



AASHTOWare BrM 5.2.3

Conducting Trade-off Analysis

April 26, 2017

Mesa, Arizona



Contact

Trade-off
Analysis

Multi-objective

Trade-offs in
BrM

- Funding
- Targets
- Deterioration Rates

BrM Help Desk

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Trade-off

A trade-off (or tradeoff) is a situation that involves losing one quality or aspect of something in return for gaining another quality or aspect. More colloquially, if one thing increases, some other thing must decrease. Tradeoffs can occur for many reasons, including simple physics (into a given amount of space, you can fit many small objects or fewer large objects). The idea of a tradeoff often implies a decision to be made with full comprehension of both the upside and downside of a particular choice, such as when a person decides whether to invest in stocks (more risky but with a greater potential return) versus bonds (generally safer, but lower potential returns).

- Wikipedia: Trade-off





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Multi-objective Optimization

For a nontrivial multi-objective optimization problem, no single solution exists that simultaneously optimizes each objective. In that case, the objective functions are said to be conflicting, and **there exists a (possibly infinite) number of Pareto optimal solutions**. A solution is called nondominated, Pareto optimal, Pareto efficient or noninferior, if none of the objective functions can be improved in value without degrading some of the other objective values. Without additional subjective preference information, all Pareto optimal solutions are considered equally good (as vectors cannot be ordered completely). Researchers study multi-objective optimization problems from different

- *Wikipedia: Multi-objective Optimization*





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Vilfredo Pareto

1848 - 1923

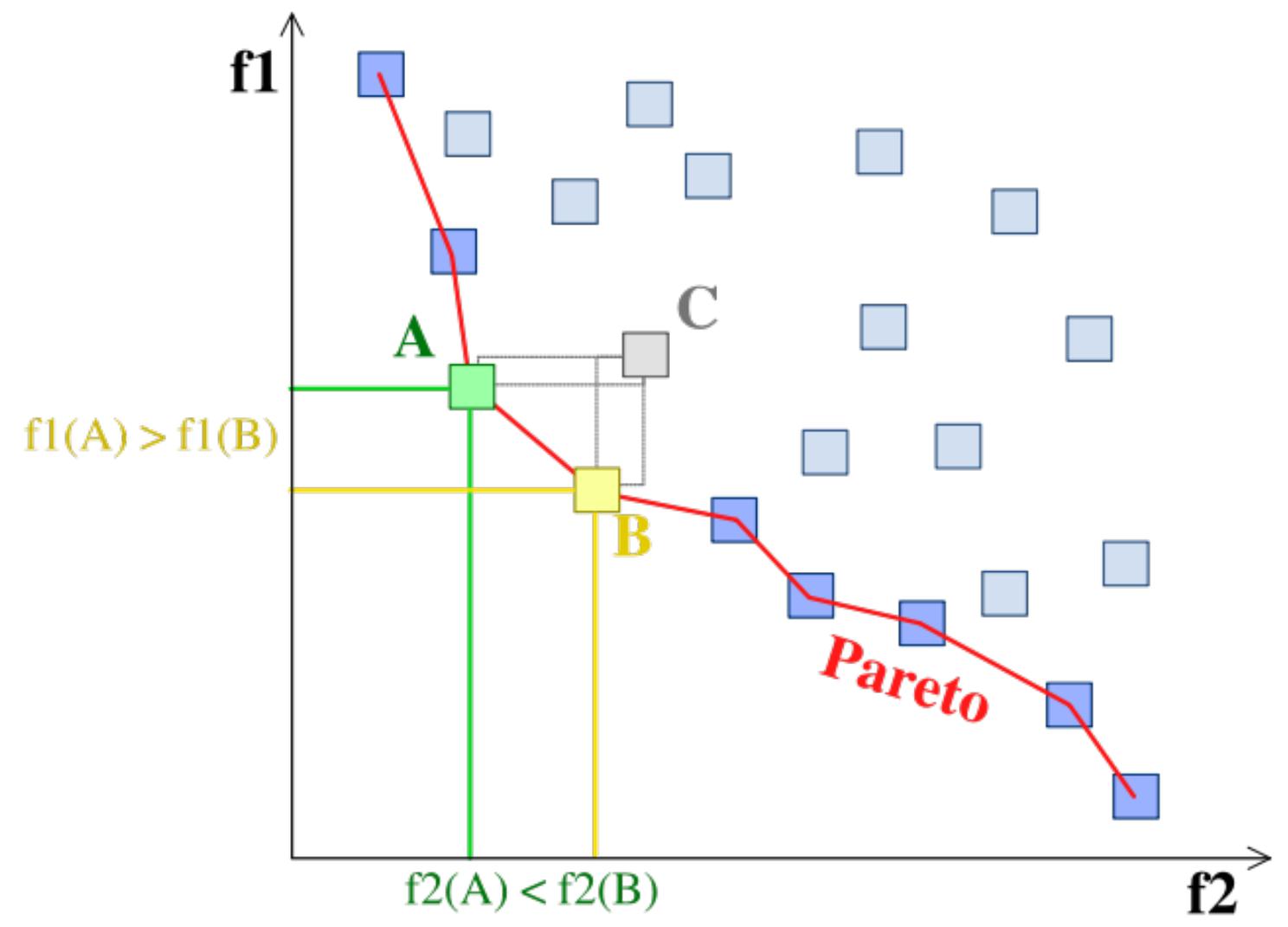
Italian Civil Engineer turned socio-economist.

