.6
Other Private Equity			2.6	3.1	2.7	0.3	0.2	0.4	0.5	0.3	0.2	0.1	0.2	0.2	0.3
Private Equity - Aggregate	11.0	11.4	9.1	9.3	9.0	11.1	10.8	9.8	10.0	9.5	9.1	8.6	7.7	8.1	7.9
Derivatives/Overlays Mkt Value	-0.1	0.0	-0.1	0.1		0.4	0.8	0.7	0.4	0.4	0.7	0.4	0.8	0.5	0.4
Total Fund	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Count	1	1	1	1	1	16	16	16	16	15	51	59	60	59	64
Median Assets (\$ billions)	82.0	72.9	78.3	71.7	70.8	91.5	90.2	86.7	78.4	79.7	21.1	19.1	19.9	17.1	16.6

Policy mix

Policy asset mix - 2015 to 2019
(as a % of total assets)

	Your fund %					Peer average %					U.S. Public average %				
	2019	2018	2017	2016	2015	2019	2018	2017	2016	2015	2019	2018	2017	2016	2015
Stock - U.S. Broad/All						7.4	7.7	9.6	10.3	11.2	8.0	8.3	9.1	9.1	9.6
Stock - U.S. Large Cap	28.0	28.0	30.0	31.0	31.0	9.8	9.8	8.6	10.2	10.2	8.8	8.6	9.2	10.4	10.6
Stock - U.S. Mid Cap						0.1	0.1				0.4	0.7	0.5	0.4	0.4
Stock - U.S. Small Cap						0.5	0.4	0.2	0.3	0.3	1.1	1.4	1.3	1.5	1.6
Stock - EAFE	18.4	19.2	20.0	20.8	20.8	5.4	5.5	6.7	7.7	7.9	4.8	5.3	4.7	5.1	5.1
Stock - Global						13.0	13.2	13.8	11.0	12.0	9.7	11.0	10.7	8.9	9.0
Employer Stock															
Stock - Other						0.1	0.1	0.1	0.3	0.5	2.1	0.8	0.9	0.8	0.9
Stock - Emerging	4.6	4.8	5.0	5.2	5.2	2.0	2.2	2.2	2.3	2.4	2.7	2.9	2.5	2.3	2.2
Stock - ACWI x U.S.						5.7	5.9	4.8	4.8	4.5	6.4	6.8	7.5	8.1	8.8
Stock - Aggregate	51.0	52.0	55.0	57.0	57.0	43.9	44.8	46.1	46.9	48.9	43.9	45.8	46.5	46.7	48.2
Fixed Income - U.S.	21.0	21.0	20.0	18.0	18.0	15.6	15.3	15.5	15.1	16.3	13.7	14.1	14.7	15.0	15.8
Fixed Income - U.S. Gov't						1.9	1.8	1.9	1.9	2.0	2.2	1.7	1.1	0.7	0.5
Fixed Income - U.S. Credits											0.6	0.5	0.3	0.3	0.2
Fixed Income - EAFE											0.0	0.0	0.1	0.1	0.1
Fixed Income - Global						1.4	1.6	1.5	1.8	2.0	1.2	1.5	1.4	1.5	1.5
Fixed Income - Other						0.1	0.1	0.2	1.0	0.8	0.5	0.4	0.6	0.6	0.5
Fixed Income - Long Bonds						1.4	1.1	0.9	0.9	0.7	2.0	2.0	2.1	1.7	1.5
Fixed Income - Emerging						0.7	0.8	0.8	0.7	0.7	1.2	1.2	1.2	0.9	0.9
Fixed Income - Inflation Indexed						2.6	2.6	2.5	2.5	1.6	2.9	2.7	2.8	2.7	2.6
Fixed Income - High Yield						1.4	1.3	0.8	1.0	0.9	2.1	1.9	1.9	1.8	1.8
Fixed Income - Absolute Return Bonds															
Fixed Income - Bundled LDI											0.3	0.2			
Fixed Income - Convertibles						0.2	0.2	0.2			0.1	0.1	0.1		
Cash	1.0	1.0	1.0	1.0	1.0	-0.7	-0.3	-0.7	-0.6	0.4	-1.5	-0.9	-0.9	-0.9	-0.9
Fixed Income - Aggregate	22.0	22.0	21.0	19.0	19.0	24.6	24.5	23.8	24.4	25.5	25.3	25.5	25.2	24.5	24.5
Commodities						0.8	0.8	0.8	0.9	0.5	0.9	1.0	0.9	1.2	1.0
Infrastructure						1.0	0.4	0.4	0.3	0.1	1.1	0.5	0.7	0.6	0.3
Natural Resources						1.0	0.5	0.6	0.6	0.5	0.9	0.8	1.1	1.0	0.7
REITs			1.5	1.5	1.5	0.4	0.4	0.4	0.5	0.5	0.6	0.8	0.8	0.6	0.6
Real Estate ex-REITs	10.0	10.0	8.5	8.5	8.5	10.2	10.1	9.7	9.5	9.3	8.6	8.1	7.7	7.6	7.4
Other Real Assets						0.6	1.0	0.8	0.8	0.4	0.6	0.7	0.6	1.0	0.8
Real Assets - Aggregate	10.0	10.0	10.0	10.0	10.0	14.0	13.3	12.9	12.5	11.2	12.7	11.8	11.8	12.0	10.9
Hedge Funds						2.9	3.2	2.7	2.4	2.1	4.0	4.4	4.4	4.5	4.8
Global TAA						0.4	0.5	0.4	0.3	0.4	1.3	1.0	0.9	1.4	1.3
Risk Parity						1.3	1.1	1.3	1.2	0.7	0.8	0.8	1.0	0.7	0.5
Mortgages						0.3	0.4	0.1	0.4	0.1	0.2	0.1	0.0	0.1	0.1
Private Credit						1.4	1.4	2.1	1.2	0.4	2.3	2.0	1.7	1.4	0.9
Diversified Private Equity						8.5	8.4	8.4	8.2	8.7	7.7	6.8	7.1	6.9	7.0
Venture Capital						0.4	0.4	0.4	0.4	0.2	0.4	0.3	0.3	0.3	0.2
LBO	17.0	16.0	14.0	14.0	14.0	2.1	1.8	1.7	1.7	1.8	1.4	1.3	0.9	1.2	1.5
Other Private Equity						0.2	0.1	0.1	0.4	0.0	0.1	0.1	0.1	0.2	0.1
Private Equity - Aggregate	17.0	16.0	14.0	14.0	14.0	11.2	10.8	10.6	10.7	10.7	9.6	8.6	8.4	8.7	8.8
Total Fund	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Count	1	1	1	1	1	16	16	16	16	15	51	59	60	59	64

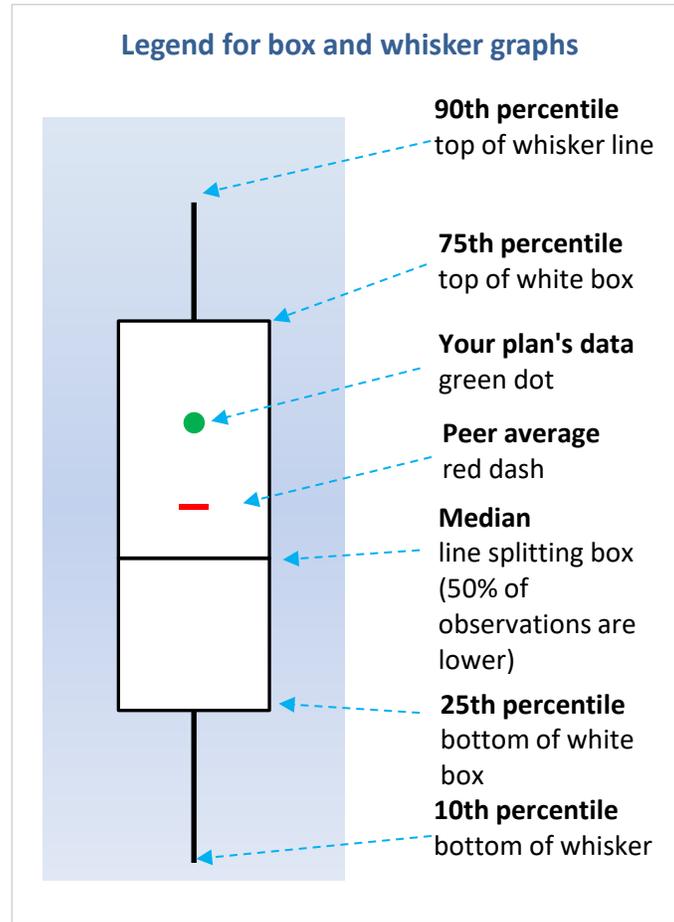
3

Returns, Benchmarks and Value Added

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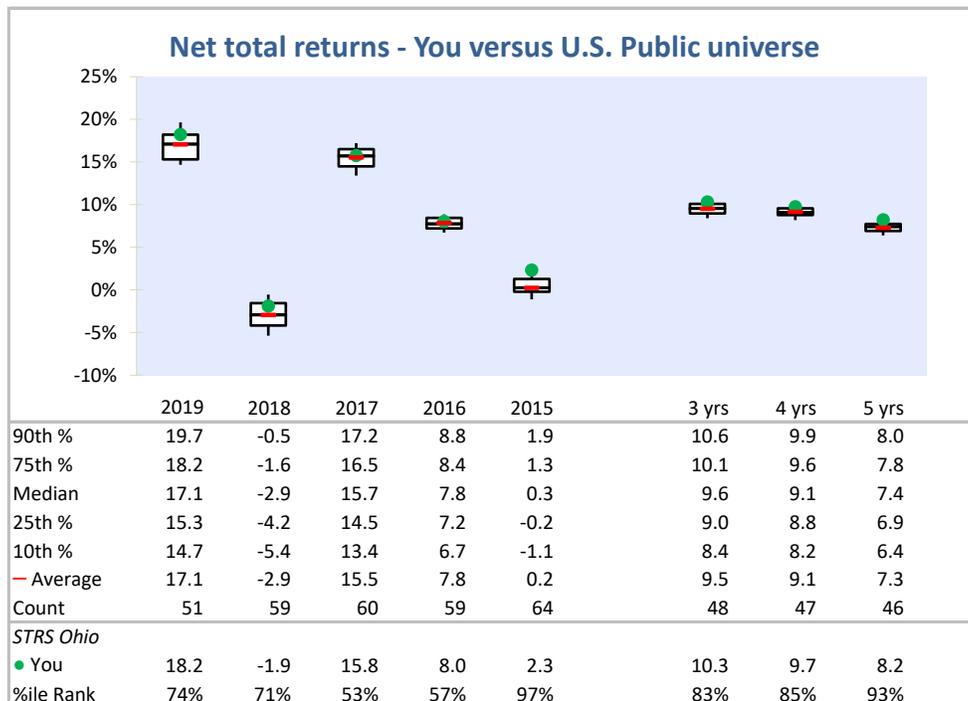
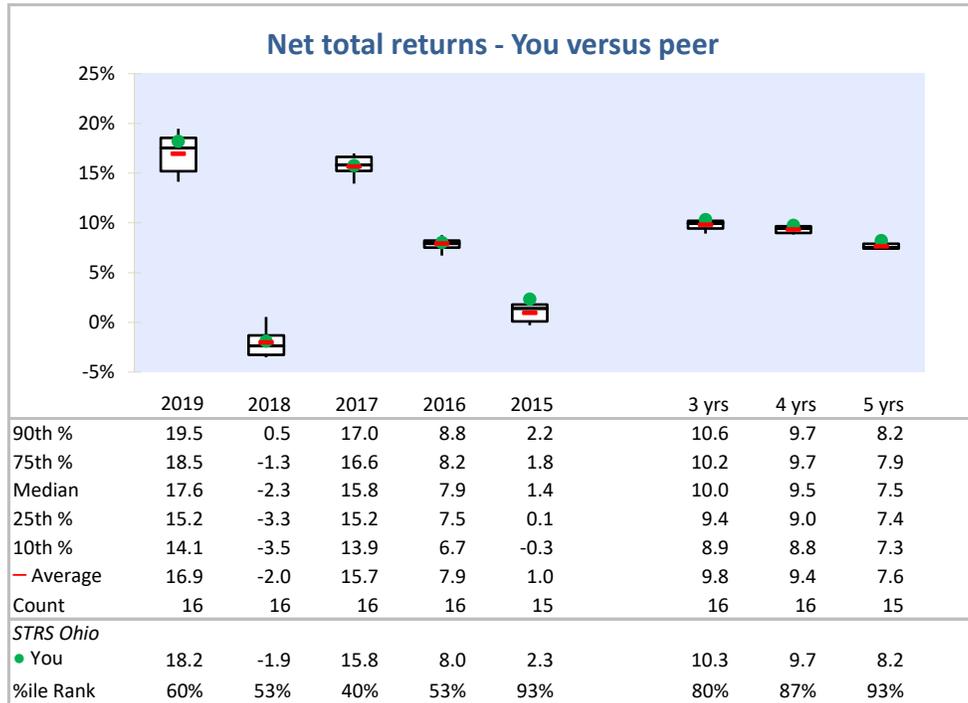
Interpreting box and whisker graphs

Box and whisker graphs are used extensively in this report because they show visually where you rank relative to all observations. At a glance you can see which quartile your data falls in.



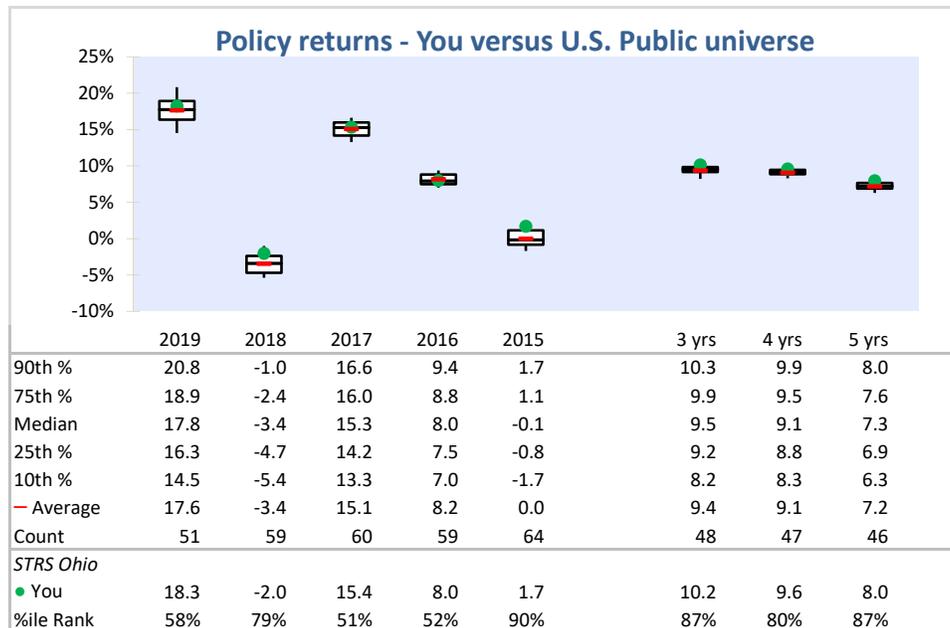
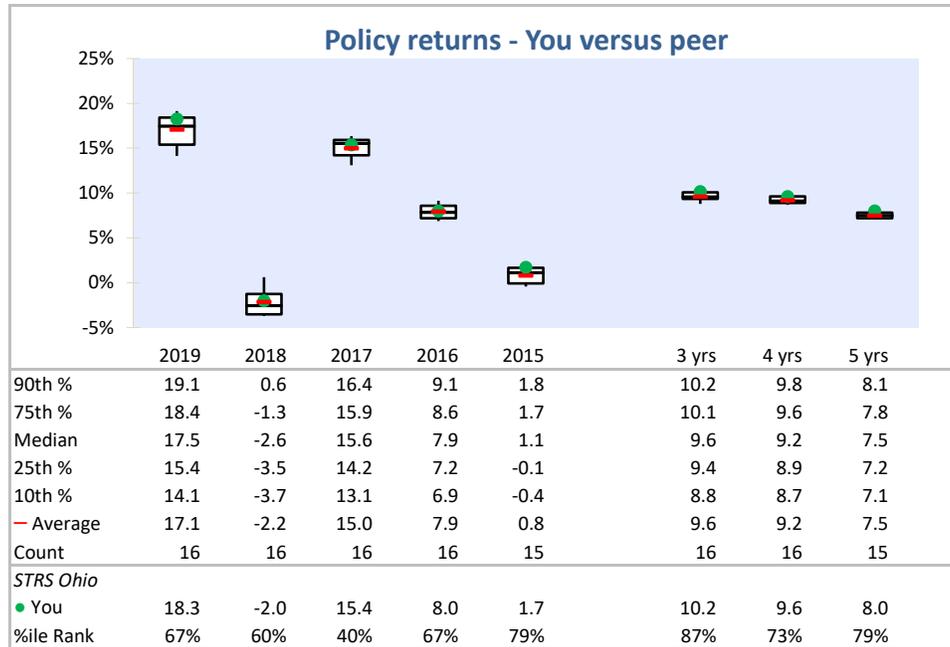
Net total returns

Your 5-year net total return of 8.2% was among the highest in your peer group and among the highest in the U.S. Public universe. Comparisons of total return do not help you understand the reasons behind relative performance. To understand the relative contributions from policy asset mix decisions and implementation decisions we separate total return into its more meaningful components - policy return and implementation value added.



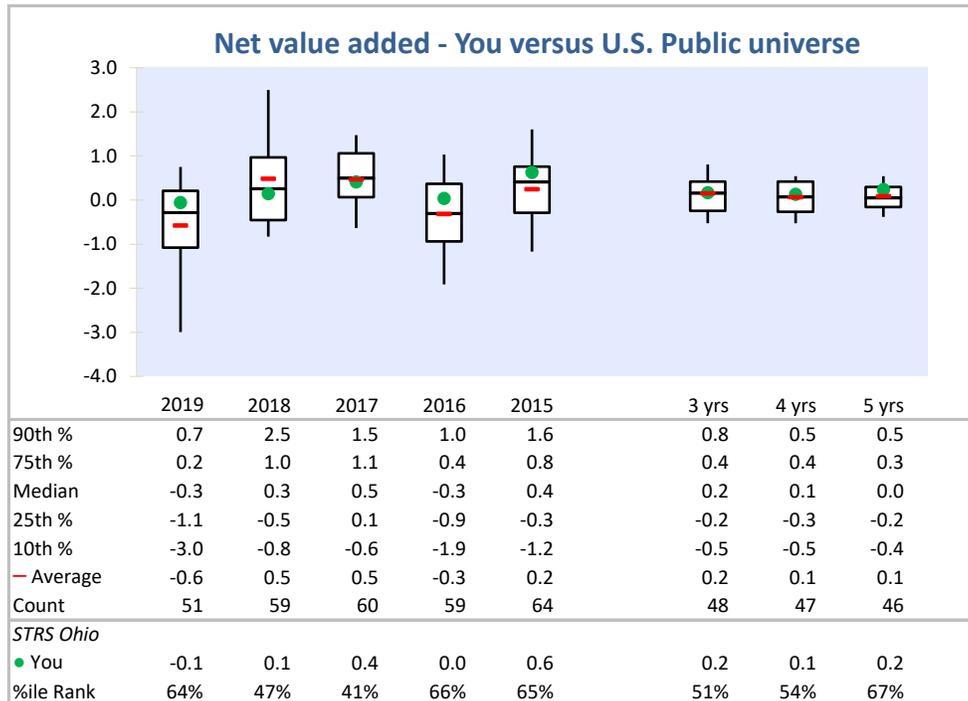
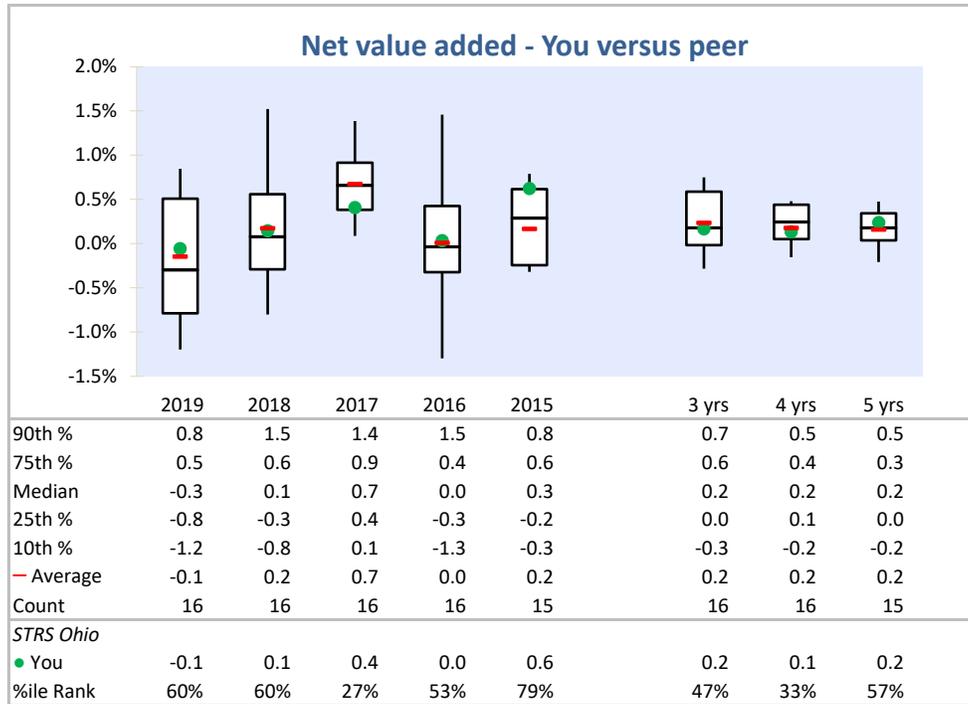
Policy returns

Your 5-year policy return of 8.0% was among the highest in your peer group and among the highest in the U.S. Public universe. Policy return is the return you would have earned had you passively implemented your policy asset mix decision through your benchmark portfolios.



Net value added

Your 5-year net value added of 0.2% was above the peer median and above the median of the U.S. Public universe. Net value added is the difference between your net total return and your policy return.



Net returns by asset class

Asset class	Your fund %						Peer average %						U.S. Public average %					
	2019	2018	2017	2016	2015	5-yr ¹	2019	2018	2017	2016	2015	5-yr ¹	2019	2018	2017	2016	2015	5-yr ¹
Stock - U.S. Broad/All							30.9	-4.8	22.0	11.1	-0.4	10.5	29.8	-5.3	20.1	11.1	-0.5	10.1
Stock - U.S. Large Cap	33.1	-4.8	22.1	10.6	1.0	11.6	33.9	-4.9	21.9	11.6	1.2	11.9	31.6	-4.9	22.3	11.2	0.9	11.5
Stock - U.S. Mid Cap							30.3	-10.9	17.6	14.8	-1.9	9.0	31.8	-9.5	18.9	13.6	-2.7	10.1
Stock - U.S. Small Cap	24.9	-9.8	19.6	17.2	-2.2	9.1	26.1	-10.3	14.9	19.7	-2.5	8.5	27.0	-11.1	15.6	18.7	-3.7	8.5
Stock - EAFE	22.0	-11.8	21.9	4.8	3.5	7.3	23.9	-13.8	26.4	2.9	0.0	6.8	22.5	-14.0	25.7	2.9	0.0	6.4
Stock - Global	21.3	-9.7	24.0	8.8	-1.3	7.8	21.3	-6.7	39.1	8.3	-0.7	8.8	24.6	-8.4	29.4	7.5	-0.9	9.0
Employer Stock																		
Stock - Other							10.0	-7.2	14.2	12.7	-5.4	4.4	14.5	-11.8	14.8	10.3	-6.2	3.0
Stock - Emerging	16.4	-12.6	31.6	13.6	-12.0	6.0	18.8	-15.2	35.7	10.5	-14.4	5.5	20.1	-15.6	36.6	10.6	-13.6	5.8
Stock - ACWI x U.S.	23.1	-12.0	23.8	7.5	-0.9	7.4	23.1	-13.5	28.5	4.3	-1.6	7.1	21.9	-14.5	28.4	3.6	-2.7	6.3
Stock - Aggregate	27.3	-8.4	22.9	9.2	0.4	9.5	26.3	-9.5	24.7	9.2	-1.3	9.0	26.1	-10.0	24.6	9.0	-1.7	8.7
Fixed Income - U.S.	8.6	0.2	3.4	2.7	1.0	3.2	9.8	-0.1	4.4	3.5	0.5	3.5	9.0	0.0	4.3	3.8	0.2	3.3
Fixed Income - U.S. Gov't							6.9	0.8	2.0	0.1	0.7	2.1	8.9	-0.2	4.5	1.2	1.0	2.1
Fixed Income - U.S. Credits													14.4	-0.1	4.5	4.4	-2.2	
Fixed Income - EAFE													6.1	-0.4	9.6	3.8	-8.1	2.0
Fixed Income - Global							10.2	-4.8	30.5	6.6	-2.3	3.8	8.4	-2.0	13.1	5.8	-2.0	3.4
Fixed Income - Other							5.0	1.9	4.9	7.2	-0.3	3.9	7.4	1.4	25.1	15.0	0.3	4.3
Fixed Income - Long Bonds							15.7	-2.9	8.3	0.7	-1.6	4.4	14.2	-3.6	9.8	3.4	-3.8	4.4
Fixed Income - Emerging	11.3	-4.5	10.4	15.4	0.6	6.4	13.8	-5.0	13.0	11.4	-4.6	5.4	13.7	-5.9	12.3	10.6	-5.3	5.1
Fixed Income - Inflation Indexed							6.7	-1.3	3.8	4.2	-2.0	2.5	8.3	-1.3	3.6	5.6	-1.7	3.1
Fixed Income - High Yield	15.0	-2.8	7.3	16.9	-4.5	6.0	13.9	-1.1	7.3	14.0	-2.4	5.9	12.5	-1.5	7.0	12.7	-3.2	5.4
Fixed Income - Absolute Return Bonds																		
Fixed Income - Bundled LDI													16.1					
Fixed Income - Convertibles							22.1	-1.3	12.5				22.1	-1.3	10.9			
Cash	2.2	2.0	0.7	0.5	0.1	1.1	-7.2	-6.3	-0.1	2.7	-1.0	-6.5	0.3	-0.1	0.9	1.3	0.0	-1.0
Fixed Income - Aggregate	8.5	0.0	3.7	4.2	0.4	3.3	9.6	-0.8	4.8	4.3	-0.3	3.4	11.8	-0.7	5.0	4.7	-0.6	3.4
Commodities							-1.4	-12.3	15.2	15.6	-33.0	-7.6	3.3	-11.3	6.8	12.5	-26.5	-5.7
Infrastructure	0.0	-3.2	1.9	3.6	3.2	1.1	8.2	8.5	13.0	8.8	5.7	8.7	9.6	7.2	12.3	9.0	4.3	8.3
Natural Resources	5.9	11.5	-34.5	-4.1	2.0	-5.4	1.0	4.8	0.9	2.4	-2.0	1.4	1.0	3.4	6.9	6.5	-5.4	2.2
REITs	26.0	-4.6	5.2	8.8	3.2	7.2	21.3	-4.2	8.7	5.3	3.5	6.4	25.4	-4.6	8.7	4.8	2.2	6.4
Real Estate ex-REITs	7.8	8.4	6.1	9.3	12.2	8.7	7.7	8.8	9.6	9.4	13.3	9.7	5.8	7.7	8.2	8.1	12.8	8.1
Other Real Assets							4.5	-1.2	3.7	12.3	-5.3	3.6	6.3	-2.3	3.4	12.5	-12.3	0.2
Real Assets - Aggregate	10.2	6.7	2.8	7.7	9.8	7.4	7.9	7.2	9.5	8.9	10.0	8.8	7.3	4.7	7.9	8.1	7.4	6.6
Hedge Funds	3.9	0.6	5.6	2.3	-1.1	2.2	5.5	-2.4	5.2	1.2	-0.7	1.7	5.1	-1.0	5.9	1.5	-0.5	2.5
Global TAA	12.2	-7.3	10.5	8.1	-2.6	3.9	16.4	-7.8	13.4	7.1	-1.7	4.9	14.6	-5.7	12.1	7.3	-3.4	4.5
Risk Parity							27.0	-7.8	15.5	13.2	-10.4	7.6	16.6	-8.0	14.4	11.6	-8.3	6.5
Mortgages							7.2	3.9	7.4	1.8	4.2	5.3	7.8	3.0	5.7	2.6	3.7	4.6
Private Credit	5.9	4.1	5.9				7.0	6.3	7.4	7.4	3.1	6.3	7.3	7.0	8.9	7.8	3.6	6.2
Diversified Private Equity	13.9	17.7	19.3	6.7	9.9	13.4	10.1	16.1	18.2	9.0	8.8	12.3	10.0	15.7	17.0	8.9	8.4	11.5
Venture Capital	12.8	18.4	13.2	3.1	11.8	11.8	14.3	20.2	10.1	5.4	12.5	13.1	11.8	20.1	11.2	4.1	14.3	12.3
LBO	14.0	19.8	19.3	6.7	9.9	13.8	10.7	15.0	17.6	9.2	7.3	11.9	14.5	17.2	19.8	14.2	10.2	14.7
Other Private Equity			7.3	4.2	5.0		7.2	22.2	10.2	8.7	9.2	14.4	21.7	23.3	8.8	9.1	8.3	21.7
Private Equity - Aggregate	13.7	19.0	14.7	5.3	8.7	12.2	10.8	17.0	17.5	9.0	8.7	12.6	11.6	16.6	17.3	9.1	9.2	12.3
Total Fund Return	18.2	-1.9	15.8	8.0	2.3	8.2	16.9	-2.0	15.7	7.9	1.0	7.6	17.1	-2.9	15.5	7.8	0.2	7.3

1. The 5-year return number only includes funds with continuous data over the last 5 years.

For alternative investments & real estate, the returns are net of all external investment management fees and costs, including carried interest and other fund expenses.

Benchmark returns by asset class

Asset class	Your fund %						Peer average %						U.S. Public average %					
	2019	2018	2017	2016	2015	5-yr ¹	2019	2018	2017	2016	2015	5-yr ¹	2019	2018	2017	2016	2015	5-yr ¹
Stock - U.S. Broad/All							31.6	-5.1	22.1	12.2	0.5	11.3	30.9	-5.2	21.8	12.4	0.7	11.3
Stock - U.S. Large Cap	31.0	-5.2	21.1	12.7	0.5	11.2	31.4	-4.8	21.4	12.2	1.0	11.5	31.6	-4.6	21.6	12.4	1.1	11.6
Stock - U.S. Mid Cap							30.0	-7.3	19.1	13.0	-2.4	9.9	27.1	-8.0	19.0	12.5	-2.0	9.6
Stock - U.S. Small Cap	25.5	-11.0	14.7	21.3	-4.4	8.2	26.9	-9.8	16.0	19.4	-4.0	8.7	26.3	-10.3	15.4	19.9	-3.4	8.5
Stock - EAFE	23.5	-11.5	20.1	5.0	0.4	6.7	22.7	-13.7	24.5	2.3	-1.0	6.0	22.5	-13.8	25.0	2.3	-1.1	5.8
Stock - Global	26.6	-9.4	24.6	7.9	-2.4	8.5	26.9	-10.0	23.9	8.4	-1.4	8.8	26.6	-9.3	24.3	8.0	-1.7	8.5
Employer Stock																		
Stock - Other							24.9	-7.3	17.8	13.1	-5.4	7.7	21.2	-9.5	16.3	8.6	-7.3	4.4
Stock - Emerging	18.9	-14.6	37.3	11.2	-14.9	5.7	18.2	-14.8	37.1	11.1	-14.8	5.5	18.3	-14.5	37.2	10.9	-14.5	5.5
Stock - ACWI x U.S.	22.5	-12.1	23.4	6.4	-2.8	6.6	21.9	-13.6	26.2	5.4	-4.5	6.0	21.7	-13.6	27.4	4.6	-4.8	5.9
Stock - Aggregate	27.2	-8.4	22.2	9.8	-1.0	9.1	26.9	-9.0	23.6	9.3	-1.7	9.0	26.4	-9.2	23.8	9.4	-2.0	8.8
Fixed Income - U.S.	8.5	0.1	3.9	3.9	0.4	3.3	9.4	-0.3	4.2	2.7	0.4	3.2	8.9	-0.1	3.8	2.8	0.4	3.1
Fixed Income - U.S. Gov't							6.9	0.9	2.3	0.2	0.8	2.2	8.7	-0.3	4.3	0.8	0.8	2.2
Fixed Income - U.S. Credits													13.8	-1.1	3.6	3.2	-0.7	
Fixed Income - EAFE													5.1	-2.2	8.4	6.1	-6.0	1.6
Fixed Income - Global							10.1	-0.6	6.2	6.2	-1.5	4.6	9.7	-0.8	5.1	4.9	-0.9	3.5
Fixed Income - Other							9.8	0.1	4.6	8.2	-0.1	4.0	9.4	0.4	4.4	7.4	0.4	4.1
Fixed Income - Long Bonds							16.7	-1.9	8.7	1.4	-1.2	4.1	14.3	-3.3	8.9	3.2	-1.9	4.2
Fixed Income - Emerging	13.1	-2.5	8.2	9.9	1.3	5.8	14.3	-4.4	12.1	9.6	-3.0	5.4	13.9	-5.0	11.4	9.8	-4.9	4.7
Fixed Income - Inflation Indexed							7.1	-0.5	3.1	5.0	-1.8	2.2	8.3	-1.4	3.2	5.6	-1.7	2.7
Fixed Income - High Yield	14.0	-2.1	7.5	17.1	-4.5	6.1	13.3	-1.5	6.9	14.9	-3.2	5.8	13.5	-1.8	6.9	15.4	-3.9	5.8
Fixed Income - Absolute Return Bonds																		
Fixed Income - Bundled LDI													17.3	-3.3				
Fixed Income - Convertibles							21.3	0.4	14.7				21.3	0.4	17.1			
Cash	2.3	1.9	0.9	0.3	0.1	1.1	2.6	1.7	0.9	0.3	0.1	1.1	2.3	1.6	1.0	0.4	0.1	1.1
Fixed Income - Aggregate	8.2	0.2	3.7	3.7	0.4	3.2	10.4	-0.6	4.9	4.5	-0.1	3.5	11.6	-1.3	5.3	4.8	-0.3	3.7
Commodities							10.2	-9.1	4.1	10.7	-22.5	-2.1	8.3	-10.7	3.0	10.9	-22.8	-3.7
Infrastructure	9.7	11.8	12.2	5.3	6.1	9.0	12.3	5.7	8.4	6.9	4.8	7.1	11.7	4.4	9.1	6.9	5.0	7.0
Natural Resources	9.7	11.8	12.2	5.3	6.1	9.0	5.7	5.8	7.5	4.4	0.8	4.7	5.5	1.4	6.5	6.8	-0.5	3.6
REITs	26.0	-4.6	5.2	8.5	3.2	7.2	23.5	-4.5	8.2	6.3	3.5	6.7	22.5	-4.3	8.2	6.7	2.9	6.8
Real Estate ex-REITs	6.4	6.7	7.0	8.0	13.3	8.2	5.6	7.5	7.0	8.5	13.7	8.5	6.3	6.6	6.6	8.5	13.7	8.4
Other Real Assets							6.8	2.4	2.3	11.2	4.2	5.5	8.7	0.1	1.5	12.5	-8.7	0.4
Real Assets - Aggregate	6.4	6.7	6.7	8.1	11.8	7.9	6.5	6.0	7.0	8.5	10.4	7.8	8.2	3.7	6.2	8.8	7.5	6.8
Hedge Funds	9.7	11.8	12.2	5.3	6.1	9.0	7.5	1.3	6.3	3.3	1.2	3.3	7.8	-0.1	6.7	3.1	1.3	3.4
Global TAA	9.7	11.8	12.2	5.3	6.1	9.0	18.2	-2.1	14.8	5.9	0.3	7.0	14.5	-3.7	13.1	5.8	1.1	6.0
Risk Parity							23.4	-8.2	13.7	10.5	-2.2	7.0	15.8	-4.7	13.3	9.3	-1.8	6.1
Mortgages							9.2	1.1	4.0	3.3	1.7	3.9	8.5	0.8	2.9	2.9	2.0	3.4
Private Credit	9.7	11.8	12.2				9.6	2.6	6.0	10.7	-0.3	4.7	9.3	2.7	7.2	12.1	-0.3	5.3
Diversified Private Equity	9.7	11.8	12.2	5.3	6.1	9.0	12.3	13.6	17.2	11.1	4.7	11.7	16.0	9.5	19.3	13.3	3.9	12.3
Venture Capital	9.7	11.8	12.2	5.3	6.1	9.0	15.3	14.8	13.8	6.5	8.3	11.9	19.2	7.6	18.5	11.0	5.5	12.0
LBO	9.7	11.8	12.2	5.3	6.1	9.0	11.5	10.7	16.9	9.3	4.1	10.3	14.6	7.5	19.5	11.6	4.0	11.2
Other Private Equity			12.2	5.3	6.1		9.1	3.0	11.3	8.7	4.7	7.4	11.4	4.2	14.6	10.6	4.2	8.3
Private Equity - Aggregate	9.7	11.8	12.2	5.3	6.1	9.0	12.3	13.0	17.2	11.2	4.9	11.7	15.8	9.3	19.3	13.3	4.0	12.3
Total Policy Return	18.3	-2.0	15.4	8.0	1.7	8.0	17.1	-2.2	15.0	7.9	0.8	7.5	17.6	-3.4	15.1	8.2	0.0	7.2

1. The 5-year return number only includes funds with continuous data over the last 5 years.

Net value added by asset class

Asset class	Your fund %						Peer average %						U.S. Public average %					
	2019	2018	2017	2016	2015	5-yr ¹	2019	2018	2017	2016	2015	5-yr ¹	2019	2018	2017	2016	2015	5-yr ¹
Stock - U.S. Broad/All							-0.8	0.4	-0.1	-1.0	-0.9	-0.7	-1.1	-0.1	-1.7	-1.2	-1.2	-1.2
Stock - U.S. Large Cap	2.0	0.4	1.0	-2.1	0.5	0.3	2.5	-0.1	0.5	-0.6	0.2	0.4	-0.1	-0.3	0.7	-1.2	-0.1	-0.1
Stock - U.S. Mid Cap							-0.8	-3.6	-1.5	1.8	0.5	-0.8	4.9	-1.5	-0.1	1.1	-0.7	0.5
Stock - U.S. Small Cap	-0.7	1.2	5.0	-4.1	2.2	0.8	-1.1	-0.5	-1.1	0.3	1.5	-0.2	0.7	-0.5	0.2	-1.2	-0.3	-0.1
Stock - EAFE	-1.5	-0.3	1.8	-0.2	3.2	0.6	1.1	-0.1	1.9	0.5	1.0	0.8	-0.1	-0.2	0.6	0.5	1.3	0.6
Stock - Global	-5.3	-0.3	-0.6	0.9	1.1	-0.7	-5.6	3.3	15.2	-0.1	0.7	0.1	-2.0	0.9	5.0	-0.3	0.6	0.3
Employer Stock																		
Stock - Other							-15.9	0.1	-4.9	-0.5	0.0	-3.3	-6.3	-1.3	-1.5	1.2	1.1	-1.5
Stock - Emerging	-2.5	1.9	-5.7	2.4	3.0	0.3	0.7	-0.3	-1.5	-0.6	0.4	0.1	1.9	-1.1	-0.5	-0.6	0.8	0.2
Stock - ACWI x U.S.	0.6	0.1	0.4	1.1	1.9	0.8	1.2	0.2	1.9	-0.9	3.3	1.3	0.2	-0.9	0.9	-0.9	2.2	0.5
Stock - Aggregate	0.1	0.1	0.6	-0.5	1.4	0.3	-0.6	-0.4	1.1	-0.1	0.4	0.1	-0.3	-0.8	0.8	-0.4	0.3	-0.1
Fixed Income - U.S.	0.1	0.1	-0.4	-1.2	0.6	-0.2	0.6	0.2	0.1	0.8	0.1	0.3	0.3	0.1	0.5	1.0	-0.2	0.2
Fixed Income - U.S. Gov't							0.0	0.0	-0.4	-0.1	0.0	-0.1	0.1	0.1	0.3	-0.1	0.2	-0.1
Fixed Income - U.S. Credits													-0.3	1.0	0.9	1.3	-1.4	
Fixed Income - EAFE													1.0	1.8	1.2	-2.3	-2.1	0.4
Fixed Income - Global							0.9	-4.3	24.3	0.4	-0.8	0.4	-0.9	-1.4	8.0	0.9	-1.2	0.2
Fixed Income - Other							-5.2	2.0	0.4	-0.9	-0.2	-0.3	-2.5	1.1	20.7	8.1	-0.8	0.2
Fixed Income - Long Bonds							0.7	-1.0	-0.4	-0.6	-0.3	0.2	1.7	-0.3	0.9	-0.6	-1.8	0.2
Fixed Income - Emerging	-1.8	-2.0	2.2	5.5	-0.6	0.5	-0.4	-0.6	0.8	1.8	-1.7	-0.1	-0.1	-1.2	0.9	0.8	-0.1	0.3
Fixed Income - Inflation Indexed							0.3	-0.8	0.8	-0.8	0.0	0.3	0.1	0.0	0.4	0.0	0.0	0.2
Fixed Income - High Yield	1.0	-0.7	-0.2	-0.3	0.0	0.0	0.6	0.3	0.3	-0.9	0.8	0.1	-0.9	0.4	0.1	-2.9	0.9	-0.4
Fixed Income - Absolute Return Bonds																		
Fixed Income - Bundled LDI													-1.2					
Fixed Income - Convertibles							-1.1	-1.7	-2.2				-1.1	-1.7	-6.1			
Cash	0.0	0.1	-0.1	0.1	0.0	0.0	-9.9	-8.2	-1.0	2.4	-1.2	-7.6	-1.9	-1.6	-0.2	0.9	0.0	-2.1
Fixed Income - Aggregate	0.3	-0.2	0.0	0.5	0.0	0.1	-0.5	-0.2	-0.1	-0.1	-0.2	0.0	0.2	0.6	-0.3	-0.2	-0.4	-0.3
Commodities							-11.9	-3.2	10.6	5.3	-11.1	-5.6	-5.1	-0.7	3.5	1.2	-3.5	-2.6
Infrastructure	-9.7	-15.0	-10.3	-1.7	-2.9	-7.9	-1.5	3.4	4.6	1.9	0.9	1.6	-0.2	2.3	3.1	2.1	-0.7	1.5
Natural Resources	-3.8	-0.3	-46.7	-9.4	-4.1	-14.4	-2.7	-1.0	-7.0	-2.0	-2.8	-2.6	-4.0	2.1	0.5	-0.5	-4.5	-1.5
REITs	0.0	0.0	0.0	0.3	0.0	0.0	-3.1	0.4	0.5	-0.9	0.1	-0.5	2.3	-0.3	0.5	-1.8	-0.8	-0.4
Real Estate ex-REITs	1.3	1.7	-0.9	1.3	-1.2	0.5	2.4	1.3	2.6	1.0	-0.3	1.4	-0.5	1.0	1.6	-0.3	-0.8	-0.2
Other Real Assets							-1.2	-2.4	1.4	1.1	-9.6	-1.9	-3.0	-2.0	1.9	-0.4	-3.6	-0.1
Real Assets - Aggregate	3.7	0.0	-3.9	-0.3	-2.0	-0.5	1.6	1.2	2.5	0.6	-0.7	1.2	-1.0	0.9	1.7	-0.7	-0.1	0.0
Hedge Funds	-5.8	-11.2	-6.7	-3.0	-7.2	-6.8	-2.8	-3.4	-0.7	-1.9	-1.9	-1.3	-3.0	-0.7	-0.8	-1.6	-1.8	-0.7
Global TAA	2.5	-19.1	-1.7	2.8	-8.7	-5.1	-1.8	-5.7	-1.5	1.3	-2.0	-2.1	-0.1	-2.3	-1.3	1.4	-4.5	-1.4
Risk Parity							0.6	0.4	1.8	2.8	-13.7	0.0	0.2	-3.3	1.1	2.4	-8.0	0.0
Mortgages							-2.2	2.8	1.3	-1.5	2.6	0.9	-0.8	2.4	1.5	-0.5	1.7	1.1
Private Credit	-3.8	-7.7	-6.3				-2.5	3.7	1.4	-3.2	3.4	1.6	-1.9	4.3	1.7	-4.0	4.3	1.2
Diversified Private Equity	4.2	5.9	7.1	1.4	3.8	4.4	-1.3	2.5	0.9	-2.1	4.1	0.8	-5.9	5.3	-2.4	-4.4	4.4	-0.5
Venture Capital	3.1	6.6	1.0	-2.2	5.7	2.8	-0.8	5.5	-3.7	-1.1	4.2	1.8	-8.3	11.9	-7.0	-6.6	8.6	0.7
LBO	4.2	8.0	7.1	1.4	3.8	4.8	-0.3	4.3	0.7	-0.1	3.2	2.5	-0.1	9.0	0.7	2.7	6.3	4.1
Other Private Equity			-4.9	-1.1	-1.1		-1.9	19.2	-1.1	-0.1	4.5	7.1	10.3	19.1	-5.9	-2.4	4.2	13.4
Private Equity - Aggregate	4.0	7.2	2.5	0.0	2.6	3.2	-0.5	4.0	0.3	-2.2	3.8	1.2	-4.2	6.5	-2.0	-4.2	5.1	0.2
Total Fund Return	-0.1	0.1	0.4	0.0	0.6	0.2	-0.1	0.2	0.7	0.0	0.2	0.2	-0.6	0.5	0.5	-0.3	0.2	0.1

Total net value add is determined by both actual and policy allocation. It is the outcome of total net return (page 6) minus total benchmark return (page 7). Aggregate net returns are an asset weighted average of all categories that the fund has an actual allocation to. Aggregate benchmark returns are a policy weighted average and includes only those categories that are part of your policy fund's mix.

