North Carolina
DEPARTMENT OF TRANSPORTATION

Scaling

Scaling Scores

Why scale scores in P4.0?
Address P3.0 biggest statistical issues of small range of values, low values, and criteria that have a disproportional impact on the total score (from Cambridge)

How will scaling be applied in P4.0?
Using a relative distribution approach, based on the % of projects with higher, lower, or equal values for each criteria component

- Component = portion of the criteria score that has defined % weight (e.g., V/C ratio = 60%)
- Highest raw component score = 100
- Lowest raw component score = 0
- Median raw component score = 50 (meaning 50% of raw scores are higher, 50% are lower)
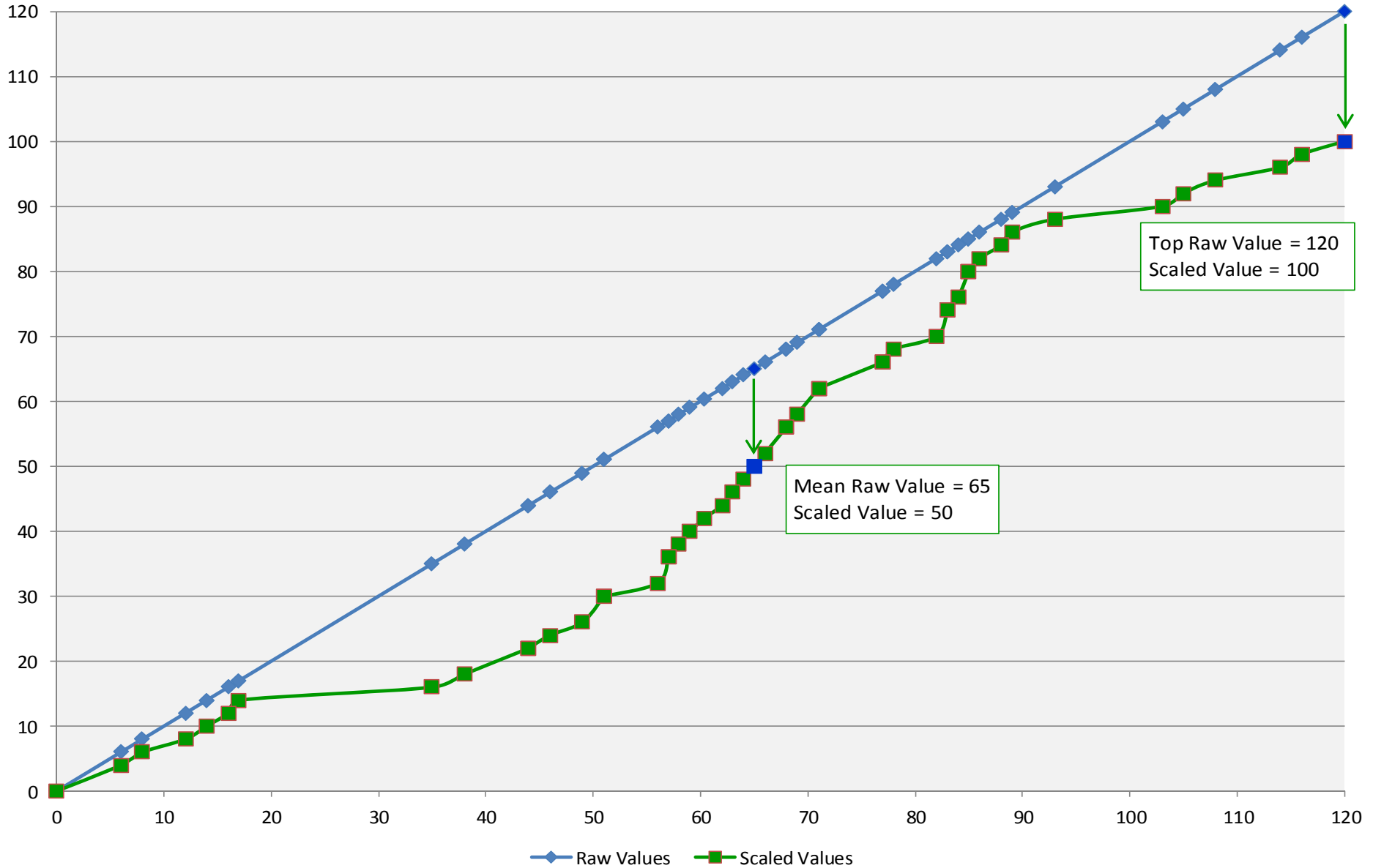
Scaling is essentially grading the component scores on a curve → comparing an individual project component score against all other project component scores