Best known for:

- The Pareto principle: the idea that variables have unequal influence on the outcome. For example, 80% of the result can be made up by 20% of the variables. Known as the 80-20 rule.
- Multi-objective optimization and Pareto Horizons.
- Pareto distribution of statistics.

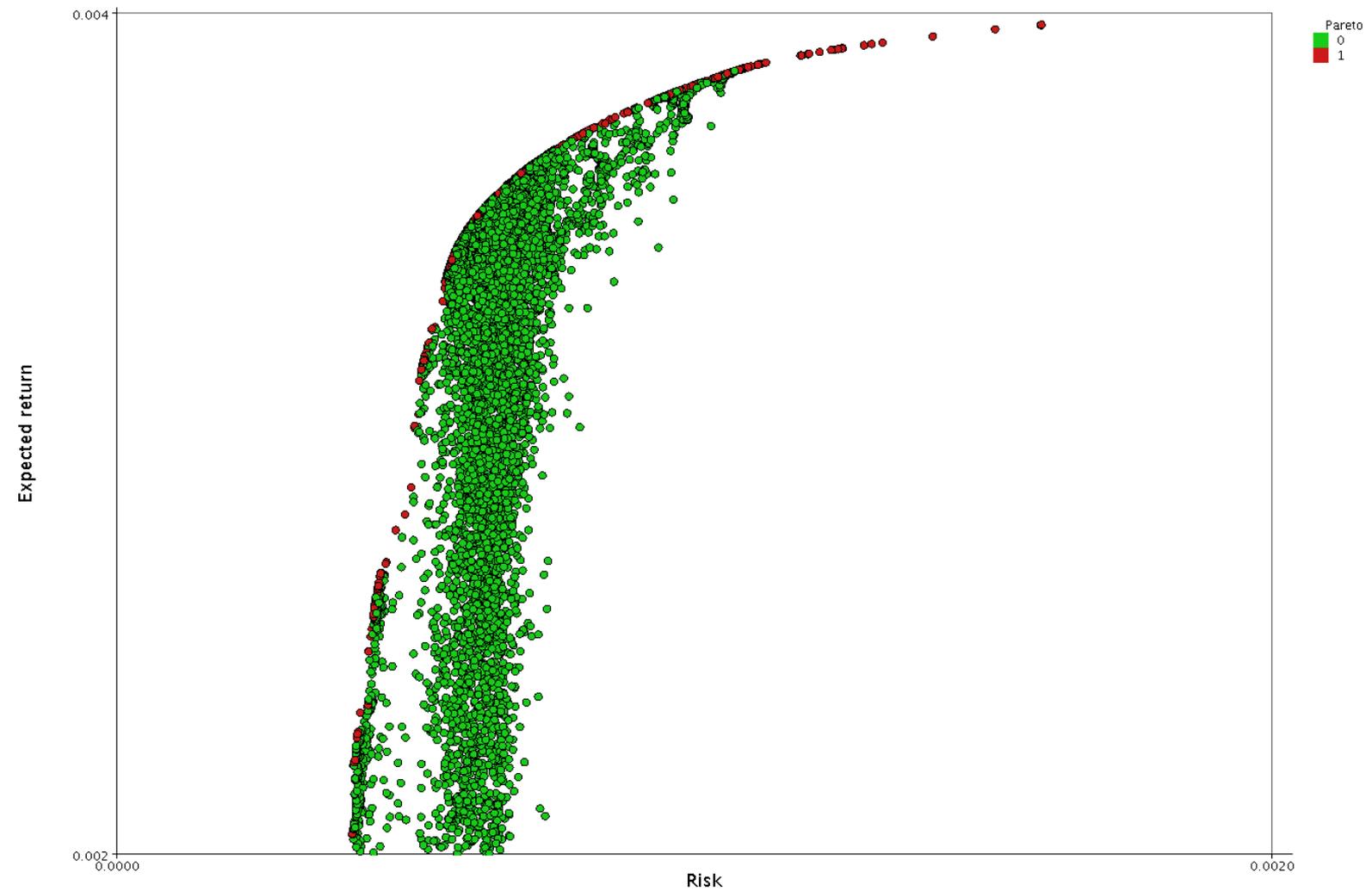


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<http://lionsolver.com/>





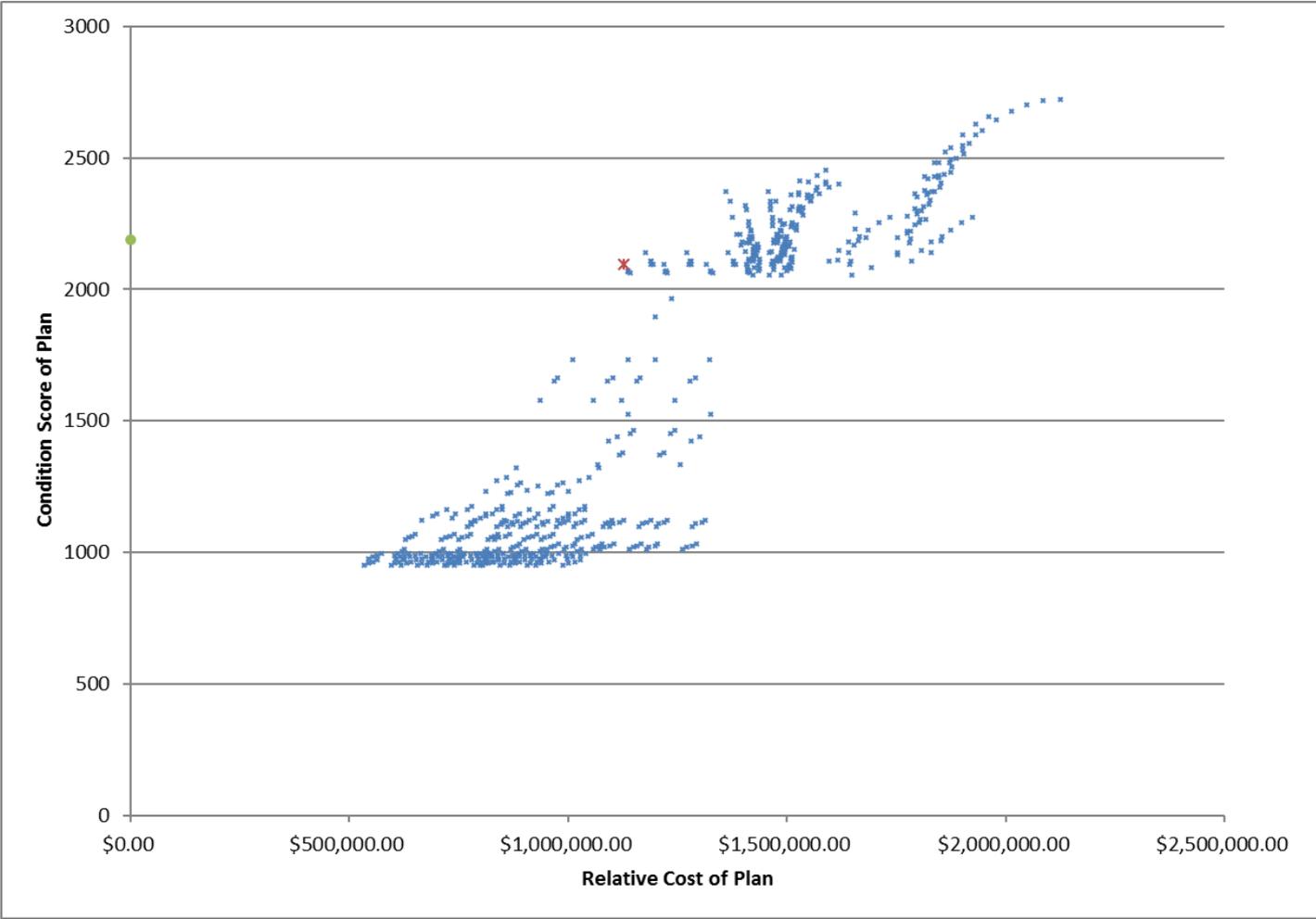
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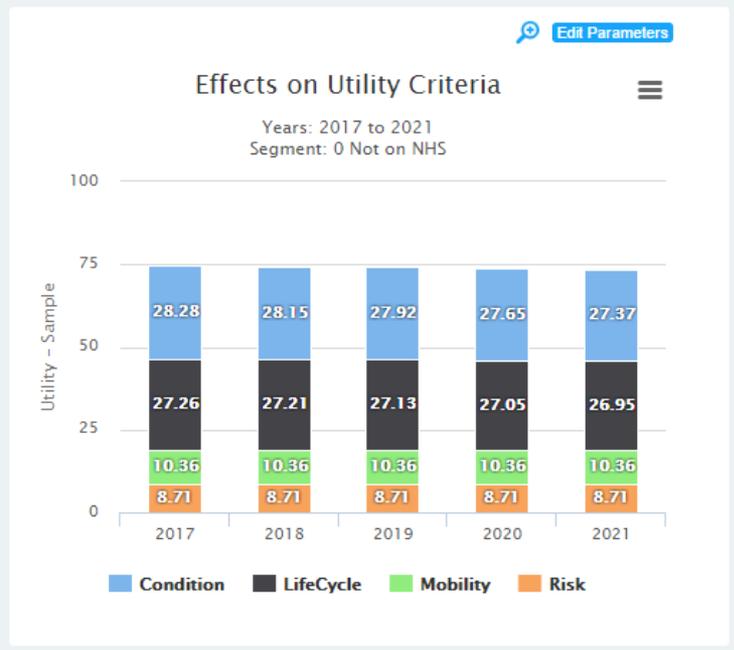