1. The 5-year return number only includes funds with continuous data over the last 5 years.

For alternative investments & real estate, the returns are net of all external investment management fees and costs, including carried interest and other fund expenses.

Your policy return and value added calculation - 2019

2019 Policy Return and Value Added

Asset class	Policy weight	Benchmark Description	Return	Net return	Value added
Stock - U.S. Large Cap	28.0%	Russell 1000 (Russell 3000 for total Dom Equity)	31.0%	33.1%	2.0%
Stock - U.S. Small Cap		Russell 2000	25.5%	24.9%	-0.7%
Stock - EAFE	18.4%	MSCI World xUS 50% Hedged Net	23.5%	22.0%	-1.5%
Stock - Global		MSCI ACWI net	26.6%	21.3%	-5.3%
Stock - Emerging	4.6%	MSCI Emerging Market net	18.9%	16.4%	-2.5%
Stock - ACWI x U.S.		International Blended Benchmark	22.5%	23.1%	0.6%
Fixed Income - U.S.	21.0%	Fixed Income Blended (Jul 1 2017)	8.5%	8.6%	0.1%
Fixed Income - Emerging		Barclays Emerging Market	13.1%	11.3%	-1.8%
Fixed Income - High Yield		Barclays US Corp High Yield	14.0%	15.0%	1.0%
Cash	1.0%	US 90 day T bill	2.3%	2.2%	0.0%
Infrastructure		Custom (Alternative Investment Actual Return)	9.7%	0.0%	-9.7%
Natural Resources		Custom (Alternative Investment Actual Return)	9.7%	5.9%	-3.8%
REITs		Your REIT benchmark	26.0%	26.0%	0.0%
Real Estate ex-REITs	10.0%	NCREIF NPI	6.4%	7.8%	1.3%
Hedge Funds		Custom (Alternative Investment Actual Return)	9.7%	3.9%	-5.8%
Global TAA		Custom (Alternative Investment Actual Return)	9.7%	12.2%	2.5%
Private Credit		Custom (Alternative Investment Actual Return)	9.7%	5.9%	-3.8%
Diversified Private Equity		Custom (Alternative Investment Actual Return)	9.7%	13.9%	4.2%
Venture Capital		Custom (Alternative Investment Actual Return)	9.7%	12.8%	3.1%
LBO	17.0%	Custom (Alternative Investment Actual Return)	9.7%	14.0%	4.2%
Total	100.0%				
Net Actual Return (reported by you)					18.2%
Calculated Policy Return = sum of (policy weights X benchmark returns)				18.0%	
Adjustment to reflect rebalancing and overlay impacts				<u>0.3%</u>	
Policy Return (reported by you)					<u>18.3%</u>
Net Value Added (Net Return - Policy Return)					-0.1%

For alternative investments & real estate, the returns are net of all external investment management fees and costs, including carried interest and other fund expenses.

Your policy return and value added calculations - 2015 to 2018

2018 Policy Return and Value Added

Asset class	Policy weight	Benchmark Description	Benchmark Return	Net return	Value added
Stock - U.S. Large Cap	28.0%	Russell 1000 (Ru	-5.2%	-4.8%	0.4%
Stock - U.S. Small Cap		Russell 2000	-11.0%	-9.8%	1.2%
Stock - EAFE	19.2%	MSCI World xUS	-11.5%	-11.8%	-0.3%
Stock - Global		MSCI ACWI net	-9.4%	-9.7%	-0.3%
Stock - Emerging	4.8%	MSCI Emerging I	-14.6%	-12.6%	1.9%
Stock - ACWI x U.S.		International Bl	-12.1%	-12.0%	0.1%
Fixed Income - U.S.	21.0%	Fixed Income Bl	0.1%	0.2%	0.1%
Fixed Income - Emerging		Barclays Emergi	-2.5%	-4.5%	-2.0%
Fixed Income - High Yield		Barclays US Corj	-2.1%	-2.8%	-0.7%
Cash	1.0%	US 90 day T bill	1.9%	2.0%	0.1%
Infrastructure		Custom (Altern	11.8%	-3.2%	-15.0%
Natural Resources		Custom (Altern	11.8%	11.5%	-0.3%
REITs		Your REIT bench	-4.6%	-4.6%	0.0%
Real Estate ex-REITs	10.0%	NCREIF NPI	6.7%	8.4%	1.7%
Hedge Funds		Custom (Altern	11.8%	0.6%	-11.2%
Global TAA		Custom (Altern	11.8%	-7.3%	-19.1%
Private Credit		Custom (Altern	11.8%	4.1%	-7.7%
Diversified Private Equity		Custom (Altern	11.8%	17.7%	5.9%
Venture Capital		Custom (Altern	11.8%	18.4%	6.6%
LBO	16.0%	Custom (Altern	11.8%	19.8%	8.0%
Other Private Equity					
Total	100.0%				
Net Return (reported by you)					-1.9%
Calculated policy return (sum: Policy weights x benchmarks)				-1.8%	
Adjustment to reflect rebalancing and overlay impacts				-0.3%	
Policy return (reported by you)					-2.0%
Net Value Added (Net Return - Policy Return)					0.1%

2016 Policy Return and Value Added

Asset class	Policy weight	Benchmark Description	Benchmark Return	Net return	Value added
Stock - U.S. Large Cap	31.0%	Russell 1000 (Ru	12.7%	10.6%	-2.1%
Stock - U.S. Small Cap		Russell 2000	21.3%	17.2%	-4.1%
Stock - EAFE	20.8%	MSCI World xUS	5.0%	4.8%	-0.2%
Stock - Global		MSCI ACWI net	7.9%	8.8%	0.9%
Stock - Emerging	5.2%	MSCI Emerging I	11.2%	13.6%	2.4%
Stock - ACWI x U.S.		International Bl	6.4%	7.5%	1.1%
Fixed Income - U.S.	18.0%	Barclays Univers	3.9%	2.7%	-1.2%
Fixed Income - Emerging		Barclays Emergi	9.9%	15.4%	5.5%
Fixed Income - High Yield		Barclays US Corj	17.1%	16.9%	-0.3%
Cash	1.0%	US 90 day T bill	0.3%	0.5%	0.1%
Infrastructure		Custom (Altern	5.3%	3.6%	-1.7%
Natural Resources		Custom (Altern	5.3%	-4.1%	-9.4%
REITs	1.5%	Your REIT bench	8.5%	8.8%	0.3%
Real Estate ex-REITs	8.5%	NCREIF NPI	8.0%	9.3%	1.3%
Hedge Funds		Custom (Altern	5.3%	2.3%	-3.0%
Global TAA		Custom (Altern	5.3%	8.1%	2.8%
Diversified Private Equity		Custom (Altern	5.3%	6.7%	1.4%
Venture Capital		Custom (Altern	5.3%	3.1%	-2.2%
LBO	14.0%	Custom (Altern	5.3%	6.7%	1.4%
Other Private Equity		Custom (Altern	5.3%	4.2%	-1.1%
Total	100.0%				
Net Return (reported by you)					8.0%
Calculated policy return (sum: Policy weights x benchmarks)				7.8%	
Adjustment to reflect rebalancing and overlay impacts				0.2%	
Policy return (reported by you)					8.0%
Net Value Added (Net Return - Policy Return)					0.0%

2017 Policy Return and Value Added

Asset class	Policy weight	Benchmark Description	Benchmark Return	Net return	Value added
Stock - U.S. Large Cap	30.0%	Russell 1000 (Ru	21.1%	22.1%	1.0%
Stock - U.S. Small Cap		Russell 2000	14.7%	19.6%	5.0%
Stock - EAFE	20.0%	MSCI World xUS	20.1%	21.9%	1.8%
Stock - Global		MSCI ACWI net	24.6%	24.0%	-0.6%
Stock - Emerging	5.0%	MSCI Emerging I	37.3%	31.6%	-5.7%
Stock - ACWI x U.S.		International Bl	23.4%	23.8%	0.4%
Fixed Income - U.S.	20.0%	Fixed Income Bl	3.9%	3.4%	-0.4%
Fixed Income - Emerging		Barclays Emergi	8.2%	10.4%	2.2%
Fixed Income - High Yield		Barclays US Corj	7.5%	7.3%	-0.2%
Cash	1.0%	US 90 day T bill	0.9%	0.7%	-0.1%
Infrastructure		Custom (Altern	12.2%	1.9%	-10.3%
Natural Resources		Custom (Altern	12.2%	-34.5%	-46.7%
REITs	1.5%	Your REIT bench	5.2%	5.2%	0.0%
Real Estate ex-REITs	8.5%	NCREIF NPI	7.0%	6.1%	-0.9%
Hedge Funds		Custom (Altern	12.2%	5.6%	-6.7%
Global TAA		Custom (Altern	12.2%	10.5%	-1.7%
Private Credit		Custom (Altern	12.2%	5.9%	-6.3%
Diversified Private Equity		Custom (Altern	12.2%	19.3%	7.1%
Venture Capital		Custom (Altern	12.2%	13.2%	1.0%
LBO	14.0%	Custom (Altern	12.2%	19.3%	7.1%
Other Private Equity		Custom (Altern	12.2%	7.3%	-4.9%
Total	100.0%				
Net Return (reported by you)					15.8%
Calculated policy return (sum: Policy weights x benchmarks)				15.4%	
Adjustment to reflect rebalancing and overlay impacts				0.0%	
Policy return (reported by you)					15.4%
Net Value Added (Net Return - Policy Return)					0.4%

2015 Policy Return and Value Added

Asset class	Policy weight	Benchmark Description	Benchmark Return	Net return	Value added
Stock - U.S. Large Cap	31.0%	Russell 1000 (Ru	0.5%	1.0%	0.5%
Stock - U.S. Small Cap		Russell 2000	-4.4%	-2.2%	2.2%
Stock - EAFE	20.8%	MSCI World xUS	0.4%	3.5%	3.2%
Stock - Global		MSCI ACWI net	-2.4%	-1.3%	1.1%
Stock - Emerging	5.2%	MSCI Emerging I	-14.9%	-12.0%	3.0%
Stock - ACWI x U.S.		International Bl	-2.8%	-0.9%	1.9%
Fixed Income - U.S.	18.0%	Barclays Univers	0.4%	1.0%	0.6%
Fixed Income - Emerging		Barclays Emergi	1.3%	0.6%	-0.6%
Fixed Income - High Yield		Barclays US Corj	-4.5%	-4.5%	0.0%
Cash	1.0%	US 90 day T bill	0.1%	0.1%	0.0%
Infrastructure		Custom (Altern	6.1%	3.2%	-2.9%
Natural Resources		Custom (Altern	6.1%	2.0%	-4.1%
REITs	1.5%	Your REIT bench	3.2%	3.2%	0.0%
Real Estate ex-REITs	8.5%	NCREIF NPI	13.3%	12.2%	-1.2%
Hedge Funds		Custom (Altern	6.1%	-1.1%	-7.2%
Global TAA		Custom (Altern	6.1%	-2.6%	-8.7%
Diversified Private Equity		Custom (Altern	6.1%	9.9%	3.8%
Venture Capital		Custom (Altern	6.1%	11.8%	5.7%
LBO	14.0%	Custom (Altern	6.1%	9.9%	3.8%
Other Private Equity		Custom (Altern	6.1%	5.0%	-1.1%
Total	100.0%				
Net Return (reported by you)					2.3%
Calculated policy return (sum: Policy weights x benchmarks)				1.6%	
Adjustment to reflect rebalancing and overlay impacts				0.1%	
Policy return (reported by you)					1.7%
Net Value Added (Net Return - Policy Return)					0.6%

For alternative investments & real estate, the returns are net of all external investment management fees and costs, including carried interest and other fund expenses.

Profit/Loss on overlay programs

Overlay type	Your fund		Peer median				U.S. Public median			
	2019	2018	2019		2018		2019		2018	
	bps	bps	bps	#	bps	#	bps	#	bps	#
Int. Discretionary Currency			9.9	1	-3.4	1	9.9	1	-3.4	1
Ext. Discretionary Currency			-0.6	2	-0.3	2	-1.3	3	0.3	3
Internal Global TAA										
External Global TAA										
Internal PolicyTilt TAA										
External PolicyTilt TAA										
Internal Commodities										
External Commodities							10.5	1	-1.9	1
Internal Long/Short										
External Long/Short										
Internal Other					0.0	1	52.5	1	0.0	1
External Other			23.4	1	-7.1	1	15.6	4	-7.1	3

Profit/loss in basis points was calculated using total fund average holdings. This was done to measure the impact of the program at the total fund level.

4

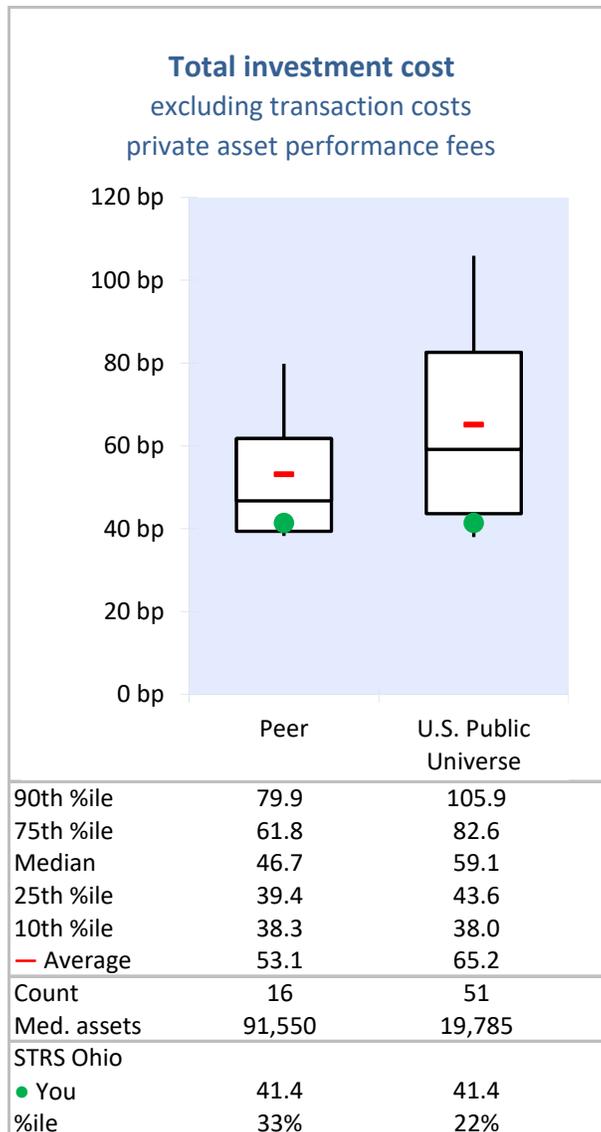
Cost: total, benchmark, trend

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Comparisons of total investment cost

Your total investment cost, excluding transaction costs and private asset performance fees, of 41.4 bps was below the peer median of 46.7 bps.

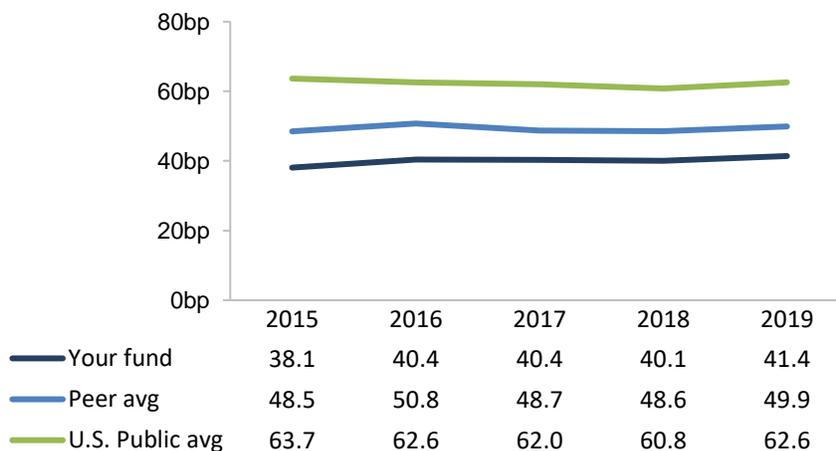
Differences in total investment cost are often caused by two factors that are usually outside of management's control: asset mix and fund size. Therefore, to assess whether your fund's total investment cost is high or low given your unique asset mix and size, CEM calculates a benchmark cost for your fund. Benchmark cost analysis begins on page 7 of this section.



Trend in total investment cost, you versus peers and universe

Your total investment cost, excluding transaction costs and private asset performance fees, increased from 38.1 bps in 2015 to 41.4 bps in 2019.

Trend in total investment cost
(excluding transaction costs and private asset performance fees)



Trend analysis is based on 46 U.S. Public funds and 15 peer funds with 5 or more consecutive years of data.

Types of costs included in your total investment cost

The table below outlines the types of costs included in your total investment cost.

Asset class	Internal		External			
	In-house total cost	Transaction costs	Manager base fees	Monitoring & other costs	Perform. fees (active only)	Transaction costs
<u>Public</u> (Stock, Fixed income, commodities, REITs)	✓	✗	✓	✓	✓	✗
Derivatives/Overlays	✓	✗	✓	✓	✓	✗
<u>Hedge funds & Global TAA</u>						
Hedge Funds	n/a	n/a	✓	✓	✓	✗
Global TAA	✓	✗	✓	✓	✓	✗
<u>Private real assets</u> (Infrastructure, natural resources, real estate ex-REITs, other real assets)	✓	✗	✓	✓	✗	✗
<u>Private equity</u> (Diversified private equity, venture capital, LBO, other private equity)	✓	✗	✓*	✓	✗	✗

*External manager base fees represent gross contractual management fees.

- ✓ indicates cost is included.
- ✗ indicates cost is excluded.
- CEM currently excludes performance fees for certain external assets and all transaction costs from your total cost because only a limited number of participants are currently able to provide complete data.

Detailed breakdown of your gross total investment cost

Your 2019 total investment cost, excluding transaction costs and private asset performance fees, was 41.4 bp or \$320.6 million.

	Internal		External Passive		External Active			Total ¹		
	Passive	Active	Fees	Monitoring & Other	Base Fees	Perform. Fees	Monitor. & Other	\$000s	bps	% of Total
Asset management										
Stock - U.S. Large Cap	77	13,352			2,369		215	16,012		5%
Stock - U.S. Small Cap		355			9,549		102	10,007		3%
Stock - EAFE		3,416			19,222		275	22,913		7%
Stock - Emerging		3,418			4,574		255	8,247		3%
Stock - Global		511						511		0%
Stock - ACWI x U.S.		490			5,594		21	6,105		2%
Fixed Income - U.S.		3,325						3,325		1%
Fixed Income - Emerging					3,325		101	3,426		1%
Fixed Income - High Yield					2,860		100	2,960		1%
Cash		313						313		0%
REITs	106							106		0%
Real Estate ex-REITs ¹²		17,277						17,277		5%
Real Estate ex-REITs - LP ¹²					14,277	7,200	465	14,742		5%
Infrastructure - FoFs ¹²					335	447	3	338		0%
Underlying FoF Fees ¹²					170	482		170		0%
Natural Resources ¹²										
Natural Resources - LP ¹²					5,425	1,787	66	5,491		2%
Natural Resources - Co-Invest. ¹							33	33		0%
Hedge Funds					20,749	8,871	186	29,806		9%
Global TAA		1,739			3,837		41	5,617		2%
Diversified Private Equity - LP ¹²		421			36,148	32,290	526	37,096		12%
Diversified Private Equity - Co-Invest. ¹					0		179	179		0%
LBO - LP ¹²					67,821	63,763	727	68,547		21%
LBO - FoFs ¹²					7,851	4,096	175	8,026		3%
Underlying FoF Fees ¹²					11,890	18,433		11,890		4%
Venture Capital - LP ¹²					17,853	27,541	390	18,243		6%
Venture Capital - FoFs ¹²					1,302	1,026	53	1,355		0%
Underlying FoF Fees ¹²					4,601	7,183		4,601		1%
Other Private Equity - LP ¹										
Other Private Equity - Co-Invest. ¹										
Private Credit ¹²		78						78		0%
Private Credit - LP ¹²					15,570	5,050	127	15,698		5%
Private Credit - Co-Invest. ¹					0		54	54		0%
Derivatives/Overlays	341			170				511		0%
Total asset management costs excluding private asset performance fees								313,677	40.5bp	98%
Oversight, custodial & other asset related costs										
Oversight of the Fund								4,580		1%
Trustee & Custodial								1,782		1%
Audit								153		0%
Other								436		0%
Total oversight, custodial & other costs								6,950	0.9bp	2%
Total investment costs excluding transaction costs and private asset performance fees								320,628	41.4bp	100%

1. Total cost excludes carry/performance fees for real estate, infrastructure, natural resources and private equity. Performance fees are included for the public market asset classes and hedge funds. For alternative investments & real estate, the returns (shown throughout the report) are net of all external investment management fees and costs, including carried interest and other fund expenses.

2. Default costs added. Refer to Appendix A.

Changes in your investment costs

The table below shows how your investment costs have changed from year to year by asset class.

Change in your investment costs (2019 - 2015)

	Investment costs (\$000s)					Change (\$000s)				Change (%)			
	2019	2018	2017	2016	2015	2019	2018	2017	2016	2019	2018	2017	2016
Asset management													
Stock - U.S. Large Cap	16,012	15,281	15,356	13,728	14,183	731	-75	1,628	-455	5%	0%	12%	-3%
Stock - U.S. Small Cap	10,007	9,866	10,064	9,173	9,392	141	-198	891	-219	1%	-2%	10%	-2%
Stock - EAFE	22,913	22,300	23,709	22,089	23,022	613	-1,409	1,620	-933	3%	-6%	7%	-4%
Stock - Emerging	8,247	9,214	9,362	8,662	8,177	-967	-148	699	486	-10%	-2%	8%	6%
Stock - Global	511	488	495	452	457	23	-7	43	-5	5%	-1%	9%	-1%
Stock - ACWI x U.S.	6,105	5,962	6,617	5,898	5,480	143	-655	719	418	2%	-10%	12%	8%
Fixed Income - U.S.	3,325	3,466	3,305	2,466	2,552	-141	161	839	-86	-4%	5%	34%	-3%
Fixed Income - Emerging	3,426	3,619	3,592	3,311	3,717	-193	27	281	-406	-5%	1%	8%	-11%
Fixed Income - High Yield	2,960	3,305	3,312	3,821	4,606	-345	-7	-510	-785	-10%	0%	-13%	-17%
Cash	313	299	286	266	269	14	13	20	-3	5%	5%	7%	-1%
REITs	106	106	94	89	226	0	12	5	-137	0%	13%	6%	-61%
Real Estate ex-REITs ¹²	17,277	17,796	17,182	16,632	16,561	-519	613	550	71	-3%	4%	3%	0%
Real Estate ex-REITs - LP ¹²	14,742	14,511	18,114	17,879	18,382	231	-3,603	235	-502	2%	-20%	1%	-3%
Infrastructure - FoFs ¹²	338	379	473	508	514	-41	-94	-36	-6	-11%	-20%	-7%	-1%
Underlying FoF Fees ¹²	170	348	767	1,321	1,946	-177	-419	-554	-625	-51%	-55%	-42%	-32%
Natural Resources ¹²	0	0	0	298	169			-298	129			-100%	77%
Natural Resources - LP ¹²	5,491	5,748	6,901	6,505	7,716	-257	-1,153	396	-1,211	-4%	-17%	6%	-16%
Natural Resources - Co-Invest. ¹	33	24	40			9	-15			36%	-39%		
Hedge Funds	29,806	39,140	50,047	54,886	45,603	-9,334	-10,907	-4,839	9,283	-24%	-22%	-9%	20%
Global TAA	5,617	4,069	1,372	1,218	690	1,548	2,698	154	528	38%	197%	13%	76%
Diversified Private Equity - LP ¹²	37,096	26,513	3,144	2,743	1,442	10,582	23,370	401	1,301	40%	743%	15%	90%
Diversified Private Equity - Co-Invest. ¹	179	88				91				103%			
LBO - LP ¹²	68,547	59,184	45,609	43,639	43,326	9,363	13,575	1,970	314	16%	30%	5%	1%
LBO - FoFs ¹²	8,026	6,497	7,500	7,355	6,569	1,529	-1,003	146	785	24%	-13%	2%	12%
Underlying FoF Fees ¹²	11,890	10,167	10,952	8,311	11,206	1,723	-785	2,641	-2,896	17%	-7%	32%	-26%
Venture Capital - LP ¹²	18,243	16,734	17,217	17,146	15,863	1,509	-483	71	1,283	9%	-3%	0%	8%
Venture Capital - FoFs ¹²	1,355	1,554	1,282	1,750	1,617	-199	272	-468	133	-13%	21%	-27%	8%
Underlying FoF Fees ¹²	4,601	4,721	4,794	4,392	3,665	-120	-73	402	727	-3%	-2%	9%	20%
Other Private Equity - LP ¹			24,065	25,635	19,766			-1,570	5,869			-6%	30%
Other Private Equity - Co-Invest. ¹			193	34	9			160	25			473%	289%
Private Credit ¹²	78	74				4				6%			
Private Credit - LP ¹²	15,698	12,935	8,365			2,763	4,571			21%	55%		
Private Credit - Co-Invest. ¹	54												
Derivatives/Overlays	511	488	495	452	457	23	-7	43	-5	5%	-1%	9%	-1%
Total excl. private asset perf. fees	313,677	294,877	294,704	280,660	267,582	18,801	173	14,044	13,078	6%	0%	5%	5%
Oversight, custodial & other asset related costs													
Oversight of the Fund	4,580	4,965	4,812	4,578	4,539	-385	153	234	39	-8%	3%	5%	1%
Trustee & Custodial	1,782	2,293	2,412	2,090	2,150	-511	-119	322	-60	-22%	-5%	15%	-3%
Audit	153	168	168	166	158	-16	0	2	8	-9%	0%	1%	5%
Other	436	511	477	418	375	-75	33	59	43	-15%	7%	14%	12%
Total oversight, custodial & other	6,950	7,937	7,870	7,252	7,222	-987	67	618	30	-12%	1%	9%	0%
Total investment costs ¹	320,628	302,813	302,574	287,912	274,804	17,814	240	14,662	13,108	6%	0%	5%	5%
Total in basis points	41.4bp	40.1bp	40.4bp	40.4bp	38.1bp								

1. Total cost excludes carry/performance fees for real estate, infrastructure, natural resources and private equity. Performance fees are included for the public market asset classes and hedge funds. For alternative investments & real estate, the returns (shown throughout the report) are net of all external investment management fees and costs, including carried interest and other fund expenses.

2. Default costs added. Refer to Appendix A.

Total cost versus benchmark cost

Your fund's total investment cost, excluding transaction costs and private asset performance fees, was 14.0 bps below your benchmark cost of 55.4 bps. This implies that your fund was low cost by 14.0 bps compared to the peer median, after adjusting for your fund's asset mix.

Your cost versus benchmark

	\$000s	bps
Your fund's total investment costs excluding transaction costs and private asset performance fees	320,628	41.4 bp
- Your fund's benchmark	429,354	55.4 bp
= Your fund's cost savings	-108,726	-14.0 bp

Your benchmark cost is an estimate of your total costs assuming that you paid the peer median cost for each of your investment mandates and fund oversight. The calculation of your benchmark cost is shown on the following page.

The reasons why your fund's total cost was below your benchmark are summarized in the table below. Details of each of the impacts below are provided on pages 9 to 11.

Reasons why your fund was low cost

	Cost/-Savings impact	
	\$000s	bps
<u>Differences in implementation style:</u>		
Less passive	24,338	3.1 bp
More int. pass. % of total passive	-74	0.0 bp
More int. active % of total active	-73,820	-9.5 bp
Less evergreen % of external	10,941	1.4 bp
Mix of fund of funds	-2,102	-0.3 bp
Less co-investment	3,377	0.4 bp
Less overlays and unfunded strategies	-1,000	-0.1 bp
Total style impact	-38,341	-5.0 bp
<u>Paying more/-less for similar services:</u>		
External investment management	-72,614	-9.4 bp
Internal investment management	3,360	0.4 bp
Oversight, custodial and other	-1,131	-0.1 bp
Total impact of paying more /-less	-70,386	-9.1 bp
Total savings	-108,726	-14.0 bp

Benchmark cost calculation

Your 2019 benchmark cost was 55.4 basis points or 429.4 million. It equals your holdings for each asset class multiplied by the peer median cost for the asset class. The peer median cost is the style weighted average for all implementation styles (i.e., internal passive, internal active, external passive, external active).

Asset class	Your average assets (A)	Weighted peer median cost ¹ (B)	Benchmark \$000s (A X B)
Asset management costs			
Stock - U.S. Large Cap	19,643	3.8 bp	7,553
Stock - U.S. Small Cap	1,934	44.8 bp	8,670
Stock - EAFE	10,603	23.3 bp	24,736
Stock - Emerging	3,052	41.6 bp	12,688
Stock - Global	586	26.0 bp	1,522
Stock - ACWI x U.S.	4,129	26.1 bp	10,778
Fixed Income - U.S.	13,405	5.8 bp	7,757
Fixed Income - Emerging	907	34.2 bp	3,097
Fixed Income - High Yield	731	31.7 bp	2,316
Cash	1,300	2.4 bp	313
REITs	1,156	18.3 bp	2,117
Real Estate ex-REITs	7,359	82.3 bp	60,567
Infrastructure	27	115.3 bp	313
Natural Resources	576	113.4 bp	6,527
Hedge Funds	1,516	111.7 bp	16,931
Perf. fees (on NAV)	1,516	69.1 bp	10,478
Global TAA	1,469	60.9 bp	8,942
Diversified Private Equity	4,279	154.4 bp	66,074
Venture Capital	2,342	165.4 bp	38,745
LBO	7,108	160.5 bp	114,055
Private Credit	1,585	98.3 bp	15,583
Overlay Programs ²	77,433	0.2 bp	1,511
Benchmark for asset management	77,433	54.4 bp	421,272
Oversight, custody and other costs³			
Oversight	77,433	0.6 bp	
Trustee & Custodial	77,433	0.2 bp	
Consulting	77,433	0.0 bp	
Audit	77,433	0.0 bp	
Other	77,433	0.1 bp	
Benchmark for oversight, custody & other	77,433	1.0 bp	8,081
Total benchmark cost		55.4 bp	429,354

1. The weighted peer median cost for asset management is the style-weighted average of the peer median costs for all implementation styles (i.e., internal passive, internal active, external passive, external active, fund of fund). The style weights by asset class for your fund and the peers are shown on page 15 of this section.

2. Total fund average holdings is used as the base when calculating the relative cost impact of the overlay programs.

3. Benchmarks for oversight total and individual lines are based on peer medians. Sum of the lines may be different from the total.

Cost impact of overlays

As summarized on the previous page, the style impact of overlays saved you 0.1 bps. If you use more overlays than your peers, or more expensive types of overlays, then it increases your relative cost.

	Your average total holdings (mils) (A)	Cost as % of total holdings		Cost/-Savings Impact (000s) A X (B - C)
		You (B)	Peer avg. (C)	
Internal Overlays				
[Redacted]				
Total impact in 000s				-1,000
Total impact in basis points				-0.1 bp

Summary of why you are high or low cost by asset class

The table below summarizes where you are high and low cost by asset class. It also quantifies how much is due to differences in implementation style (i.e., differences in the mix of external active, external passive, internal active, internal passive and fund of fund usage) and how much is due to paying more or less for similar services (i.e., same asset class and style).

	Your cost ¹	Benchmark = peer weighted median cost ¹	More/-less	Your average assets (or fee basis)	More/-less in \$000s		
					Total More/-less	Due to Impl. style	Due to paying more/less
	(A)	(B)	(C = A - B)	(D)	(C X D)		
Asset management costs							
Stock - U.S. Large Cap	8.2 bp	3.8 bp	4.3 bp	19,643	8,459	-487	8,946
Stock - U.S. Small Cap	51.7 bp	44.8 bp	6.9 bp	1,934	1,337	-754	2,091
Stock - EAFE	21.6 bp	23.3 bp	-1.7 bp	10,603	-1,823	1,359	-3,182
Stock - Emerging	27.0 bp	41.6 bp	-14.6 bp	3,052	-4,441	-4,738	297
Stock - Global	8.7 bp	26.0 bp	-17.3 bp	586	-1,011	-1,011	0
Stock - ACWI x U.S.	14.8 bp	26.1 bp	-11.3 bp	4,129	-4,673	-2,621	-2,052
Fixed Income - U.S.	2.5 bp	5.8 bp	-3.3 bp	13,405	-4,433	-2,958	-1,475
Fixed Income - Emerging	37.8 bp	34.2 bp	3.6 bp	907	329	49	280
Fixed Income - High Yield	40.5 bp	31.7 bp	8.8 bp	731	644	96	548
Cash	2.4 bp	2.4 bp	0.0 bp	1,300	0	0	0
REITs	0.9 bp	18.3 bp	-17.4 bp	1,156	-2,011	-1,952	-59
Real Estate ex-REITs	43.5 bp	82.3 bp	-38.8 bp	7,359	-28,548	-21,551	-6,997
Infrastructure	187.2 bp	115.3 bp	71.9 bp	27	195	128	68
Natural Resources	96.0 bp	113.4 bp	-17.4 bp	576	-1,003	-318	-685
Hedge Funds	138.1 bp	111.7 bp	26.4 bp	1,516	4,005	-394	4,399
Perf. fees (on NAV)	58.5 bp	69.1 bp	-10.6 bp	1,516	-1,607	-73	-1,534
Global TAA	38.2 bp	60.9 bp	-22.6 bp	1,469	-3,325	-2,977	-348
Diversified Private Equity	87.1 bp	154.4 bp	-67.3 bp	4,279	-28,799	-8,835	-19,964
Venture Capital	103.3 bp	165.4 bp	-62.1 bp	2,342	-14,545	2,387	-16,932
LBO	124.4 bp	160.5 bp	-36.0 bp	7,108	-25,591	5,776	-31,368
Private Credit	99.9 bp	98.3 bp	1.6 bp	1,585	246	1,534	-1,288
Overlay Programs ²	0.1 bp	0.2 bp	-0.1 bp	77,433	-1,000	-1,000	0
Total asset management	40.5 bp	54.4 bp	-13.9 bp	77,433	-107,595	-38,341	-69,254
Oversight, custody and other costs³							
Oversight of the Fund			0.0 bp				
Trustee & Custodial			0.0 bp				
Consulting			0.0 bp				
Audit			0.0 bp				
Other			0.0 bp				
Total oversight, custody & other	0.9 bp	1.0 bp	-0.1 bp	77,433	-1,131	n/a	-1,131
Total	41.4 bp	55.4 bp	-14.0 bp	77,433	-108,726	-38,341	-70,386

1. The weighted peer median cost for asset management is the style-weighted average of the peer median costs for all implementation styles (i.e., internal passive, internal active, external passive, external active, fund of fund). It excludes performance fees on private assets. The style weights by asset class for your fund and the peers are shown on page 15 of this section.

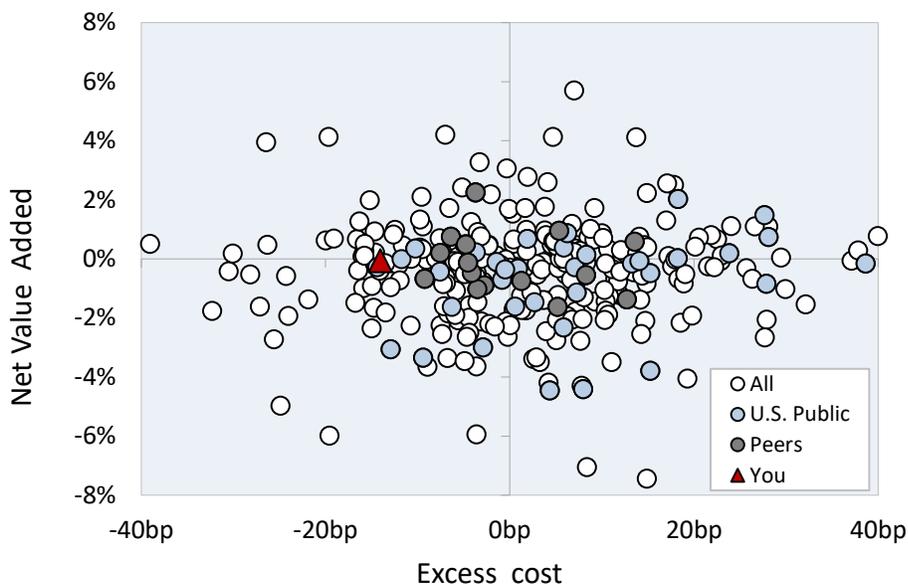
2. Total fund average holdings is used as the base when calculating the relative cost impact of the overlay programs.

3. Benchmarks for oversight total and individual lines are based on peer medians. Sum of the lines may be different from the total.

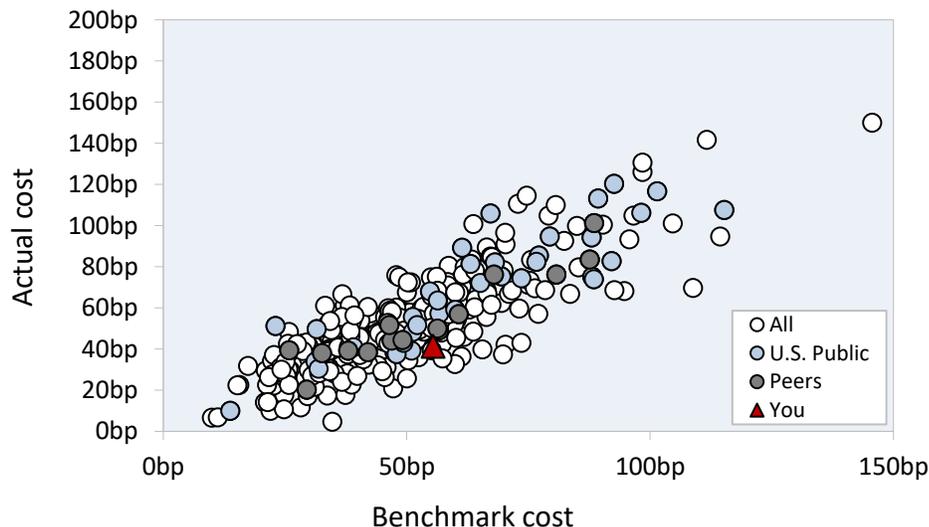
Your cost effectiveness ranking

Being high or low cost is neither good nor bad. More important is whether you are receiving sufficient value for your excess cost. At the total fund level, we provide insight into this question by combining your value added and excess cost to create a snapshot of your cost effectiveness performance relative to that of the global universe. In 2019, your fund ranked in the negative value added, low cost quadrant.