In P3.0, the criteria scores were based on the raw component scores without a comparison to other projects

Scaling Example 1: Raw vs. Scaled Values

Top Raw Value = 93
Scaled Value = 100

Mean Raw Value = 13
Scaled Value = 50

Raw Values — Scaled Values
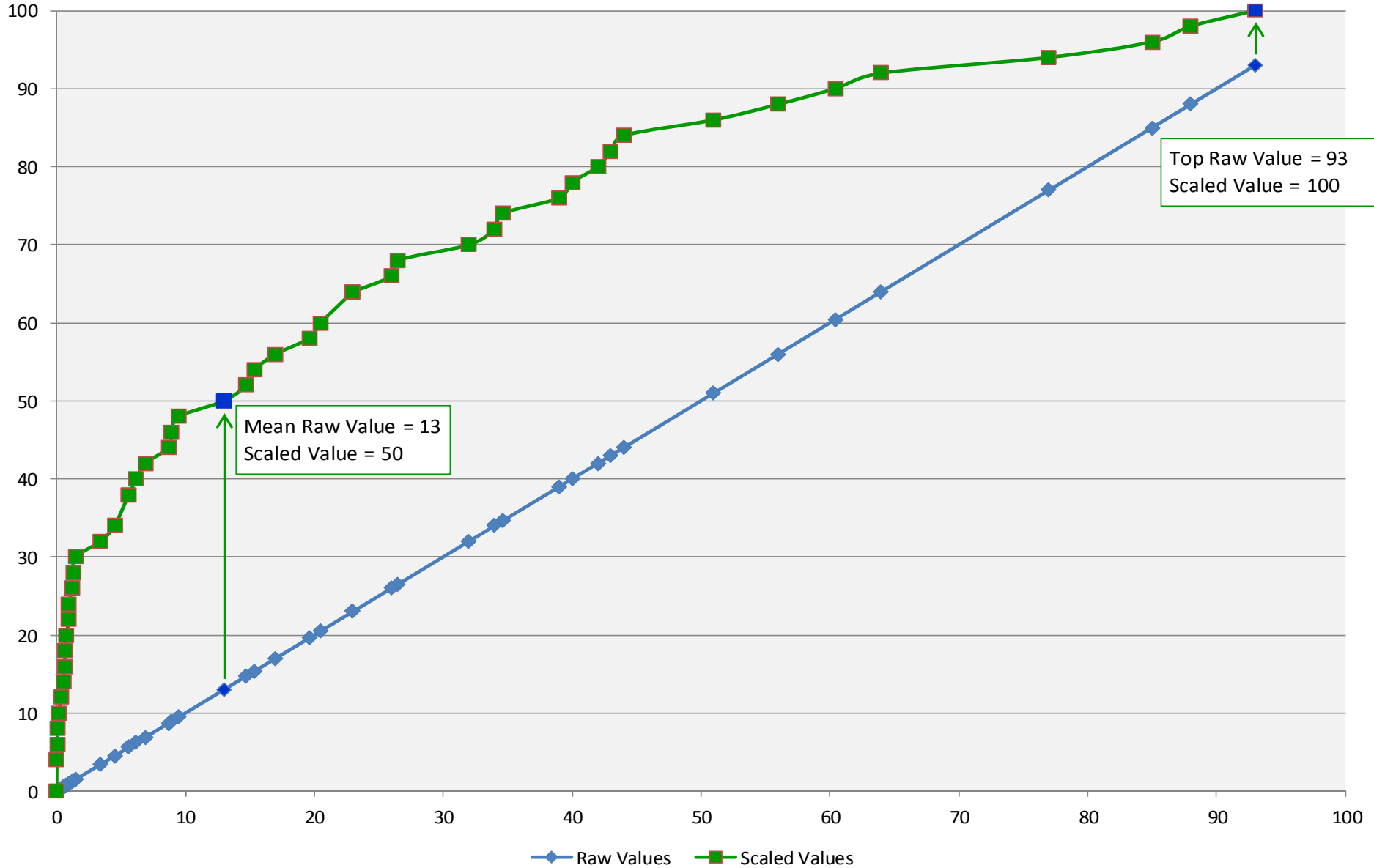
Scaling Example 2: Raw vs. Scaled Values