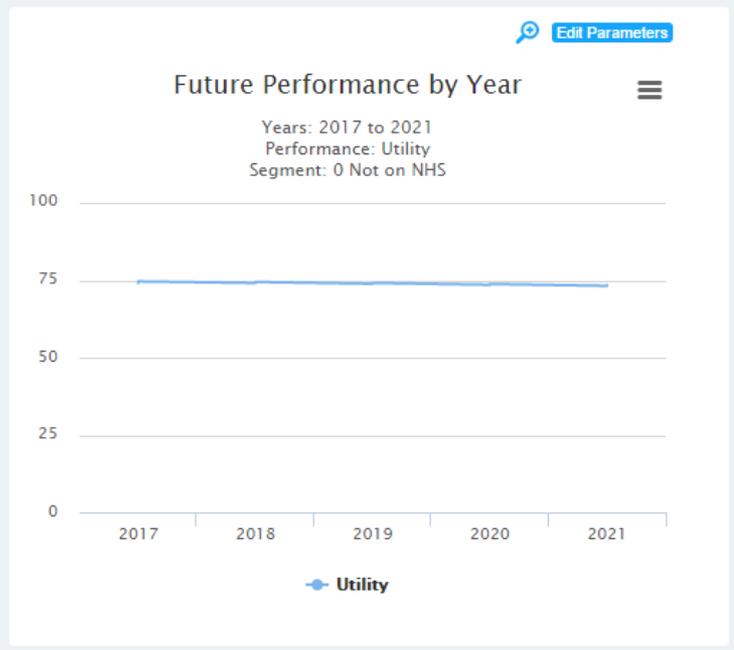
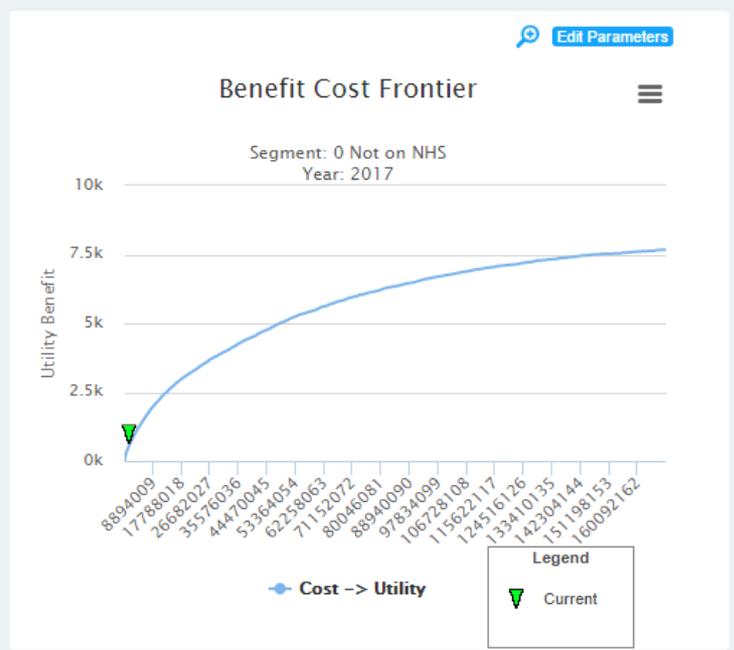
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Programs > Program Results





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So in what scenarios
will you conduct a
trade-off analysis?