Your 2019 Net value added -0.1%, Excess cost -14 bps



Your 2019 Actual cost 41.4 bps, Benchmark cost 55.4 bps



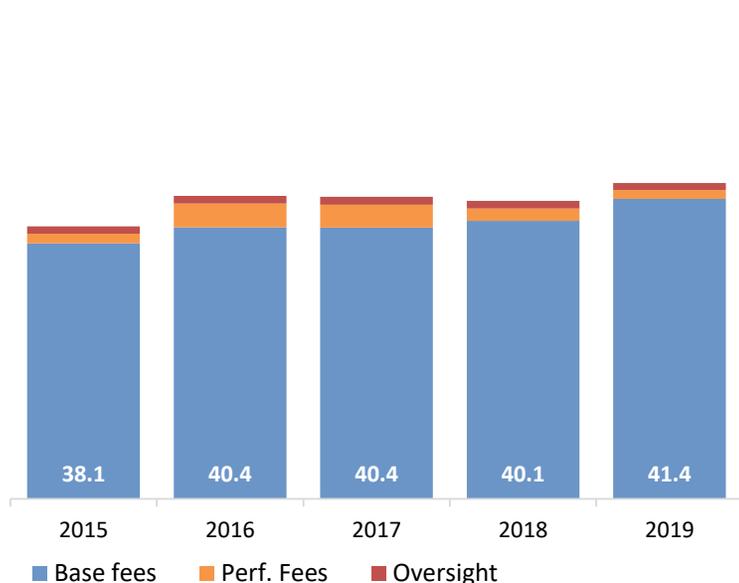
For all funds except your fund, benchmark cost equals the sum of group median costs x fund's average holdings by asset class plus group median cost of derivatives/overlays plus group median cost of oversight/support. Group peer if the fund is in the peer group, universe - if the fund is part of the universe, and global/database otherwise. Your fund's benchmark cost is calculated using peer-based methodology per page 7 of this section.

Methodology of the cost trend model

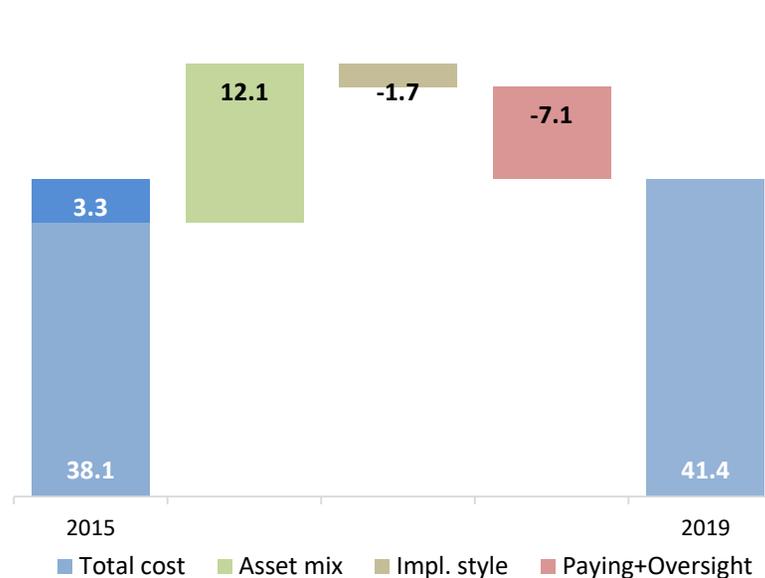
[Redacted text block containing the methodology of the cost trend model]

Total plan cost and cost changes

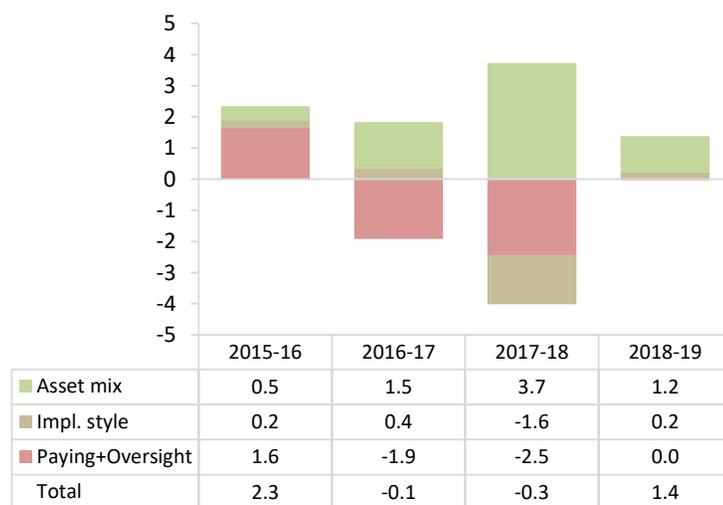
Total plan cost over time, bps



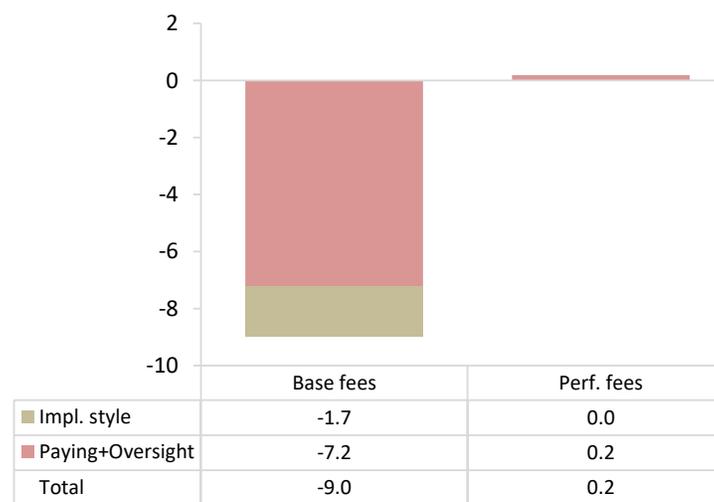
Cost differences, 2019 versus 2015, bps



Reasons for cost differences over time, bps



Impact of base and performance fees, 2019 vs. 2015, bps



Summary of cost differences, 2019 versus 2015

Your total cost increased by 3.3 bps between 2015 and 2019 because of changes in: asset mix (12.1 bps), implementation style (-1.7 bps), and paying more/less for similar services (-7.1 bps).

	bps	\$000s
Starting total cost, 2015	38.1	274,804
Growth in asset value		20,117
Asset mix	<u>12.1</u>	<u>93,842</u>
Stock, REITs, Commodities	-0.7	-5,442
Fixed Income	-0.2	-1,175
Real Estate ex-REITs	0.0	-49
Real Assets ex Real Estate	-0.7	-5,632
Hedge Funds & Multi-Asset	-1.4	-10,589
Private Equity	13.0	100,899
Private Debt	2.0	15,829
Implementation style (less expensive vs. more)	<u>-1.7</u>	<u>-13,528</u>
More passive, less active	-0.1	-556
More int. active % of total active	-0.3	-2,581
More LP, less fund of funds	-0.2	-1,471
More co-investment	-1.2	-8,920
Paying more/-less for	<u>-6.9</u>	<u>-53,807</u>
Stock, REITs, Commodities	0.5	3,920
Fixed Income	-0.1	-761
Real Estate ex-REITs	-0.8	-6,428
Real Assets ex Real Estate	-0.2	-1,362
Hedge Funds & Multi-Asset	-0.4	-3,090
Performance fees	0.2	1,477
Private Equity	-6.1	-47,584
Overlays and unfunded strategies	0.0	20
Oversight, custodial, other (pay more/-less)	<u>-0.1</u>	<u>-801</u>
Total difference	3.3	45,823
Ending total cost, 2019	41.4	320,628

Summary of cost differences, year over year

	bps	\$000s								
	2015		2016		2017		2018		2019	
Starting total cost	38.1	274,804	40.4	287,912	40.4	302,574	40.1	302,813	38.1	274,804
Growth in asset value		-3,590		15,260		2,476		7,357		20,117
Asset mix	0.5	3,391	1.5	11,135	3.7	28,138	1.2	9,092	12.1	93,842
Stock, REITs, Commodities	0.2	1,070	0.0	-282	-0.5	-3,429	-0.4	-2,892	-0.7	-5,442
Fixed Income	-0.2	-1,410	0.0	-81	0.0	269	0.0	279	-0.2	-1,175
Real Estate ex-REITs	0.3	2,347	-0.4	-2,793	-0.1	-632	0.1	1,033	0.0	-49
Real Assets ex Real Estate	0.0	115	-0.3	-2,295	-0.1	-760	-0.2	-1,371	-0.7	-5,632
Hedge Funds & Multi-Asset	0.1	832	-1.0	-7,858	-0.6	-4,387	-0.3	-2,241	-1.4	-10,589
Private Equity	0.1	437	2.1	16,080	4.3	32,774	1.4	10,489	13.0	100,899
Private Debt	n/a	n/a	1.1	8,365	0.6	4,303	0.5	3,795	2.0	15,829
Implementation style (less expensive vs. more)	0.2	1,593	0.4	2,626	-1.6	-11,734	0.2	1,644	-1.7	-13,528
Passive vs. active	0.0	-280	0.0	-156	-0.1	-598	0.1	475	-0.1	-556
Internal active vs. external active	0.6	4,243	0.4	3,106	-0.7	-4,950	0.6	4,633	-0.3	-2,581
LP/Co vs. fund of funds	0.1	1,024	0.0	-134	-0.2	-1,714	-0.1	-398	-0.2	-1,471
Co-investment vs. LP	-0.5	-3,394	0.0	-191	-0.6	-4,471	-0.4	-3,066	-1.2	-8,920
Paying more/-less for	1.6	11,589	-1.9	-14,593	-2.5	-18,644	0.1	901	-6.9	-53,807
Stock, REITs, Commodities	-0.1	-903	0.3	2,463	0.1	989	0.2	1,569	0.5	3,920
Fixed Income	0.0	276	0.0	189	0.0	-161	-0.2	-1,204	-0.1	-761
Real Estate ex-REITs	-0.3	-2,153	0.3	2,076	-0.3	-2,291	-0.5	-3,556	-0.8	-6,428
Real Assets ex Real Estate	-0.3	-2,204	-0.1	-963	0.0	-146	0.1	754	-0.2	-1,362
Hedge Funds & Multi-Asset	1.3	9,584	0.0	199	-0.7	-5,290	-1.1	-8,846	-0.2	-1,613
Private Equity	1.0	6,988	-2.5	-18,575	-1.7	-12,934	1.3	9,961	-6.1	-47,584
Private Debt	n/a	n/a	0.0	0	0.2	1,199	0.3	2,211	0.0	0
Overlays and unfunded strategies	0.0	1	0.0	19	0.0	-11	0.0	11	0.0	20
Oversight, custodial, other (pay more/-less)	0.0	124	0.0	233	0.0	2	-0.2	-1,179	-0.1	-801
Total difference	2.3	13,108	-0.1	14,662	-0.3	240	1.4	17,814	3.3	45,823
Ending total cost	40.4	287,912	40.4	302,574	40.1	302,813	41.4	320,628	41.4	320,628
	2016		2017		2018		2019		2019	

Sum of all changes (except for the total) between adjacent years will differ from the changes between starting and ending years in the last two columns.

Reasons by asset class and cost type, \$000

Your total cost has increased by \$46 million in 2019 compared to 2015. An increase of \$20 million was due to the \$5.3 billion rise in plan total average nav holdings. The remaining increase of \$26 million is explained by the changes in the asset mix (\$94 million), implementation style (-\$14 million), and paying more/less for similar services (-\$55 million).

Asset class ¹	2015 cost \$000s	Asset mix \$000s	Implement. style \$000s	Paying more/-less \$000s	Total ex asset gr. \$000s	Total difference \$000s	Growth in asset value \$000s	2019 cost \$000s
	A	B	C	D	E=B+C+D	F=G-A	F-E	G
Stock - U.S. Large Cap	14,183	-1,659	-377	2,827	791	1,829	1,038	16,012
Stock - U.S. Small Cap	9,392	-676	726	-123	-73	615	688	10,007
Stock - EAFE	23,022	-2,983	506	683	-1,795	-109	1,685	22,913
Stock - Emerging	8,177	43	-1,033	462	-528	71	599	8,247
Stock - Global	457	-149	0	169	20	54	33	511
Stock - ACWI x U.S.	5,480	-6	203	27	224	625	401	6,105
Fixed Income - U.S.	2,552	549	0	36	586	772	187	3,325
Fixed Income - Emerging	3,717	236	0	-799	-563	-291	272	3,426
Fixed Income - High Yield	4,606	-1,859	0	-125	-1,984	-1,646	337	2,960
Cash	269	-102	0	127	25	44	20	313
REITs	226	-12	0	-125	-137	-120	17	106
Real Estate ex-REITs	34,943	-49	995	-6,428	-5,482	-2,924	2,558	32,019
Infrastructure	514	-400	0	186	-214	-176	38	338
Underlying base fees	1,946	-1,512	0	-406	-1,918	-1,776	142	170
Natural Resources	7,885	-3,719	1,923	-1,142	-2,938	-2,361	577	5,524
Hedge Funds	35,630	-11,822	0	-5,481	-17,302	-14,694	2,608	20,936
Top layer perf. fees	9,973	-3,309	0	1,477	-1,832	-1,102	730	8,871
Global TAA	690	4,542	-2,057	2,391	4,876	4,927	51	5,617
Diversified Private Equity	1,442	80,375	-12,943	-31,705	35,727	35,833	106	37,274
Venture Capital	17,480	5,275	-182	-4,254	839	2,118	1,280	19,598
Underlying base fees	3,665	1,106	909	-1,346	669	937	268	4,601
LBO	49,895	28,879	2,500	-8,354	23,026	26,678	3,653	76,573
Underlying base fees	11,206	6,486	-4,697	-1,925	-136	684	820	11,890
Other Private Equity	19,775	-21,222	0	0	-21,222	-19,775	1,448	n/a
Private Credit	n/a	15,829	0	0	15,829	15,829	0	15,829
Total for asset management	267,124	93,842	-13,528	-53,827	26,487	46,042	19,555	313,166
Overlays and unfunded strategies ²	457	0		20	20	54	33	511
Oversight	4,539			-292	-292	41	332	4,580
Trustee & Custodial	0			0	0	0	0	0
Consulting	2,150			-526	-526	-368	157	1,782
Audit	158			-17	-17	-6	12	153
Other	375			34	34	61	27	436
Total for fund oversight ³	7,222			-801	-801	-272	529	6,950
Total	274,804	93,842	-13,528	-54,608	25,706	45,823	20,117	320,628

1. Cost differences for asset classes are attributed to the effects of:

- Asset growth, asset mix, implementation style, and paying for similar services, when the asset class exists in both years.
- Asset growth and asset mix, when the asset class exists only in one of the years.

2. Cost differences for overlays are attributed to the effects of:

- Asset growth and paying more/less for similar services, when the fund has overlays in both years.
- Asset growth and asset mix, when the fund has overlays only in one of the years.

3. Cost differences for oversight are attributed to the effects of asset growth and paying more/less for similar services.

Reasons by asset class and cost type, basis points

Your total cost has increased by 3.3 bps in 2019 vs. 2015. It was driven by the changes in the asset mix (12.1 bps), implementation style (-1.7 bps), and paying more/less for similar services (-7.1 bps).

Asset class	Asset mix bps	Implement. style bps	Paying more/-less bps	Total difference bps	Total ¹ ex asset gr. \$000s
	B	C	D	B+C+D	
Stock - U.S. Large Cap	-0.2	0.0	0.4	0.1	791
Stock - U.S. Small Cap	-0.1	0.1	0.0	0.0	-73
Stock - EAFE	-0.4	0.1	0.1	-0.2	-1,795
Stock - Emerging	0.0	-0.1	0.1	-0.1	-528
Stock - Global	0.0	0.0	0.0	0.0	20
Stock - ACWI x U.S.	0.0	0.0	0.0	0.0	224
Fixed Income - U.S.	0.1	0.0	0.0	0.1	586
Fixed Income - Emerging	0.0	0.0	-0.1	-0.1	-563
Fixed Income - High Yield	-0.2	0.0	0.0	-0.3	-1,984
Cash	0.0	0.0	0.0	0.0	25
REITs	0.0	0.0	0.0	0.0	-137
Real Estate ex-REITs	0.0	0.1	-0.8	-0.7	-5,482
Infrastructure	-0.1	0.0	0.0	0.0	-214
Underlying base fees	-0.2	0.0	-0.1	-0.2	-1,918
Natural Resources	-0.5	0.2	-0.1	-0.4	-2,938
Hedge Funds	-1.5	0.0	-0.7	-2.2	-17,302
Top layer perf. fees	-0.4	0.0	0.2	-0.2	-1,832
Global TAA	0.6	-0.3	0.3	0.6	4,876
Diversified Private Equity	10.4	-1.7	-4.1	4.6	35,727
Venture Capital	0.7	0.0	-0.5	0.1	839
Underlying base fees	0.1	0.1	-0.2	0.1	669
LBO	3.7	0.3	-1.1	3.0	23,026
Underlying base fees	0.8	-0.6	-0.2	0.0	-136
Other Private Equity	-2.7	0.0	0.0	-2.7	-21,222
Private Credit	2.0	0.0	0.0	2.0	15,829
Total for asset management	12.1	-1.7	-7.0	3.4	26,487
Overlays and unfunded strategies	0.00		0.00	0.00	20
Oversight			0.0	0.0	-292
Trustee & Custodial			0.0	0.0	0
Consulting			-0.1	-0.1	-526
Audit			0.0	0.0	-17
Other			0.0	0.0	34
Total for fund oversight			-0.1	-0.1	-801
Total	12.1	-1.7	-7.1	3.3	25,706
Total basis point costs in years 2019 and 2015		41.4	38.1	3.3	

1. Calculated by multiplying total difference in bps by plan total nav average holdings for year 2019, \$77 billion. Similarly, basis point costs on this page are converted from the amounts on the previous page using the same total nav holdings as the fee basis.

Impact of changes in asset mix

Changes in the asset mix increased your total cost by \$94 million or 12.1 bps.

Asset class	2015 Cost bps	2019 Cost bps	2015 asset ¹ weight %	2019 asset ¹ weight %	Change in asset weight	Asset mix changes ² bps	Asset mix changes ³ \$000s
	A	B	C	D	E=D-C	A (or B) x E	
Stock - U.S. Large Cap	6.9	8.2	28%	25%	-3%	-0.2	-1,659
Stock - U.S. Small Cap	48.6	51.7	3%	2%	0%	-0.1	-676
Stock - EAFE	20.5	21.6	16%	14%	-2%	-0.4	-2,983
Stock - Emerging	28.9	27.0	4%	4%	0%	0.0	43
Stock - Global	5.8	8.7	1%	1%	0%	0.0	-149
Stock - ACWI x U.S.	14.2	14.8	5%	5%	0%	0.0	-6
Fixed Income - U.S.	2.5	2.5	14%	17%	3%	0.1	549
Fixed Income - Emerging	46.6	37.8	1%	1%	0%	0.0	236
Fixed Income - High Yield	42.2	40.5	2%	1%	-1%	-0.2	-1,859
Cash	1.4	2.4	3%	2%	-1%	0.0	-102
REITs	2.0	0.9	2%	1%	0%	0.0	-12
Real Estate ex-REITs	50.9	43.5	10%	10%	0%	0.0	-49
Infrastructure	56.0	124.5	0%	0%	0%	-0.1	-400
Underlying base fees	212.0	62.7	0%	0%	0%	-0.2	-1,512
Natural Resources	82.4	96.0	1%	1%	-1%	-0.5	-3,719
Hedge Funds	174.3	138.1	3%	2%	-1%	-1.5	-11,822
Top layer perf. fees (on NAV)	48.8	58.5	3%	2%	-1%	-0.4	-3,309
Global TAA	36.0	38.2	0%	2%	2%	0.6	4,542
Diversified Private Equity	191.5	87.1	0%	6%	5%	10.4	80,375
Venture Capital	102.6	83.7	2%	3%	1%	0.7	5,275
Underlying base fees	21.5	19.6	2%	3%	1%	0.1	1,106
LBO	116.0	107.7	6%	9%	3%	3.7	28,879
Underlying base fees	26.0	16.7	6%	9%	3%	0.8	6,486
Other Private Equity	69.8	n/a	4%	0%	-4%	-2.7	-21,222
Private Credit	n/a	99.9	0%	2%	2%	2.0	15,829
Total for asset management						12.1	93,842

1. Weight % = asset's average (NAV for performance lines) holdings / plan total nav average holdings.

2. If asset is not available in one of the years, the entire weighted cost difference in bps is attributed to the asset mix.

3. Calculated by multiplying asset mix changes in bps by plan total nav average holdings for year 2019, \$77 billion.

Impact of changes in implementation style



Impact of paying more/-less for similar services

In 2019, you paid \$55 million less for similar asset management and oversight / support services vs. 2015.

Asset class styles where you had assets in both 2019 and 2015 ¹	Style	2019 avg. assets \$mils	Cost in bps			Cost/ -Savings \$000s
			2019	2015	More/ -less	
<u>External asset management</u>		A			B	A x B
Stock - U.S. Large Cap	active	1,049	24.6	23.7	0.9	99
Stock - U.S. Small Cap	active	1,216	79.4	81.2	-1.8	-219
Stock - EAFE	active	5,493	35.5	35.7	-0.2	-89
Stock - Emerging	active	830	58.2	56.2	2.0	170
Stock - ACWI x U.S.	active	1,223	45.9	45.9	0.0	1
Fixed Income - Emerging	active	907	37.8	46.6	-8.8	-799
Fixed Income - High Yield	active	731	40.5	42.2	-1.7	-125
Real Estate ex-REITs	LP	1,716	85.9	122.5	-36.6	-6,289
Infrastructure	FoF	27	124.5	56.0	68.4	186
Underlying base fees	FoF	27	62.7	212.0	-149.3	-406
Natural Resources	LP	445	123.3	149.0	-25.7	-1,142
Hedge Funds	active	1,516	138.1	174.3	-36.2	-5,481
Top layer perf. fees (on NAV)	active	1,516	58.5	48.8	9.7	1,477
Global TAA	active	413	93.8	36.0	57.9	2,391
Diversified Private Equity	LP	3,572	102.7	191.5	-88.8	-31,705
Venture Capital	FoF	357	38.0	73.5	-35.6	-1,270
Underlying base fees	FoF	357	128.9	166.6	-37.7	-1,346
Venture Capital	LP	1,985	91.9	106.9	-15.0	-2,985
LBO	FoF	1,190	67.4	68.0	-0.6	-73
Underlying base fees	FoF	1,190	99.9	116.1	-16.2	-1,925
LBO	LP	5,918	115.8	129.8	-14.0	-8,281
Total for external management						-57,809
<u>Internal asset management</u>		A			B	A x B
Stock - U.S. Large Cap	passive	8,800	0.1	0.0	0.0	36
Stock - U.S. Large Cap	active	9,794	13.6	10.9	2.7	2,692
Stock - U.S. Small Cap	active	719	4.9	3.6	1.3	96
Stock - EAFE	active	5,110	6.7	5.2	1.5	772
Stock - Emerging	active	2,222	15.4	14.1	1.3	293
Stock - Global	active	586	8.7	5.8	2.9	169
Stock - ACWI x U.S.	active	2,905	1.7	1.6	0.1	26
Fixed Income - U.S.	active	13,405	2.5	2.5	0.0	36
Cash	active	1,300	2.4	1.4	1.0	127
REITs	passive	1,156	0.9	2.0	-1.1	-125
Real Estate	active	5,643	30.6	30.9	-0.2	-139
Total for internal management						3,982
Overlays and unfunded strategies		77,433	0.1	0.1	0.0	20
Oversight		77,433	0.6	0.6	0.0	-291.8
Trustee & Custodial		77,433	0.0	0.0	0.0	0
Consulting		77,433	0.2	0.3	-0.1	-526
Audit		77,433	0.0	0.0	0.0	-17
Other		77,433	0.1	0.1	0.0	34
Total for fund oversight						-801
Total						-54,608

1. Cost differences are attributed to paying more/less for similar services only if the asset-class style existed in both years.

5

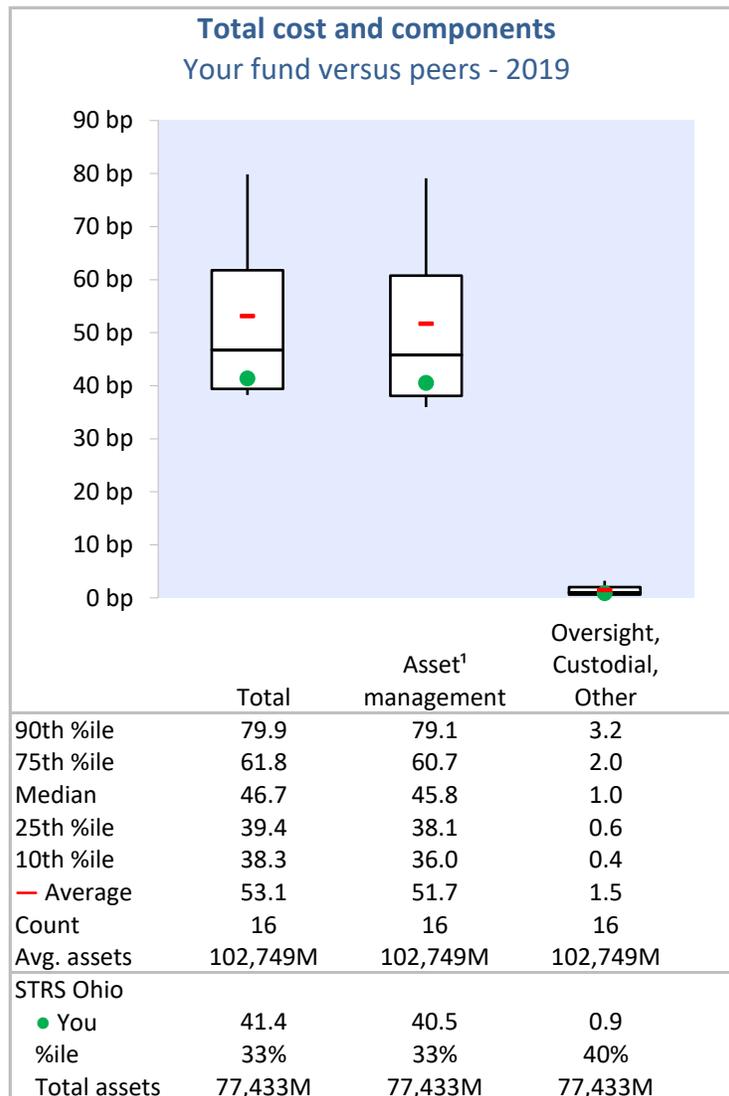
Cost comparisons

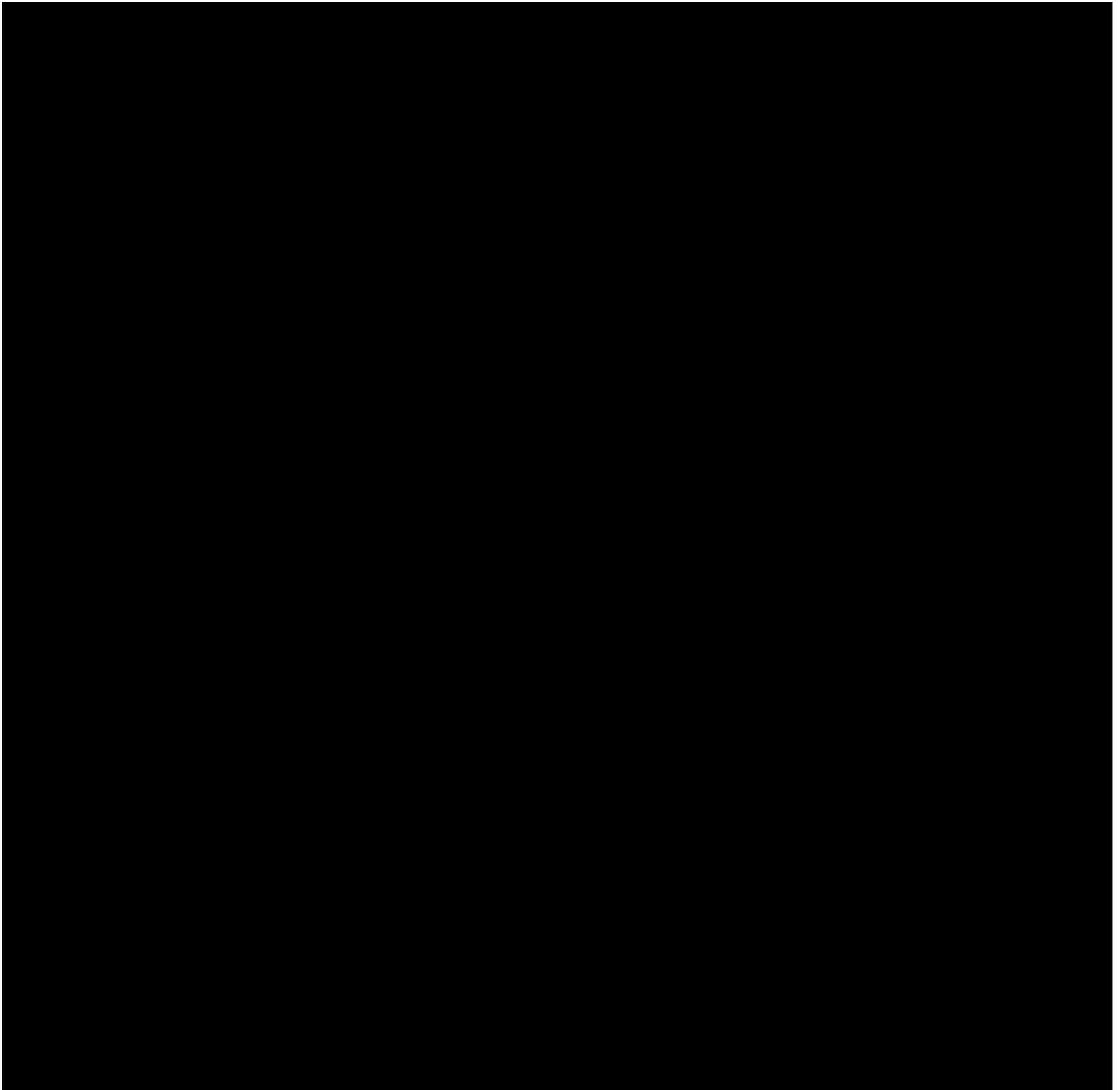
Total fund cost	2
Governance, operations & support	3
Public asset classes	
- Stock	4
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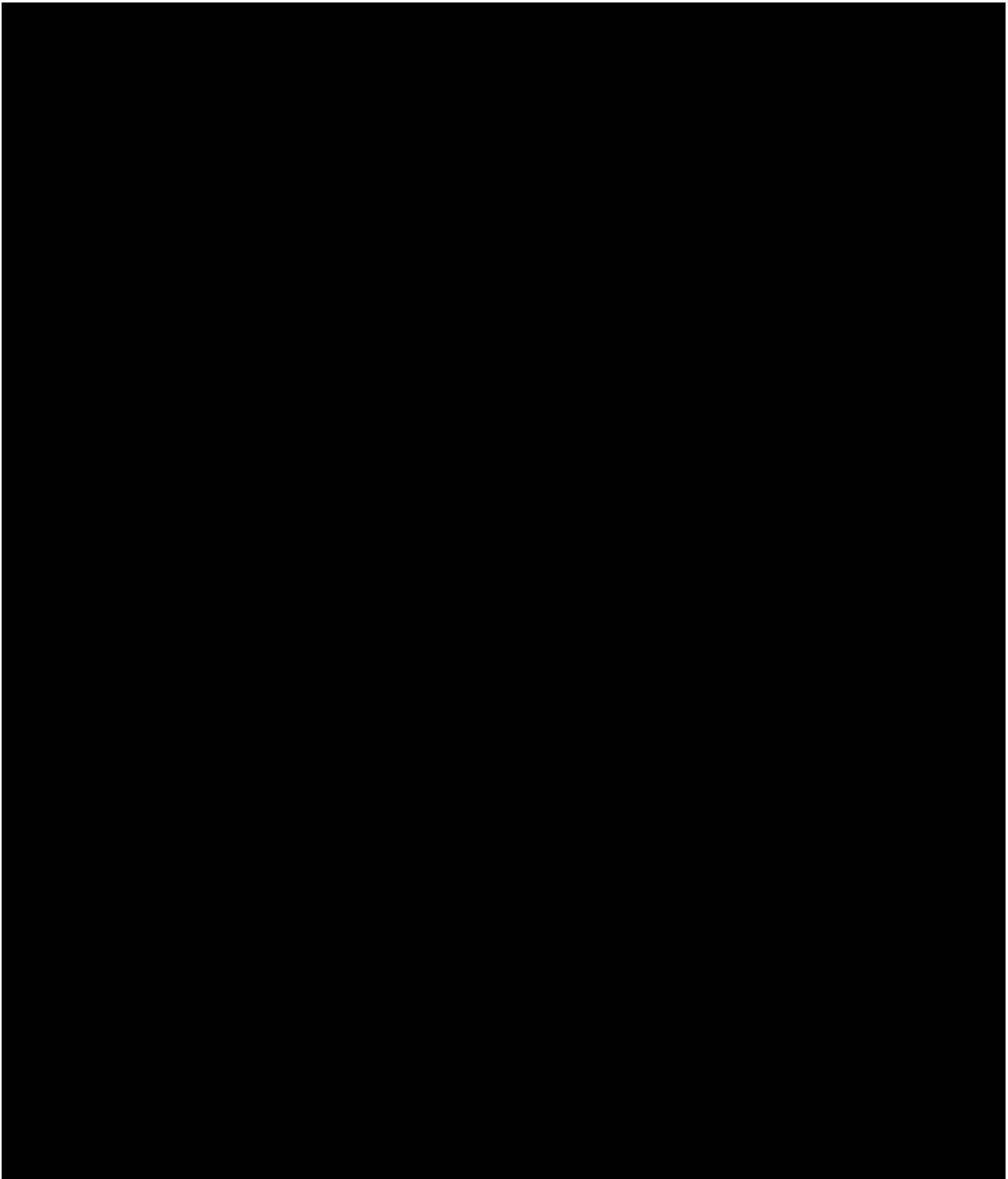
Total fund cost

Total costs are benchmarked in the previous section. In this section, your fund's costs are compared on a line-item basis to your peers. This enables you to understand better why you may be a high or low cost fund and it also identifies and quantifies major cost differences that may warrant further investigation.

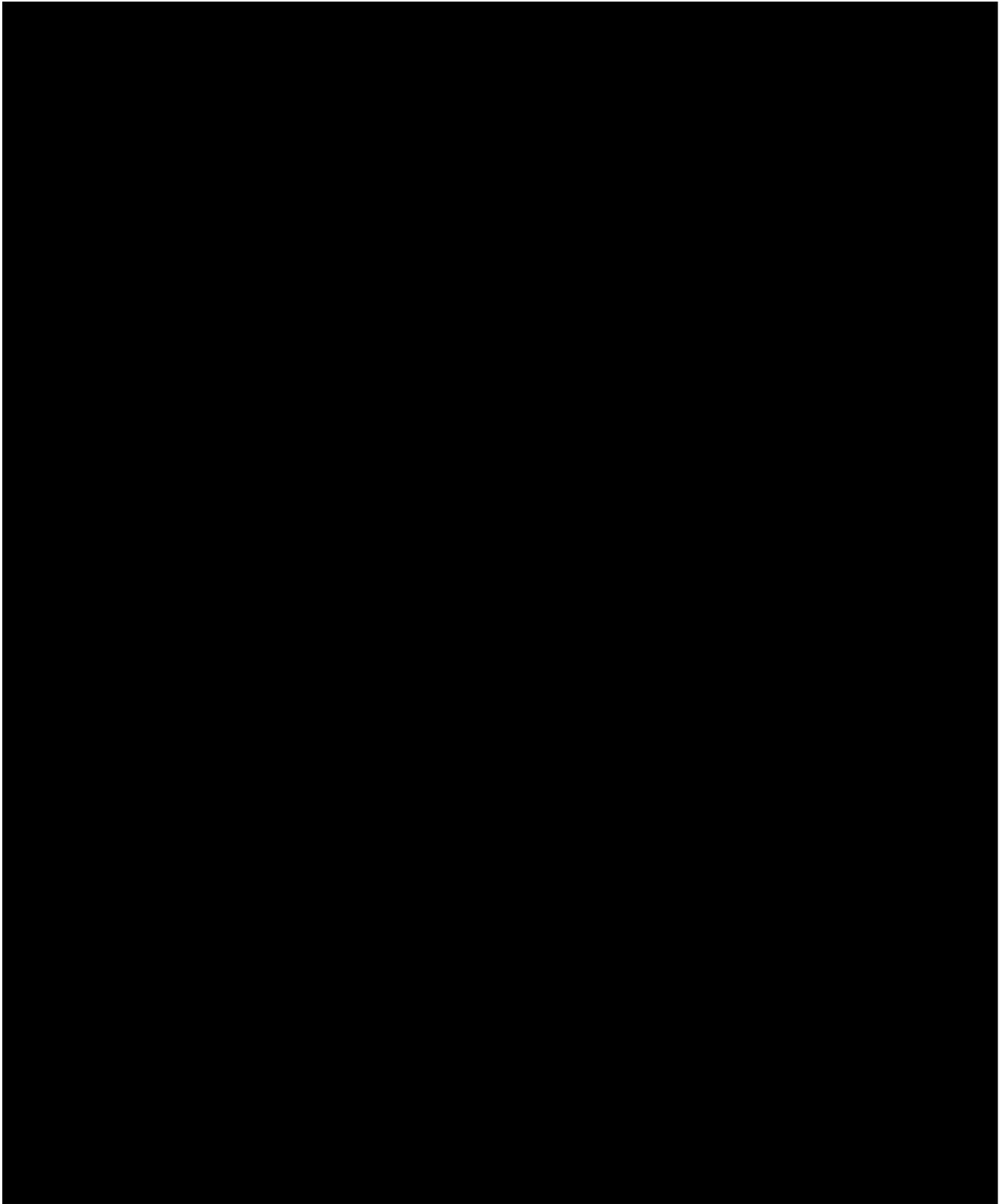
The 25th to 75th percentile range is the most relevant since higher and lower values may include outliers caused by unusual circumstances, such as performance-based fees. Count refers to the number of funds in your peer group that have costs in this category. It enables you to gauge the statistical significance.