Top Raw Value = 120
Scaled Value = 100

Mean Raw Value = 65
Scaled Value = 50

Raw Values   Scaled Values

Criteria Scaling

Criteria	Component	Component Weight	Notes
Congestion	Volume/Capacity	60% (Statewide) 80% (Regional) 100% (Division)	
	Volume	40% (Statewide) 20% (Regional) 0% (Division)	
Benefit-Cost	Benefit/Cost	100%	Scaling based on raw (Benefit/Cost to NCDOT) ratio only and not extra % for local funds/tolls. Extra % added to Scaled B/C score with total Benefit-Cost criteria score not to exceed 100. Travel Time and Safety Benefits are summed in Benefits (numerator)
Safety	Crash Density (segments)	33%	
	Crash Severity (segments)	33%	
	Critical Crash Rate (segments)	33%	
	Crash Frequency (intersections)	50%	
	Severity Index (intersections)	50%	
Economic Competitiveness	% Change in Value Added	50%	
	Long-term Jobs	50%	

Criteria Scaling (continued)

Criteria	Component	Component Weight	Notes
Accessibility / Connectivity	County Economic Indicator	50%	
	Upgrade Roadway Travel Time Savings	50%	Scaling based only on projects that are eligible for this component
Freight	Truck Volume	50%	
	Volume/Capacity on Non-Interstate STRAHNet or Future Interstate Route	30%	Scaling based only on projects that are eligible for this component
	Distance to Freight Terminal	20%	Scaling based only on projects within 20 miles of Freight Terminal
Multimodal	Distance to Multimodal Passenger Terminal	60%	Scaling based only on projects within 5 miles of Multimodal Passenger Terminal
	Volume/Capacity on Route near Multimodal Passenger Terminal	40%	Scaling based only on projects that are eligible for this component
Lane Width	Lane Width Difference	100%	Scaling based only on projects where difference is greater than 0
Paved Shoulder Width	Paved Shoulder Width Difference	100%	Scaling based only on projects where difference is greater than 0
Pavement Condition	Pavement Condition Rating	100%	

Scaling Scores - Examples

Congestion Criteria

Two Components: Volume/Capacity Ratio (60% of score) and Volume (40% of score)

Prioritization Version	Raw Volume / Capacity Ratio	Scaled Volume / Capacity Ratio Score (60%)	Raw Volume	Scaled Volume Score (40%)	Congestion Criteria Score
P4.0 (using Scaling)	1.29	89	40,000	53	**74.6**
P3.0	1.29	N/A	40,000	N/A	**93.4**

Benefit-Cost Criteria

Prioritization Version	Benefits / Cost to NCDOT	Scaled B/C Score	Local Funds/Toll %	Benefit-Cost Criteria Score
P4.0 (using Scaling)	2.4	64.8	25%	**89.8**
P3.0	2.4	N/A	25%	**2.4**

Example does not account for differences in travel time saving calculation or safety benefits which will be incorporated in P4.0