



Session 1:
Approach for Evaluating the Short List
of Route Alternatives



PURPOSE

- Review and discuss the evaluation methodology for the short list of route alternatives
- Obtain your input on the importance of each of the evaluation factors





WHAT IS THE PURPOSE OF THE EVALUATION?

- Find a location for a new transportation corridor
 - **Balance benefits and impacts to:**
 - Natural environment
 - Land use /socio-economic environment
 - Cultural environment
 - Transportation needs
 - Cost
- The GTA West Study Terms of Reference (ToR) was approved in 2008 and specifies:
 - **Factors to be considered in the evaluation**
 - **Consultation requirements**



A GOOD EVALUATION PROCESS IS:

1. Comprehensive and systematic
2. Rational and understandable
3. Replicable
4. Traceable
5. Participatory





TWO EVALUATION METHODOLOGIES

1. Reasoned Argument Method

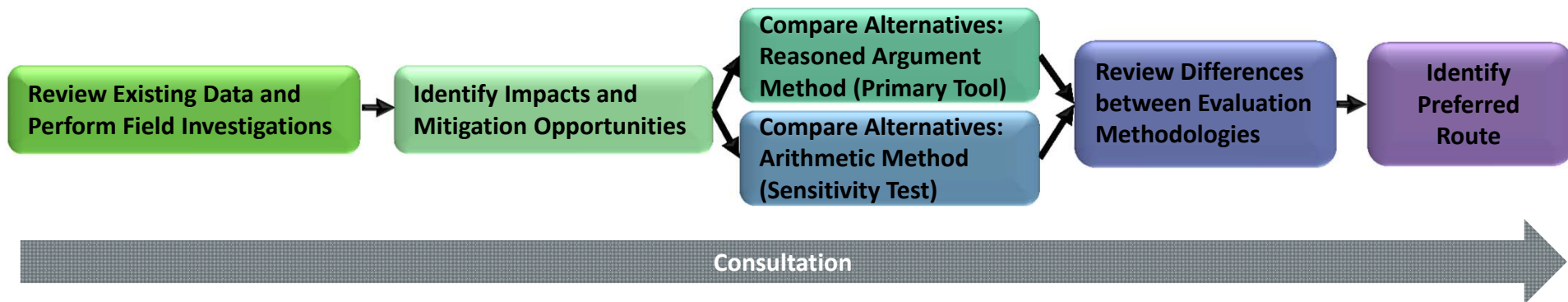
- **Qualitatively (with words)** compares advantages and disadvantages of the alternatives
- Primary tool to select a preferred route

2. Arithmetic Method

- **Quantitatively (with numbers)** compares advantages and disadvantages of the alternatives
- Secondary tool that tests the results of the reasoned argument method by running multiple numerical evaluations, each based on a stakeholder group's perspective



EVALUATION PROCESS



EVALUATION FACTORS

FACTOR	SUB-FACTOR
NATURAL ENVIRONMENT	
Fisheries and Aquatic Ecosystems	<ul style="list-style-type: none"> Fish Habitat Fish Community
Terrestrial Ecosystems	<ul style="list-style-type: none"> Wildlife and Wildlife Habitat Wetlands Woodlands and Vegetation Designated / Special / Natural Areas
Ecosystem Services	
Groundwater	<ul style="list-style-type: none"> Areas of Groundwater Recharge or Discharge Groundwater Source Areas and Wellhead Protection Areas Large Volume Wells Private Wells Groundwater Dependent Commercial Enterprises Groundwater Sensitive Ecosystems
Surface Water	<ul style="list-style-type: none"> Watershed / Subwatershed Drainage Features / Patterns Surface Water Quality and Quantity
Air Quality	<ul style="list-style-type: none"> Local and Regional Air Quality Impacts; Greenhouse Gas Emissions
TRANSPORTATION	
System Capacity and Efficiency	<ul style="list-style-type: none"> Movement of People Movement of Goods System Performance During Peak Periods
System Reliability and Redundancy	
Safety	<ul style="list-style-type: none"> Traffic Safety Emergency Access
Mobility and Accessibility	<ul style="list-style-type: none"> Modal Integration and Balance Linkages to Population and Employment Centres Recreation and Tourism Travel Accommodation for Pedestrians, Cyclists and Snowmobiles
Network Compatibility	<ul style="list-style-type: none"> Network connectivity Flexibility for Future Expansion
Engineering	<ul style="list-style-type: none"> Constructability Compliance with Design Criteria
Construction Cost	
Traffic Operations	