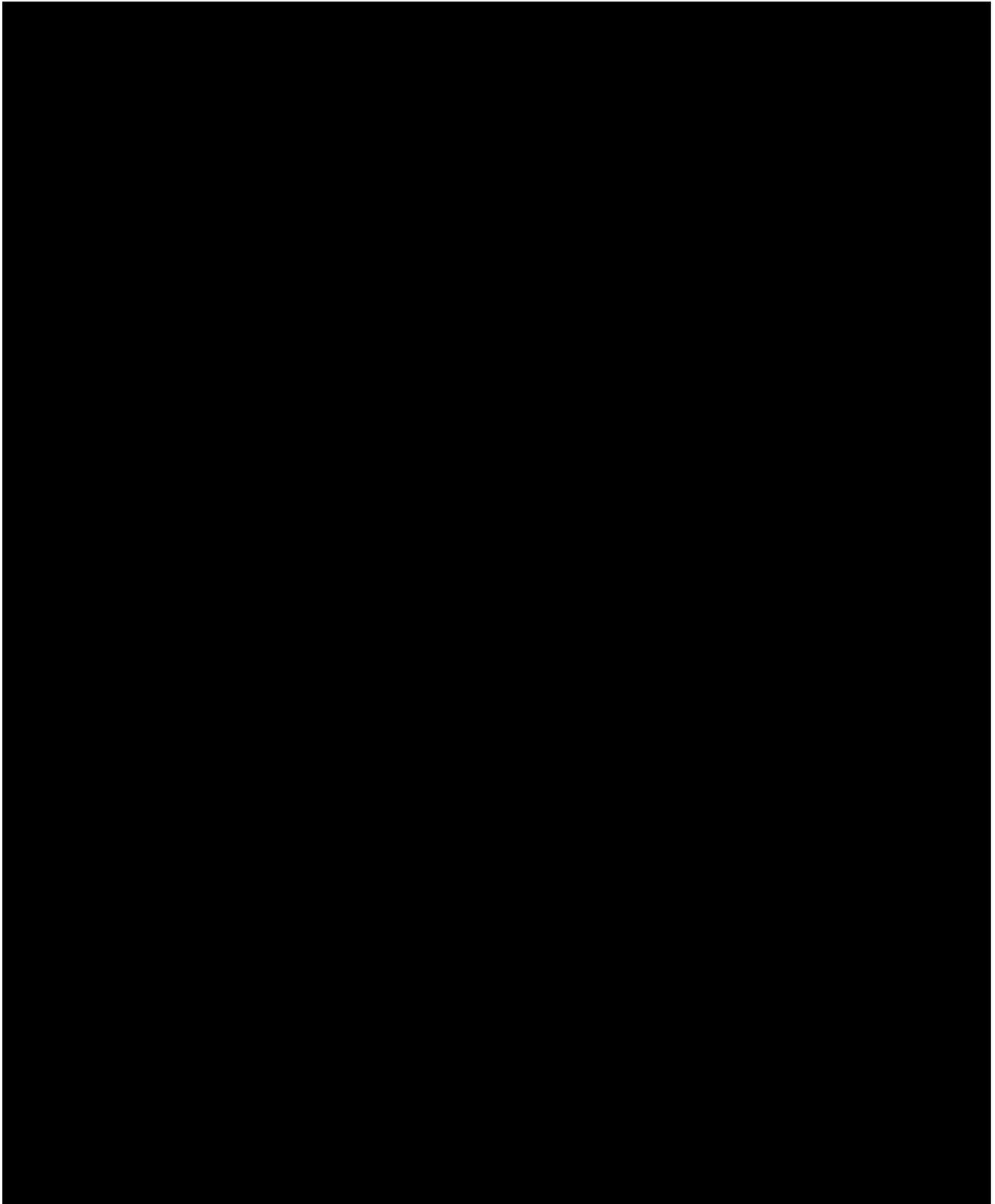


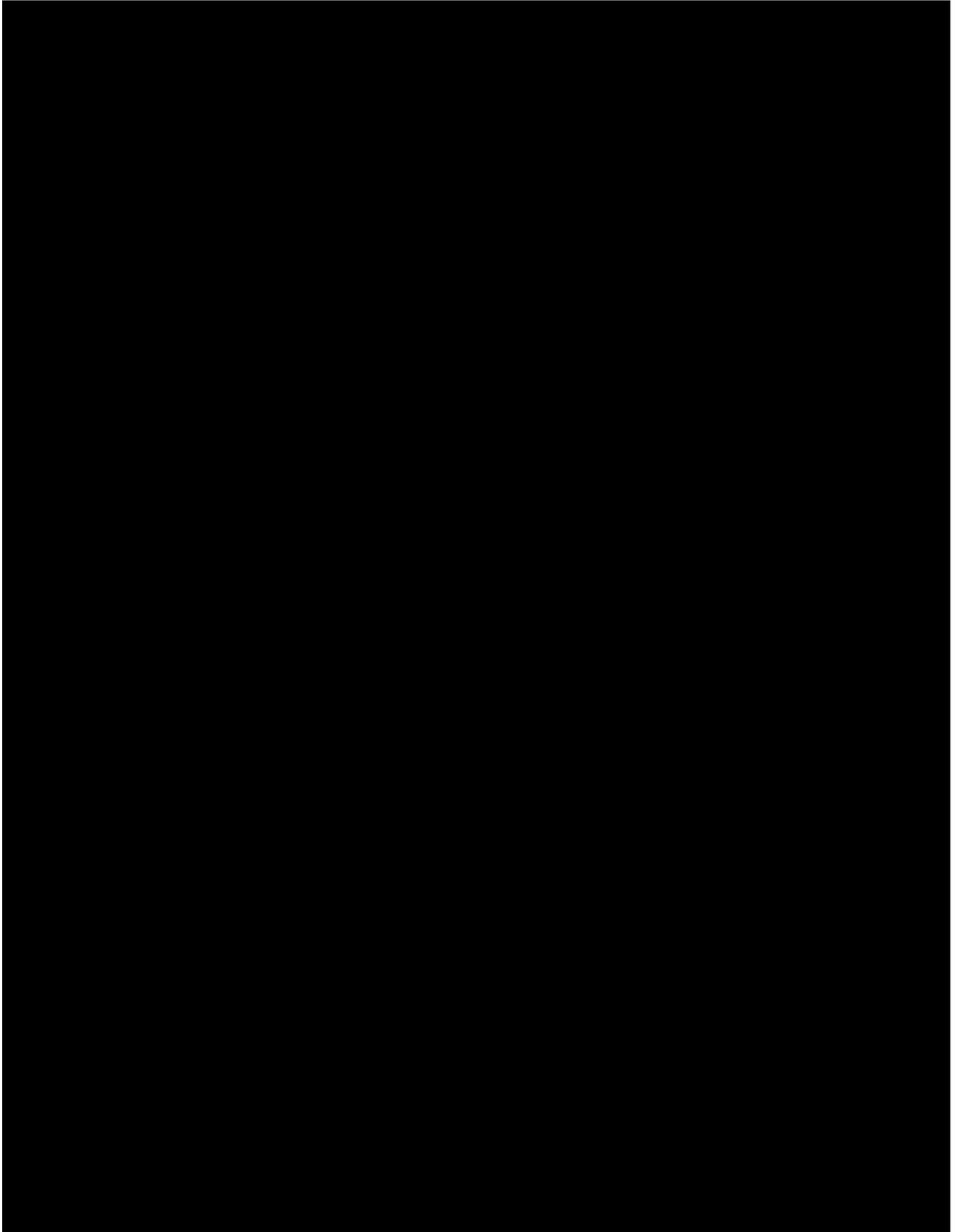


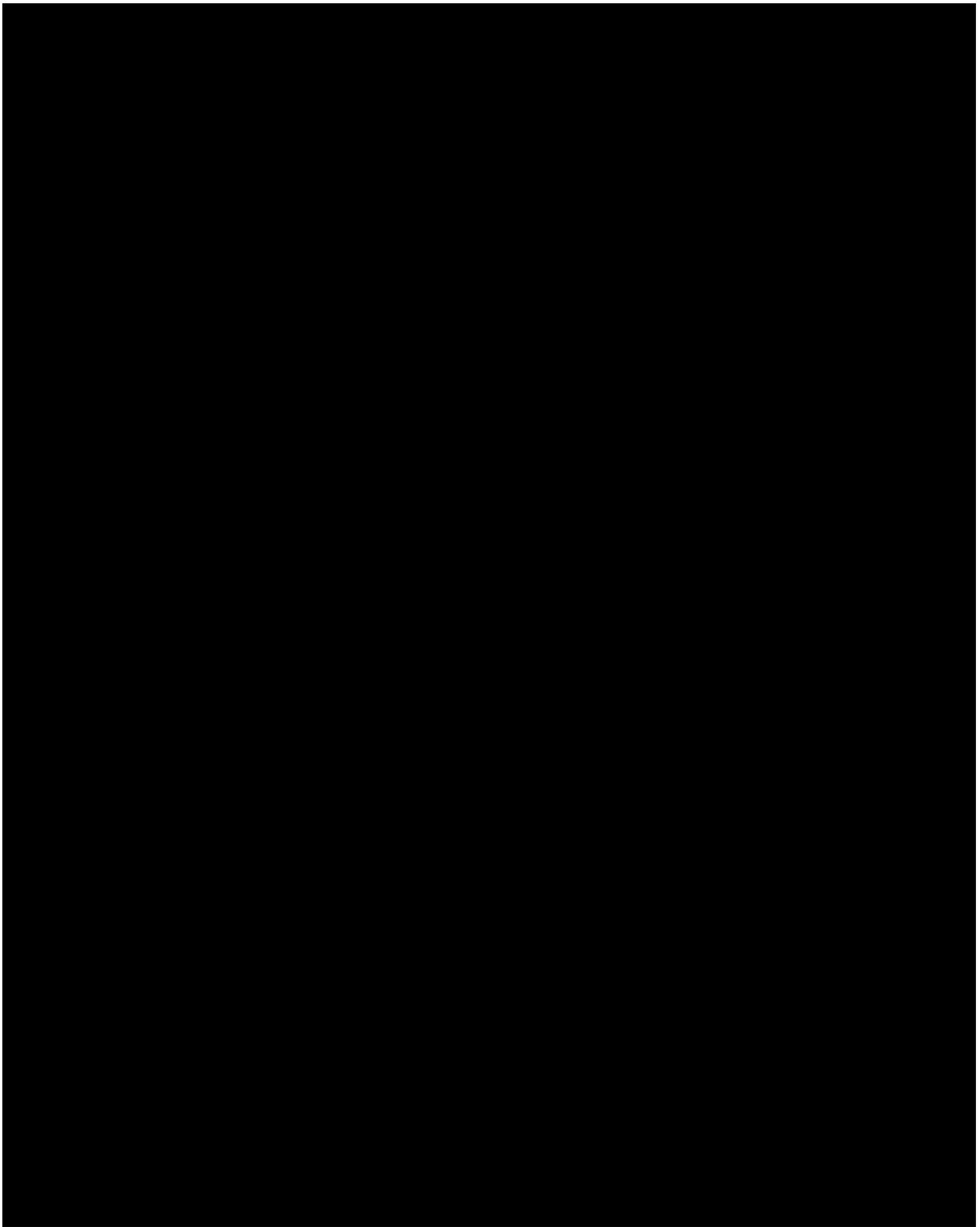


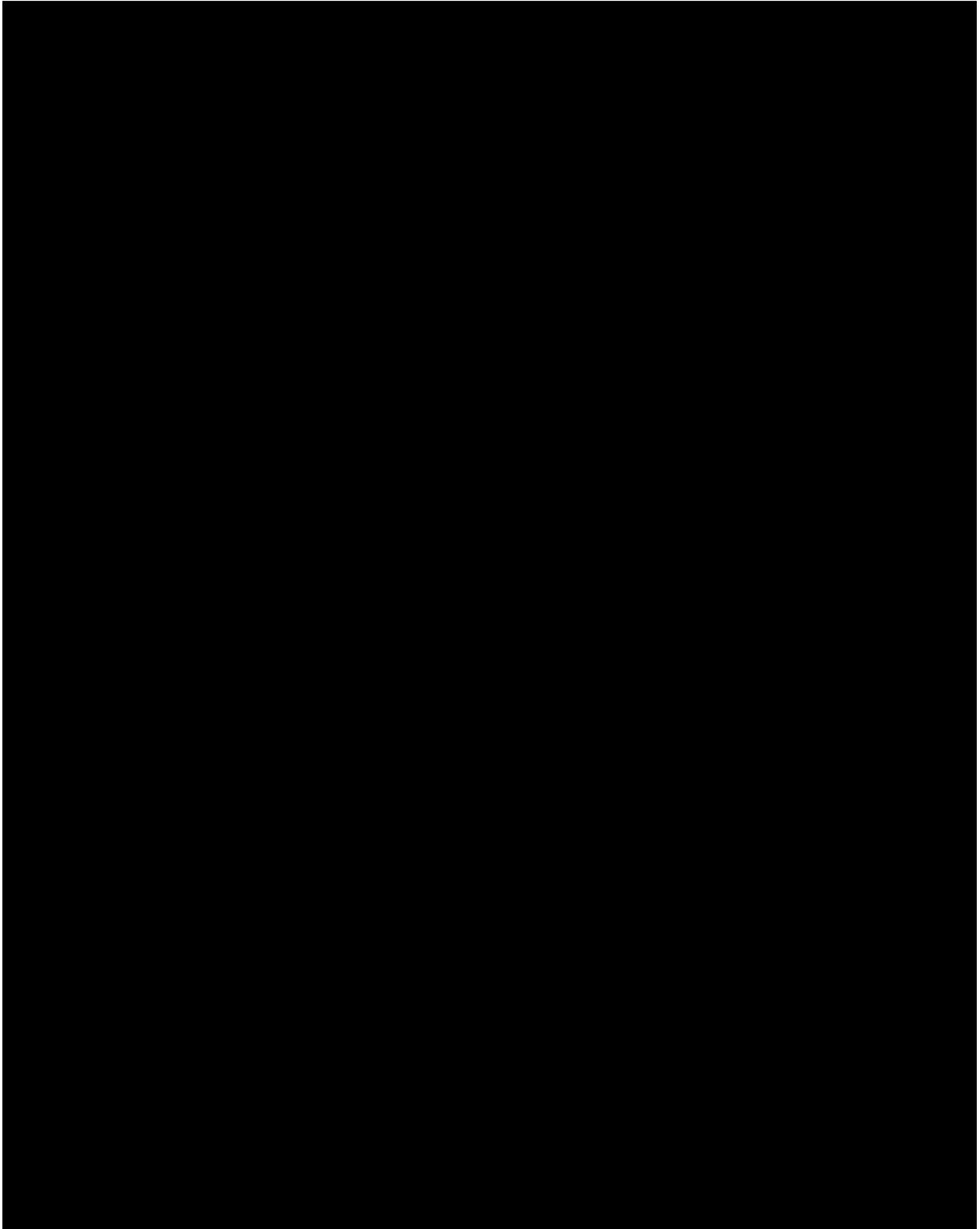
No funds reported a performance fee.