Programs > Create/Edit Scenarios

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Scenarios

Scenario Name	
	Default
	\$10m
	\$20m
	\$30m

Scenarios Details:

Name:

Program:

Deterioration Profile:





Programs > Funding Allocation

Program: Scenario:

Funding Allocation

A new Funding Source Target in Projects > Funding Sources may be created for new Funding Allocations
No Funding Sources

Budget Distribution

Quick Distribution

Override budget

Total budget: \$180,000,000

Total allocated funds: \$0

	2017	2018	2019	2020	2021
Identified annual funds:	\$0	\$0	\$0	\$0	\$0
Additional funds:	<input type="text" value="\$30,000,000"/>				
Total annual budget:	\$30,000,000	\$30,000,000	\$30,000,000	\$30,000,000	\$30,000,000
Allocated funds:	\$0	\$0	\$0	\$0	\$0
Available Funds:	\$30,000,000	\$30,000,000	\$30,000,000	\$30,000,000	\$30,000,000

Budget distribution by program's segments:

Input method: Actual Budget

Segment	Total Budget per segment	Pct. overall budget	2017 <input type="checkbox"/>	2018 <input type="checkbox"/>	2019 <input type="checkbox"/>	2020 <input type="checkbox"/>	2021 <input type="checkbox"/>
ALL	\$0	0%	<input type="text" value=""/>				
Total	\$0		\$0	\$0	\$0	\$0	\$0

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Trade-off Analysis

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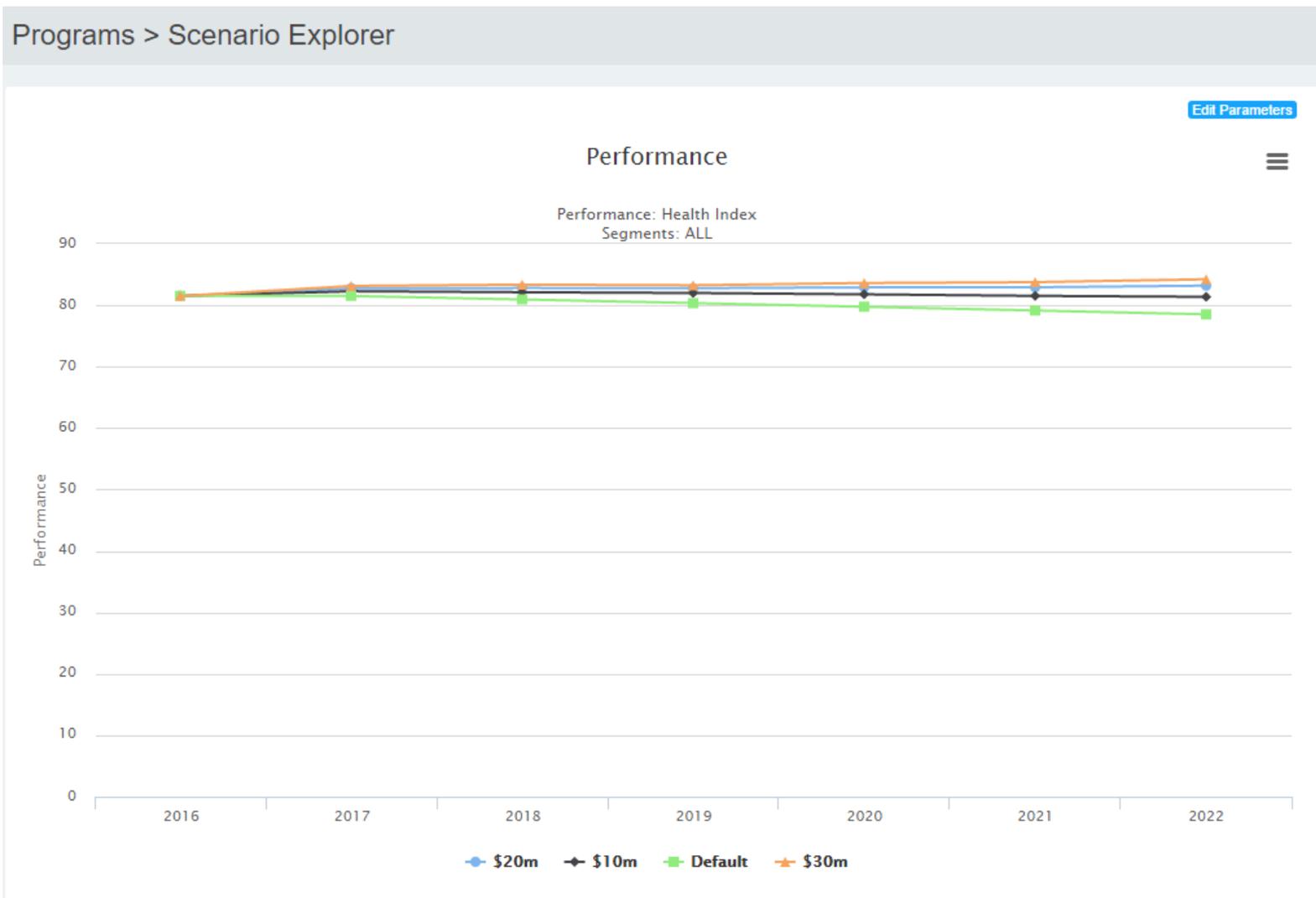
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Programs > Create/Edit Scenarios