FACTOR	SUB-FACTOR
LAND USE / SOCIO-ECONOMIC ENVIRONMENT	
Land Use Planning, Policies, Goals, Objectives	<ul style="list-style-type: none"> First Nation Land Claims Provincial / Federal Land Use Planning Policies / Goals / Objectives Municipal (Local / Regional) Land Use Planning Policies / Goals / Objectives Development Objectives of Private Property Owners
Land Use – Community	<ul style="list-style-type: none"> First Nation Reserves First Nation Sacred Grounds Urban and Rural Residential Uses and Properties Commercial / Industrial Uses and Properties Recreation Areas and Tourist Attractions Community Facilities / Institutions Municipal Infrastructures and Public Service Facilities
Noise Sensitive Areas	<ul style="list-style-type: none"> Transportation Noise
Land Use Resources	<ul style="list-style-type: none"> First Nation Treaty Rights and Use of Land and Resources for Traditional Purposes Agriculture / Specialty Crop Recreation Aggregate and Mineral Resources
Major Utility Transmission Corridors and Pipelines	<ul style="list-style-type: none"> Major Existing Utility Transmission Corridors and Pipelines Major Proposed Utility Transmission Corridors and Pipelines
Contaminated Property and Waste Management	
Landscape Composition	<ul style="list-style-type: none"> Terrain Vegetation Visual Impacts Aesthetics
CULTURAL ENVIRONMENT	
Built Heritage and Cultural Heritage Landscapes	<ul style="list-style-type: none"> Built Heritage Resources Heritage Bridges Cultural Heritage Landscapes
Archaeology	<ul style="list-style-type: none"> Pre-Contact and Contact First Nations Archaeological Sites Historic Euro Canadian Archaeological Sites First Nation Burial Sites Cemeteries



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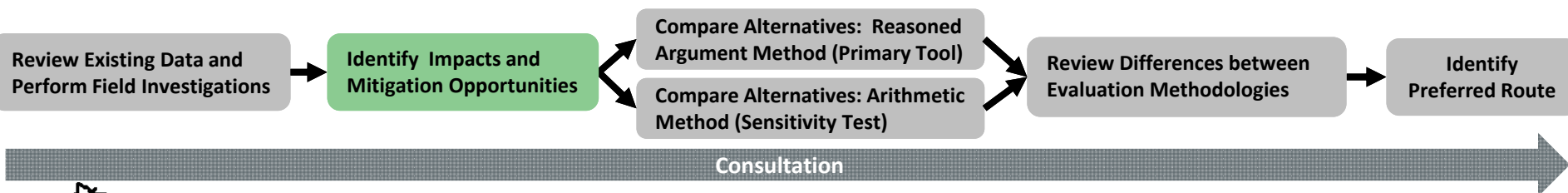
IMPACT ASSESSMENT

- For each alternative, the project team will determine:
 - Positive and negative impacts
 - Opportunities for mitigation



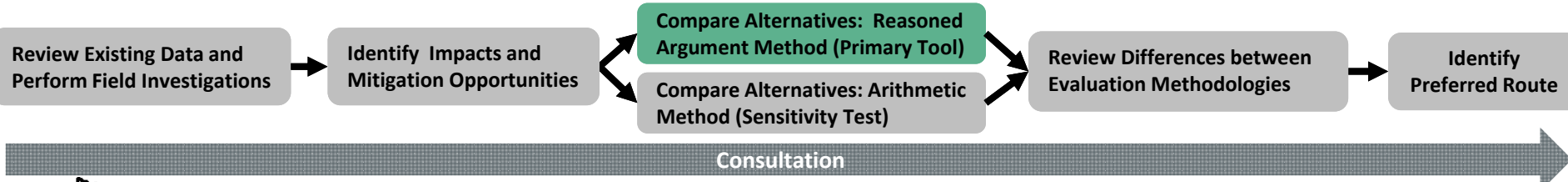
Example for illustrative purposes only

Route Alternative	FACTOR & SUB-FACTOR	POTENTIAL EFFECTS BASED ON INDICATORS	POTENTIAL MITIGATION MEASURES	RANGE OF IMPACT
LAND USE / SOCIO-ECONOMIC ENVIRONMENT				
Route X	Agriculture / Specialty Crop	<ul style="list-style-type: none"> • Class 1 soils – 100 hectares impacted • Class 4 soils – 30 hectares impacted • Class 5 soils – 15 hectares impacted • Route bisects two properties farmed by one agricultural operation. Eliminates access to one field. 	<ul style="list-style-type: none"> • Opportunity to provide alternate access to farm property. 	<ul style="list-style-type: none"> • Medium impact on agricultural lands.
Route Y	Agriculture / Specialty Crop	<ul style="list-style-type: none"> • Class 1 soils – 20 hectares impacted • Class 4 soils – 15 hectares impacted • Class 5 soils – 30 hectares impacted 	<ul style="list-style-type: none"> • Maintenance of farm building and field access location. 	<ul style="list-style-type: none"> • Low impact on agricultural lands.