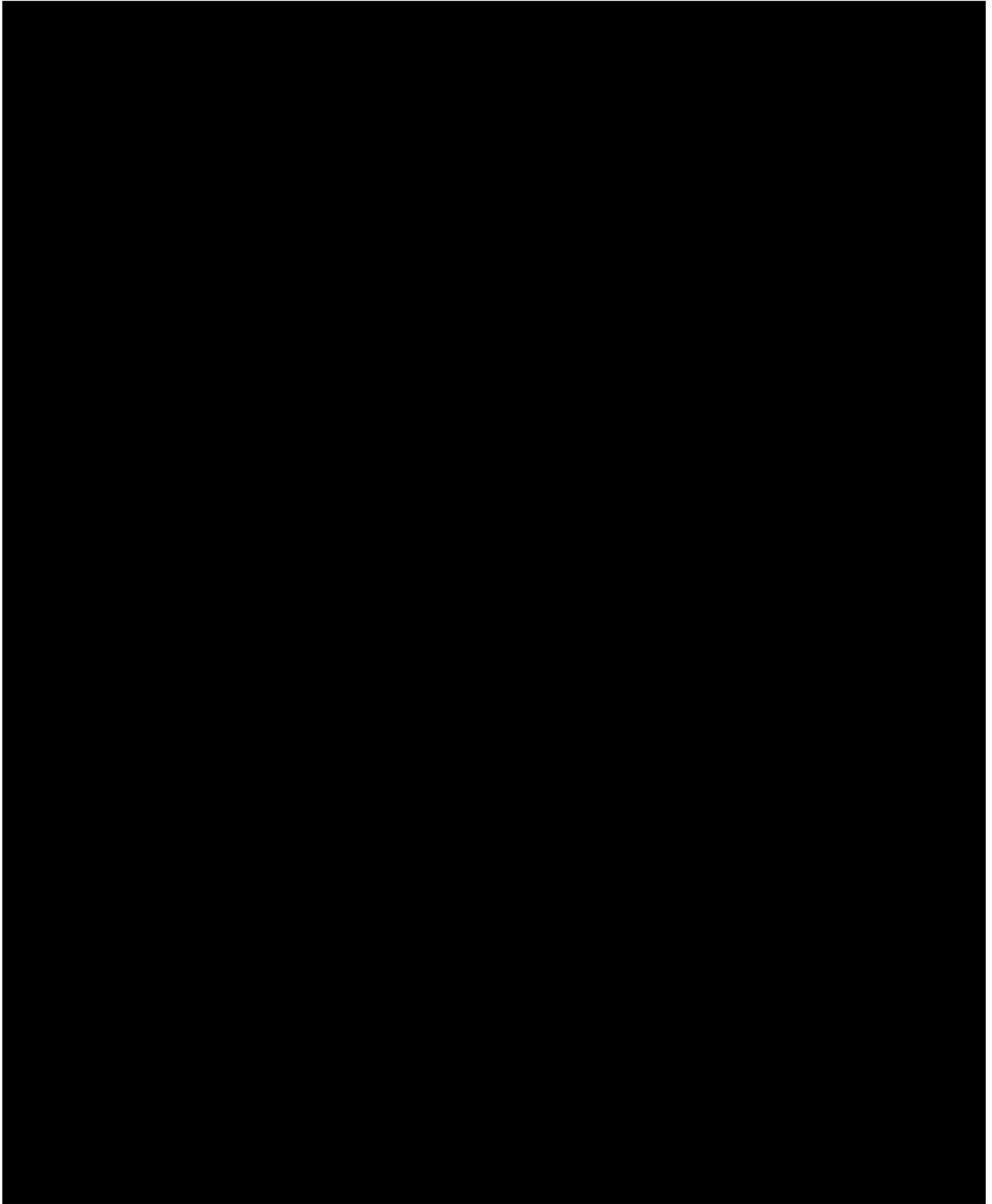


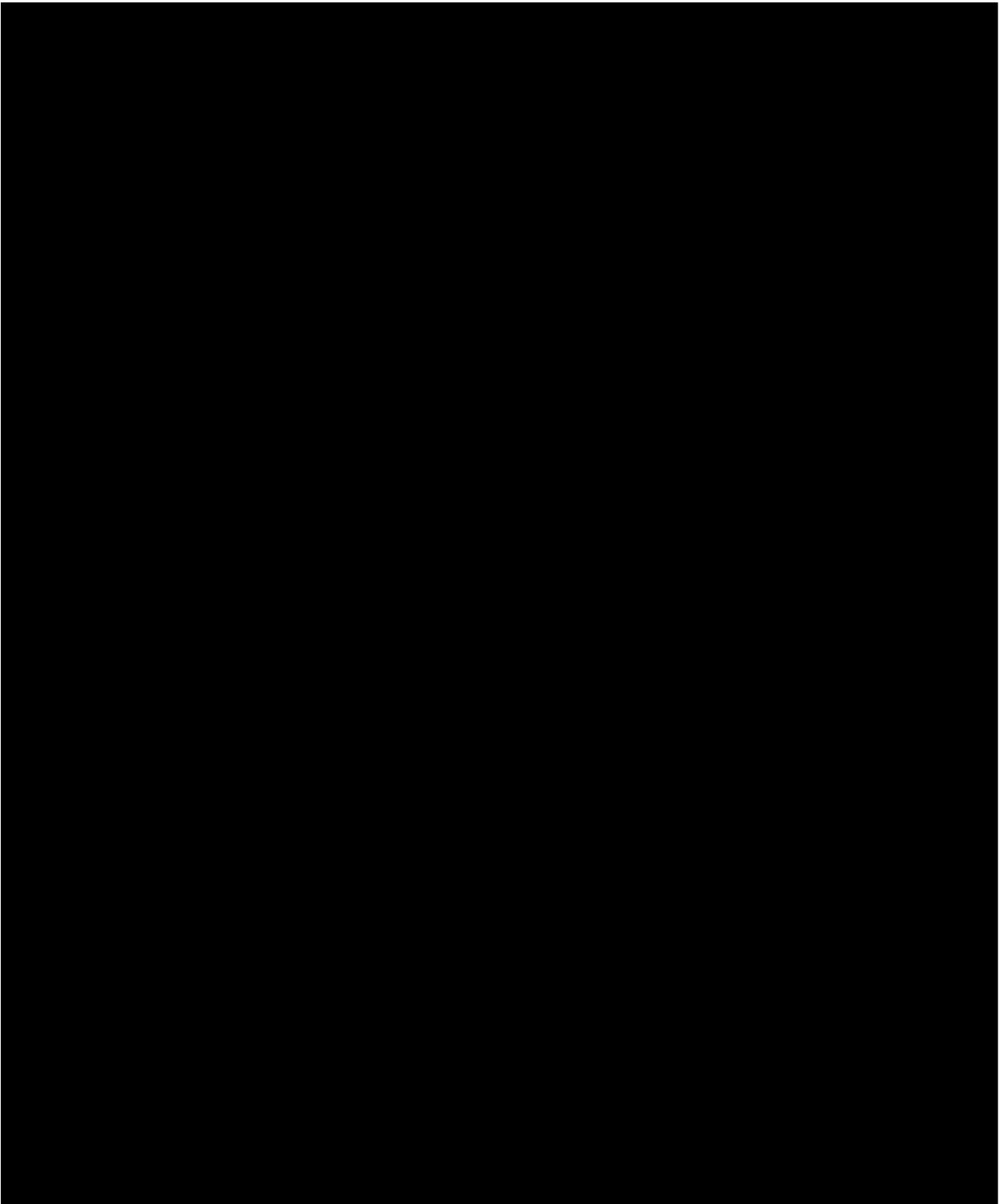


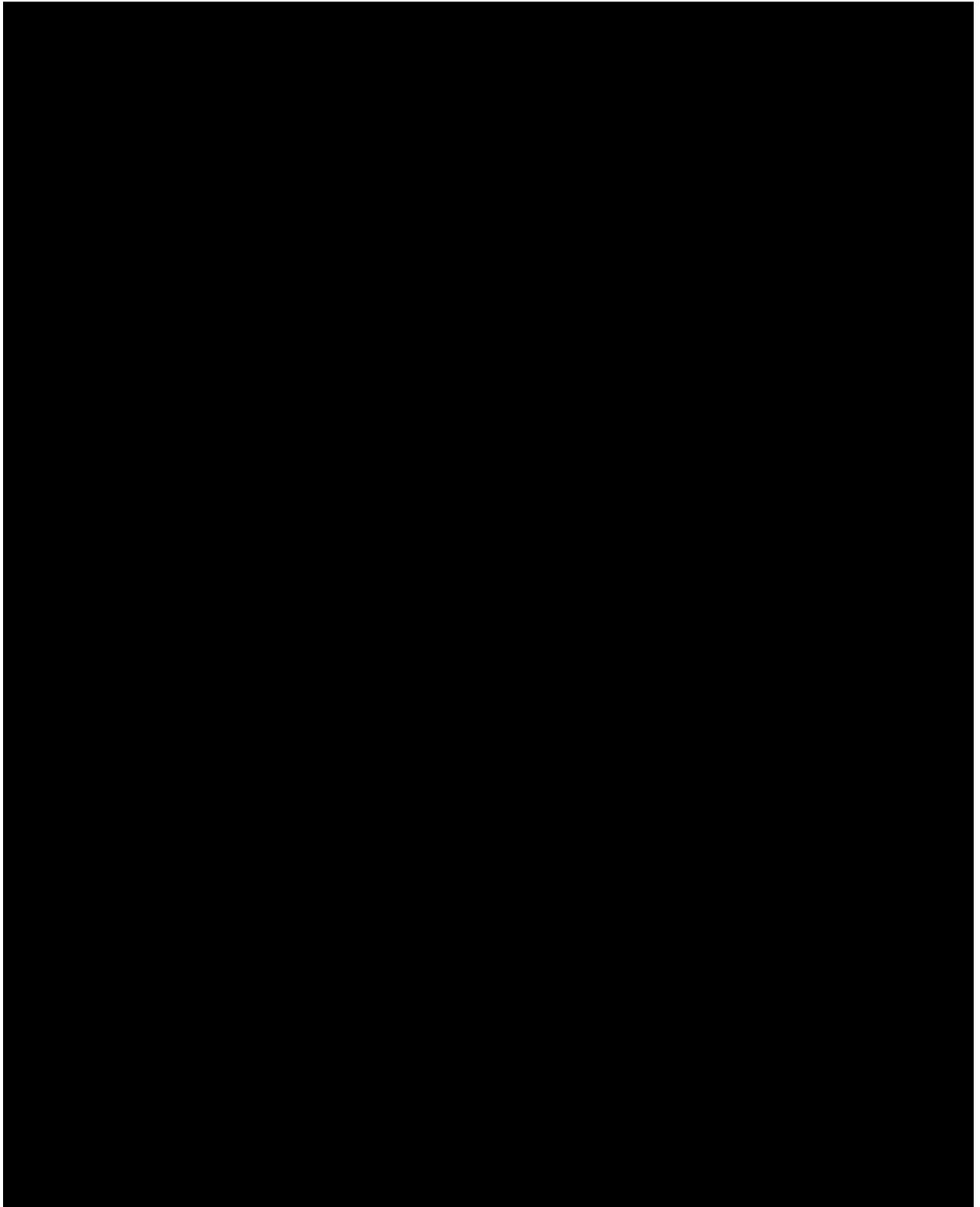


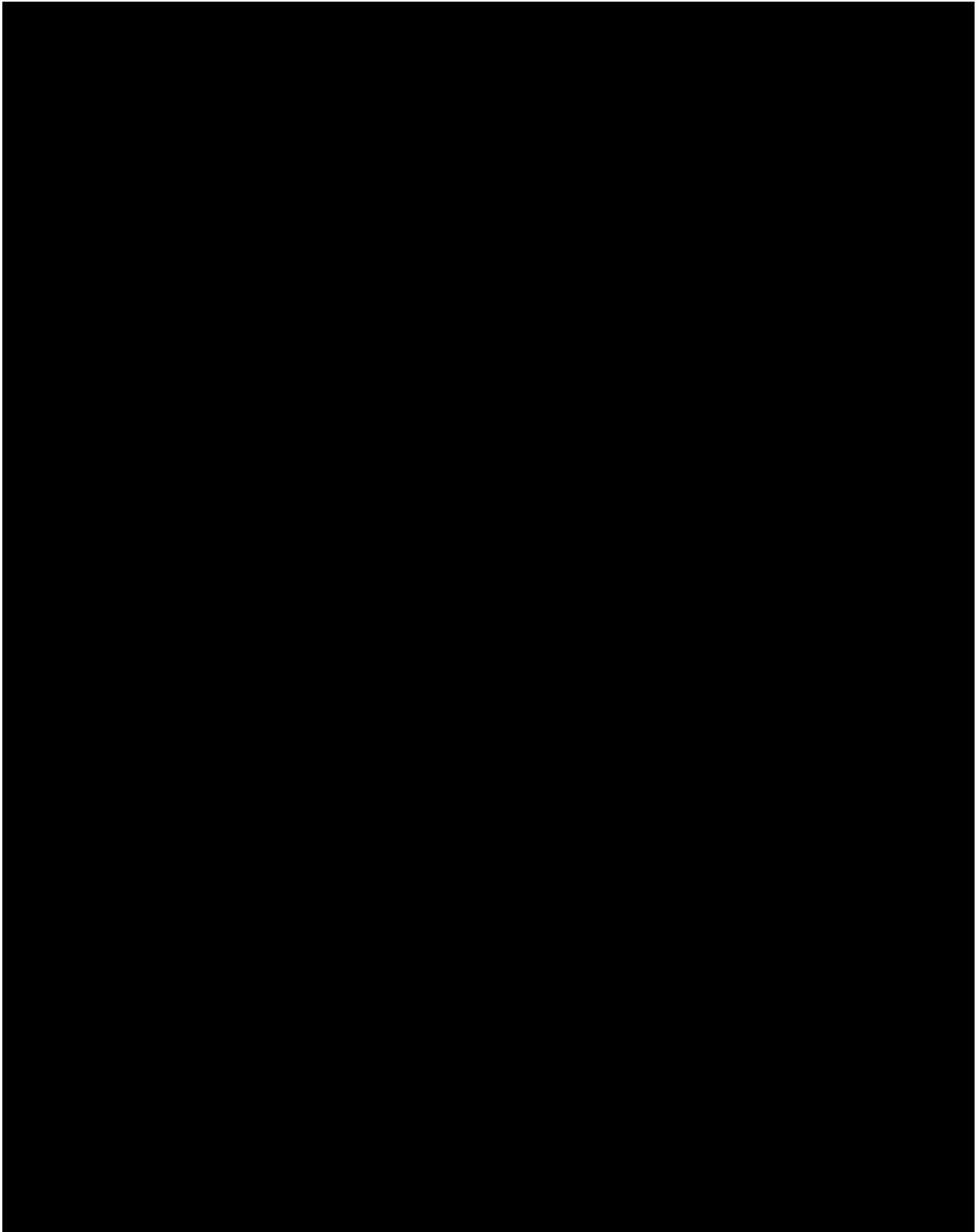


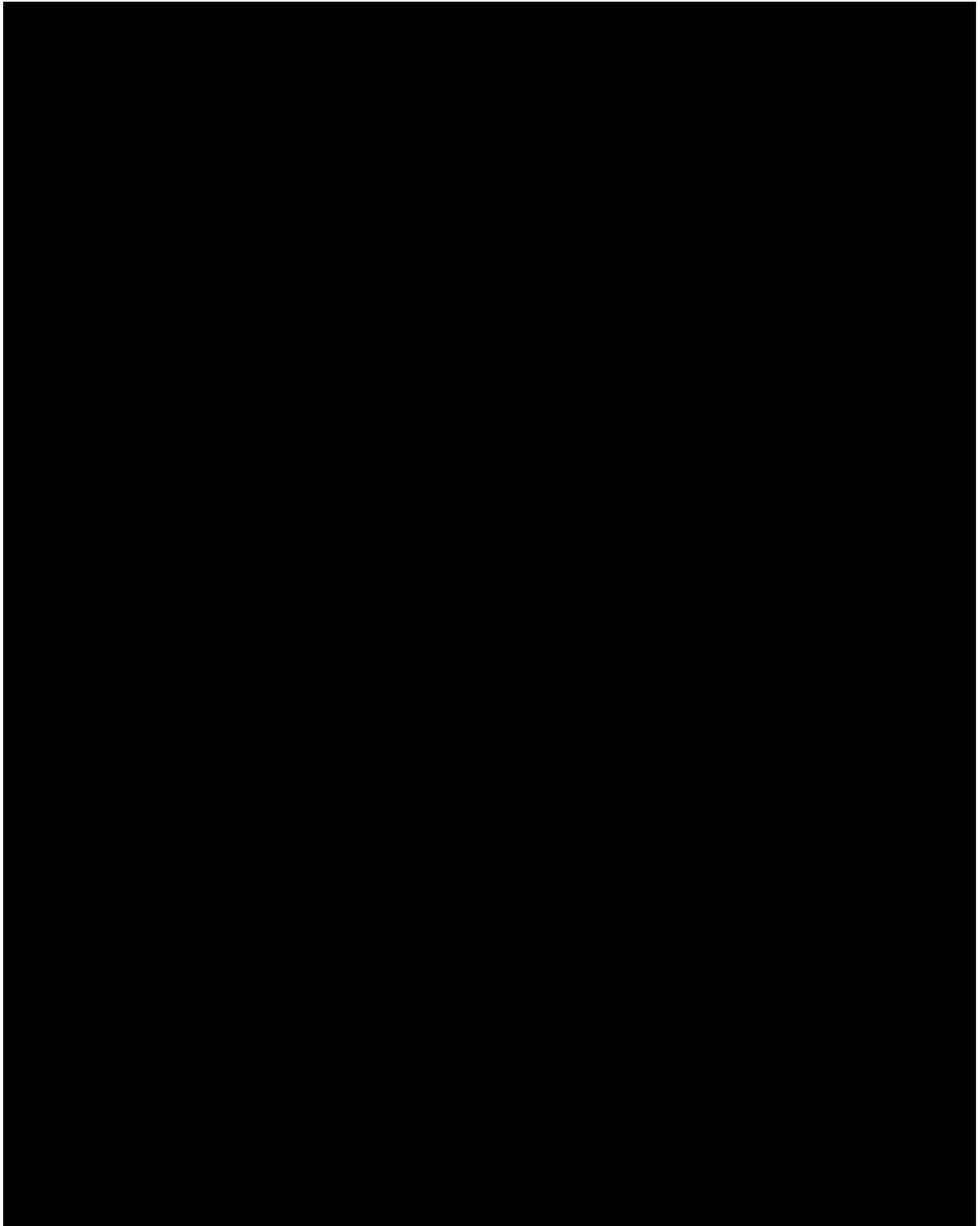


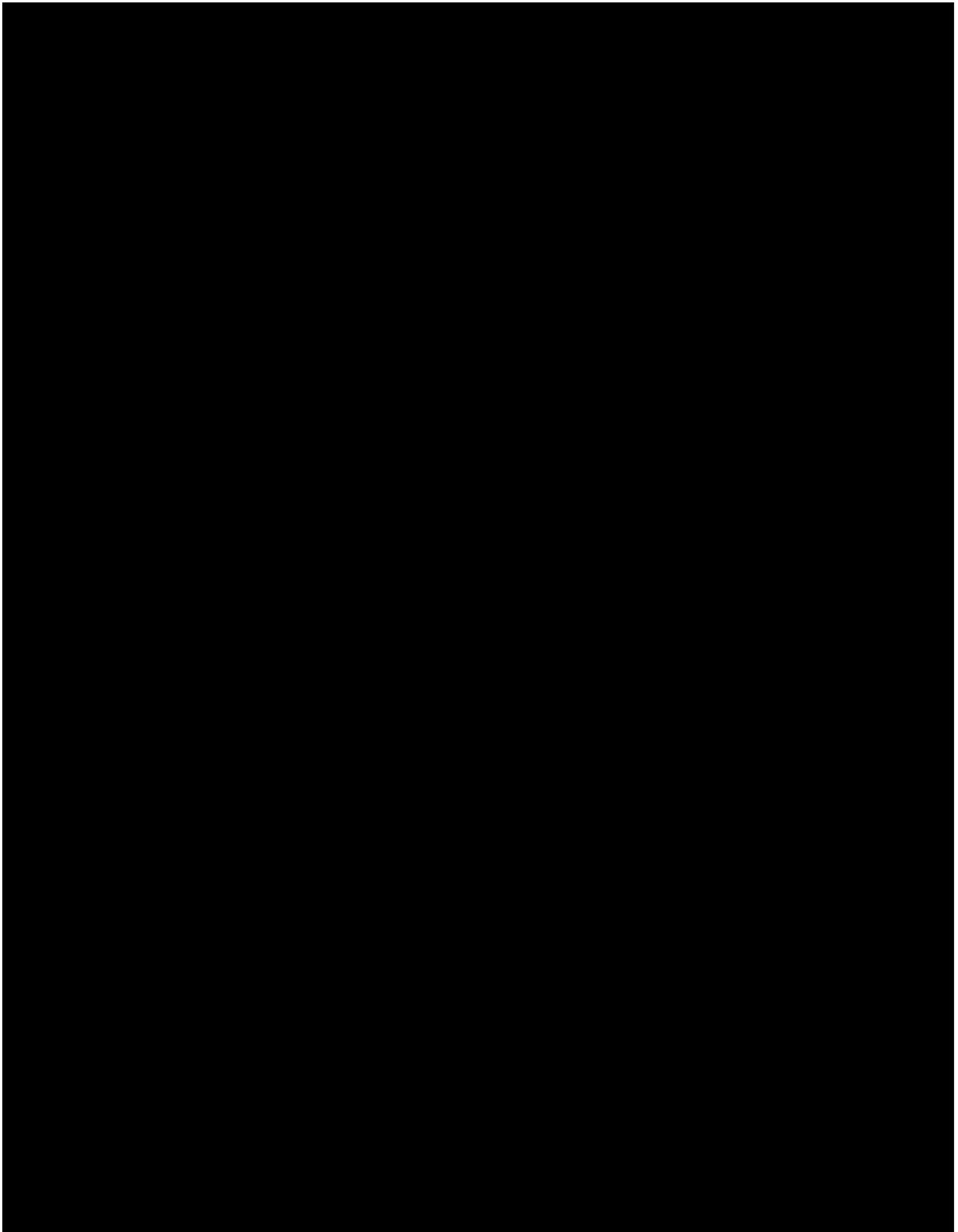


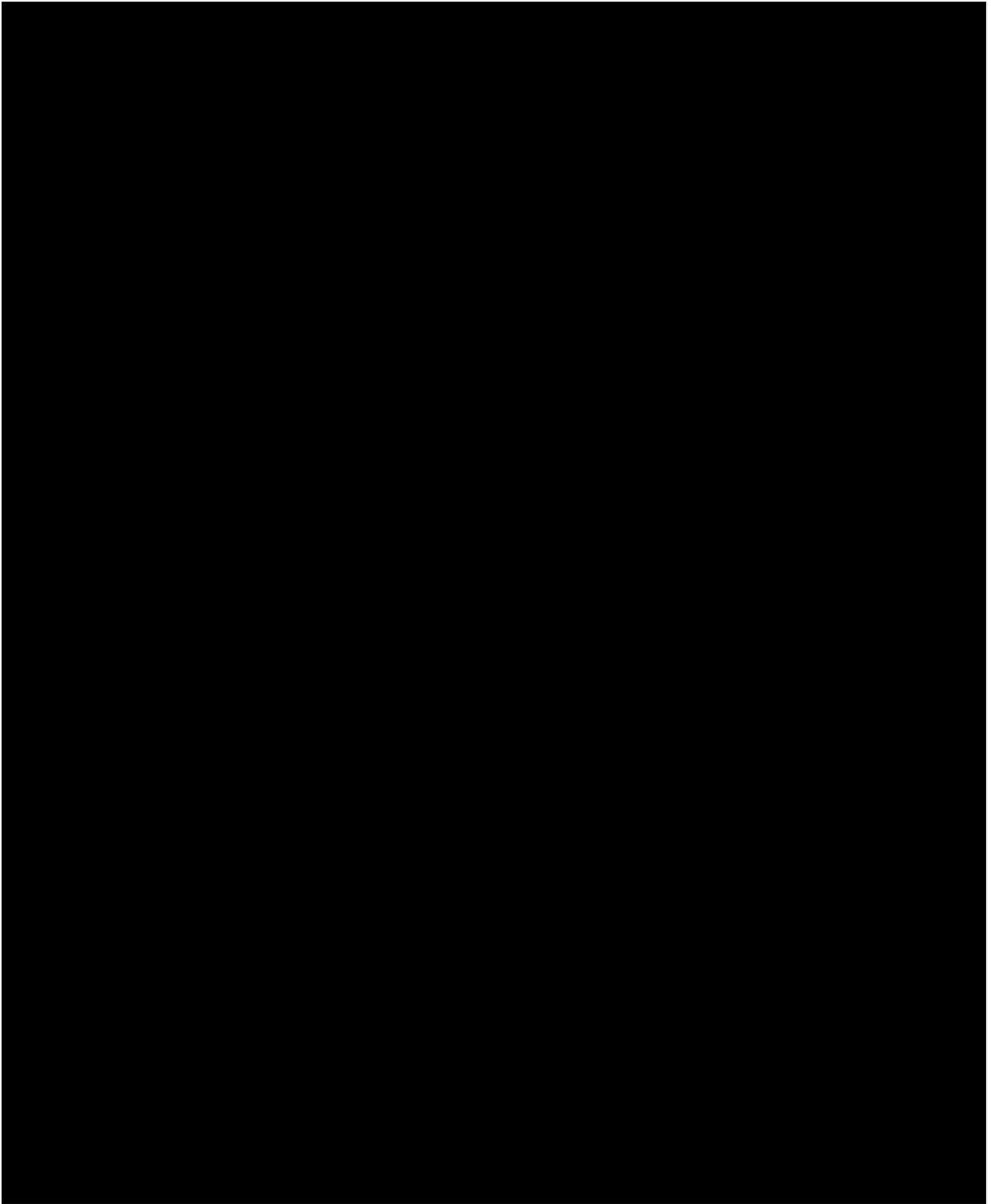


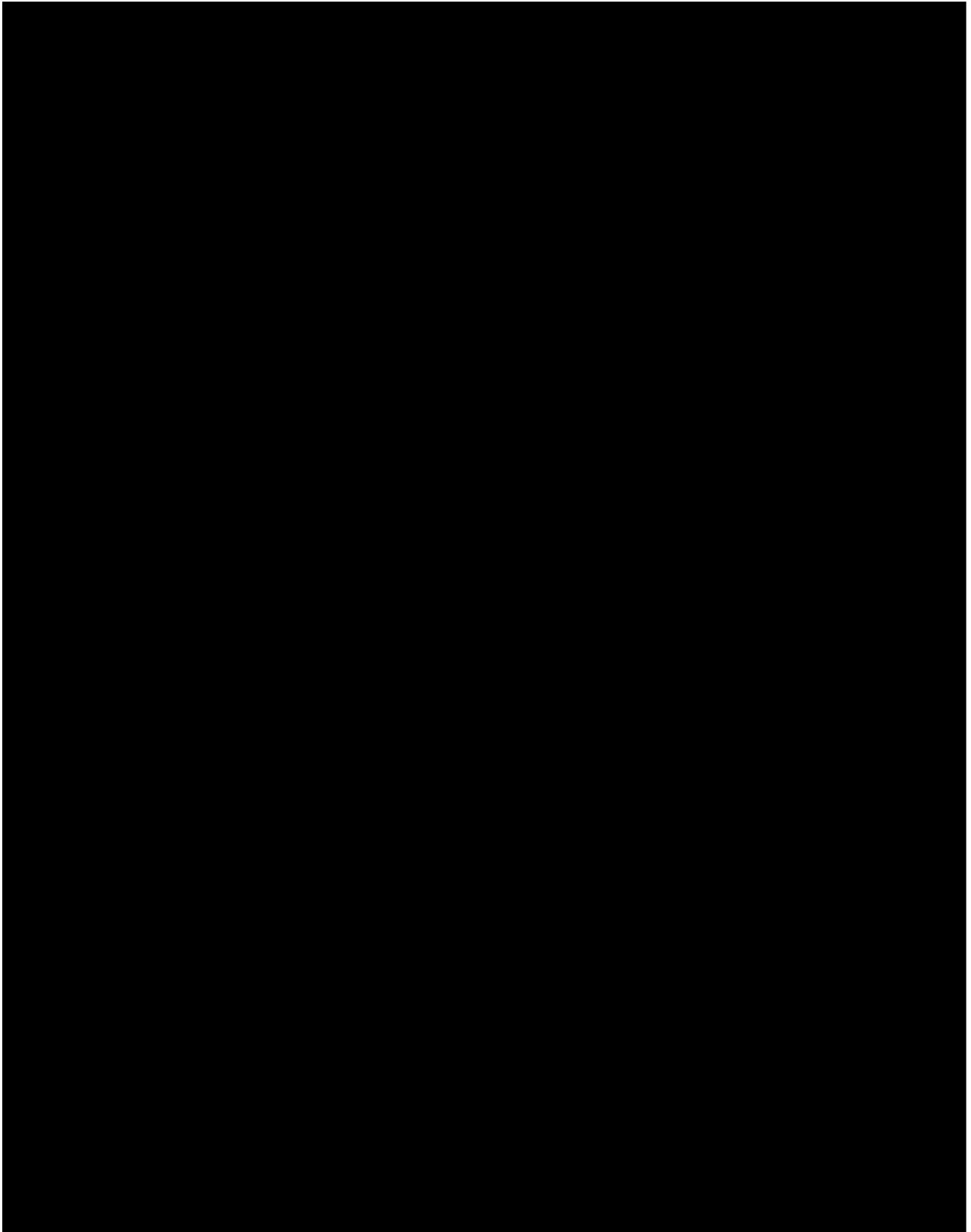


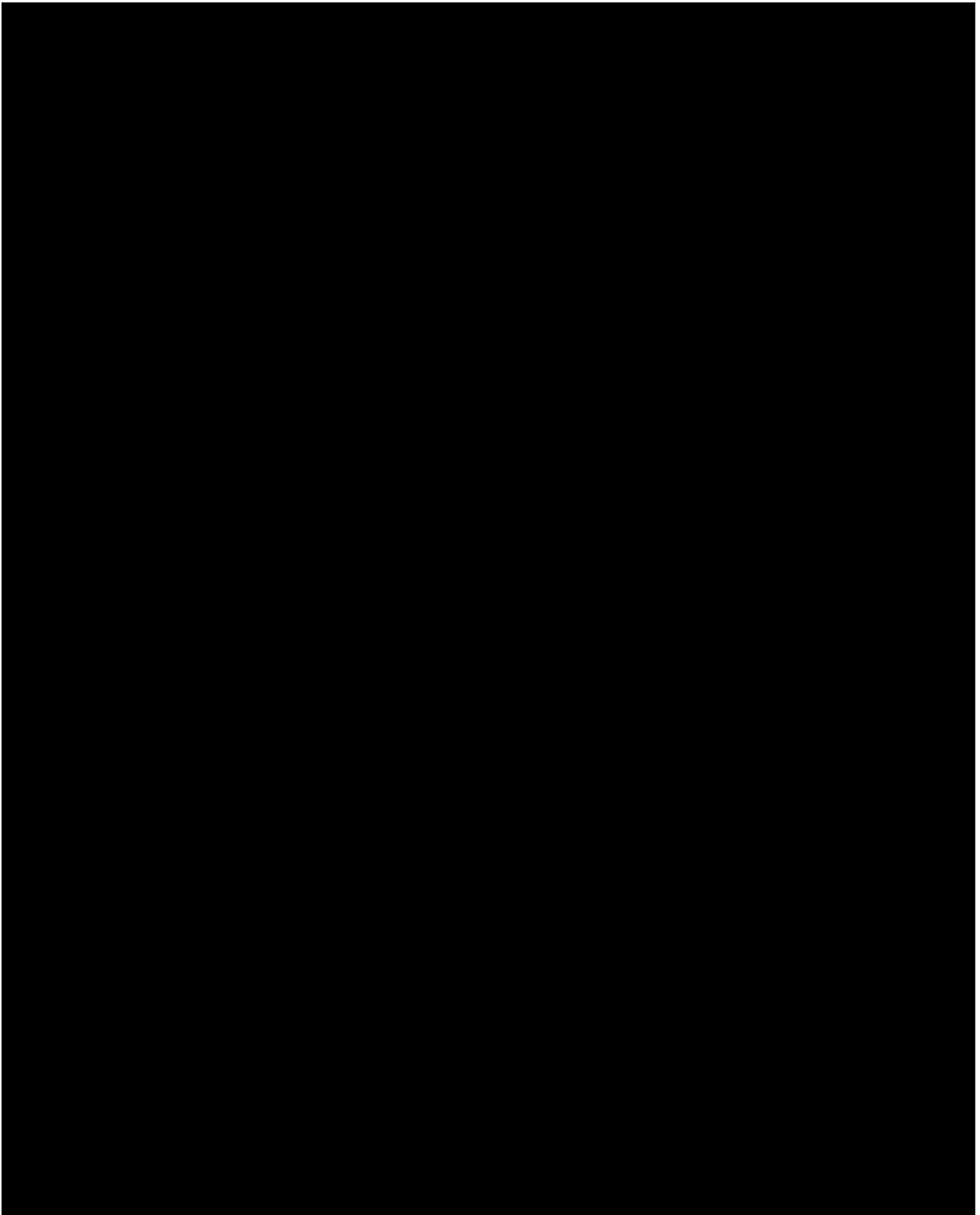


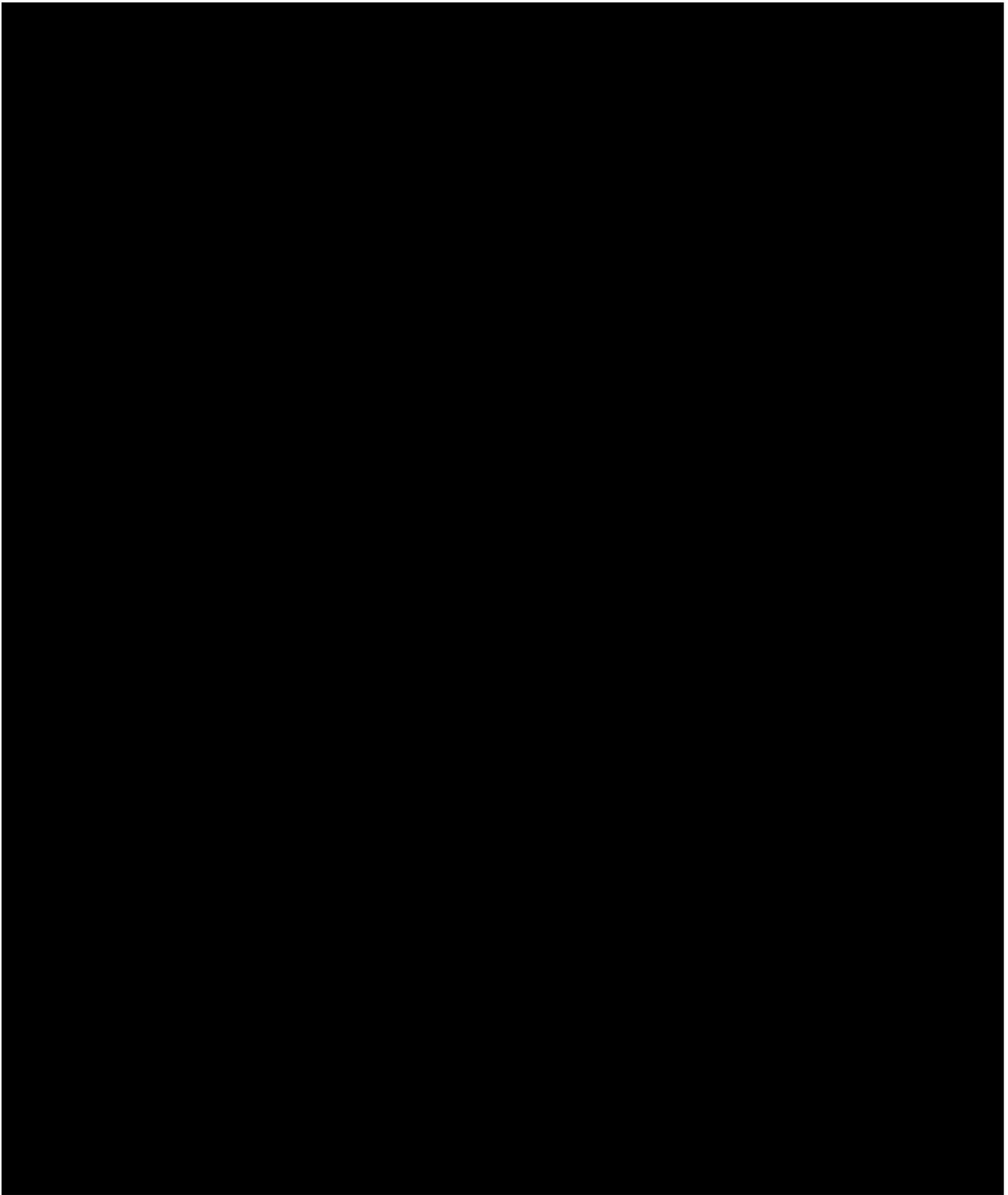


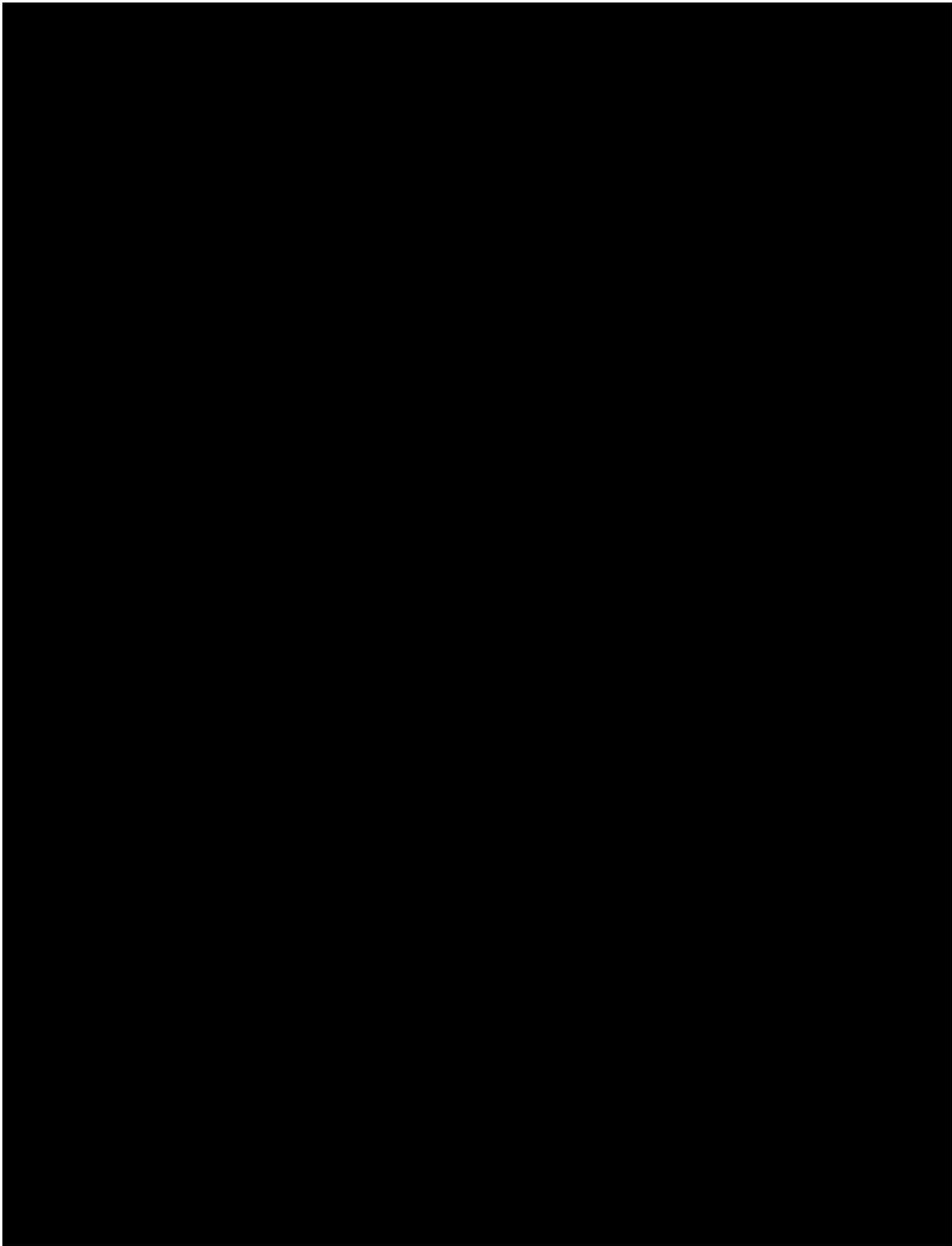


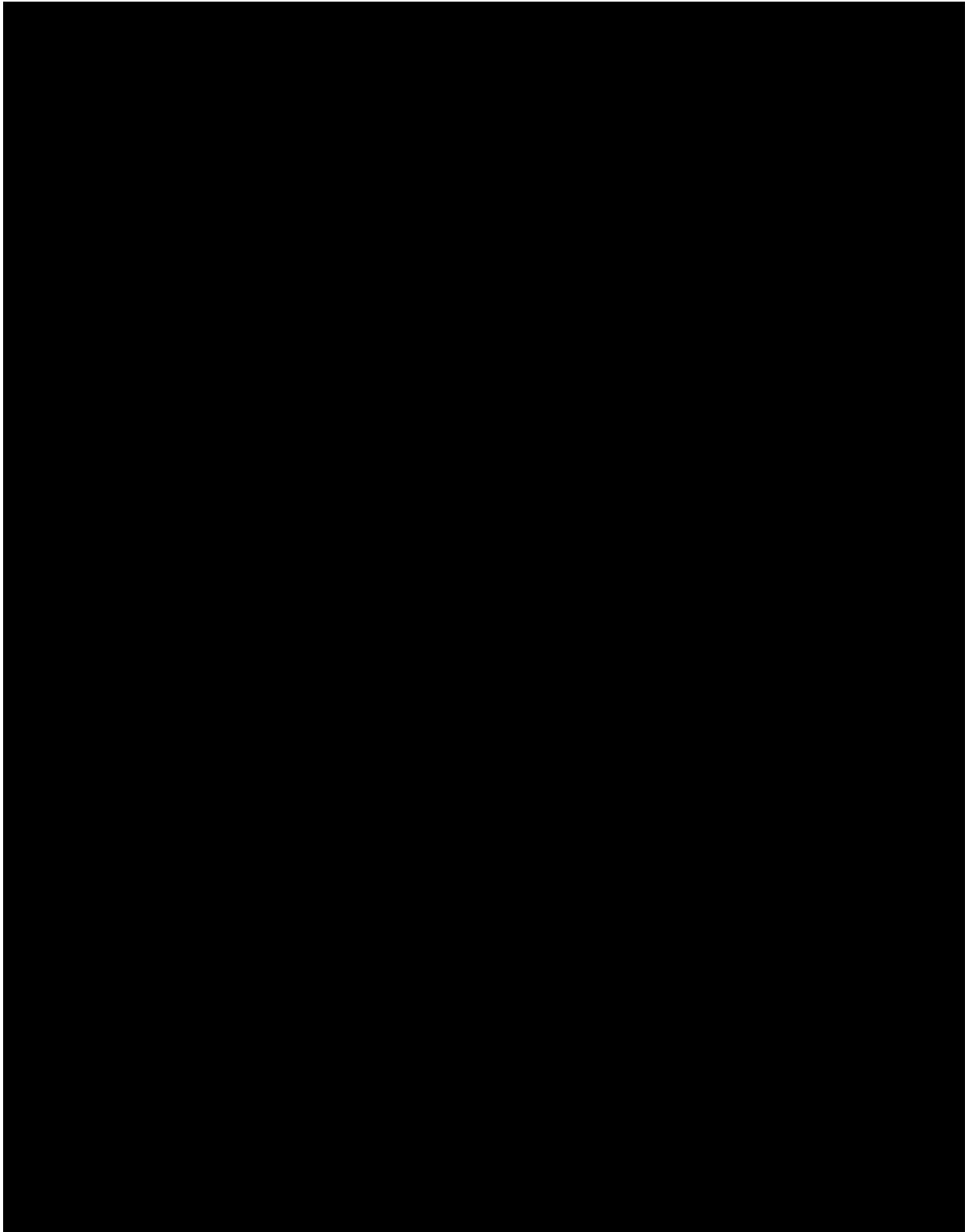


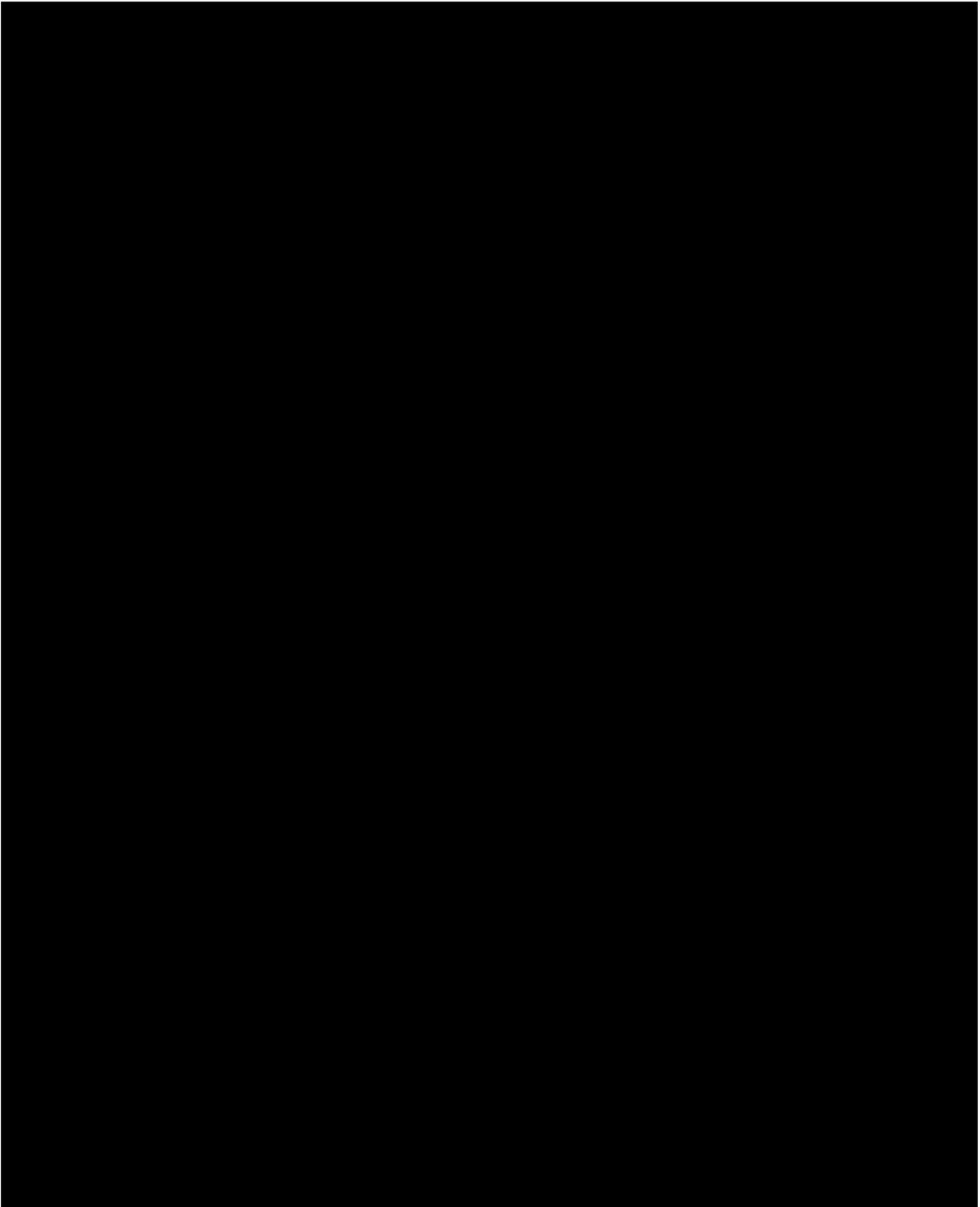


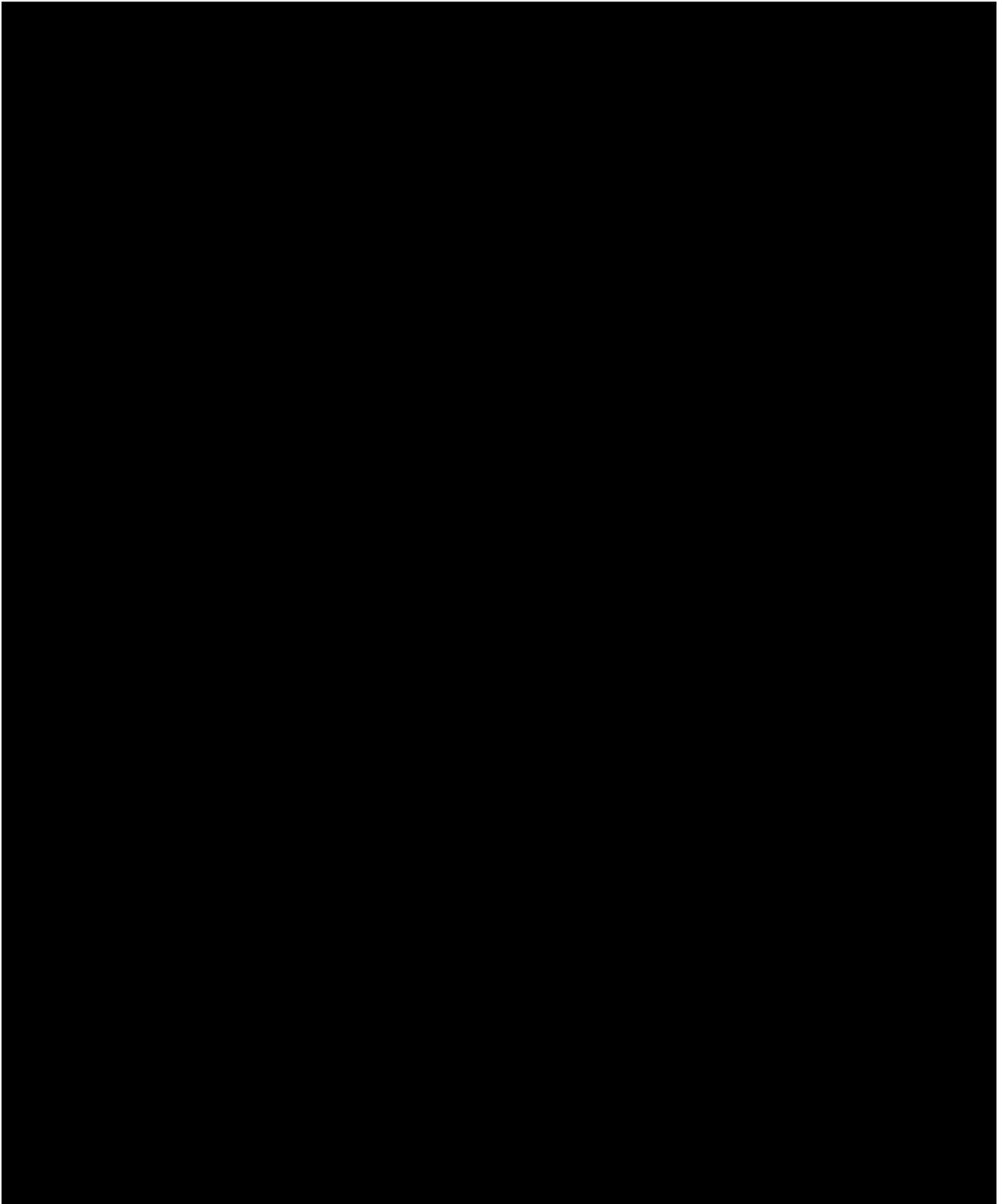


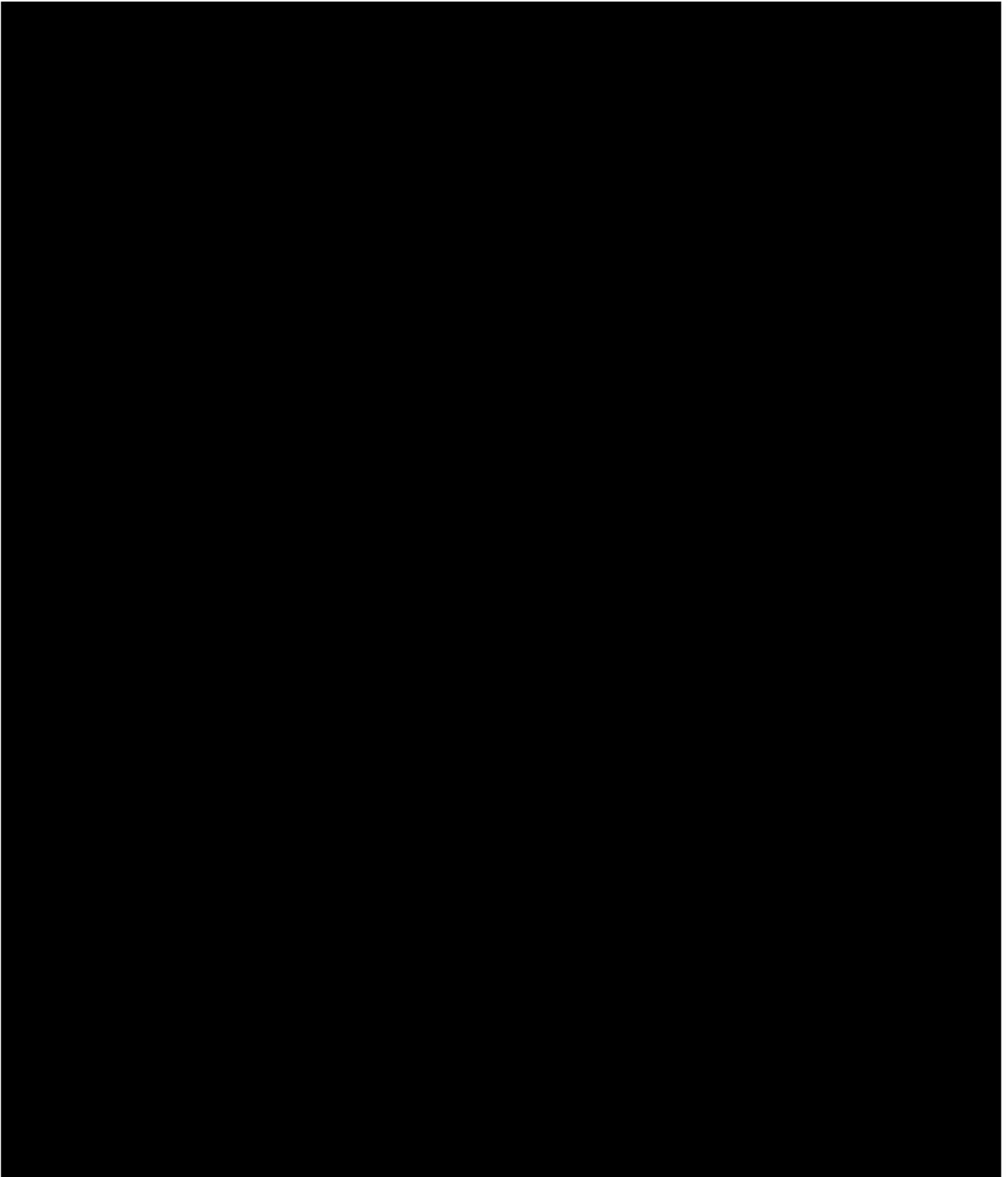


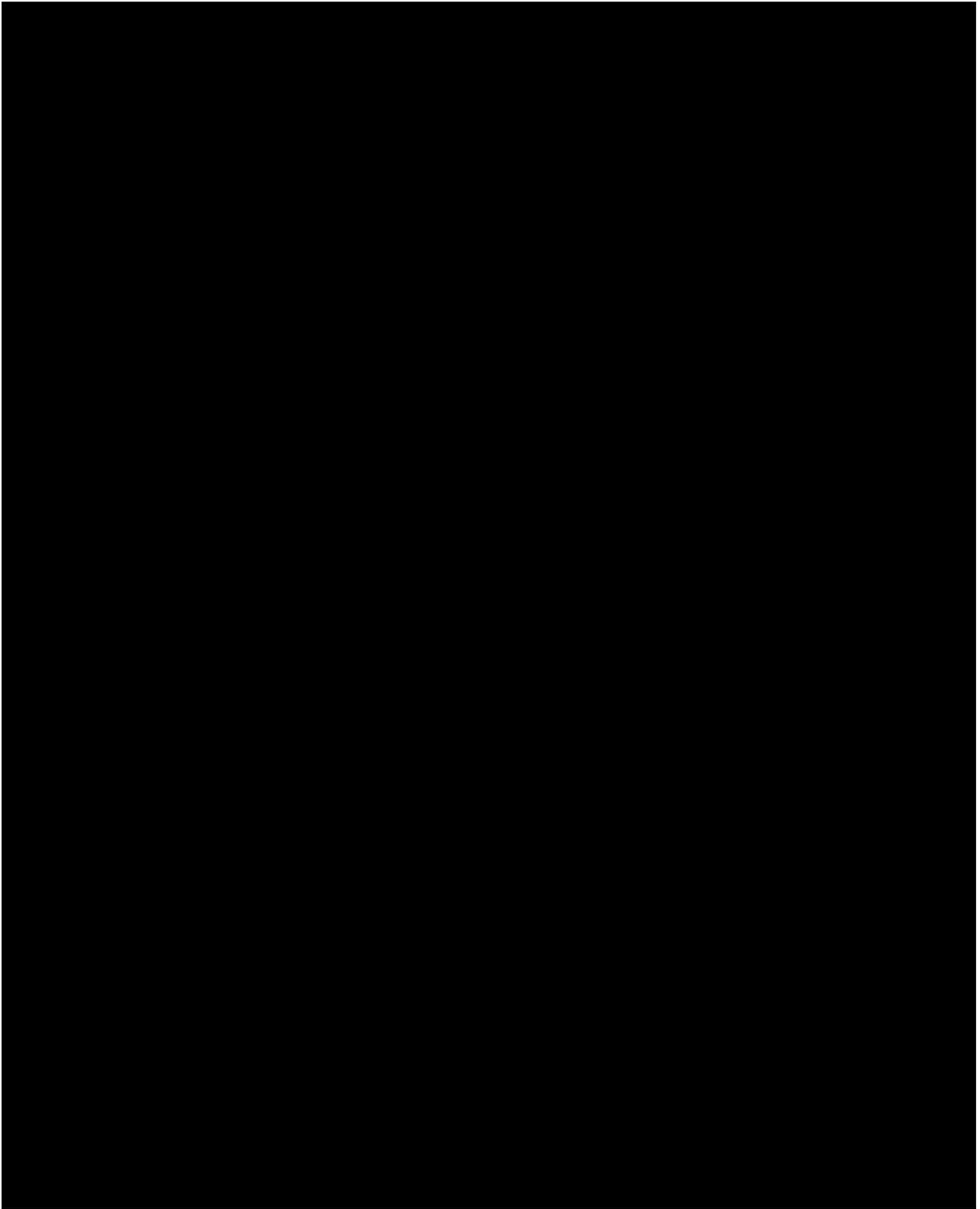


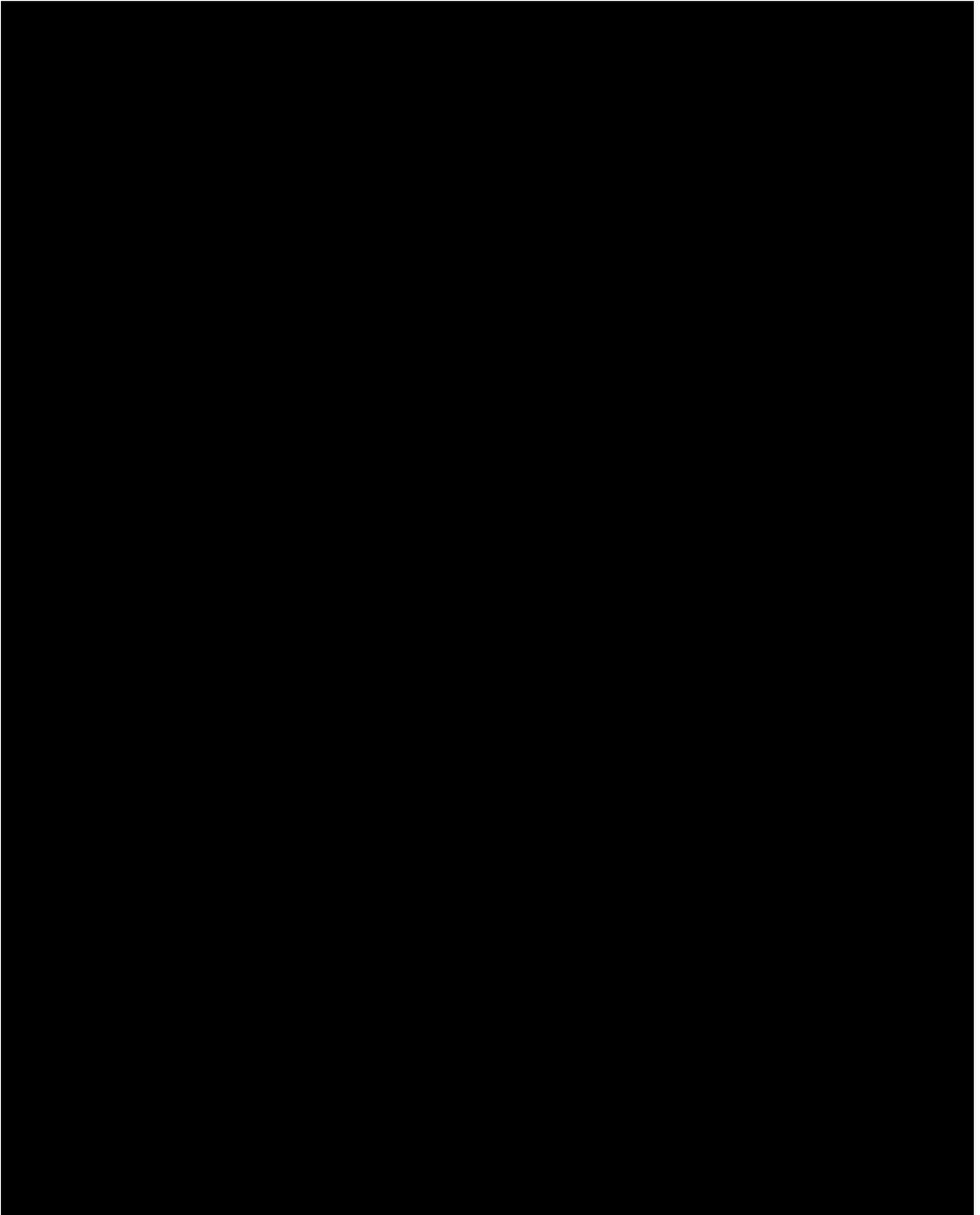


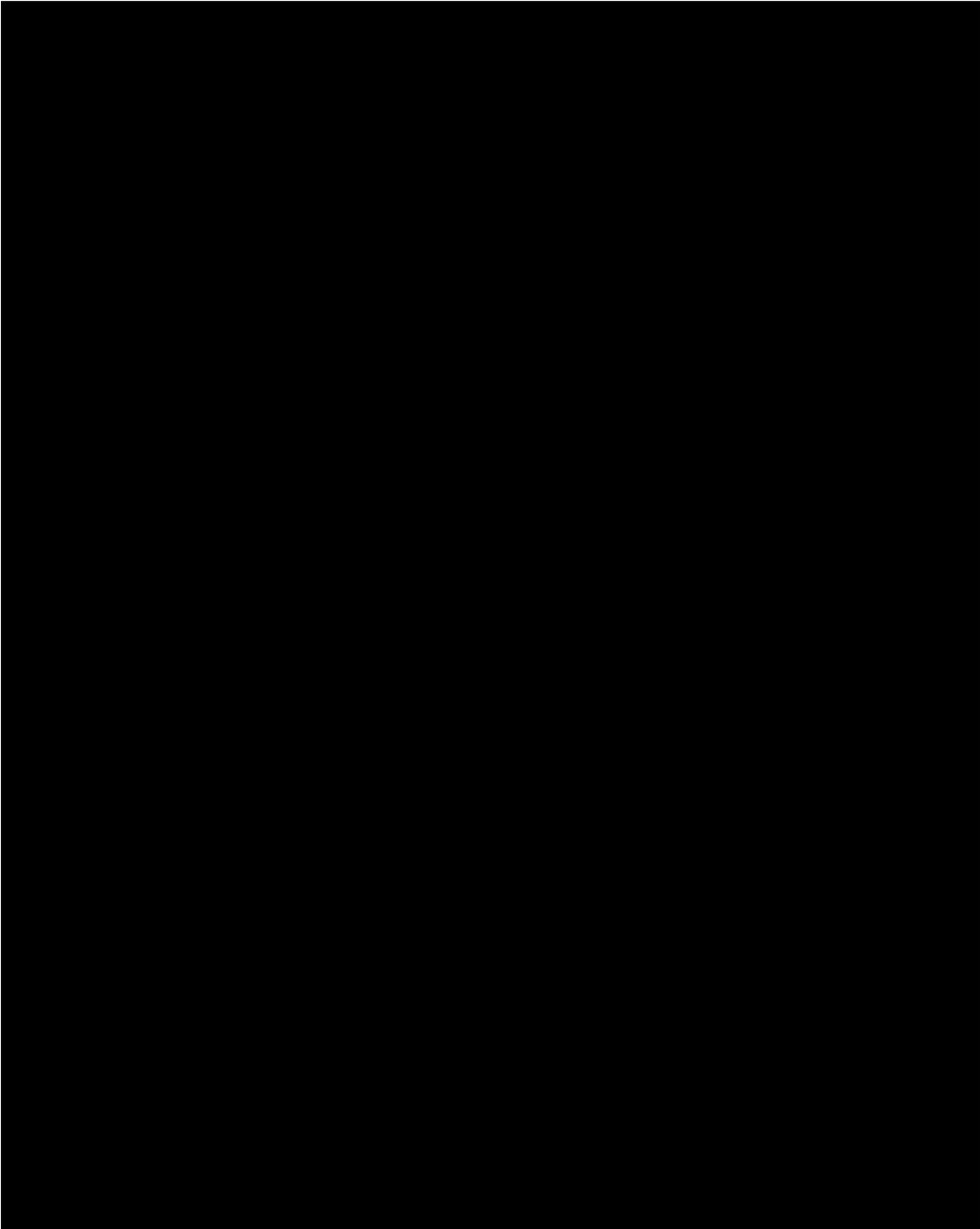


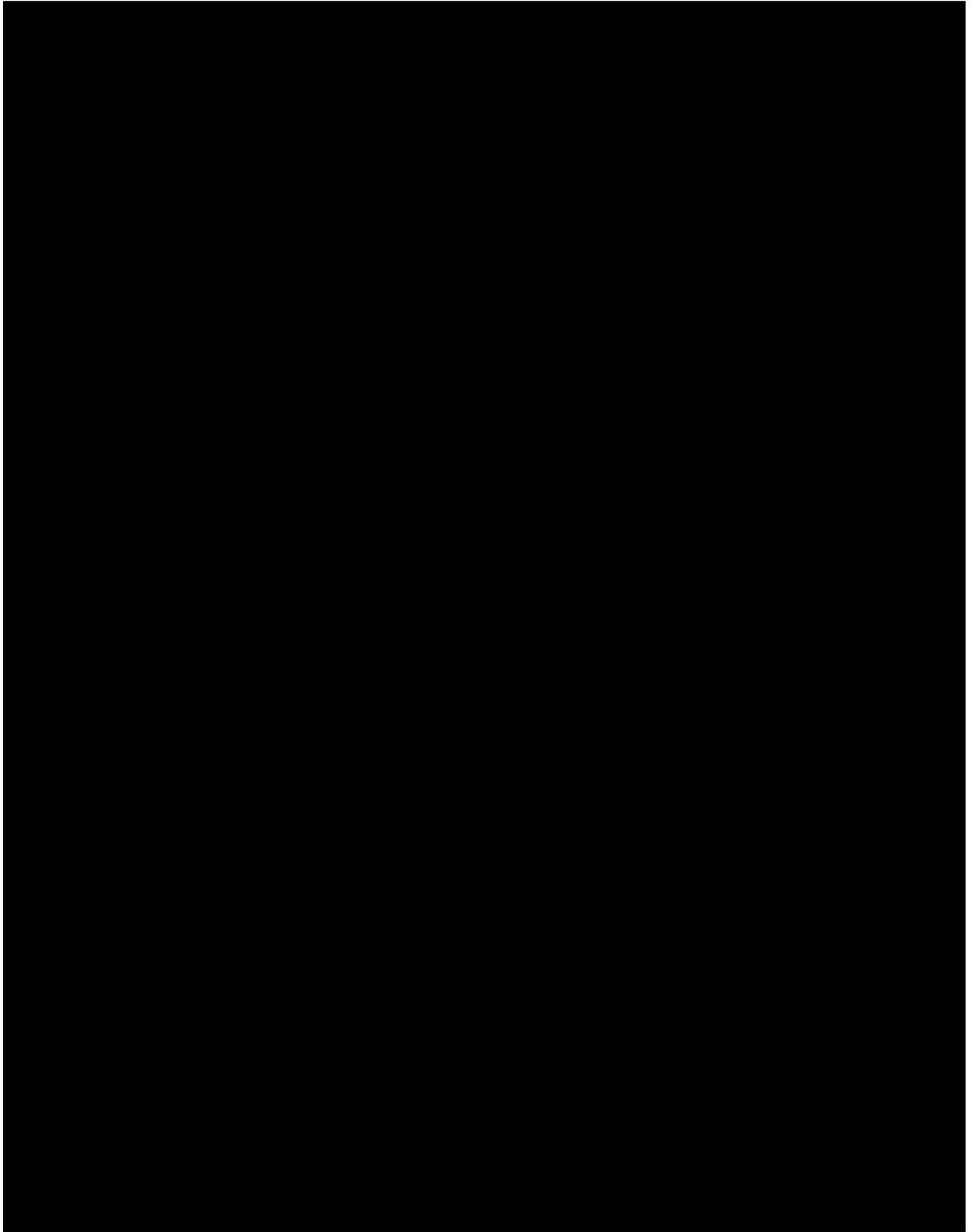


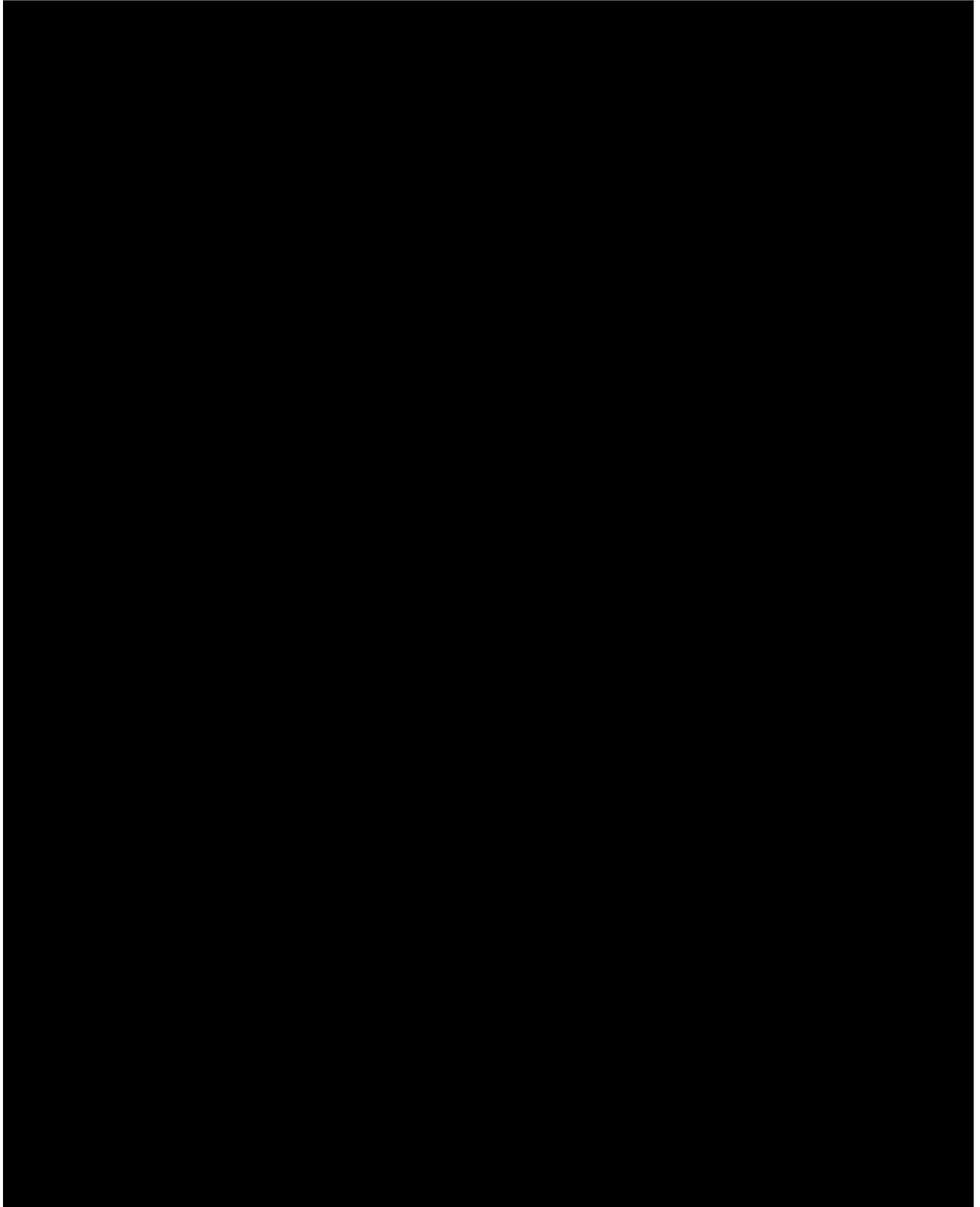


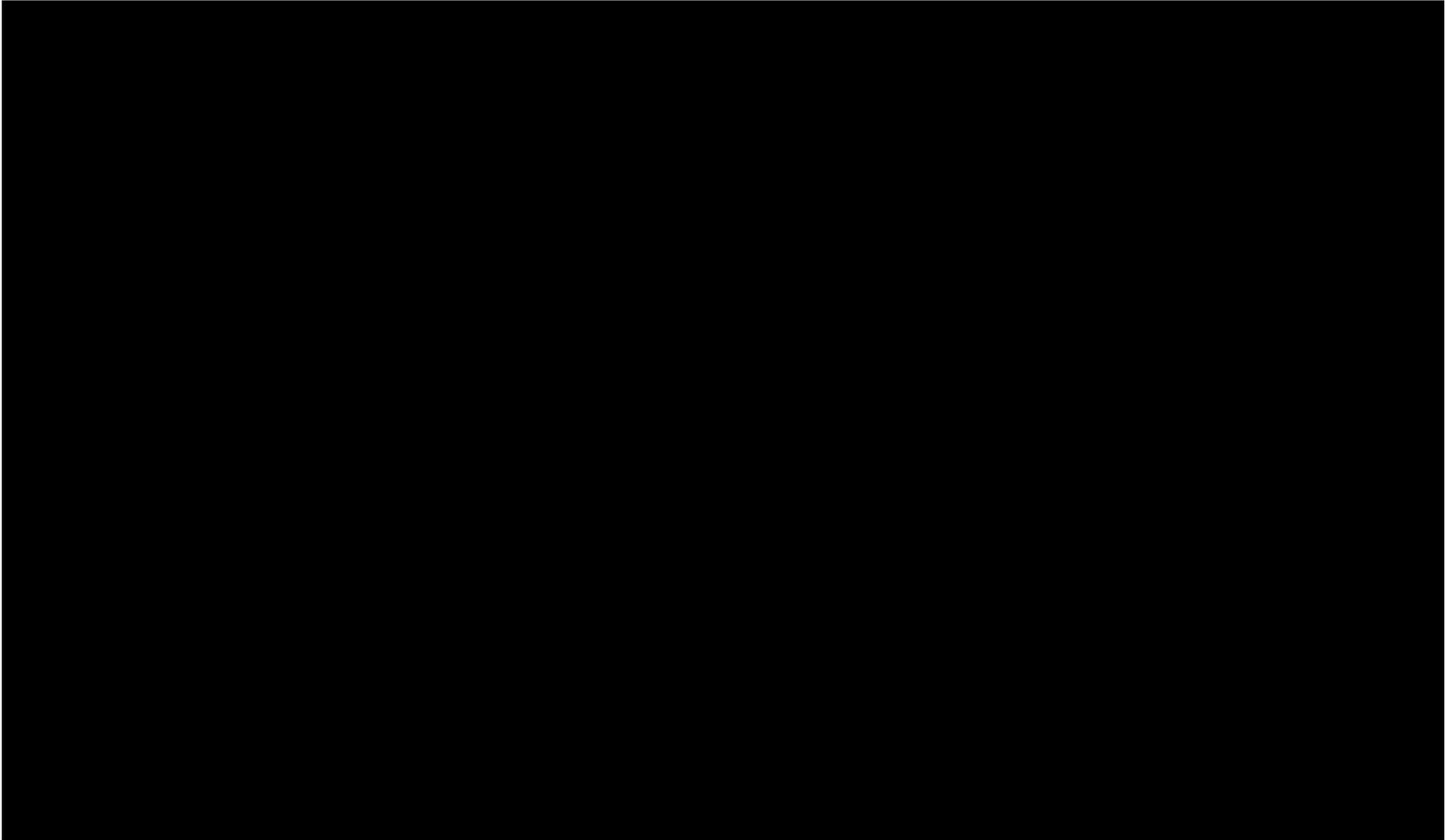


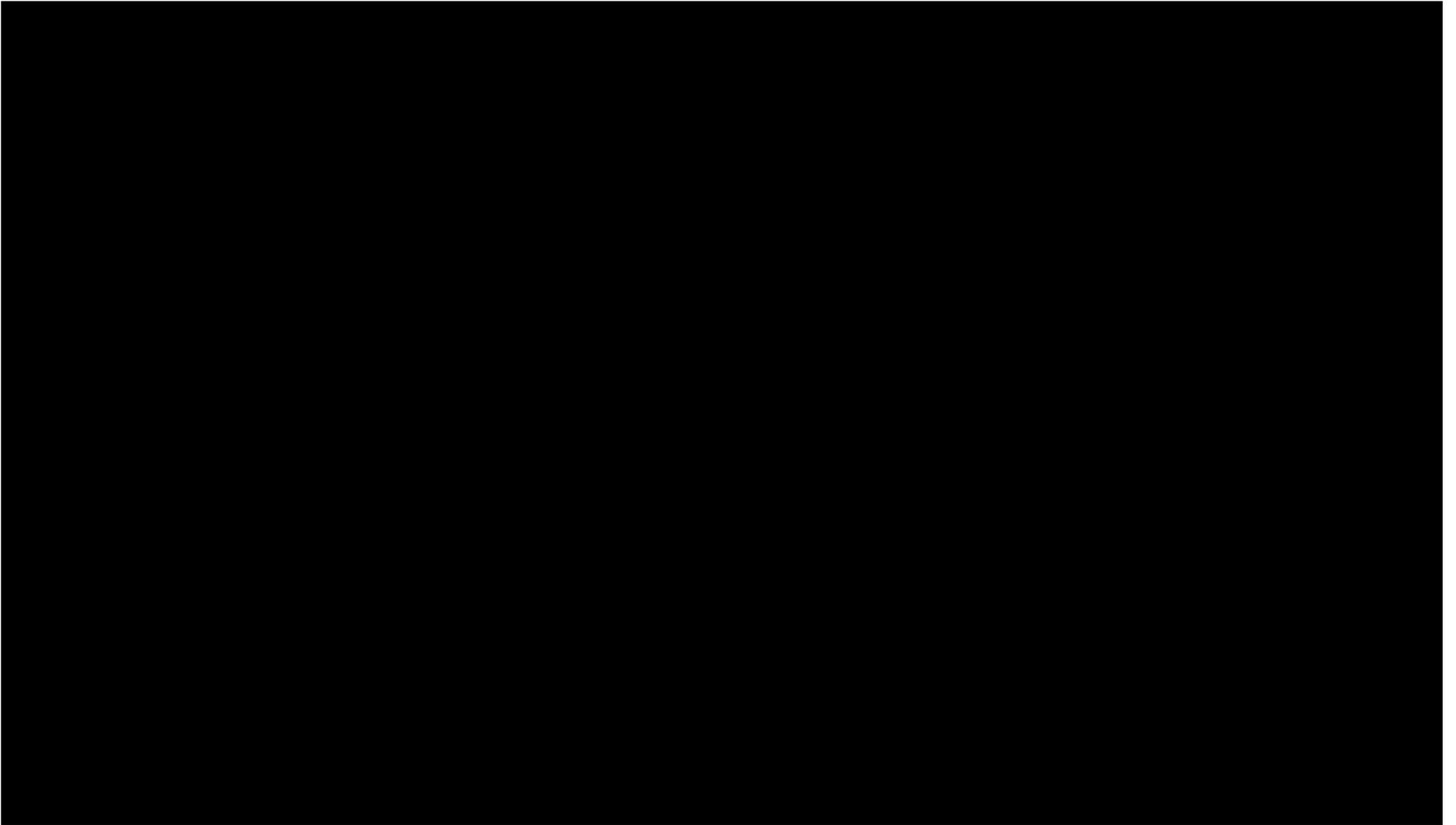


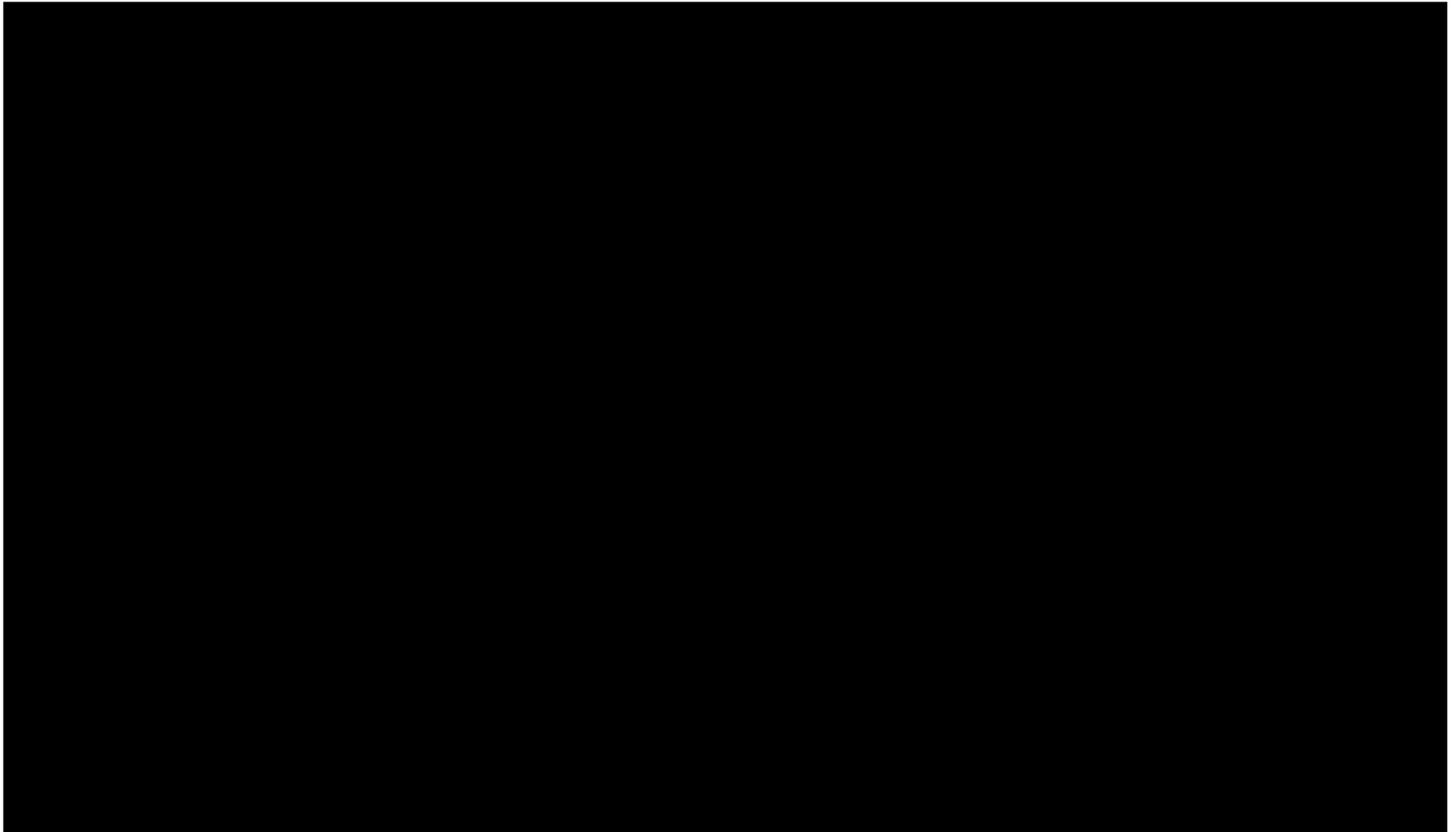


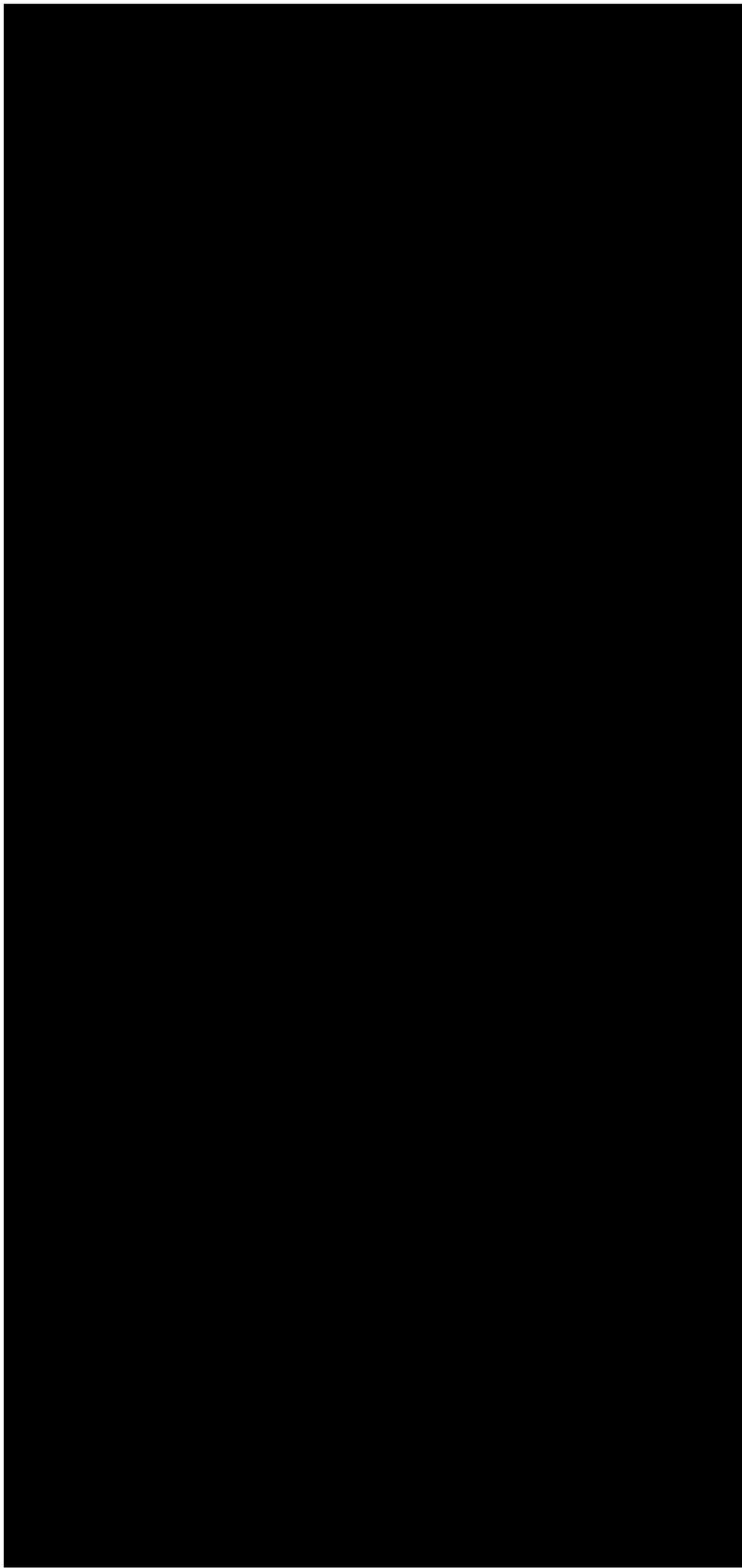


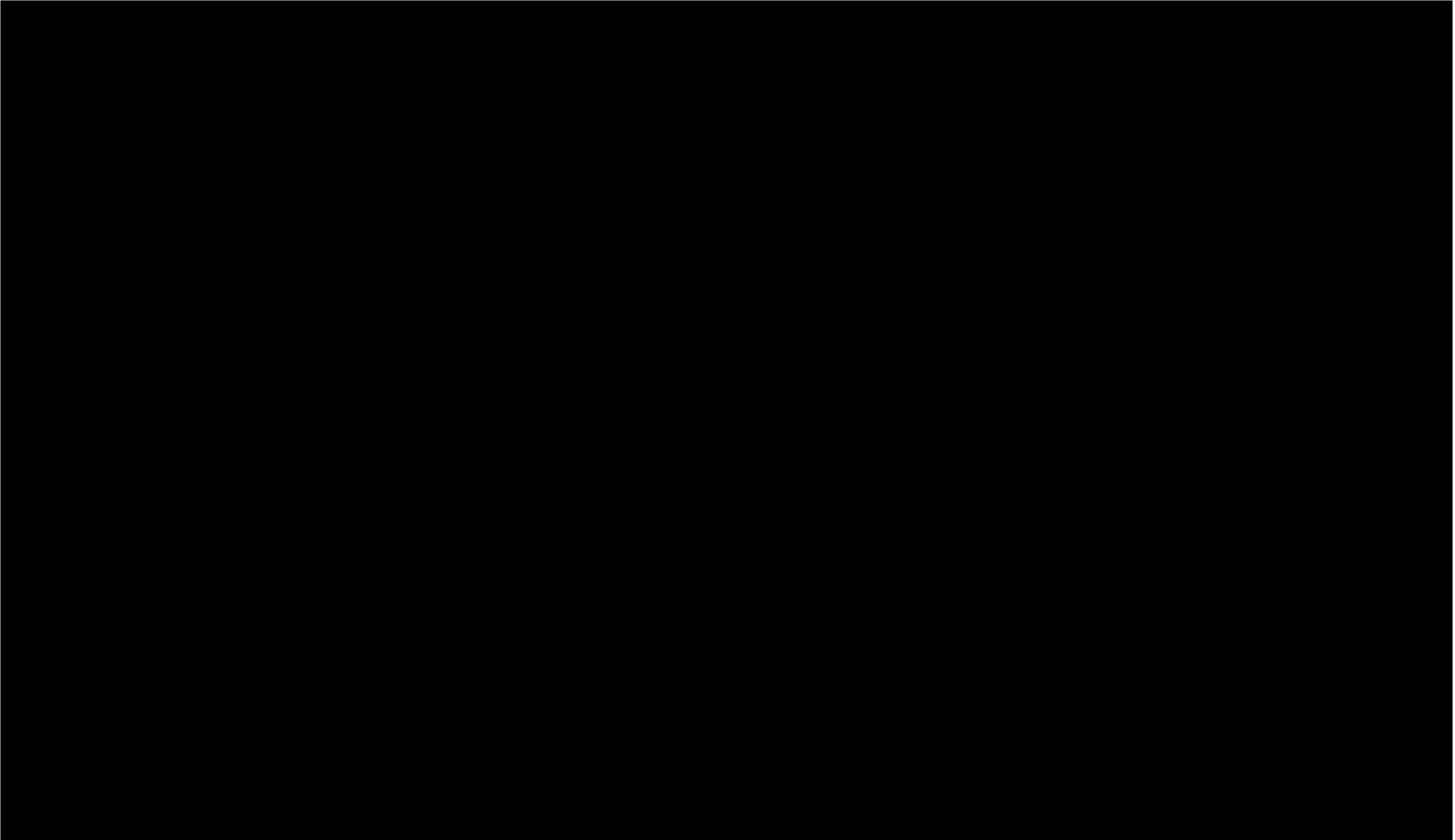


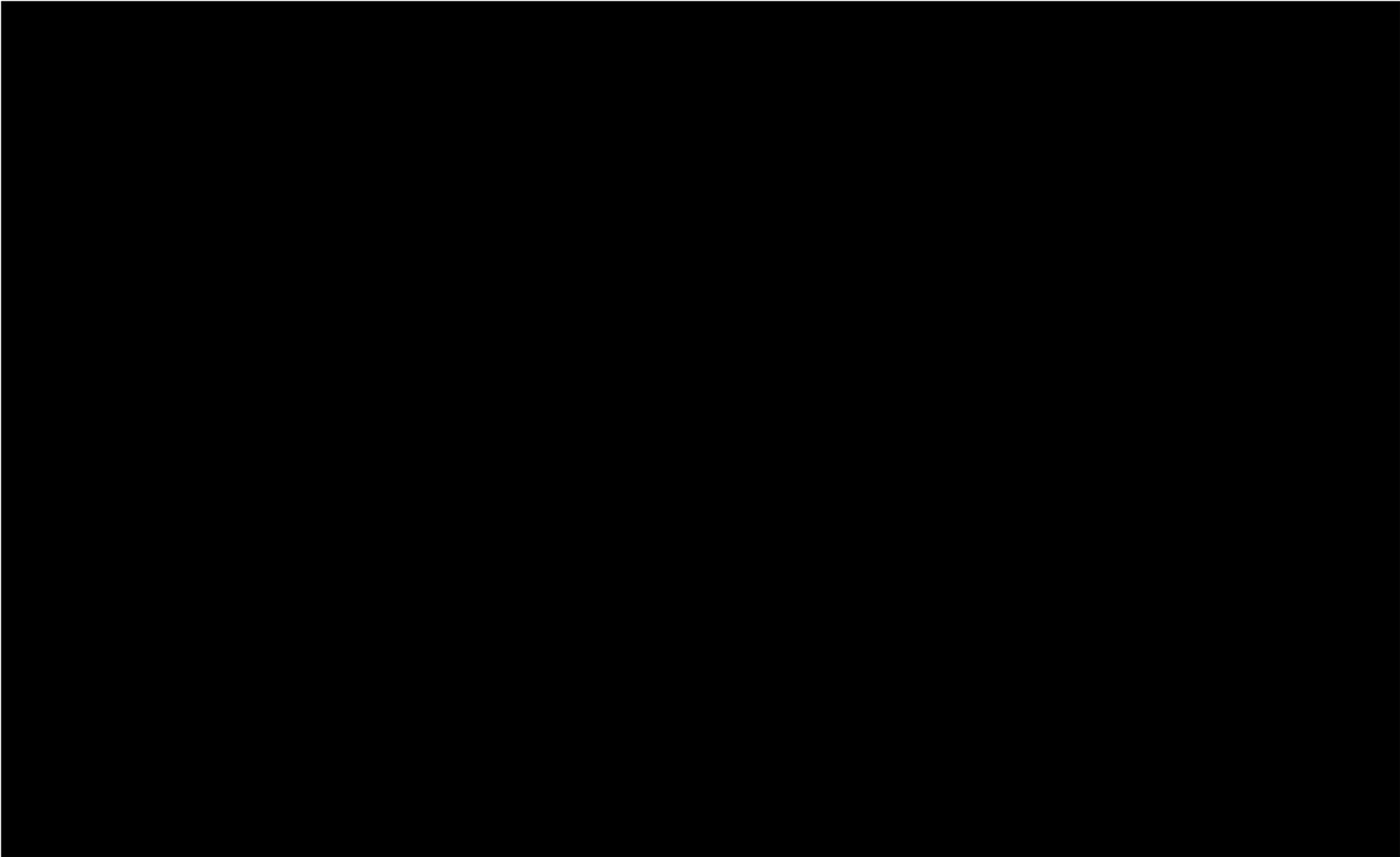


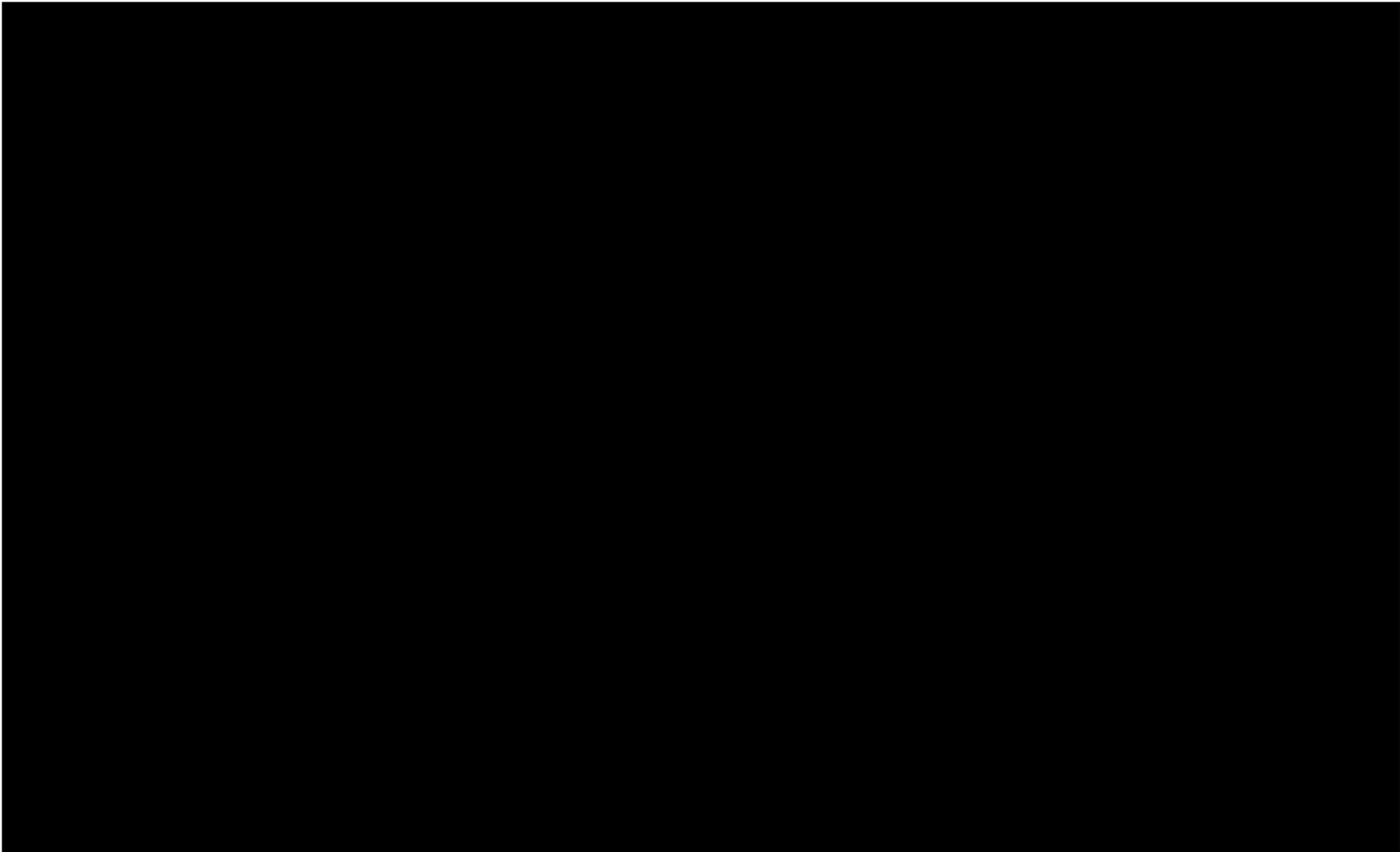




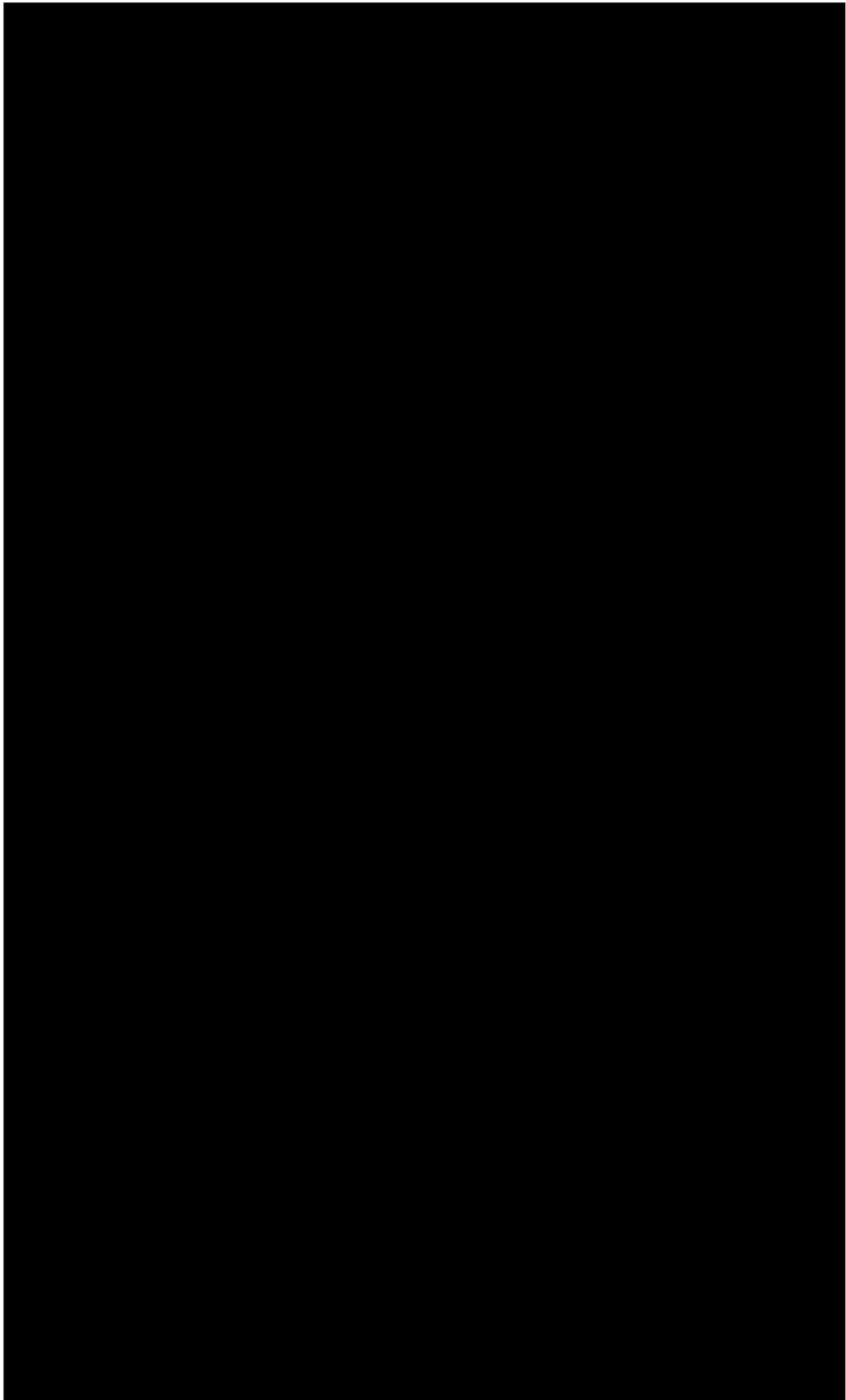


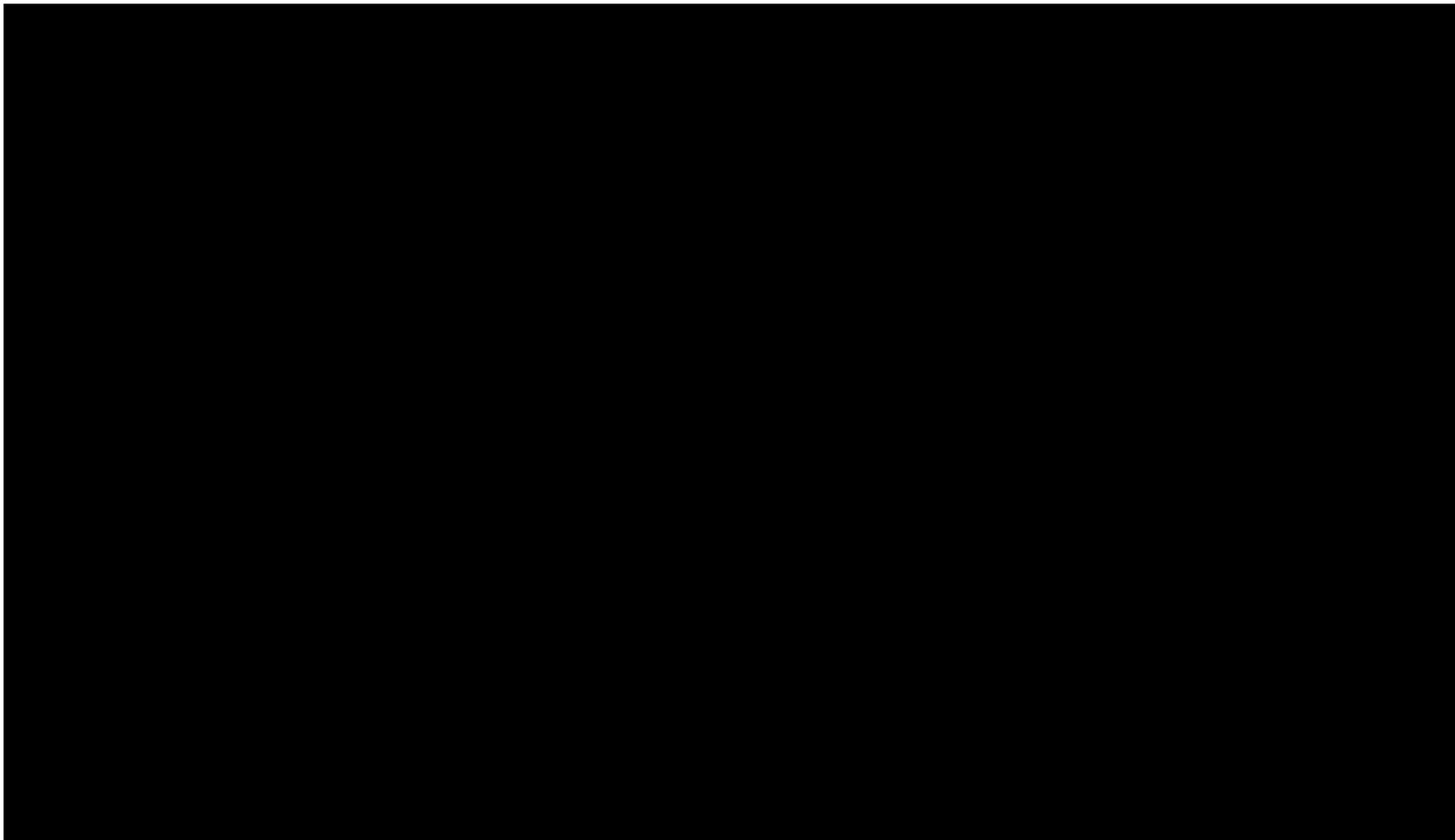


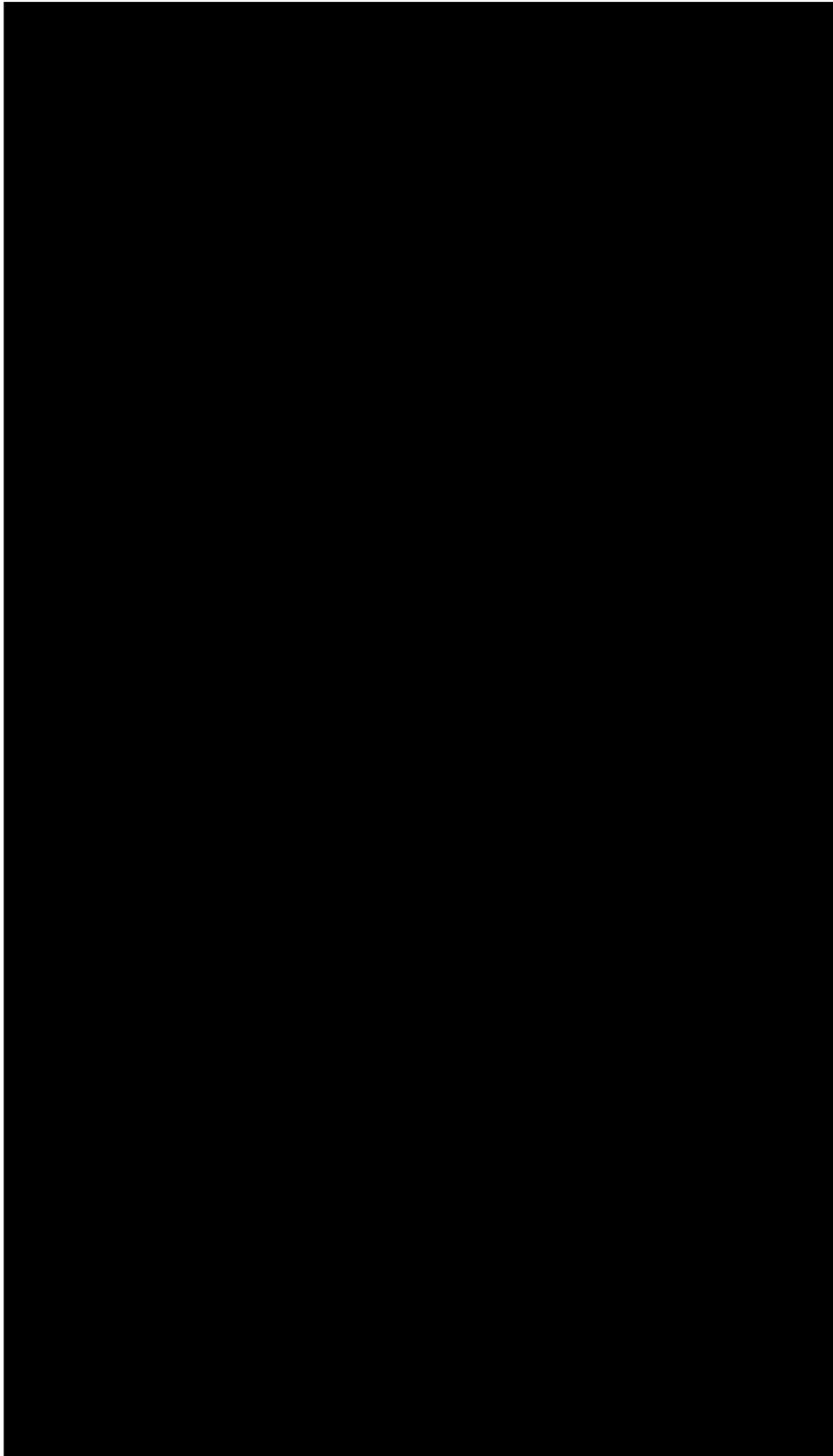


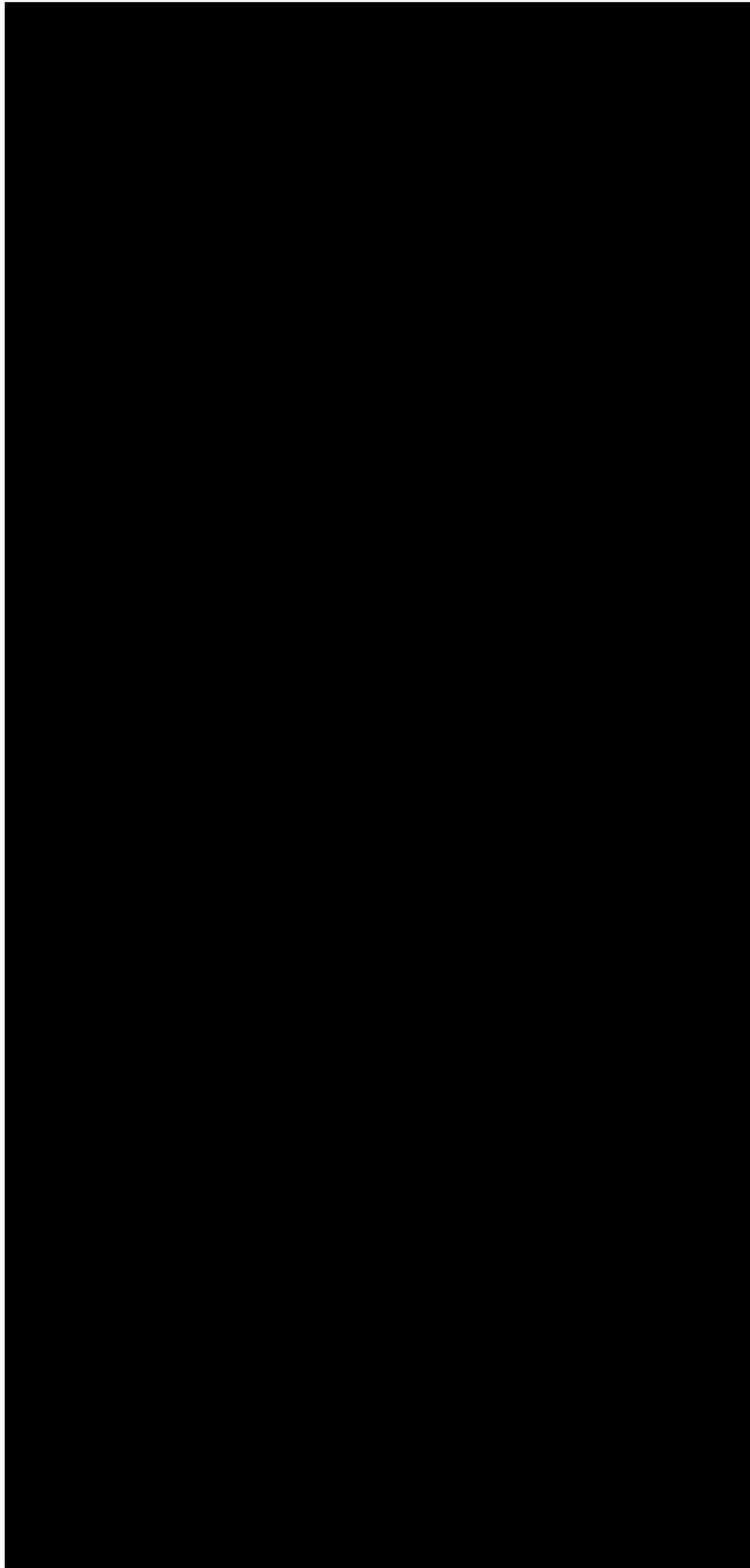


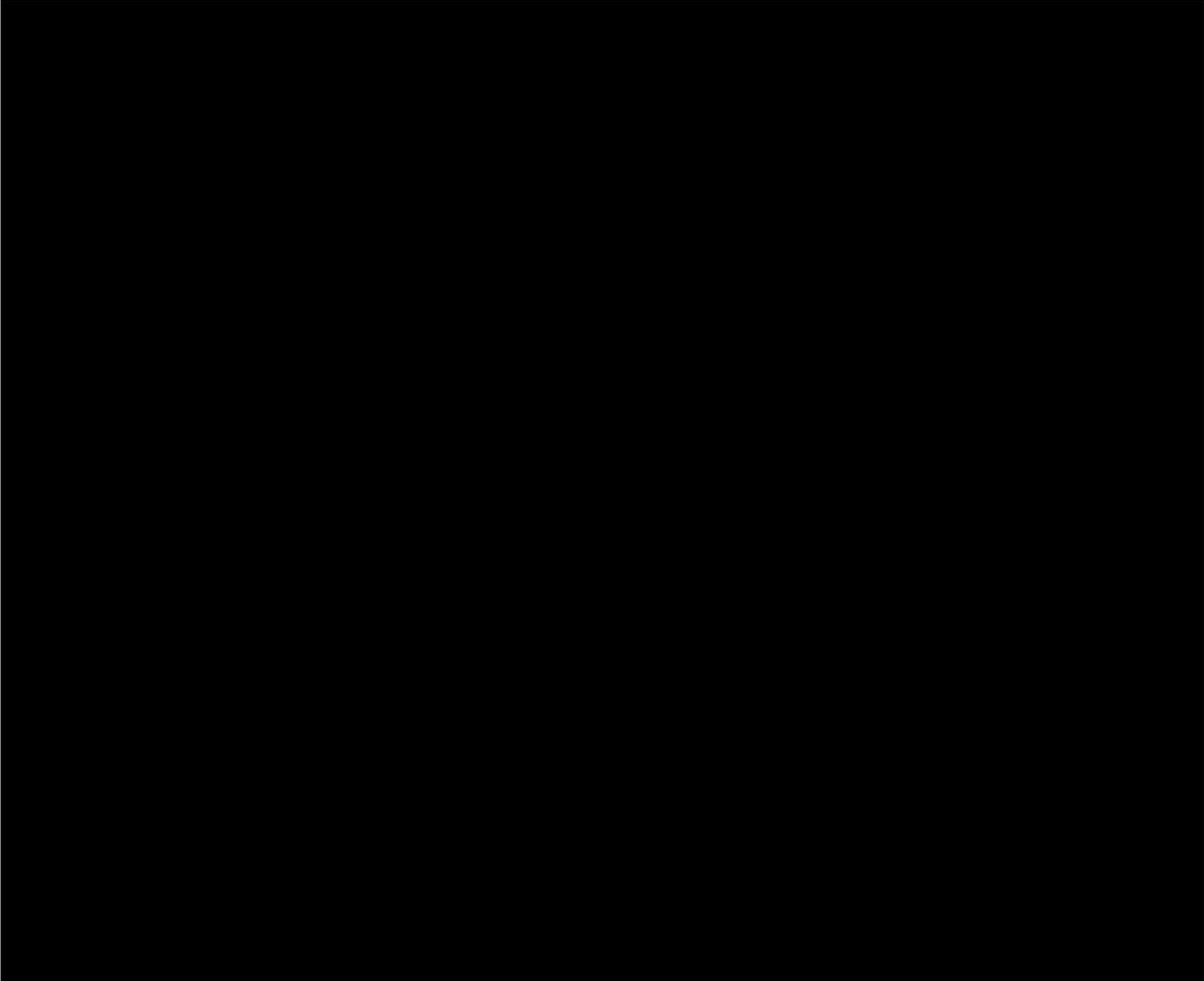






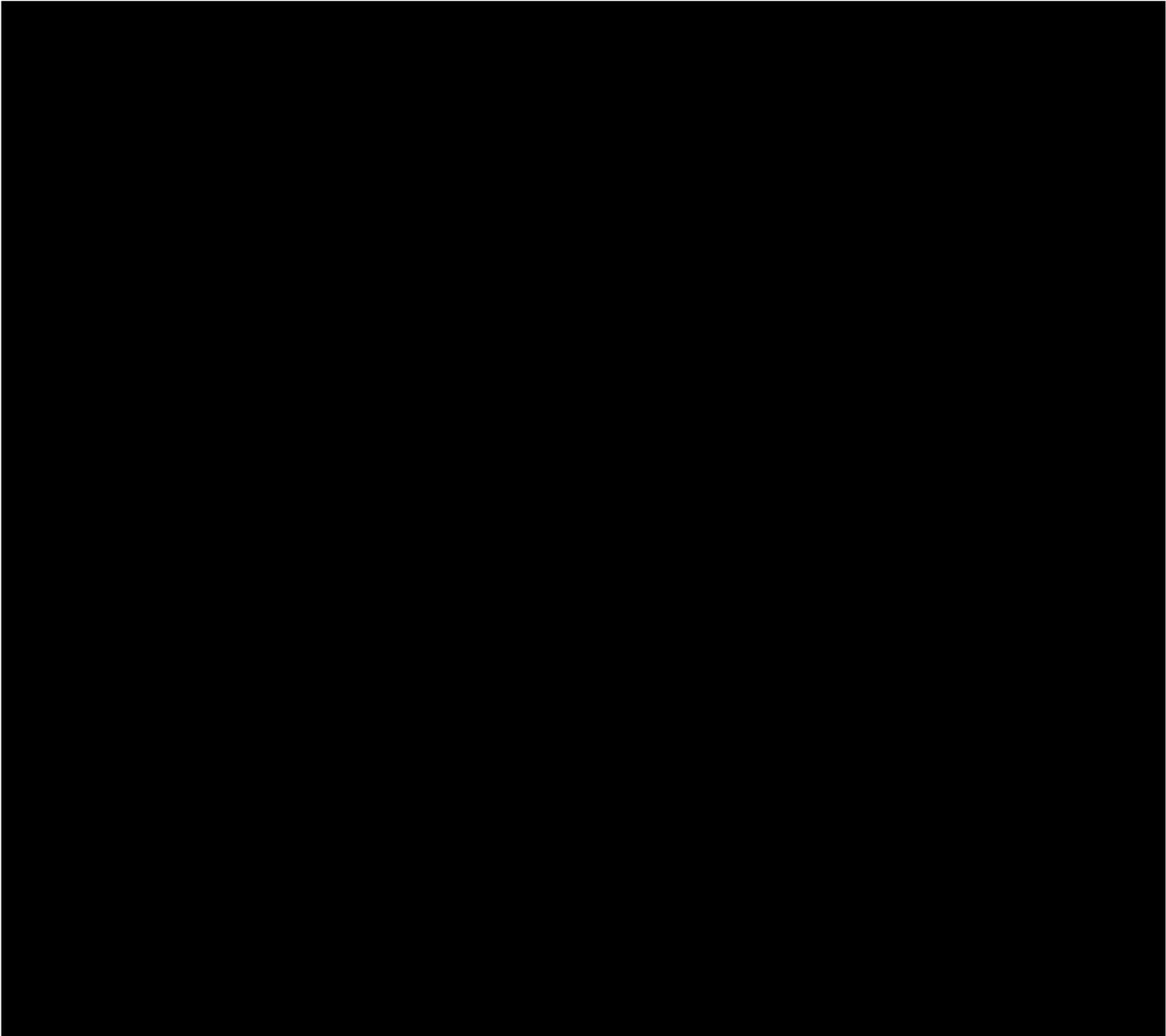




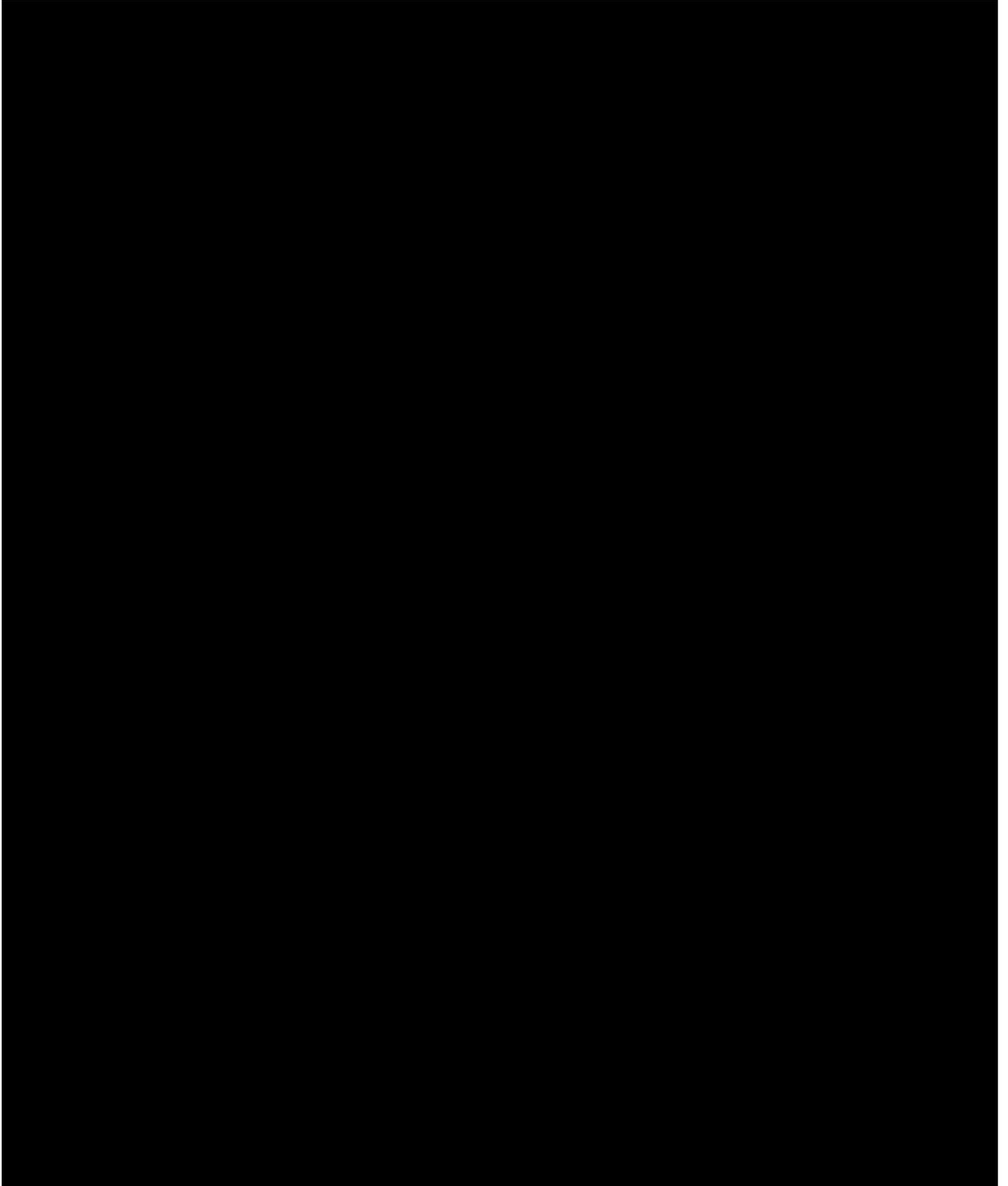




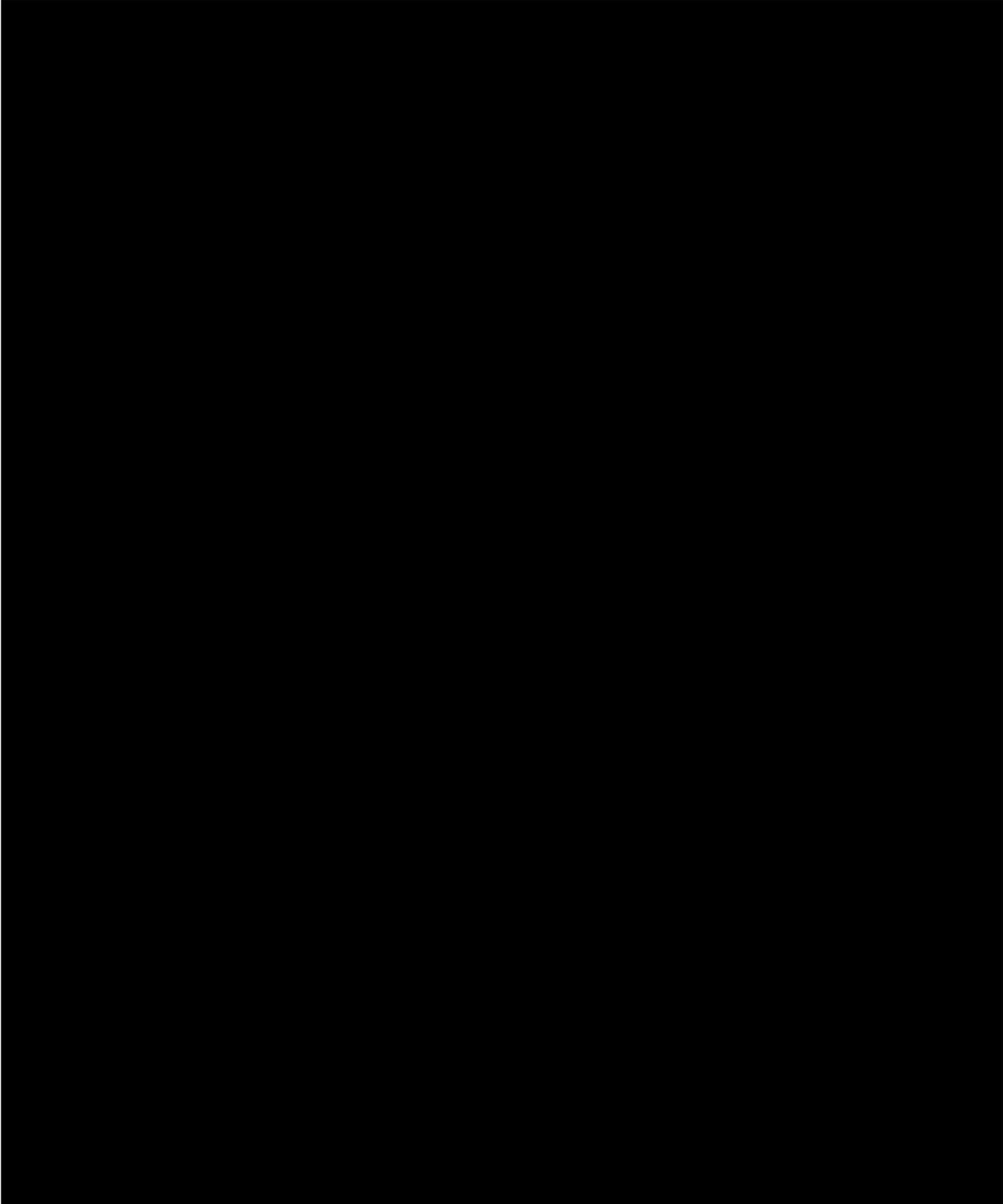




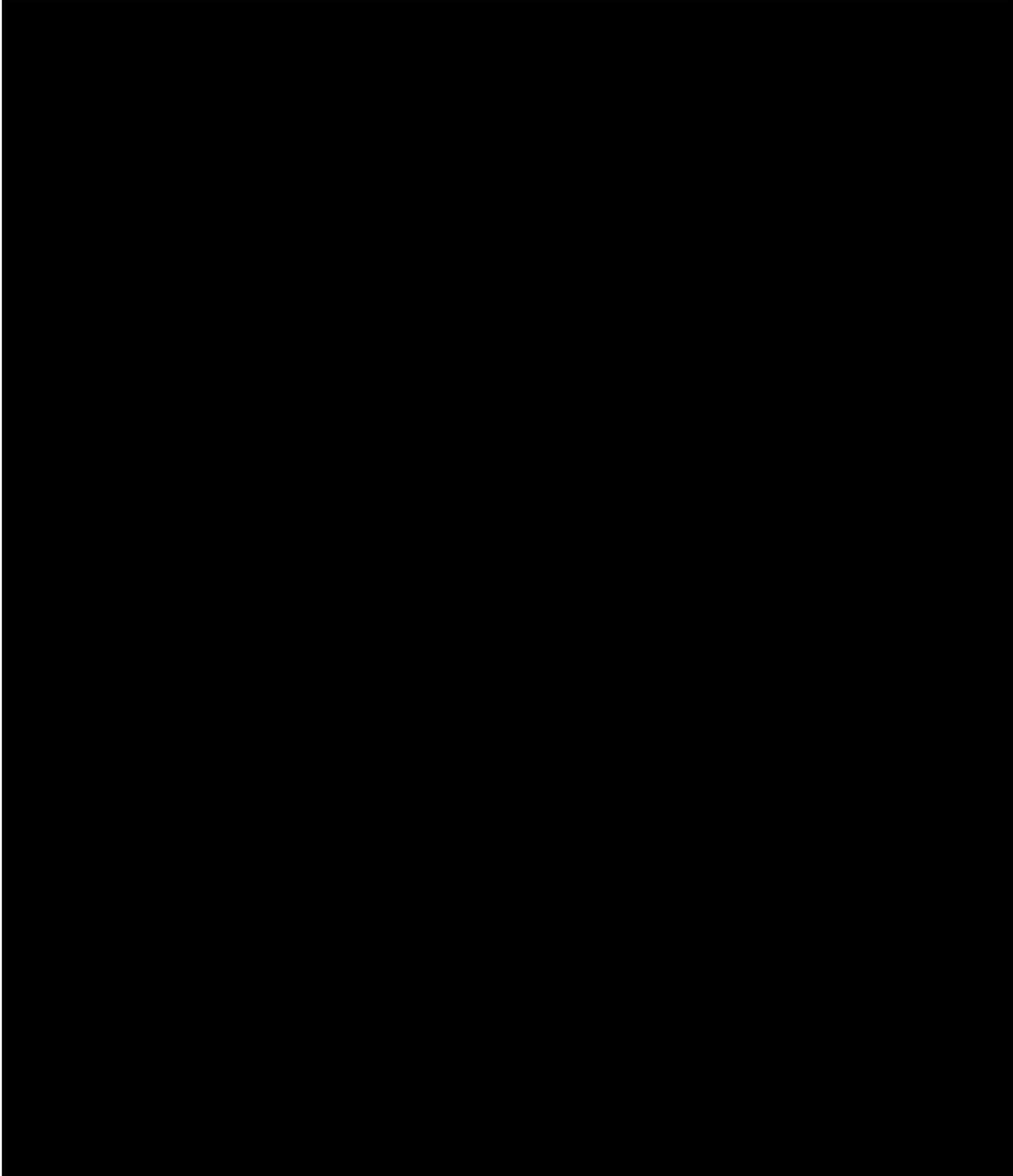
Transaction costs



An estimate of total portfolio transaction costs for the average fund.



Your total portfolio transaction costs

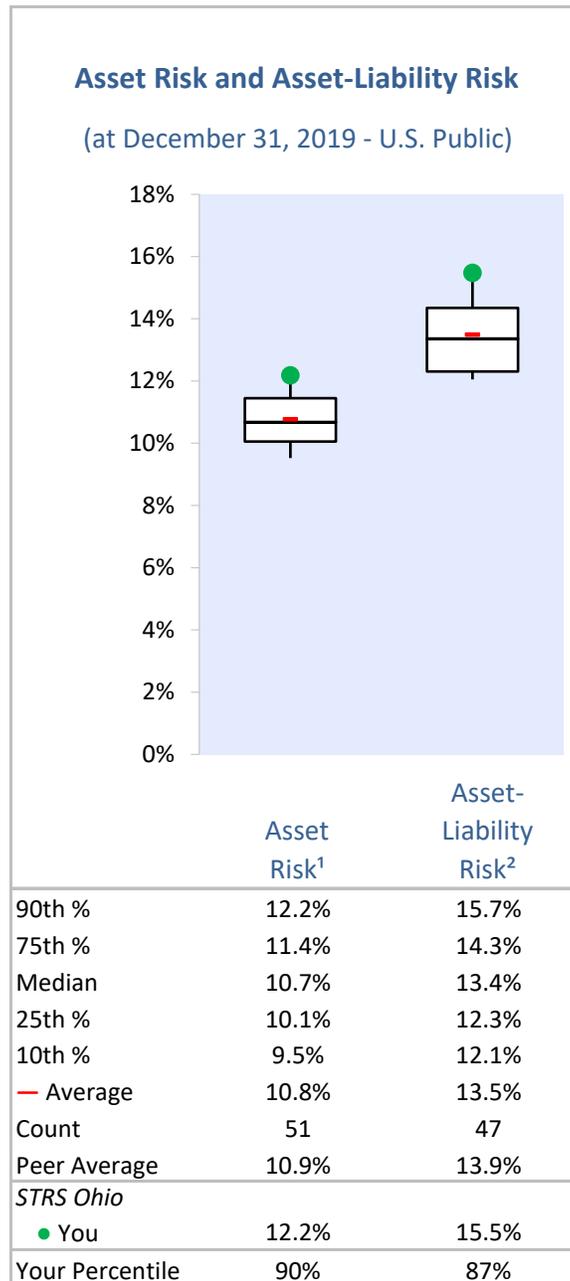


6

Risk

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Comparison of your risk levels to the U.S. Public universe



1. Asset risk is the expected volatility of your policy return. It is based on the historical variance of, and covariance between, the asset classes in your asset mix policy. It is expressed as an annual standard deviation.

2. Asset-liability risk is the expected volatility of surplus returns. Surplus returns are the changes in a plan's marked-to-market funded status caused by market factors. Asset liability risk is a function of the volatility of policy returns (asset risk), the volatility of surplus returns (surplus risk) and the correlation between policy returns and surplus returns.

Calculation of asset risk

Before considering the benefit of diversification, the weighted average risk of the asset classes in your asset mix policy was 14.4%.

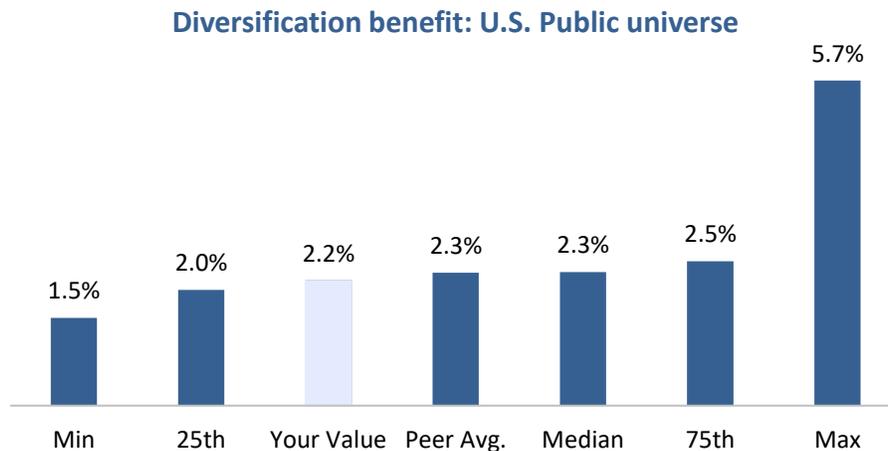
Calculation of your weighted asset class risk

Asset Class	Policy weight (A)	Risk ¹ (B)	Weighted risk (A X B)
Stock: U.S. Large Cap	28.0%	14%	4.0%
Stock: EAFE	18.4%	17%	3.1%
Stock: Emerging	4.6%	23%	1.0%
Bonds: U.S.	21.0%	5%	1.1%
Bonds: Cash	1.0%	1%	0.0%
Real Estate ex-REITs	10.0%	10%	1.0%
LBO	17.0%	24%	4.2%
Weighted Total			14.4%

1. Risk is the standard deviation of returns for the asset class based on standard benchmarks used by CEM.

Reduction in asset risk due to diversification

Your asset risk is less than your weighted asset risk because of the benefit of diversification. Diversification reduces risk because when one asset class has a negative return, it might be offset by another asset class with a positive return. The lower the correlation between your policy asset classes, the greater the diversification benefit. The correlation between your policy asset classes is shown on page 15 of this section.



The benefit of diversification equals weighted asset risk minus asset risk.

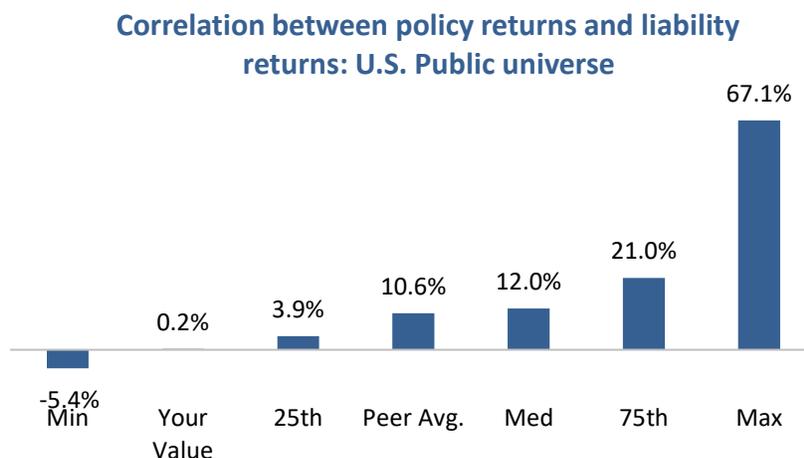
Components of asset risk

	You	Peer median*	Peer average	U.S. Public median*	U.S. Public average
Weighted asset risk	14.4%	13.0%	13.2%	13.0%	13.1%
Benefit of diversification	2.2%	2.4%	2.3%	2.3%	2.4%