Scenarios

Scenario Name	
<input checked="" type="checkbox"/>	10% SD
<input type="checkbox"/>	Default
<input checked="" type="checkbox"/>	15% SD
<input checked="" type="checkbox"/>	5% SD

Scenarios Details:

Name:

Program:

Deterioration Profile:

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Programs > Performance Measures

Performance Measures

Program: Scenario:

Select Performance Measures

Performance Measures	Best Value	Worst Value		
Utility	100.00	0.00		
Health Index	100.00	0.00		
Pct. Poor (Count-Based)	0.00	100.00		

Add new record

Performance Constraints by Segment

Segment	Utility	Health Index	Pct. Poor (Count-Based)
1 On the NHS	Min: <input type="text"/> Target: <input type="text"/>	Min: <input type="text"/> Target: <input type="text"/>	Target: <input type="text" value="10"/>
0 Not on NHS	Min: <input type="text"/> Target: <input type="text"/>	Min: <input type="text"/> Target: <input type="text"/>	Target: <input type="text" value="10"/>

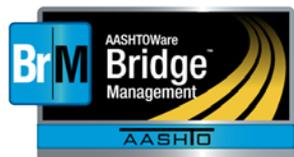
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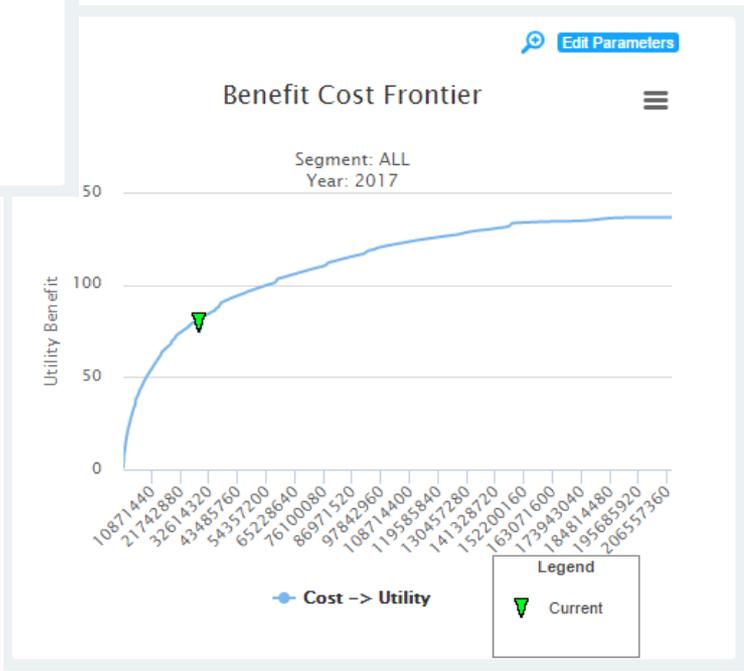
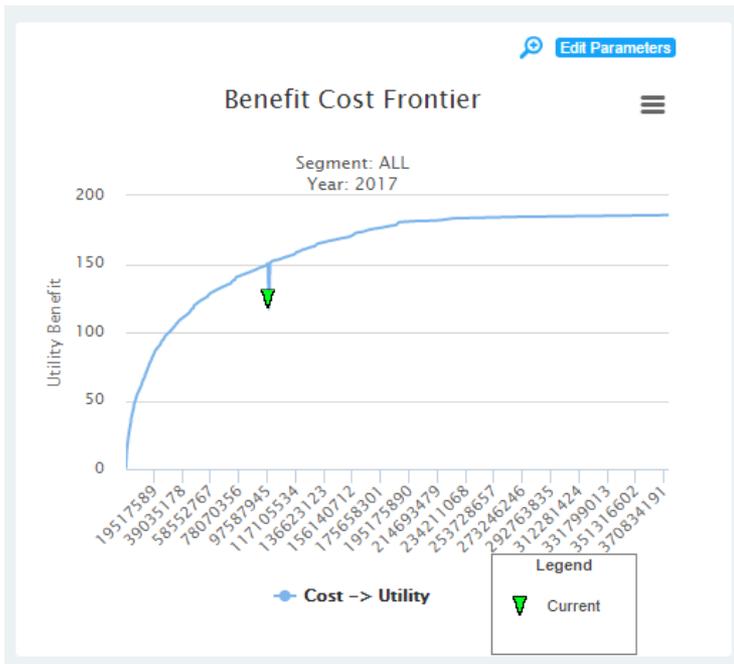
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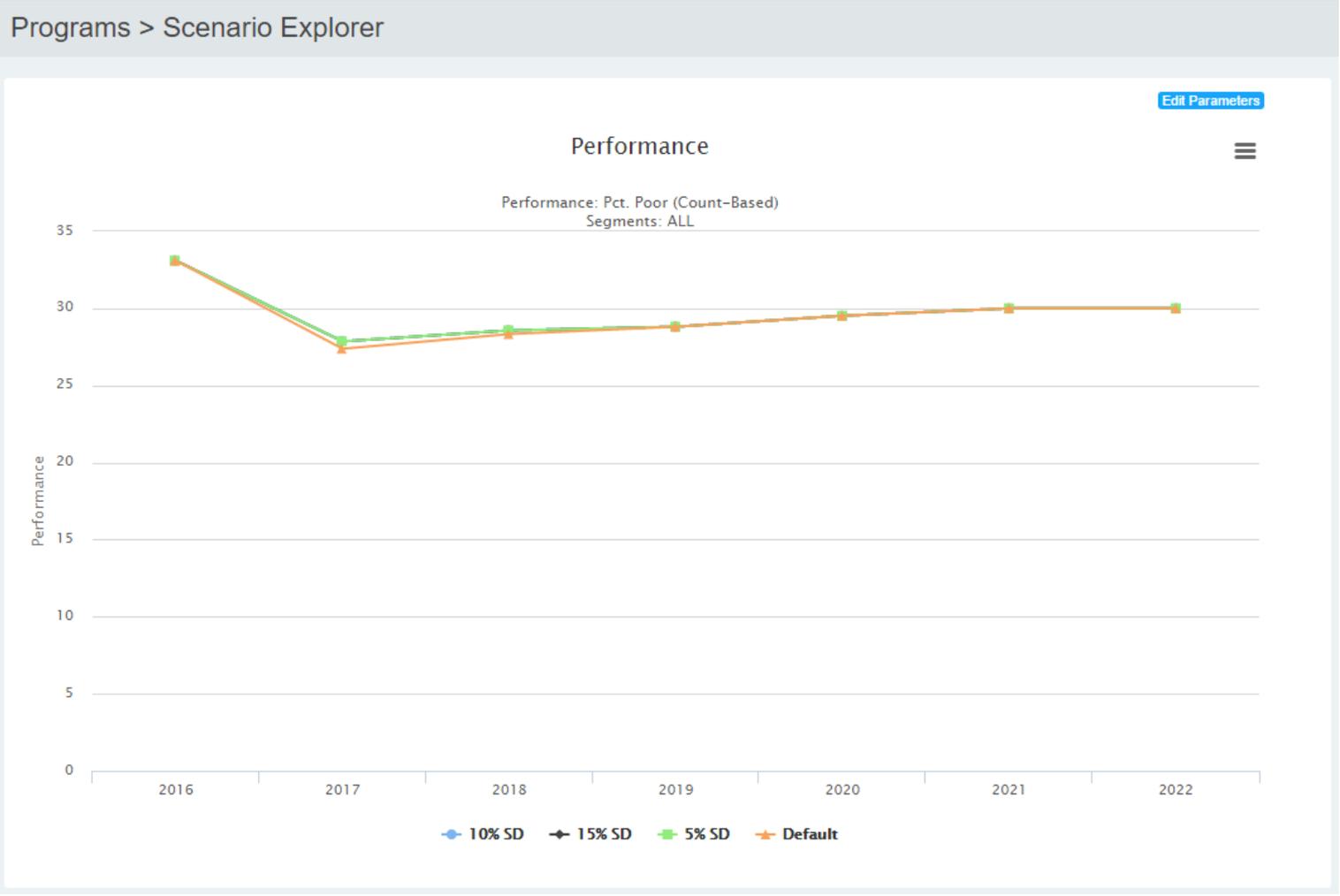
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Programs > Create/Edit Scenarios

Scenarios

Scenario Name	
<input checked="" type="checkbox"/>	BYU New Deterioration Rates
<input type="checkbox"/>	Default

Scenarios Details:

Name:

Program:

Deterioration Profile:

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Admin > Modeling Config > Deterioration Profiles

Deterioration Profile Editor

Deterioration Profile Details

Name:

Description:

Elements

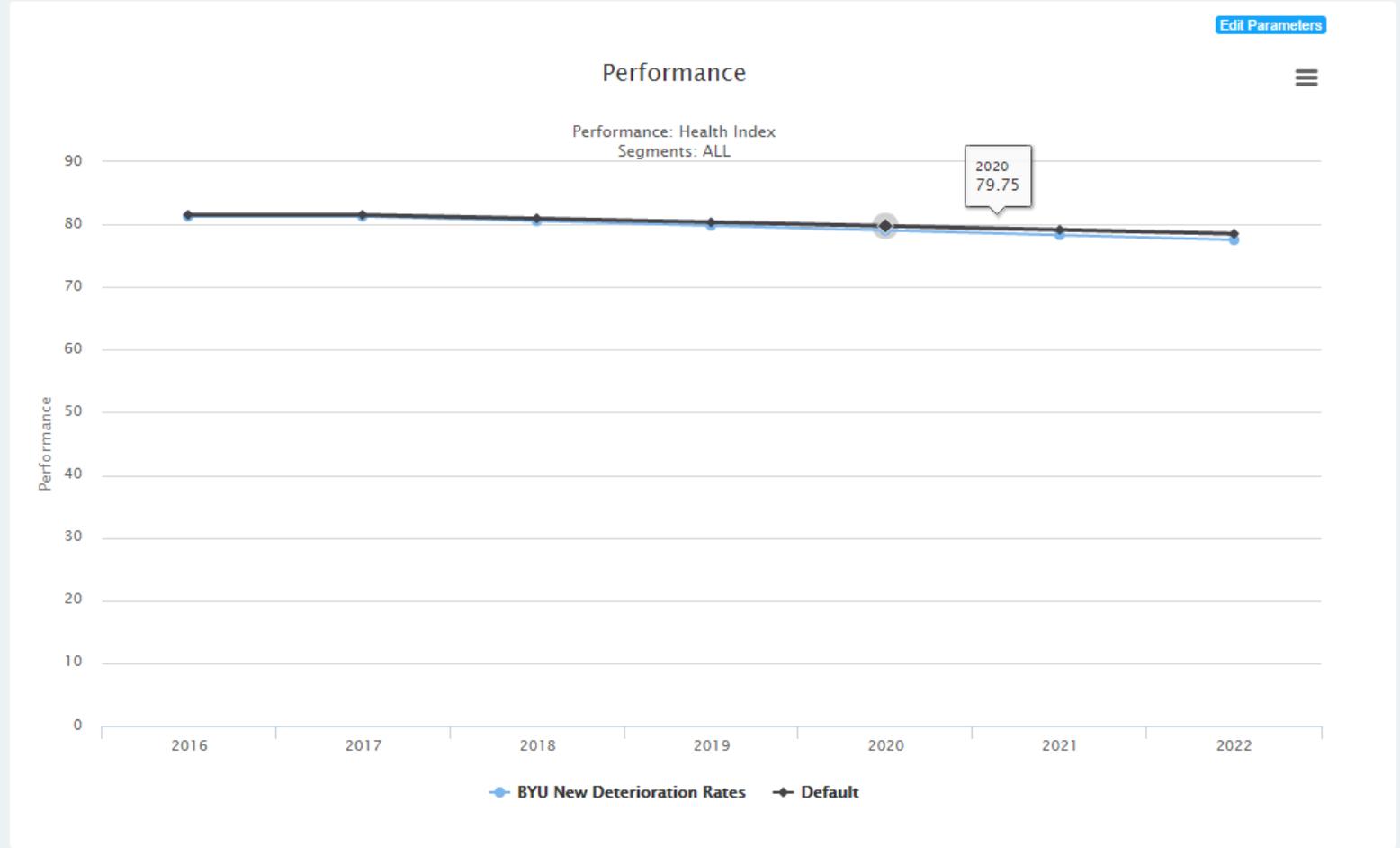
Element Key	Element Name	Altered	
12	Re Concrete Deck	Yes (Use Default)	View/Edit Model
13	Pre Concrete Deck	No	View/Edit Model
15	Pre Concrete Top Flange	No	View/Edit Model
16	Re Conc Top Flange	No	View/Edit Model
28	Steel Deck - Open Grid	No	View/Edit Model
29	Steel Deck - Conc Fill Grid	No	View/Edit Model
30	Steel Deck - Orthotropic	No	View/Edit Model
31	Timber Deck	No	View/Edit Model
38	Re Concrete Slab	No	View/Edit Model
54	Timber Slab	No	View/Edit Model

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