REASONED ARGUMENT METHOD



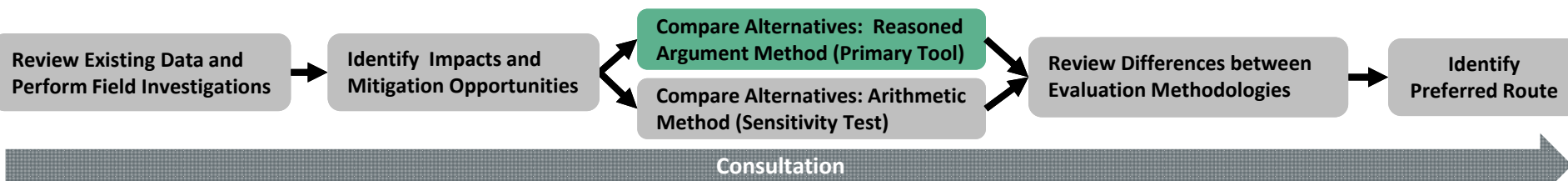


REASONED ARGUMENT METHOD

- For each factor, compare the ranges of impact between alternatives and explain why one is preferred

Example for illustrative purposes only

FACTOR / SUB-FACTOR	RANGE OF IMPACT	
	Route X	Route Y
LAND USE / SOCIO-ECONOMIC ENVIRONMENT		
Agriculture / Specialty Crop	• Medium impact on agricultural lands.	• Low impact on agricultural lands.
Urban and Rural Residential Uses and Properties		
Commercial / Industrial Uses and Properties		
Factor Recommendation		



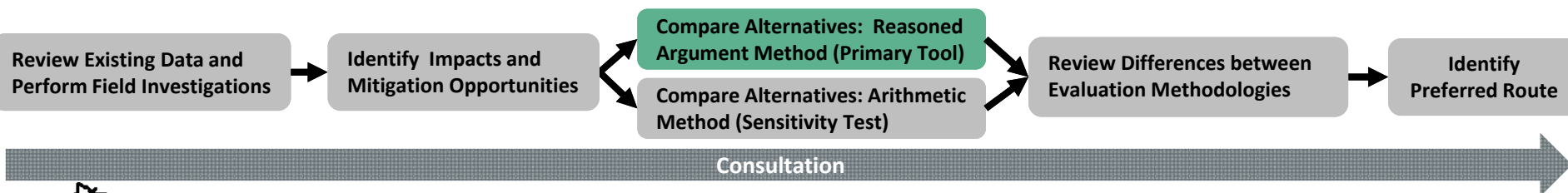


REASONED ARGUMENT METHOD

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Example for illustrative purposes only

FACTOR / SUB-FACTOR	RANGE OF IMPACT	
	Route X	Route Y
LAND USE / SOCIO-ECONOMIC ENVIRONMENT		
Agriculture / Specialty Crop	<ul style="list-style-type: none"> • Medium impact on agricultural lands. 	<ul style="list-style-type: none"> • Low impact on agricultural lands.
Urban and Rural Residential Uses and Properties	<ul style="list-style-type: none"> • High impact • 29 rural residences displaced. 	<ul style="list-style-type: none"> • Low impact • 3 rural residences displaced.
Commercial / Industrial Uses and Properties	<ul style="list-style-type: none"> • Low impact • 1 industrial property access realignment. 	<ul style="list-style-type: none"> • Medium impact • 4 commercial property displacements.
Factor Recommendation		



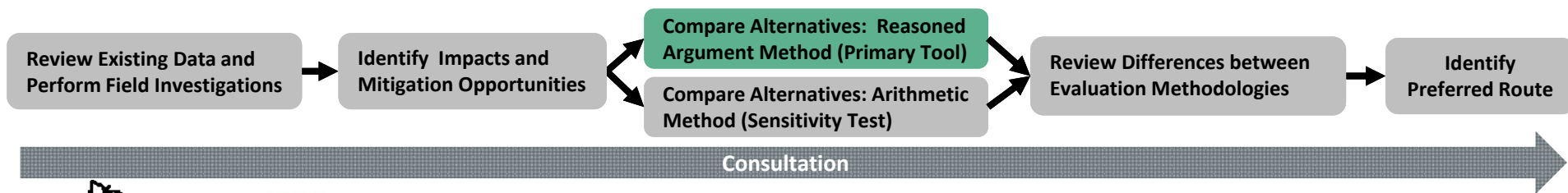


REASONED ARGUMENT METHOD

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FACTOR / SUB-FACTOR	RANGE OF IMPACT	
	Route X	Route Y
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Urban and Rural Residential Uses and Properties	<ul style="list-style-type: none"> • High impact • 29 rural residences displaced. 	<ul style="list-style-type: none"> • Low impact • 3 rural residences displaced.
Commercial / Industrial Uses and Properties	<ul style="list-style-type: none"> • Low impact • 1 industrial property access realignment. 	<ul style="list-style-type: none"> • Medium impact • 4 commercial property displacements.
Factor Recommendation	2nd	1st
	Although Route Y displaces 3 additional commercial properties, it minimizes rural residential displacements, and has a low impact on agricultural lands. Therefore, Route Y is preferred from a Land Use/Socio-Economic Environment perspective.	