Asset risk	12.2%	10.6%	10.9%	10.7%	10.8%

* Comparisons of components of asset risk should be interpreted with caution because it is not always possible to separate the diversification benefit from the weighted asset risk. For example, global stock as an asset class includes the diversification benefit of its geographic components within its asset risk.

Asset-liability risk

Your plan would not have any asset-liability risk if your assets perfectly matched your liabilities. If they matched, then the correlation between asset returns and liability returns would be 100%. If liabilities increased, assets would increase by a like amount (and vice versa). Thus higher correlation between your asset returns and liability returns reduces your asset-liability risk.



In addition to the correlation between asset returns and liability returns, asset-liability risk is also a function of the volatility of asset returns (asset risk) and the volatility of liability returns¹ (liability risk = $\sqrt{R_A^2 + R_L^2 - 2\rho_{AL}R_AR_L}$).

Components of asset-liability risk

	You	Peer median	Peer average	U.S. Public median	U.S. Public average
Asset risk (R_A)	12.2%	10.6%	10.9%	10.7%	10.8%
Liability risk (R_L)	9.6%	10.0%	9.8%	9.6%	9.6%
Correlation between policy returns and liability returns (ρ_{AL})	0.2%	7.2%	10.6%	12.0%	13.9%
Asset-liability risk	15.5%	14.1%	13.9%	13.4%	13.5%

1. Liability returns equal the changes in your marked-to-market liabilities caused by market factors. These are assumed to equal the return on your liability proxy portfolio (see next page).

Liability proxy portfolio

Your liability proxy portfolio is the portfolio of nominal and inflation-indexed bonds that best matches the sensitivity of your liabilities to changes in real and nominal interest rates.

Comparisons of liability proxy portfolio

	Your fund		Peer average		U.S. Public	
	Duration	% of Assets	Duration	% of Assets	Duration	% of Assets
Inflation Indexed Bonds	10.0	25%	11.4	51%	12.0	58%
Nominal Bonds	11.5	75%	13.5	49%	12.8	42%
Total		100%		100%		100%

Your liability proxy portfolio is a tool that:

- a) Helps you understand how the unsmoothed market value of your liabilities responds to changes in real and nominal interest rates.
- b) Helps you make better asset mix policy decisions by providing an understanding of which assets will decrease your asset-liability risk (i.e., assets that behave similarly to the neutral asset mix) and which assets will increase your risk.
- c) Helps you understand how your liabilities are different from your peers. Differences in liabilities mean that the same asset will have different risk / reward characteristics for different funds. For example, the risk of a nominal bond for a fund with 100% inflation sensitivity is much higher than it is for a fund with less than 100% inflation sensitivity.

Asset-liability risk could theoretically be eliminated if your actual asset mix matched the liability proxy portfolio. However, we recognize that this is neither an option nor a goal for most funds because:

- The supply of inflation-indexed assets is limited. These assets are required to match the obligations of pension liabilities.
- This low-risk strategy also has a lower expected return, implying either higher future funding costs or lower future benefits.

The methodology and formula used to determine your liability proxy portfolio are provided on pages 11-13 of this section.

Liability risk

Differences in liability risk are due to differences in inflation sensitivity and member demographics.

A plan's inflation sensitivity depends on:

a) The type of plan

Final and highest average plans have more inflation sensitivity than career average plans. Conversely, career average plans have more inflation sensitivity than flat benefit plans. Your plan type is final average.

Plan type	# of plans	% of Total
Flat Benefit	1	2%
Career Average	1	2%
Final/Highest/Best Avg	47	84%
Other	7	13%
Total	56	100%

b) Contractual inflation protection for retired members

Your retired members get 0% contractual inflation protection. Your retiree inflation protection is subject to a cap of 0%.

Retiree inflation protection	# of plans		
	Corporate	Public	Other
0%	0	23	0
>0% and <50%	0	0	0
50%	0	1	0
>50% and <100%	0	6	0
100%	0	19	0
Total	0	49	0

c) Member demographics

Member demographics impacts both inflation sensitivity and the duration of plan liabilities. The survey asks for your plan's percentage of liabilities that relate to retired members from your actuarial reports. If you did not provide this number, then it is estimated (see page 12 of this section). Your percentage of liabilities that relate to retired members was 71%.

	Your fund	Peer Average	U.S. Public Average
Active Members	55%	58%	56%
Retired Members	45%	42%	44%
Total	100%	100%	100%

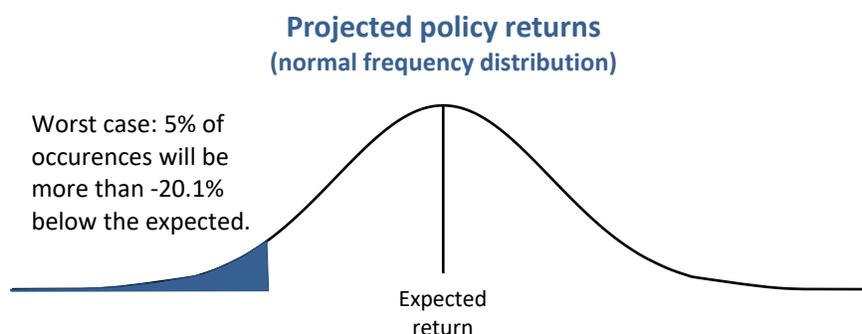
Projected worst case scenarios

We can convert your asset risk and asset-liability risk into worst case outcomes for policy returns and funded status if we make the following simplifying assumptions:

- Returns are normally distributed.
- Historic return volatility and correlations will continue in the future.
- No change in your policy asset mix or liabilities.

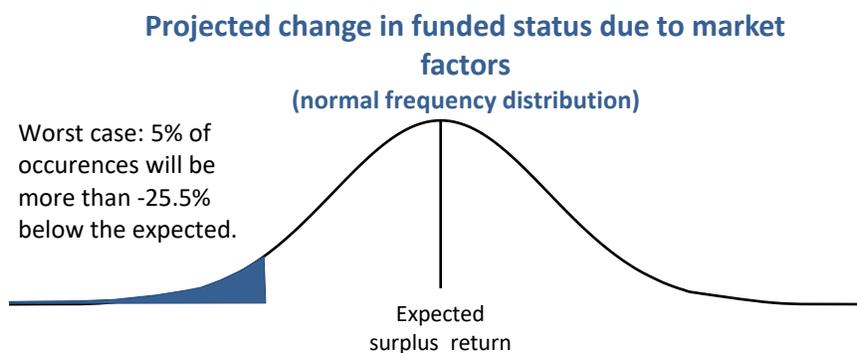
a) Worst case policy returns

Every year there is a 5% probability that your policy return will be worse than your expected policy return by more than -20.1% (-20.1% equals -1.65 X your asset risk of 12.2%). -20.1% is the starting point of worst case outcomes. They could be much worse.



b) Worst case impact on funded status

Every year, there is a 5% probability that changes in your mark-to-market funded status caused by market factors ("Surplus Returns") will be worse than expected by more than -25.5%. (-25.5% equals -1.65 X your asset-liability risk of 15.5%). -25.5% is the starting point of worst case outcomes. They could be much worse.



Historic worst case scenarios during the past 5 years

a) Historic worst case policy returns

During the past 5 years, your lowest policy return was -2.0% in 2018.

Historic policy returns - U.S. Public universe

	2019	2018	2017	2016	2015
90th %	20.8%	-1.0%	16.6%	9.4%	1.7%
75th %	18.9%	-2.4%	16.0%	8.8%	1.1%
Median	17.8%	-3.4%	15.3%	8.0%	-0.1%
25th %	16.3%	-4.7%	14.2%	7.5%	-0.8%
10th %	14.5%	-5.4%	13.3%	7.0%	-1.7%
Average	17.6%	-3.4%	15.1%	8.2%	0.0%
Count	51	59	60	59	64
Peer Avg	17.1%	-2.2%	15.0%	7.9%	0.8%
Your Value	18.3%	-2.0%	15.4%	8.0%	1.7%

b) Historic worst case changes in funded status

During the past 5 years, your worst change in marked-to-market funded status caused by market factors ("Surplus Returns") was -1.0% in 2018.

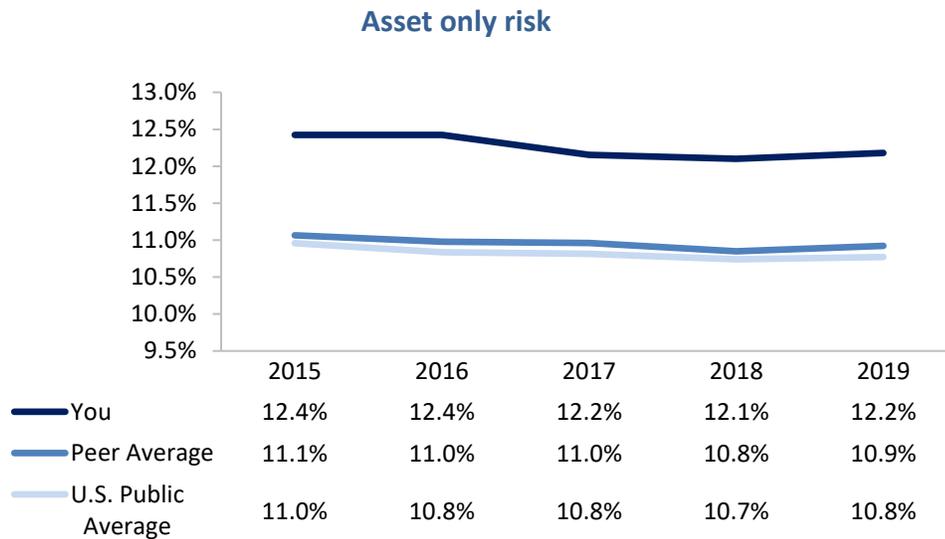
Historic changes in funded status caused by market factors - U.S. Public universe

	2019	2018	2017	2016	2015
90th %	7.9%	2.7%	8.7%	4.9%	4.6%
75th %	7.1%	0.9%	7.7%	4.4%	3.5%
Median	5.3%	-0.2%	6.7%	2.8%	2.1%
25th %	3.5%	-1.7%	5.1%	1.4%	0.8%
10th %	1.7%	-3.4%	3.1%	0.1%	-0.5%
Average	5.1%	-0.3%	6.4%	2.8%	2.1%
Count	47	54	54	55	59
Peer Avg	5.0%	0.4%	6.3%	3.2%	2.6%
Your Value	7.5%	-1.0%	6.7%	5.1%	1.8%

Risk Trends - 2015 to 2019

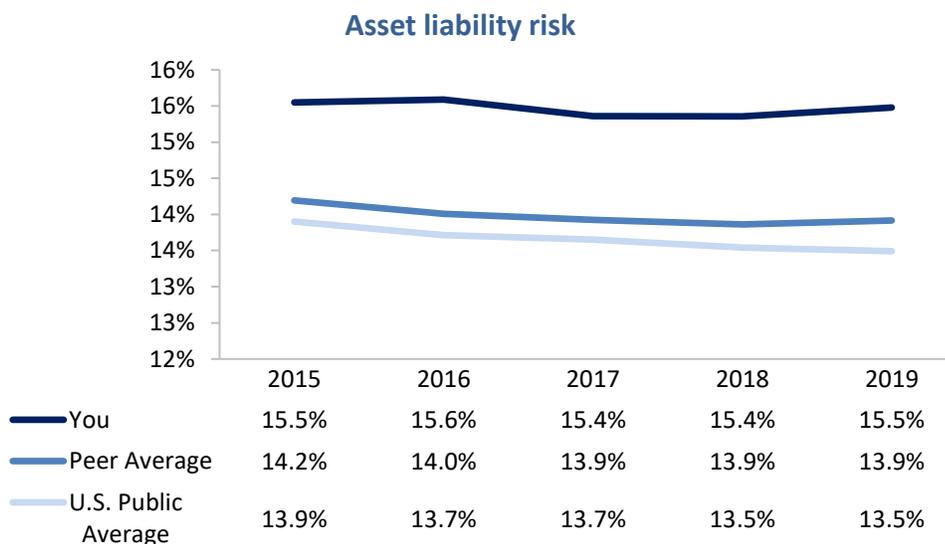
a) Asset risk trends

Asset risk will only change if policy asset mix changes. Between 2015 and 2019 the asset risk for your fund decreased from 12.4% to 12.2%.



b) Asset-liability risk trends

Asset-liability risk will change if policy asset mix changes, or if the nature of your liabilities changes. Between 2015 and 2019 the asset-liability risk for your fund remained the same at 15.5%.

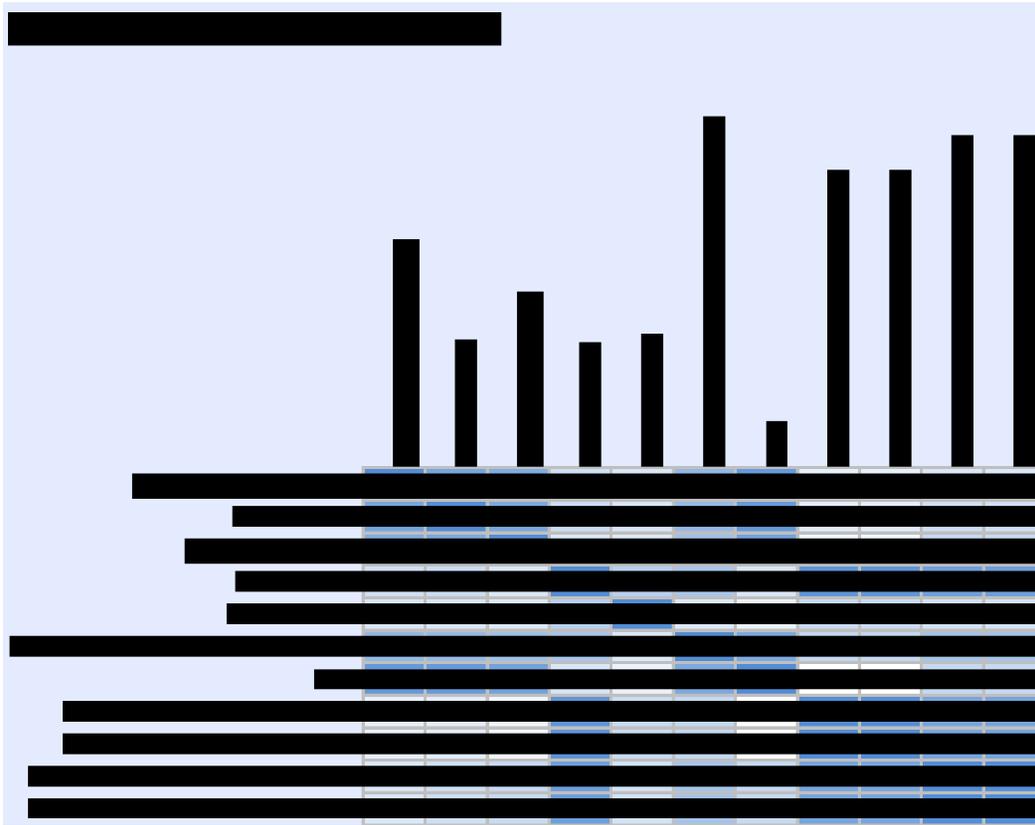


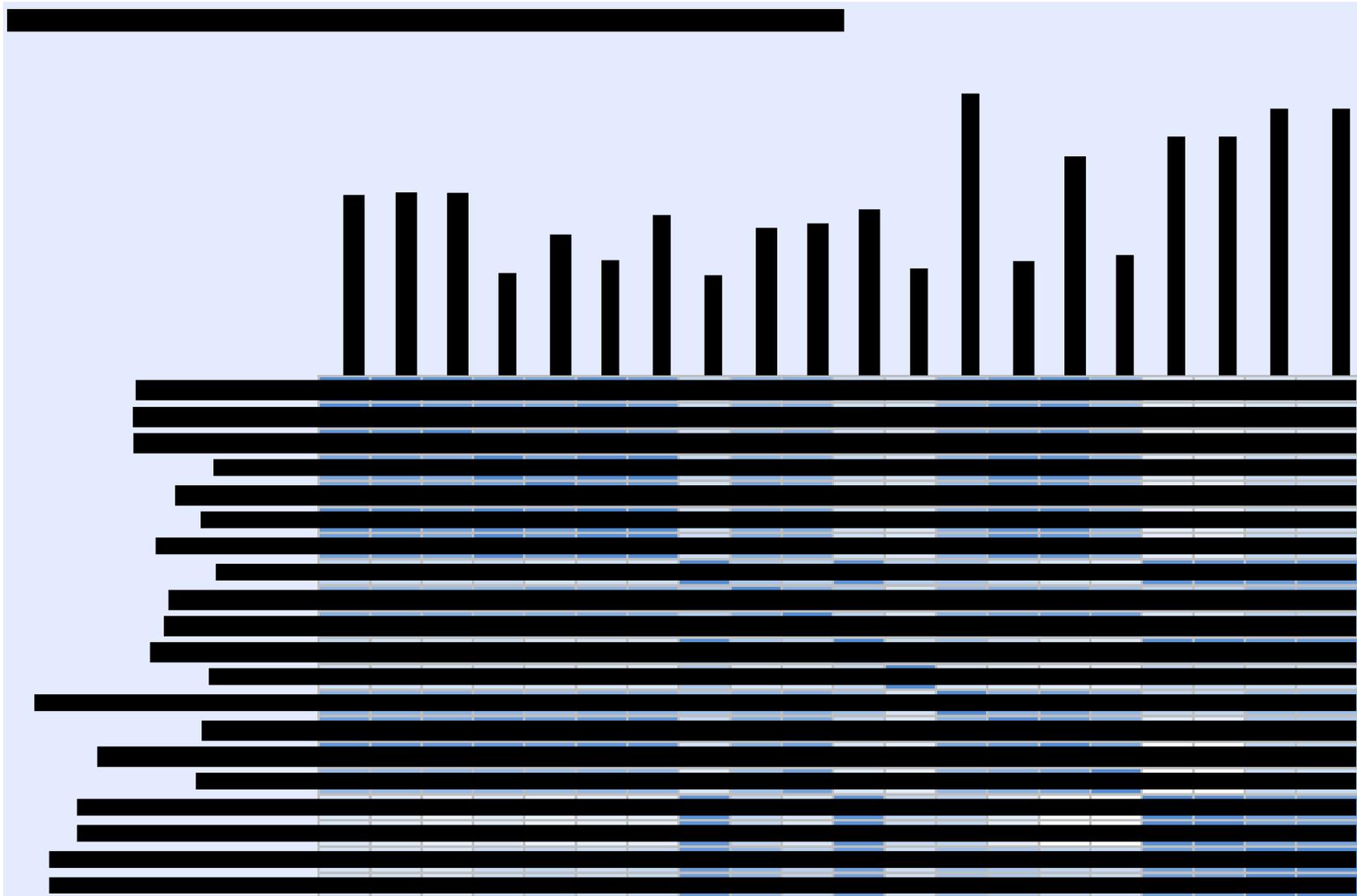
[REDACTED]

Long Nominal Bonds	Inflation Indexed Bonds	CPI
[REDACTED]	[REDACTED]	[REDACTED]

Appendix B - Methodology used to calculate asset and asset-liability risk

[Redacted]