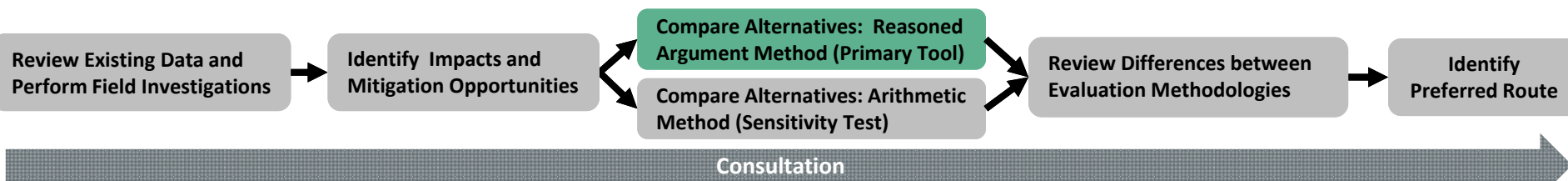


REASONED ARGUMENT METHOD

- Summarize factor rankings and identify the preferred alternative overall

Example for illustrative purposes only

FACTOR	Route X	Route Y
Natural Environment		
Land Use / Socio-Economic Environment	2 nd	1 st
Cultural Environment		
Transportation		
RECOMMENDATION		



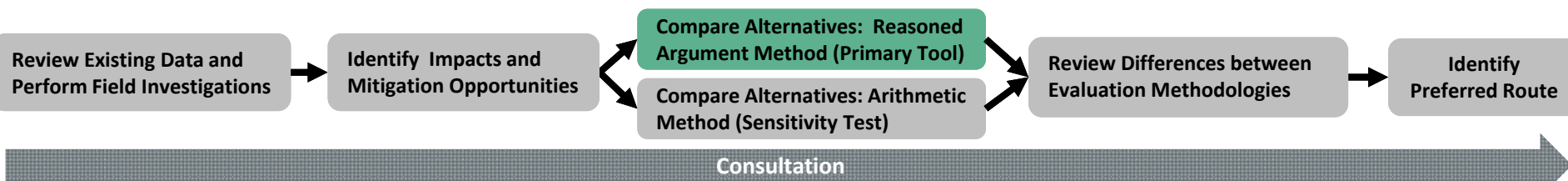


REASONED ARGUMENT METHOD

- Summarize factor rankings and identify the preferred alternative overall

Example for illustrative purposes only

FACTOR	Route X	Route Y
Natural Environment	1 st	2 nd
Land Use / Socio-Economic Environment	2 nd	1 st
Cultural Environment	1 st (Tied)	1 st (Tied)
Transportation	2 nd	1 st
RECOMMENDATION		



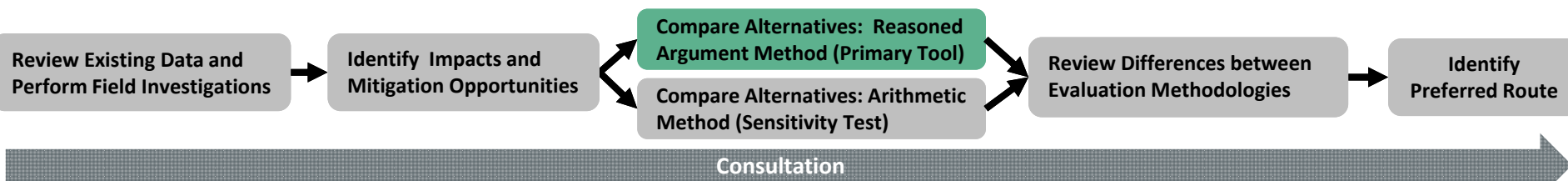


REASONED ARGUMENT METHOD

- Summarize factor rankings and identify the preferred alternative overall

Example for illustrative purposes only

FACTOR	Route X	Route Y
Natural Environment	1 st	2 nd
Land Use / Socio-Economic Environment	2 nd	1 st
Cultural Environment	1 st (Tied)	1 st (Tied)
Transportation	2 nd	1 st
RECOMMENDATION	2 nd	1 st
	<p>Route Y is preferred from land use/socio-economic environment, cultural environment, and transportation perspectives. These benefits outweigh the slightly larger impact to the natural environment.</p>	

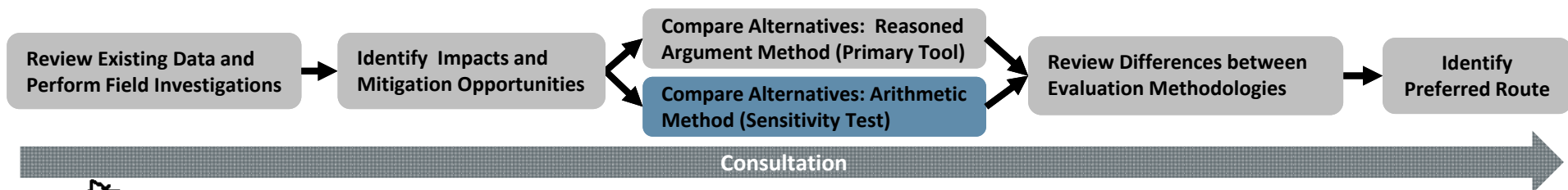




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ARITHMETIC METHOD



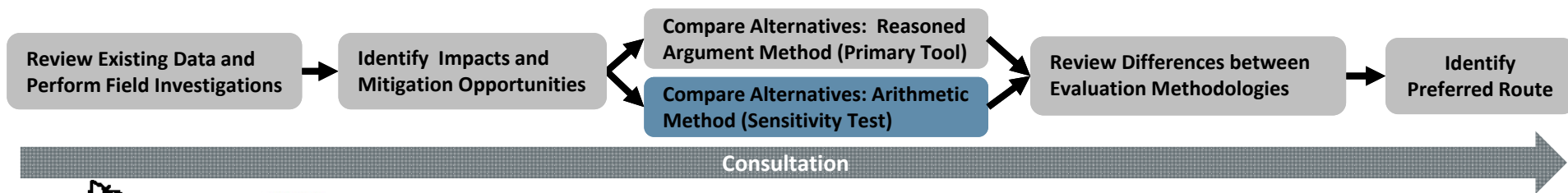


ARITHMETIC METHOD

- A level of importance (numerical weighting) will be assigned to each factor
 - Higher weight = more important factor to you

Example for illustrative purposes only

FACTOR	WEIGHTING
NATURAL ENVIRONMENT	25
LAND USE / SOCIO-ECONOMIC ENVIRONMENT	30
CULTURAL ENVIRONMENT	10
TRANSPORTATION	35
TOTAL	100






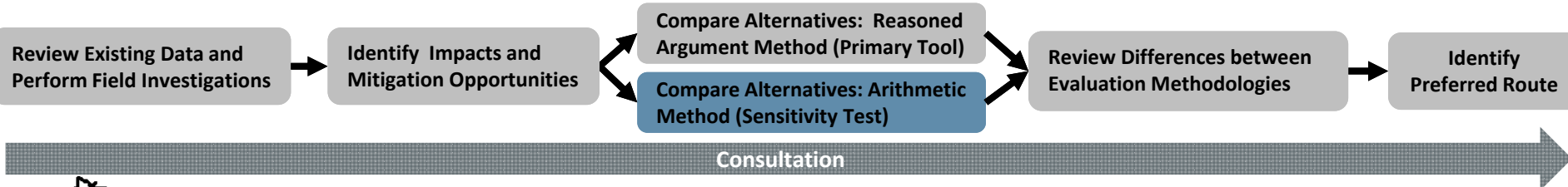
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NATURAL ENVIRONMENT	25
LAND USE / SOCIO-ECONOMIC ENVIRONMENT	30
CULTURAL ENVIRONMENT	10
TRANSPORTATION	35
TOTAL	100

You can provide your factor weighting today! 





ARITHMETIC METHOD – WEIGHTING

- A level of importance (numerical weighting) will be assigned to each factor
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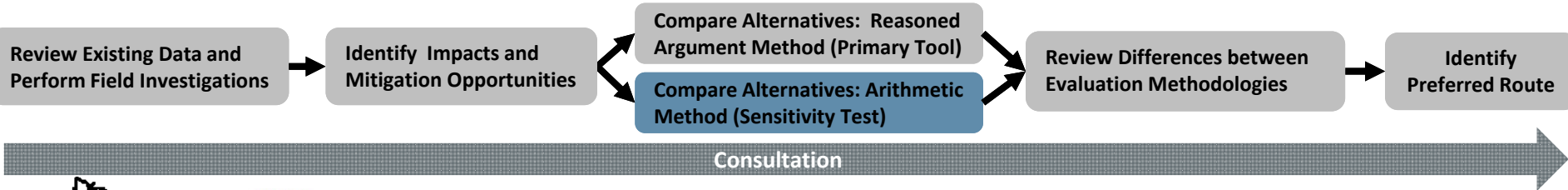
Example for illustrative purposes only

FACTOR	WEIGHTING
NATURAL ENVIRONMENT	25
LAND USE / SOCIO-ECONOMIC ENVIRONMENT	30
CULTURAL ENVIRONMENT	10
TRANSPORTATION	35
TOTAL	100

Weightings will be divided within each factor:

LAND USE / SOCIO-ECONOMIC ENVIRONMENT	30
Agriculture / Specialty Crop	11
Urban and Rural Residential Uses and Properties	9
Commercial / Industrial Uses and Properties	10

You can provide your factor weighting today!