7

Appendices

Appendix A - Data Summary

Appendix A2 - Enhanced survey data & mapping to regular survey

Appendix B - Data quality

Appendix C - Glossary of terms

Appendix A - Data Summary

STRS Ohio

Plan Info	2019	2018	2017	2016	2015
Survey Preparer	Jeffrey Lieser	Jeffrey Lieser	Jeffrey Lieser	Jeffrey Lieser	Jeffrey Lieser
Additional Contact	Lynn Hoover	Lynn Hoover	Lynn Hoover	Lynn Hoover	Lynn Hoover
Type of fund (corporate, public, other)	Public	Public	Public	Public	Public
Total fund size (\$mils) as at December 31	81,977.7	72,888.7	78,304.0	71,661.0	70,756.0
Asset-class level holdings provided on survey are: year end or average?	Year End	Year End	Year End	Year End	Year End
Total return for year ended	18.39%	-1.89%	15.76%	8.03%	2.33%
Is the return net or gross?	Gross except for private asset costs	Net of all investment costs			
Total fund policy or benchmark return	18.27%	-2.04%	15.35%	8.00%	1.71%

Ancillary Data	2019	2018	2017	2016	2015
What is your hedging policy for: Foreign Holdings					
What were your actuarial fees in 000s?	248	219	513	266	247
How many plan members/beneficiaries do you have:					
Active?	191,030	192,365	193,141	195,440	189,731
Active (no-accrual)?	139,421	138,075	139,533	135,738	135,215
Retired?	157,418	157,422	158,039	157,938	158,116
Other?	18,803	18,416	18,403	17,627	17,453
What type of plan(s) do you have?	Final Average				
To what extent are your retired members' benefits indexed to inflation?					
Contractual %	0%	0%	0%	0%	0%
If the indexation is subject to a cap, describe the cap	0%	0%	0%	2% per year,	2% per year,
What % of the plan's liabilities pertain to retired members?	71%	72%	73%	74%	75%
Actuarial valuation assumptions for funding purposes:					
Liability discount rate	7.5%	7.5%	7.5%	7.8%	7.8%
Salary progression rate	3.0%	3.0%	3.0%	3.5%	3.5%
What was your actuarial assumption for expected rate of return?	7.5%	7.5%	7.5%	7.8%	7.8%

Appendix A - Data Summary: Policy Weights and Benchmarks

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Asset Class	Year	Policy Weight	Benchmark	
			Description	Return
Stock - U.S. Large Cap	2019	28.0	Russell 1000 (Russell 3000 for total Dom Equity)	31.0
	2018	28.0	Russell 1000 (Russell 3000 for total Dom Equity)	-5.2
	2017	30.0	Russell 1000 (Russell 3000 for total Dom Equity)	21.1
	2016	31.0	Russell 1000 (Russell 3000 for total Dom Equity)	12.7
	2015	31.0	Russell 1000 (Russell 3000 for total Dom Equity)	0.5
Stock - U.S. Small Cap	2019		Russell 2000	25.5
	2018		Russell 2000	-11.0
	2017		Russell 2000	14.7
	2016		Russell 2000	21.3
	2015		Russell 2000	-4.4
Stock - EAFE	2019	18.4	MSCI World xUS 50% Hedged Net	23.5
	2018	19.2	MSCI World xUS 50% Hedged Net	-11.5
	2017	20.0	MSCI World xUS 50% Hedged Net	20.1
	2016	20.8	MSCI World xUS 50% Hedged Net	5.0
	2015	20.8	MSCI World xUS 50% Hedged Net	0.4
Stock - Emerging	2019	4.6	MSCI Emerging Market net	18.9
	2018	4.8	MSCI Emerging Market net	-14.6
	2017	5.0	MSCI Emerging Market Net	37.3
	2016	5.2	MSCI Emerging Market net	11.2
	2015	5.2	MSCI Emerging Market net	-14.9
Stock - Global	2019		MSCI ACWI net	26.6
	2018		MSCI ACWI net	-9.4
	2017		MSCI ACWI net	24.6
	2016		MSCI ACWI net	7.9
	2015		MSCI ACWI net	-2.4
Stock - ACWI x U.S.	2019		International Blended Benchmark	22.5
	2018		International Blended Benchmark	-12.1
	2017		International Blended Benchmark	23.4
	2016		International Blended Benchmark	6.4
	2015		International Blended Benchmark	-2.8
Fixed Income - U.S.	2019	21.0	Fixed Income Blended (Jul 1 2017)	8.5
	2018	21.0	Fixed Income Blended (Jul 1 2017)	0.1
	2017	20.0	Fixed Income Blended (Jul 1 2017)	3.9
	2016	18.0	Barclays Universal for total FI (Barclays Aggregate Index not appropriate for US FI segment)	3.9
	2015	18.0	Barclays Universal for total FI (Barclays Aggregate Index not appropriate for US FI segment)	0.4
Fixed Income - Emerging	2019		Barclays Emerging Market	13.1
	2018		Barclays Emerging Market	-2.5
	2017		Barclays Emerging Market	8.2
	2016		Barclays Emerging Market	9.9
	2015		Barclays Emerging Market	1.3
Fixed Income - High Yield	2019		Barclays US Corp High Yield	14.0
	2018		Barclays US Corp High Yield	-2.1
	2017		Barclays US Corp High Yield	7.5
	2016		Barclays US Corp High Yield	17.1
	2015		Barclays US Corp High Yield	-4.5
Cash	2019	1.0	US 90 day T bill	2.3
	2018	1.0	US 90 day T bill	1.9
	2017	1.0	US 90 day T bill	0.9
	2016	1.0	US 90 day T bill	0.3
	2015	1.0	US 90 day T bill	0.1
REITs	2019		Your REIT benchmark	26.0
	2018		Your REIT benchmark	-4.6
	2017	1.5	Your REIT benchmark	5.2
	2016	1.5	Your REIT benchmark	8.5
	2015	1.5	Your REIT benchmark	3.2
Real Estate ex-REITs	2019	10.0	NCREIF NPI	6.4
	2018	10.0	NCREIF NPI	6.7
	2017	8.5	NCREIF NPI	7.0
	2016	8.5	NCREIF NPI	8.0
	2015	8.5	NCREIF NPI	13.3
Infrastructure	2019		Custom (Alternative Investment Actual Return)	9.7
	2018		Custom (Alternative Investment Actual Return)	11.8
	2017		Custom (Alternative Investment Actual Return)	12.2
	2016		Custom (Alternative Investment Actual Return)	5.3
	2015		Custom (Alternative Investment Actual Return)	6.1
Natural Resources	2019		Custom (Alternative Investment Actual Return)	9.7
	2018		Custom (Alternative Investment Actual Return)	11.8

Appendix A - Data Summary: Policy Weights and Benchmarks

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Asset Class	Year	Policy Weight	Benchmark	
			Description	Return
	2017		Custom (Alternative Investment Actual Return)	12.2
	2016		Custom (Alternative Investment Actual Return)	5.3
	2015		Custom (Alternative Investment Actual Return)	6.1
Hedge Funds	2019		Custom (Alternative Investment Actual Return)	9.7
	2018		Custom (Alternative Investment Actual Return)	11.8
	2017		Custom (Alternative Investment Actual Return)	12.2
	2016		Custom (Alternative Investment Actual Return)	5.3
	2015		Custom (Alternative Investment Actual Return)	6.1
Global TAA	2019		Custom (Alternative Investment Actual Return)	9.7
	2018		Custom (Alternative Investment Actual Return)	11.8
	2017		Custom (Alternative Investment Actual Return)	12.2
	2016		Custom (Alternative Investment Actual Return)	5.3
	2015		Custom (Alternative Investment Actual Return)	6.1
Diversified Private Equity	2019		Custom (Alternative Investment Actual Return)	9.7
	2018		Custom (Alternative Investment Actual Return)	11.8
	2017		Custom (Alternative Investment Actual Return)	12.2
	2016		Custom (Alternative Investment Actual Return)	5.3
	2015		Custom (Alternative Investment Actual Return)	6.1
Venture Capital	2019		Custom (Alternative Investment Actual Return)	9.7
	2018		Custom (Alternative Investment Actual Return)	11.8
	2017		Custom (Alternative Investment Actual Return)	12.2
	2016		Custom (Alternative Investment Actual Return)	5.3
	2015		Custom (Alternative Investment Actual Return)	6.1
LBO	2019	17.0	Custom (Alternative Investment Actual Return)	9.7
	2018	16.0	Custom (Alternative Investment Actual Return)	11.8
	2017	14.0	Custom (Alternative Investment Actual Return)	12.2
	2016	14.0	Custom (Alternative Investment Actual Return)	5.3
	2015	14.0	Custom (Alternative Investment Actual Return)	6.1
Private Credit	2019		Custom (Alternative Investment Actual Return)	9.7
	2018		Custom (Alternative Investment Actual Return)	11.8
	2017		Custom (Alternative Investment Actual Return)	12.2
Other Private Equity	2019			
	2017		Custom (Alternative Investment Actual Return)	12.2
	2016		Custom (Alternative Investment Actual Return)	5.3
	2015		Custom (Alternative Investment Actual Return)	6.1

Appendix A Data Summary - Assets, Returns and Costs: Public Market

STRS Ohio

(Default costs are highlighted with blue shading. See page 9 for more details)

Asset Class/Style		Year	Asset (\$millions)	Return %	Cost (\$'000)				
					Internal & Other	Base Fees	Perf Fees	Total	Bps
Stock - U.S. Large Cap	Internal Passive	2019	8,596.1	31.77	76.8			76.8	0.1
		2018	9,004.0	-3.08	72.8			72.8	0.1
		2017	9,544.3	22.97	72.1			72.1	0.1
		2016	8,868.0	11.34	64.0			64.0	0.1
		2015	8,672.3	2.36	40.6			40.6	0.0
	Internal Active	2019	11,001.0	34.46	13,351.9			13,351.9	13.6
		2018	8,586.9	-6.09	12,687.9			12,687.9	13.2
		2017	10,622.7	21.38	12,590.5			12,590.5	12.0
		2016	10,342.4	10.22	11,243.9			11,243.9	10.9
		2015	10,308.3	-0.14	11,794.0			11,794.0	10.9
	External Active	2019	1,193.3	32.24	214.6	2,368.6		2,583.2	24.6
		2018	905.6	-7.20	210.7	2,309.6		2,520.3	23.7
		2017	1,220.9	23.29	226.9	2,466.3		2,693.2	23.8
		2016	1,046.3	9.78	186.0	2,233.7		2,419.7	23.6
		2015	1,003.0	2.45	179.9	2,168.3		2,348.3	23.7
Stock - U.S. Small Cap	Internal Active	2019	752.9	20.06	355.4			355.4	4.9
		2018	684.6	-10.05	323.5			323.5	4.2
		2017	842.2	13.70	346.3			346.3	4.2
		2016	824.9	22.03	257.6			257.6	3.2
		2015	778.8	-2.44	293.3			293.3	3.6
	External Active	2019	1,363.0	28.52	102.2	9,549.2		9,651.3	79.4
		2018	1,068.3	-8.82	104.9	9,437.5		9,542.4	81.9
		2017	1,262.6	24.33	74.6	9,642.9		9,717.5	77.3
		2016	1,252.0	14.77	54.0	8,861.7		8,915.7	75.8
2015	1,101.3	-1.24	203.3	8,895.4		9,098.7	81.2		
Stock - EAFE	Internal Active	2019	5,304.3	19.66	3,415.7			3,415.7	6.7
		2018	4,915.3	-11.91	2,968.2			2,968.2	5.6
		2017	5,663.8	20.07	3,597.2			3,597.2	6.4
		2016	5,589.9	4.49	3,292.2			3,292.2	5.9
		2015	5,658.2	1.84	2,892.7			2,892.7	5.2
	External Active	2019	5,866.2	24.58	275.4	19,221.8		19,497.2	35.5
		2018	5,120.4	-11.31	205.8	19,125.7		19,331.5	35.1
		2017	5,881.0	24.11	241.7	19,869.7		20,111.5	35.5
		2016	5,463.5	5.58	214.5	18,582.3		18,796.8	34.2
2015	5,529.7	5.63	194.7	19,934.8		20,129.5	35.7		
Stock - Emerging	Internal Active	2019	2,312.9	16.90	3,418.4			3,418.4	15.4
		2018	2,131.9	-11.13	3,183.9			3,183.9	14.1
		2017	2,382.3	32.16	2,696.7			2,696.7	12.1
		2016	2,061.8	14.55	2,571.8			2,571.8	13.1
		2015	1,856.3	-10.54	2,578.4			2,578.4	14.1
	External Active	2019	755.3	16.13	255.2	4,573.7		4,828.9	58.2
		2018	903.8	-15.07	252.2	5,777.8		6,029.9	59.0
		2017	1,139.1	31.36	263.3	6,401.6		6,664.9	61.4
		2016	1,030.7	12.63	256.1	5,834.4		6,090.6	62.4
		2015	920.4	-13.75	280.4	5,317.9		5,598.3	56.2
Stock - Global	Internal Active	2019	625.2	21.43	511.1			511.1	8.7
		2018	546.9	-9.63	488.3			488.3	8.3
		2017	634.2	24.07	495.3			495.3	8.5
		2016	536.0	8.83	452.5			452.5	6.9
		2015	778.8	-1.24	457.4			457.4	5.8

Appendix A Data Summary - Assets, Returns and Costs: Public Market

STRS Ohio

(Default costs are highlighted with blue shading. See page 9 for more details)

Asset Class/Style		Year	Asset (\$millions)	Return %	Cost (\$'000)				
					Internal & Other	Base Fees	Perf Fees	Total	Bps
Stock - ACWI x U.S.	Internal Active	2019	3,106.3	22.37	490.5			490.5	1.7
		2018	2,704.6	-10.91	468.3			468.3	1.6
		2017	3,211.2	24.22	475.0			475.0	1.5
		2016	2,988.9	9.11	433.9			433.9	1.5
		2015	2,730.5	-1.78	439.9			439.9	1.6
	External Active	2019	1,339.9	25.46	20.6	5,593.9		5,614.5	45.9
		2018	1,106.3	-14.01	20.0	5,474.0		5,494.0	43.5
		2017	1,418.8	23.41	20.4	6,121.7		6,142.1	46.1
		2016	1,243.3	4.09	18.6	5,445.3		5,463.8	44.6
		2015	1,206.1	1.97	17.5	5,022.1		5,039.7	45.9
Fixed Income - U.S.	Internal Active	2019	14,638.4	8.65	3,324.6			3,324.6	2.5
		2018	12,171.5	0.27	3,465.9			3,465.9	2.7
		2017	13,081.7	3.46	3,304.9			3,304.9	3.0
		2016	8,787.2	2.71	2,465.8			2,465.8	2.7
		2015	9,726.0	1.01	2,552.2			2,552.2	2.5
Fixed Income - Emerging	External Active	2019	1,063.4	11.66	101.2	3,325.0		3,426.2	37.8
		2018	750.1	-4.04	143.1	3,475.7		3,618.7	46.3
		2017	813.7	10.82	156.3	3,435.7		3,592.0	46.3
		2016	737.3	15.81	130.4	3,180.6		3,311.0	45.1
		2015	731.4	1.11	130.5	3,586.6		3,717.1	46.6
Fixed Income - High Yield	External Active	2019	733.7	15.37	99.7	2,860.0		2,959.7	40.5
		2018	728.2	-2.33	144.3	3,160.8		3,305.1	41.9
		2017	849.1	7.74	165.3	3,146.4		3,311.7	40.4
		2016	792.0	17.30	155.0	3,666.2		3,821.3	43.8
		2015	953.9	-4.03	178.5	4,427.6		4,606.1	42.2
Cash	Internal Active	2019	1,597.5	2.26	312.8			312.8	2.4
		2018	1,002.8	1.98	299.0			299.0	2.2
		2017	1,699.9	0.77	285.8			285.8	1.7
		2016	1,679.5	0.48	266.0			266.0	1.8
		2015	1,274.8	0.08	268.6			268.6	1.4
REITs	Internal Passive	2019	1,154.8	25.96	106.0			106.0	0.9
		2018	1,156.5	-4.60	106.4			106.4	0.9
		2017	1,117.2	5.21	94.3			94.3	0.8
		2016	1,262.4	8.78	89.1			89.1	0.7
		2015	1,166.2	3.21	226.4			226.4	2.0
Global TAA	Internal Active	2019	1,152.9	12.32	1,739.3			1,739.3	16.5
		2018	958.1	-7.17	1,666.5			1,666.5	64.0
	External Active	2019	461.4	12.32	40.6	3,836.9		3,877.5	93.8
		2018	365.3	-7.17	96.2	2,306.4		2,402.6	31.1
		2017	741.8	10.52	36.8	1,334.7		1,371.5	23.8
		2016	412.0	8.44	26.5	1,191.4	-	1,217.9	30.6
		2015	383.8	-2.20	12.0	678.1	-	690.1	36.0

Appendix A Data Summary - Assets, Returns and Costs: Hedge Funds and Private Market

STRS Ohio

(Default costs are highlighted with blue shading. See page 9 for more details)

Asset Class/Style		Year	Asset (\$millions)	Fee basis (\$millions)	Return %	Cost (\$'000)						
						Internal & Other	Base Fees	Perf Fees	Underlying Base Fees	Underlying Perf Fees	Total	Bps
Hedge Funds												
External Active	2019	1,395.4		3.91	186.1	20,749.4	8,870.7			29,806.3	196.6	
	2018	1,636.3		0.64	255.1	26,478.9	12,406.2			39,140.1	239.0	
	2017	1,638.9		5.59	290.8	26,980.9	22,775.2			50,046.9	274.8	
	2016	2,003.9		4.98	336.8	32,054.3	22,495.0			54,886.1	271.5	
	2015	2,039.1		1.18	319.6	35,310.0	9,973.0			45,602.6	223.0	
Real Estate ex-REITs												
Internal Active	2019	5,521.3		7.80	17,276.8					17,276.8	30.6	
	2018	5,764.4		7.94	17,795.5					17,795.5	32.1	
	2017	5,315.0		5.91	17,182.4					17,182.4	30.9	
	2016	5,794.6		9.08	16,632.4					16,632.4	29.3	
	2015	5,554.9		13.04	16,561.4					16,561.4	30.9	
	LP	2019	940.1	2,012.6	9.52	465.2	14,277.0	7,199.6			14,742.2	85.9
		2018	882.5	1,419.8	13.24	481.0	14,030.0	5,525.9			14,511.0	101.7
		2017	990.6	1,434.8	8.63	464.1	17,650.0	5,940.9			18,114.1	122.3
		2016	1,131.1	1,526.4	13.54	447.4	17,431.8	6,098.0			17,879.2	114.4
		2015	1,008.5	1,599.0	11.04	443.5	17,938.0	10,592.0			18,381.5	122.5
Infrastructure												
Fund of Funds	2019	41.1	41.1	0.00	3.3	334.8	446.9	170.4	481.7	508.5	187.2	
	2018	58.2	13.2	-3.15	8.6	370.4	506.2	347.6	506.2	726.7	131.6	
	2017	68.4	97.2	1.92	12.9	459.7	351.7	766.8	1,626.6	1,239.5	137.8	
	2016	107.5	82.7	5.28	12.5	495.9	426.0	1,320.8	1,267.2	1,829.2	220.1	
	2015	105.5	83.6	5.62	12.9	501.4	637.0	1,945.9	821.9	2,460.3	268.0	
Natural Resources												
Internal Active	2019											
	2018											
	2017											
	2016	375.8		-3.43	298.4					298.4	7.2	
	2015	455.9		2.95	169.0					169.0	3.8	
	Co-Investment	2019	106.3		5.93	33.1					33.1	2.5
		2018	154.8		11.49	24.3	-				24.3	1.6
		2017	149.4		-34.45	39.7					39.7	5.3
	LP	2019	327.0	380.4	5.93	65.6	5,425.4	1,787.3			5,491.0	123.3
		2018	360.4	510.0	11.49	56.9	5,691.0	2,090.3			5,747.9	110.1
2017		549.4	652.7	-34.45	69.4	6,832.0	2,885.0			6,901.4	111.1	
2016		604.6	589.4	-3.43	66.1	6,439.0	4,926.2			6,505.1	114.7	
2015	478.1	544.8	2.95	56.7	7,659.5	2,238.5			7,716.2	149.0		
Diversified Private Equity												
Internal Active	2019	345.4		13.97	421.3					421.3	12.7	
	2018	318.5		19.85	319.6					319.6	8.0	
Co-Investment	2019	422.1		13.97	178.6	0.1				178.8	4.8	
	2018	328.7		4.74	88.1	-				88.1	3.0	
LP	2019	1,899.4	3,489.7	13.97	526.2	36,148.1	32,289.8			36,674.3	102.7	
	2018	1,591.4	3,653.5	19.85	511.7	25,682.0	26,112.8			26,193.7	95.7	
	2017	100.6	240.3	19.35	39.7	3,104.0	1,807.9			3,143.7	126.4	
	2016	97.0	257.0	6.76	27.7	2,715.0	1,258.3			2,742.7	165.1	
	2015	60.3	75.3	9.89	11.8	1,429.9	892.7			1,441.6	191.5	

For alternative investments & real estate, the returns are net of all external investment management fees and costs, including carried interest and other fund expenses.

Appendix A Data Summary - Assets, Returns and Costs: Hedge Funds and Private Market

STRS Ohio

Asset Class/Style	Year	Asset (\$millions)	Fee basis (\$millions)	Return %	Cost (\$000)									
					Internal & Other	Base Fees	Perf Fees	Underlying Base Fees	Underlying Perf Fees	Total	Bps			
Venture Capital	LP	2019	1,456.1	2,061.0	12.86	389.9	17,853.4	27,541.0			18,243.3	91.9		
		2018	1,166.9	1,908.8	18.47	405.9	16,328.0	15,264.3			16,733.9	102.8		
		2017	1,052.4	1,486.4	13.26	251.7	16,965.0	11,703.3			17,216.7	131.1		
		2016	914.5	1,141.0	3.08	234.6	16,911.0	11,281.4			17,145.6	146.1		
		2015	919.9	1,205.5	11.88	278.2	15,584.7	19,258.5			15,862.9	106.9		
	Fund of Funds	2019	354.4	372.7	12.86	52.6	1,302.5	1,026.2	4,601.4	7,183.4	5,956.5	166.8		
		2018	329.8	341.4	18.47	61.3	1,492.4	887.6	4,721.3	4,319.6	6,275.0	191.4		
		Fund of Funds (cont'd)	2017	262.0	314.2	13.26	75.3	1,206.9	739.8	4,794.2	2,934.7	6,076.4	206.3	
			2016	231.3	275.0	3.08	72.6	1,677.4	655.2	4,391.9	2,686.3	6,141.9	225.4	
			2015	205.5	270.0	11.88	55.0	1,562.2	506.3	3,664.6	3,611.6	5,281.8	240.1	
LBO	LP	2019	3,495.6	6,163.4	13.97	726.6	67,820.8	63,763.1			68,547.4	115.8		
		2018	3,589.2	5,672.8	19.85	1,068.0	58,116.0	66,235.5			59,184.0	103.6		
		2017	2,778.2	5,382.0	19.35	791.4	44,818.0	55,268.1			45,609.4	101.2		
		2016	2,510.6	3,630.2	6.76	638.4	43,001.0	50,104.9			43,639.4	125.3		
		2015	2,550.5	3,337.4	9.89	573.9	42,751.8	47,243.1			43,325.7	129.8		
	Fund of Funds	2019	1,056.9	1,364.9	13.97	175.4	7,850.6	4,096.2	11,890.3	18,433.0	19,916.2	167.3		
		2018	991.2	1,015.8	19.85	183.0	6,314.4	3,703.1	10,166.8	18,608.2	16,664.2	141.8		
		2017	860.4	1,334.1	19.35	793.8	6,706.6	3,151.1	10,951.9	16,464.3	18,452.4	148.5		
		2016	715.2	1,151.7	6.76	653.0	6,701.6	2,754.0	8,310.5	13,632.1	15,665.1	159.9		
		2015	661.8	808.1	9.89	603.7	5,965.6	2,377.6	11,206.1	10,520.9	17,775.4	184.1		
		Other Private Equity	Internal Active	2019										
				2018										
				2017	229.5		19.35	168.4					168.4	8.3
2016	178.3				6.76	25.9					25.9	1.4		
2015	192.4				9.89	50.0					50.0	0.7		
Co-Investment	2019													
	2018													
	2017		605.3		5.97	193.3					193.3	2.9		
LP	2016	705.2		4.00	33.7					33.7	0.5			
	2015	648.6		2.35	8.7	-				8.7	0.3			
	2019													
	2018													
	2017	1,239.7	2,474.6	5.97	347.9	23,549.0	12,341.8			23,896.9	131.6			
2016	1,323.7	1,948.1	4.00	344.1	25,265.0	11,853.2			25,609.1	148.8				
2015	1,095.3	1,494.6	2.35	345.1	19,370.8	11,448.9			19,715.9	107.2				
Private Credit	Internal Active	2019	223.3		5.93	78.1					78.1	4.9		
		2018	94.8		-0.22	73.7					73.7	7.8		
	Co-Investment	2019	545.7		5.93	53.6	-				53.6	2.0		
		2018												
	LP	2019	904.0	1,020.2	5.93	127.4	15,570.3	5,049.8			15,697.7	136.1		
		2018	837.3	1,286.2	4.74	190.2	12,745.0	5,138.6			12,935.2	116.6		
		2017	417.3	791.1	5.97	113.7	8,251.0	4,712.1			8,364.7	105.7		

For alternative investments & real estate, the returns are net of all external investment management fees and costs, including carried interest and other fund expenses.

Appendix A - Data Summary: Oversight, Custodial and Other Costs

STRS Ohio

Oversight, Custodial and Other Costs			
		000s	bps
Oversight of the fund assets ¹	2019	4,579.9	0.6bp
	2018	4,964.8	0.7bp
	2017	4,812.2	0.6bp
	2016	4,578.3	0.6bp
	2015	4,539.4	0.6bp
Custodial total	2019	1,781.5	0.2bp
	2018	2,292.9	0.3bp
	2017	2,412.3	0.3bp
	2016	2,090.0	0.3bp
	2015	2,149.9	0.3bp
Audit	2019	152.7	0.0bp
	2018	168.5	0.0bp
	2017	168.3	0.0bp
	2016	165.9	0.0bp
	2015	158.3	0.0bp
Other (legal etc)	2019	436.1	0.1bp
	2018	510.6	0.1bp
	2017	477.4	0.1bp
	2016	418.1	0.1bp
	2015	374.8	0.1bp
Total	2019	6,950.2	0.9bp
	2018	7,936.8	1.0bp
	2017	7,870.1	1.0bp
	2016	7,252.3	1.0bp
	2015	7,222.4	1.0bp

Summary of All Asset Management Costs			
		000s	bps
Investment Management Costs	2019	313,677.4	40.5bp
	2018	294,876.6	39.0bp
	2017	294,703.6	39.3bp
	2016	280,659.8	39.4bp
	2015	267,581.8	37.1bp
Oversight, Custodial & Other Costs	2019	6,950.2	0.9bp
	2018	7,936.8	1.0bp
	2017	7,870.1	1.0bp
	2016	7,252.3	1.0bp
	2015	7,222.4	1.0bp
Total	2019	320,627.6	41.4bp
	2018	302,813.4	40.1bp
	2017	302,573.7	40.4bp
	2016	287,912.1	40.4bp
	2015	274,804.2	38.1bp

1. Oversight includes the salaries and benefits of executives and their staff responsible for overseeing the entire fund or multiple asset classes and the fees / salaries of the board or investment committee. All costs associated with the above including fees / salaries, travel, director's insurance and attributed overhead should be included.

[REDACTED]



Appendix A - Data Summary - Enhanced Survey Data and Mapping to Regular Survey - Mapped Data

Data after the mapping process from enhanced survey to regular is shown below. The below data is used through the rest of this report.

Investment Costs by Asset Class and Style (\$000s)									
	Internal		External Passive		Base Fees	External Active		Total	
	Passive	Active	Fees	Monitoring & Other		Perform. Fees	Monitoring & Other	000s	% of Total
Stock - U.S. Large Cap	77	13,352			2,369			215	16,012 5%
Stock - U.S. Small Cap		355			9,549			102	10,007 3%
Stock - EAFE		3,416			19,222			275	22,913 7%
Stock - Emerging		3,418			4,574			255	8,247 3%
Stock - ACWI x U.S.		490			5,594			21	6,105 2%
Stock - Global		511							511 0%
Fixed Income - U.S.		3,325							3,325 1%
Fixed Income - Emerging					3,325			101	3,426 1%
Fixed Income - High Yield					2,860			100	2,960 1%
Cash		313							313 0%
Infrastructure - FoFs					335	447		3	338 0%
REITs	106								106 0%
Real Estate ex-REITs		17,277							17,277 5%
Real Estate ex-REITs - LP					14,277	7,200		465	14,742 5%
Natural Resources - Co-Invest.								33	33 0%
Natural Resources - LP					5,425	1,787		66	5,491 2%
Hedge Funds					20,749	8,871		186	20,936 7%
Global TAA		1,739			3,837			41	5,617 2%
Private Credit		78			15,570	5,050		127	15,776 5%
Diversified Private Equity		421			36,148	32,290		526	37,096 12%
Diversified Private Equity - Co-Invest.					0			179	179 0%
LBO					67,821	63,763		727	68,547 21%
LBO - Co-Invest.									
LBO - FoFs					7,851	4,096		175	8,026 3%
LBO - FoFs					11,890	18,433			11,890 4%
Venture Capital					17,853	27,541		390	18,243 6%
Venture Capital - Co-Invest.									
Venture Capital - FoFs					1,302	1,026		53	1,355 0%
Venture Capital - FoFs					4,601	7,183			4,601 1%
Overlay Programs	341			170					511 0%
Total investment management costs - Internal & Monitoring									49,430 15%
Total investment management fees (excluding performance in private assets)									255,153 80%
Total investment management costs (including performance in hedge funds)							40.5bp		313,677 98%

Oversight, Custodial & Other Asset Related Costs (\$000s)			
Oversight of the Fund			4,580 1%
Trustee & Custodial			1,782 1%
Consulting / performance measurement			
Audit			153 0%
Other			436 0%
Total oversight, custodial & other costs			0.9bp 6,950 2%

Total cost for STRS Ohio	41.4bp	320,628	100%
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* Default cost used. Refer to Appendix A.

Costs in blue come from the following page.

Costs in purple are from a two-step process shown over the next two pages.

Appendix A - Data Summary - Enhanced Survey Mapping to Regular Survey

Activity	Cost per Enhanced Survey	# of FTE	Step 1: Attribution of Oper. & Support	Cost with Attribution
Front Office				
Currency hedge (from internal developed)	360	1.0	151	511
external alternative investments	2,274	1.0	151	2,425
internal active large & mid cap	9,640	26.0	3,927	13,566
internal active small cap	155	2.0	302	458
internal alternative investments	286	2.3	347	633
internal developed	2,521	7.8	1,170	3,691
internal emerging	2,881	5.3	793	3,674
internal fixed income	2,468	7.0	1,057	3,525
internal Global ex US (ACWI ex US)	360	1.0	151	511
internal global quant	360	1.0	151	511
Internal liquidity reserves	162	1.0	151	313
internal passive domestic equity	47	0.2	30	77
internal real estate (directly held)	11,236	40.0	6,041	17,277
internal real estate indirect	314	1.0	151	465
internal reit	76	0.2	30	106
internal TAA	1,738	0.0	2	1,739
Total front office	34,877	96.7	14,606	49,483
Governance, Operations and Support				
Board, CEO & assistants re: investments (A)	1,081	2.0	302	1,383
CIO, Investment strategy, asset allocation (B)	2,291	6.0	906	3,197
Oversight of the fund per regular CEM survey (A + B)				4,580
Custodial fees	1,782		n/a	1,782
Internal audit	153	1.0	n/a	153
Legal services	436	2.0	n/a	436
Risk management	280	0.4	-280	0
Performance reporting and data management	2,791	3.0	-2,791	0
Investment operations, exc. private markets	627	4.0	-627	0
Investment operations, private markets	157	1.0	-157	0
Compliance	185	1.0	-185	0
Information technology	7,965	42.0	-7,965	0
Public relations & internal communication	258	2.0	-258	0
Finance, external reporting & tax	777	3.0	-777	0
Human resources	569	3.0	-569	0
Building, utilities & office services	2,182	16.0	-2,182	0
Other investment and support	25	8.0	-25	0
Total cost excluding external manager fees	56,433	191.1	0	56,433

How CEM mapped the above costs to the regular survey

CEM attributed both front office and back office costs to the CEM asset classes by style using the following methodology:

Step 1 - CEM attributed operations and support costs to front office & oversight pro rata based on FTE.

Step 2 - CEM attributes the fully loaded cost (shown in green) to all of the CEM asset classes that the team manages (see next page). The attribution preserves the relative cost ratios versus the CEM universe for each of the asset classes that the team manages.

Appendix A - Data Summary - Enhanced Survey Mapping of Internal Teams

Front Office	Cost with Attribution from Step 1	Responsibilities by CEM asset class	Step 2 Attribution to Asset Classes
Currency hedge (from internal develop	511	Passive Derivatives/Overlays - Currency	341
external alternative investments	2,425	Monitoring Passive Derivatives/Overlays - Currency	170
		Infrastructure	3
		Monitoring LP Natural Resources	66
		Monitoring Hedge Funds	186
		Monitoring Global TAA	41
		Monitoring LP Diversified Private Equity	526
		Venture Capital	53
		Monitoring LP Venture Capital	390
		LBO	175
		Monitoring LP LBO	727
		Private Credit	54
		Private Credit	78
		Monitoring LP Private Credit	127
internal active large & mid cap	13,566	Stock - U.S. Large Cap	13,352
		Monitoring Stock - U.S. Large Cap	215
internal active small cap	458	Stock - U.S. Small Cap	355
		Monitoring Stock - U.S. Small Cap	102
internal alternative investments	633	Natural Resources	33
		Diversified Private Equity	179
		Diversified Private Equity	421
internal developed	3,691	Stock - EAFE	3,416
		Monitoring Stock - EAFE	275
internal emerging	3,674	Stock - Emerging	3,418
		Monitoring Stock - Emerging	255
internal fixed income	3,525	Fixed Income - U.S.	3,325
		Monitoring Fixed Income - Emerging	101
		Monitoring Fixed Income - High Yield	100
internal Global ex US (ACWI ex US)	511	Stock - ACWI x U.S.	490
		Monitoring Stock - ACWI x U.S.	21
internal global quant	511	Stock - Global	511
Internal liquidity reserves	313	Cash	313
internal passive domestic equity	77	Passive Stock - U.S. Large Cap	77
internal real estate (directly held)	17,277	Real Estate ex-REITs	17,277
internal real estate indirect	465	Monitoring LP Real Estate ex-REITs	465
internal reit	106	Passive REITs	106
internal TAA	1,739	Global TAA	1,739
Total Front Office	49,483		49,483

Front Office team costs, including allocated operations and support costs (see prior page), are attributed to the asset classes managed or overseen by the team. These attributions, shown in purple, are then inserted back into the regular survey.

Appendix A - Data Summary - Enhanced Survey Definitions

Costs - Attribute 100% of costs excluding manager fees and transaction costs including:

- (i) **Salaries and benefits** of FTE
- (ii) **General & administrative**: travel, supplies, staff education, publications and reference materials, etc.
- (iii) **Consulting** and other third party fees

FTE - Includes full time permanent salaried employees, include the FTE of long and short term contract individuals dedicated to your organization that are working onsite or working full-time for your fund on a project or in a role supervised by your staff. Do not include FTE at external consultants or service providers if they are not being supervised by your staff, even if they are dedicated to serving your organization.

Activity Definitions

1. **Front Office** consists of investment-decision making staff, including traders, analysts, portfolio managers and staff selecting and monitoring external managers, their immediate assistants and their management below the CIO level. Include third party fees for advice at the asset-class or security level such as manager search consultants, private equity consultants, and investment specific legal and due diligence fees that are not treated as transaction costs.

Does NOT include:

- (i) External manager fees. These are collected separately on the holdings tabs.
- (ii) Costs that relate to activities defined as Governance, Operations and Support in the table such as: board consultants, CIO, asset allocation and risk policy consultants, or other services (such as building, utilities and office services, information technology and human resources).

a. Board, CEO & assistants re: investments: Include only the proportion of the costs (fees paid to Board directors, travel, director insurance, CEO and CEO's direct assistants) equal to their proportion of time spent on investments and investment governance support. Exclude time spent on non-investment activities such as benefit administration, sales, marketing, new product development.

b. CIO, Investment strategy, asset allocation: Include 100% of CIO FTE and costs including his/her direct assistants, total fund asset allocation strategy, tactical deviations from the mix, economic political or other research, etc.

c. Strategic consulting: Include all investment consulting that pertain to the total fund (i.e., asset mix consulting). Consulting costs that can be attributed to a single asset category (i.e., private equity consultant) should be included with the appropriate front office team.

d. Risk management: Developing and implementing risk controls for operational and investment risk including surplus risk, factor exposures, credit, counterparty, etc. Excludes the cost of IT/IS risk systems. These belong in IT/IS.

e. Internal Audit: Independent review of business processes. Excludes external auditor fees. These belong in Finance, external reporting & tax.

f. Responsible investing, corporate governance: Policy setting and coordination across asset classes for sustainable, socially and/or environmentally responsible investing, and for corporate governance.

g. Client account management: Client service & reporting related to investing client assets, including client Board meetings, strategic client advice (ALM, risk, client portfolio construction).

h. Custodial fees: should be reported gross before any reductions relating to securities lending or other revenues credited against fees.

i. Data, valuation & performance analytics: Valuation and performance measurement of securities, funds, portfolios, risk, compliance, client reporting and other analysis and reporting. Include costs of data, dealing with data vendors and cleaning data.

Appendix A - Data Summary - Enhanced Survey Definitions (cont'd)

i. Investment operations: Listed security operations including trade settlement, custodial bank monitoring and reconciliation, cash management and corporate actions, private asset class, derivatives and swap administration, COO. If the COO or CFO is responsible for multiple activities (i.e., Valuations and performance analytics, investment operation and finance) then split their FTE between the activities based on time spent.

j. Compliance: Monitoring, training on and dealing with regulatory infractions. Includes securities and pension regulation. Excludes compliance related to benefit administration.

k. IT/IS systems: IT management and strategy, architecture, data center, database and application management and maintenance, development, user services, network, telecommunications, etc. Also include the costs of purchasing and maintaining the following systems/software applications: portfolio management, risk management, trade processing/order execution management, compliance monitoring, performance analytics, fund accounting system. Exclude the pro rata portion that relates to non-investment activities such as benefit administration, sales, marketing, new product development.

l. Public relations and internal communication: External communication with entities such as regulators and media. Internal communication to staff. Excludes member and employer communication, marketing and sales.

m. Finance, external reporting & tax: Financial statements, external auditor fees, general accounting, budgeting, tax reporting, procurement and accounts payable. CFO. If the CFO or COO is responsible for multiple activities (i.e., finance and IT) then split their FTE between the activities based on time spent.

n. Legal services: General counsel, corporate secretary, legal counsel of any kind, even those specializing in real estate or private equity, paralegals, legal assistants and all FTE involved in legal analysis and advice. Investment related legal fees and costs, such as the legal fees to close private equity transactions, should be included under 'Front Office' if not treated as a transaction cost. Exclude amounts that pertain to non-investment activities such as benefit administration.

o. Human resources: Human resources staff and consulting, including recruitment, training, career development, induction, disciplinary action, developing HR policies and procedures, etc.
Exclude: Amounts that relate to non investment activities such as benefit administration and both severance and recruitment fees and activity specific training (these should be included in the Front Office Cost Centers table).

p. Building, utilities and office services: Building occupancy costs including rent, lease, amortization of leaseholds and depreciation of buildings, office services such as reception, mailroom, cleaning and maintenance, building insurance, utilities. Include satellite offices. Exclude the pro rata portion that relates to non-investment activities such as benefit administration, sales, marketing, new product development.

Appendix B - Data quality

The value of the information contained in these reports is only as good as the quality of the data received. CEM's procedures for checking and improving the data include the following.

Improved survey clarity

Twenty years of feedback from survey participants has led to improved definitions and survey clarity. In addition to immediate feedback from participants, CEM has hosted user workshops to solicit additional feedback and to resolve issues, such as trade-offs between more information and effort on the part of participants.

Computer and desktop verification

Survey responses are compared to norms for the survey universe and to each sponsor's prior year data when available. This typically results in questions generated by our online survey engine as well as additional follow-up to clarify responses or with additional questions.

In addition to these procedures, data quality continues to improve for the following reasons:

Learning curve

This is CEM's 29th year of gathering this data and experience is teaching the firm and the participants how to do a better job.

Growing universe

As our universe of respondents continues to increase in size, so does our confidence in the results as unbiased errors tend to average themselves out.

Any suggestions on how to further improve data quality are welcome.

Currency Conversions

For reports where either the peer group or report universe includes funds from multiple countries, we have converted the returns back to the base currency of the fund we prepared the report for. For example, for a Euro zone fund with peers from the U.S. we converted U.S. returns to Euro based on the currency return for the year using December 31 spot rates.

Appendix C - Glossary of terms

Average cost

- Calculated by dividing actual annual costs by the average of beginning and end-of-year holdings. If beginning-of-year holdings are not available, they are estimated using end-of-year holdings before the effect of this year's return on investment.

Benchmark return

- Rate of return on a portfolio of investable assets (such as the S&P500) designated as the benchmark portfolio against which the fund measures its own performance for that asset class.

F statistics

- Measure of the statistical significance of the regression coefficients taken as a group. Generally, regression equations with 5 coefficients and sample sizes greater than 20 are statistically significant if its F statistic is greater than 3.

Global TAA

- Fully funded segregated asset pool dedicated to active asset allocation.

Impact coefficient

- Estimate of the impact on the dependent variable in a regression of a change in the value of a given explanatory variable

Level of significance

- Degree to which sample data explains the universe from which they are extracted.

N-year peers

- Subset of peer group that have participated in our study for at least the consecutive n years.

Oversight of the fund

- Resources devoted to the oversight of the fund.

Overlay

- Derivative based program (unfunded other than margin requirements), designed to enhance total portfolio return (such as a tactical asset allocation program) or to achieve some specific mandate such as currency hedging.

Passive proportion

- Proportion of assets managed passively, i.e., indexed to broad capital market benchmarks or dedicated to replicate market benchmarks.

Policy mix

- Reflects long-term policy or target asset weights. Policy asset mix is often established by a fund's investment committee or board and is determined by such long term considerations as liability structure, risk tolerance and long term capital markets prospects.

Policy return

- The return you would have earned if you had passively implemented your policy mix decision through your benchmark portfolios. Your policy return equals the sum of your policy weights multiplied by your asset class benchmarks for each asset class.

R squared (coefficient of determination)

- The percentage of the differences in the dependent variable explained by the regression equation. For example, an R squared of 1 means 100% of the differences are explained and an R squared of 0 means that none of the differences are explained.

Value added

- the difference between your total actual return and your policy return. It is a measure of actual value produced over what could have been earned passively.