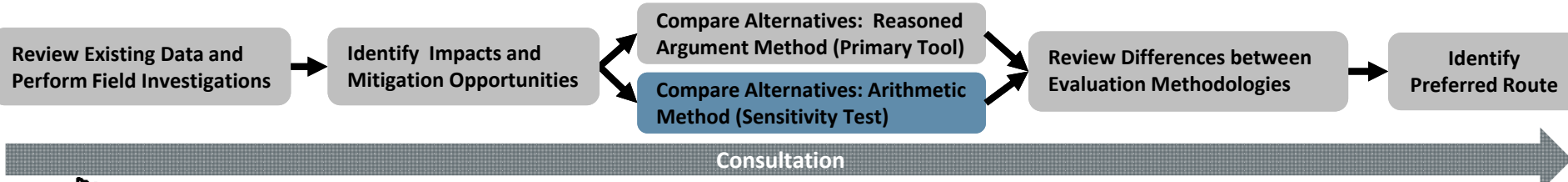
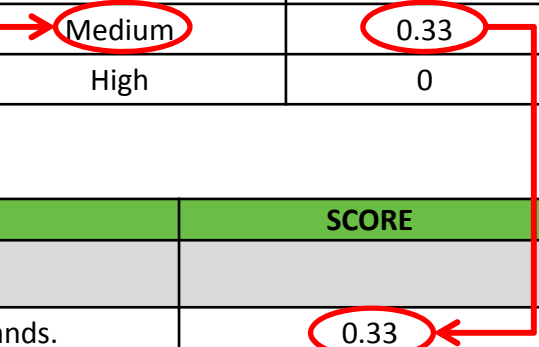
ARITHMETIC METHOD – SCORE

- The qualitative impacts previously determined are converted into numerical scores
 - Higher score = more benefits, lower impacts

Range of Impact	Score
No Impact	1
Low	0.67
Medium	0.33
High	0

Example for illustrative purposes only

ROUTE ALTERNATIVE	FACTOR & SUB-FACTOR	RANGE OF IMPACT	SCORE
LAND USE / SOCIO-ECONOMIC ENVIRONMENT			
Route X	Agriculture / Specialty Crop	• Medium impact on agricultural lands.	0.33
Route Y	Agriculture / Specialty Crop	• Low impact on agricultural lands.	0.67



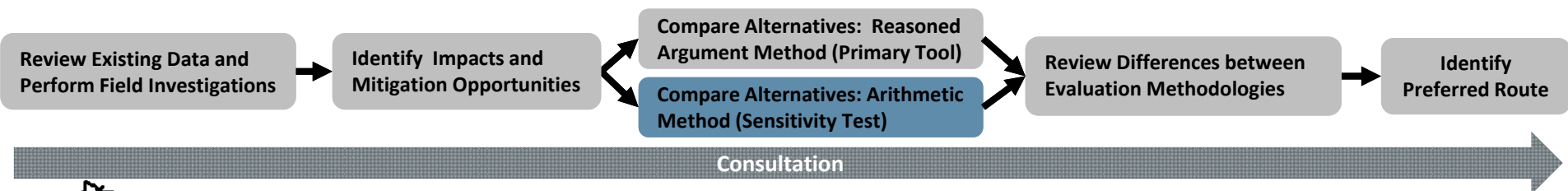


ARITHMETIC METHOD

- The range of impact (score) is multiplied by the importance of the impact (weight) to give the weighted score for that factor

Example for illustrative purposes only

Factor / Sub-Factor	Route X			Route Y		
	Weight	Score	Weighted Score (Weight x Score)	Weight	Score	Weighted Score (Weight x Score)
LAND USE / SOCIO-ECONOMIC ENVIRONMENT	30			30		
Agriculture / Specialty Crop	11	0.33		11	0.67	
Urban and Rural Residential Uses and Properties						
Commercial / Industrial Uses and Properties						



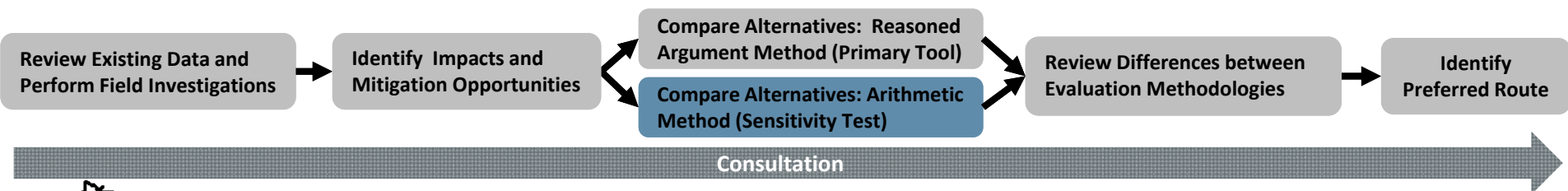


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	Weight	Score	Weighted Score (Weight x Score)	Weight	Score	Weighted Score (Weight x Score)
LAND USE / SOCIO-ECONOMIC ENVIRONMENT	30			30		
Agriculture / Specialty Crop	11	0.33		11	0.67	
Urban and Rural Residential Uses and Properties	9	0.00		9	0.67	
Commercial / Industrial Uses and Properties	10	0.67		10	0.33	



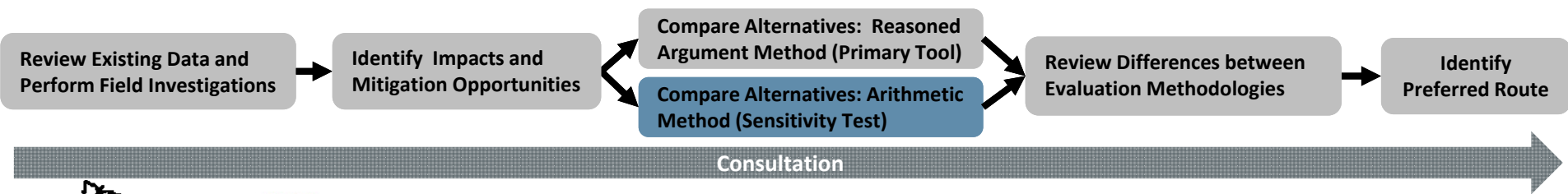


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Factor / Sub-Factor	Route X			Route Y		
	Weight	Score	Weighted Score (Weight x Score)	Weight	Score	Weighted Score (Weight x Score)
LAND USE / SOCIO-ECONOMIC ENVIRONMENT	30			30		
Agriculture / Specialty Crop	11	0.33	3.63	11	0.67	7.37
Urban and Rural Residential Uses and Properties	9	0.00	0	9	0.67	6.03
Commercial / Industrial Uses and Properties	10	0.67	6.70	10	0.33	3.30



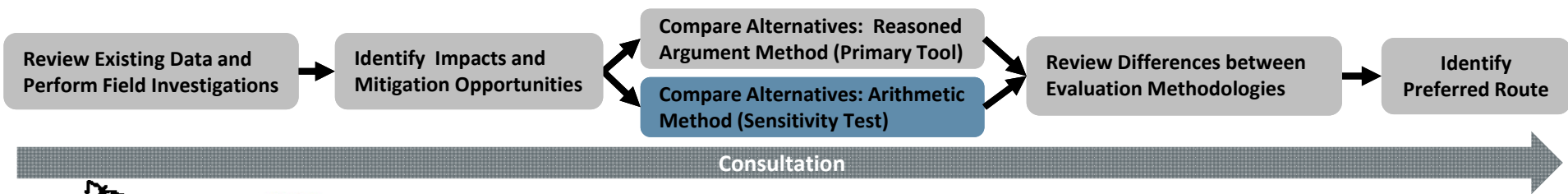


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	Weight	Score	Weighted Score (Weight x Score)	Weight	Score	Weighted Score (Weight x Score)
LAND USE / SOCIO-ECONOMIC ENVIRONMENT	30			30		
Agriculture / Specialty Crop	11	0.33	3.63	11	0.67	7.37
Urban and Rural Residential Uses and Properties	9	0.00	+ 0	9	0.67	+ 6.03
Commercial / Industrial Uses and Properties	10	0.67	+ 6.70	10	0.33	+ 3.30
LAND USE / SOCIO-ECONOMIC FACTOR WEIGHTED SCORE			= 10.33			= 16.70
RANK			2ND			1ST



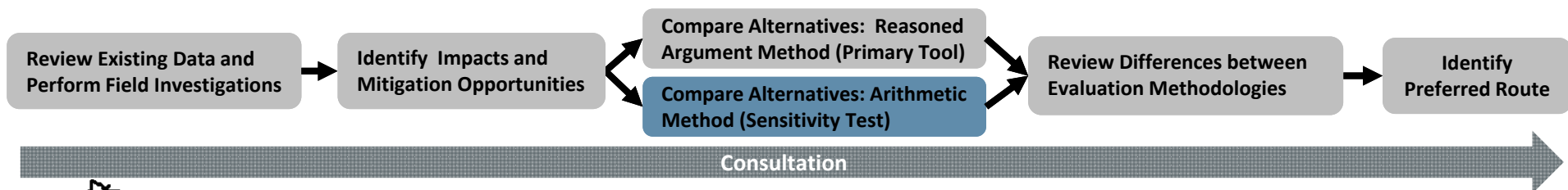


ARITHMETIC METHOD

- The weighted factor scores are added to give a total for each alternative
 - Higher total = more preferred

Example for illustrative purposes only

Factors	Route X	Route Y
	Weighted Factor Score	Weighted Factor Score
Natural Environment		
Land Use / Socio-Economic Environment	10.33	16.70
Cultural Environment		
Transportation		
TOTAL		
RANK		



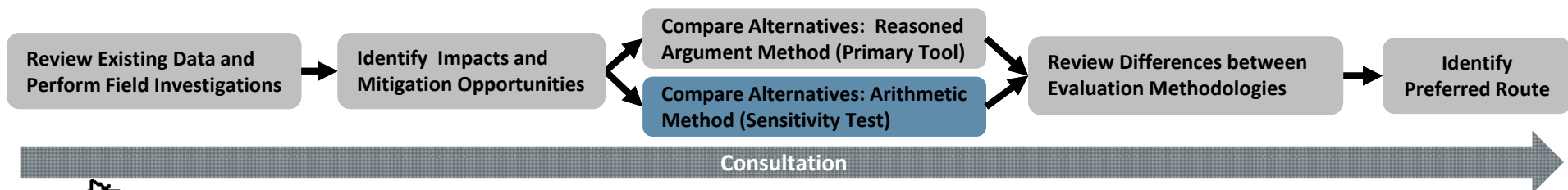


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Factors	Route X	Route Y
	Weighted Factor Score	Weighted Factor Score
Natural Environment	15.30	14.10
Land Use / Socio-Economic Environment	10.33	16.70
Cultural Environment	21.30	21.30
Transportation	20.15	25.33
TOTAL		
RANK		



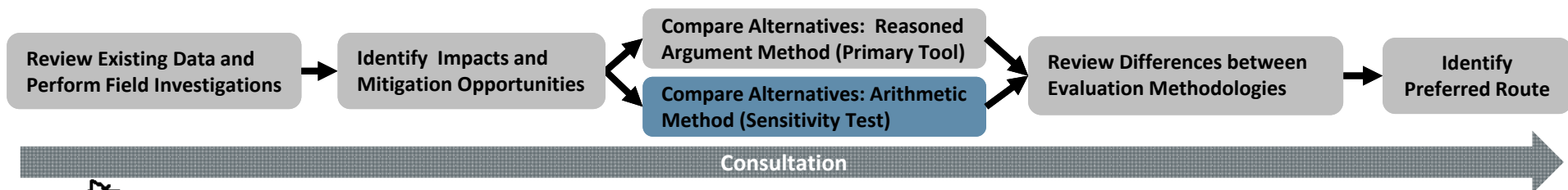


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Example for illustrative purposes only

Factors	Route X	Route Y
	Weighted Factor Score	Weighted Factor Score
Natural Environment	15.30	14.10
Land Use / Socio-Economic Environment	+ 10.33	+ 16.70
Cultural Environment	+ 21.30	+ 21.30
Transportation	+ 20.15	+ 25.33
TOTAL	= 67.08	= 77.43
RANK	2nd	1st

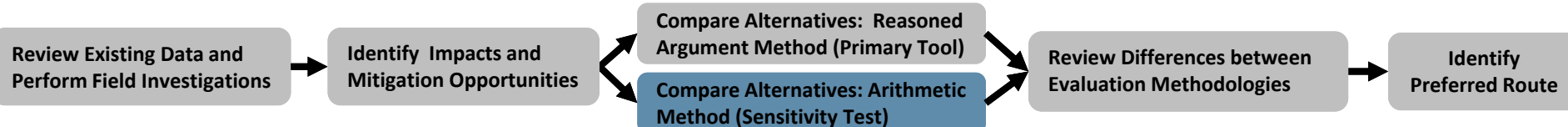
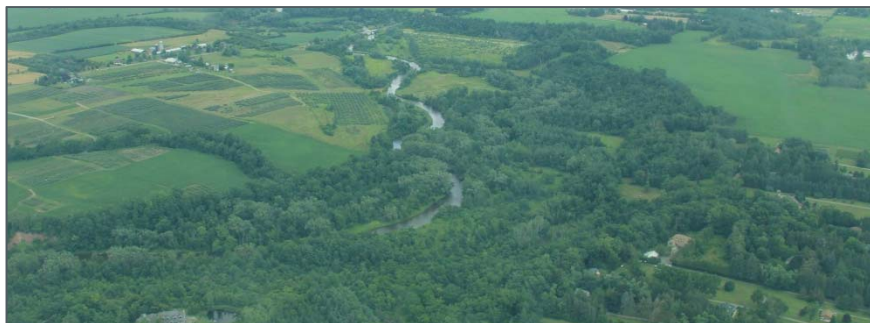




ARITHMETIC METHOD

- Rural and urban scenario weightings will be collected from each of these groups:
 - Project Team
 - Municipalities and Regulatory Agencies (May 11)
 - Public (June 18 - July 31)
 - First Nation and Métis Communities (Summer)
 - Community and Greenbelt Transportation Advisory Groups (May 7)

- The arithmetic method will be run for each group
 - Results from all groups incorporated so that all perspectives are captured



Consultation





COMPARE RESULTS

- If the results of the reasoned argument method (qualitative) and arithmetic method (quantitative) scenarios are consistent – evaluation is confirmed
- If there are significant differences, the project team will revisit the rationale in the reasoned argument method
- The results of the reasoned argument method and the arithmetic scenarios will be available for review at PIC #2 (December 2015)

