

Parametrix

Enhancing Multi-Objective Utility Planning with Decision Tree Screening

American Water Works Association
Pacific Northwest Section

2026 AWWA PNWS | Tacoma, WA
May 7, 2026

Simplifying Alternative Screening on Complex Projects

- Why This Matters
  - Making Clear Defensible Decisions Can Be Challenging
  - Overcoming Delayed Decisions and Rework
  - Reduced Clarity of Communication
- Beneficial Outcomes
  - Better Focus on Key Decision Points
  - Visual Clarity
- Decision Tree One Example vs Cumbersome Spreadsheets/Matrix



Presentation Outline



- Purpose and Background
- BCA/MODA Overview
- Decision Tree Screening Approach
- Lessons Learned

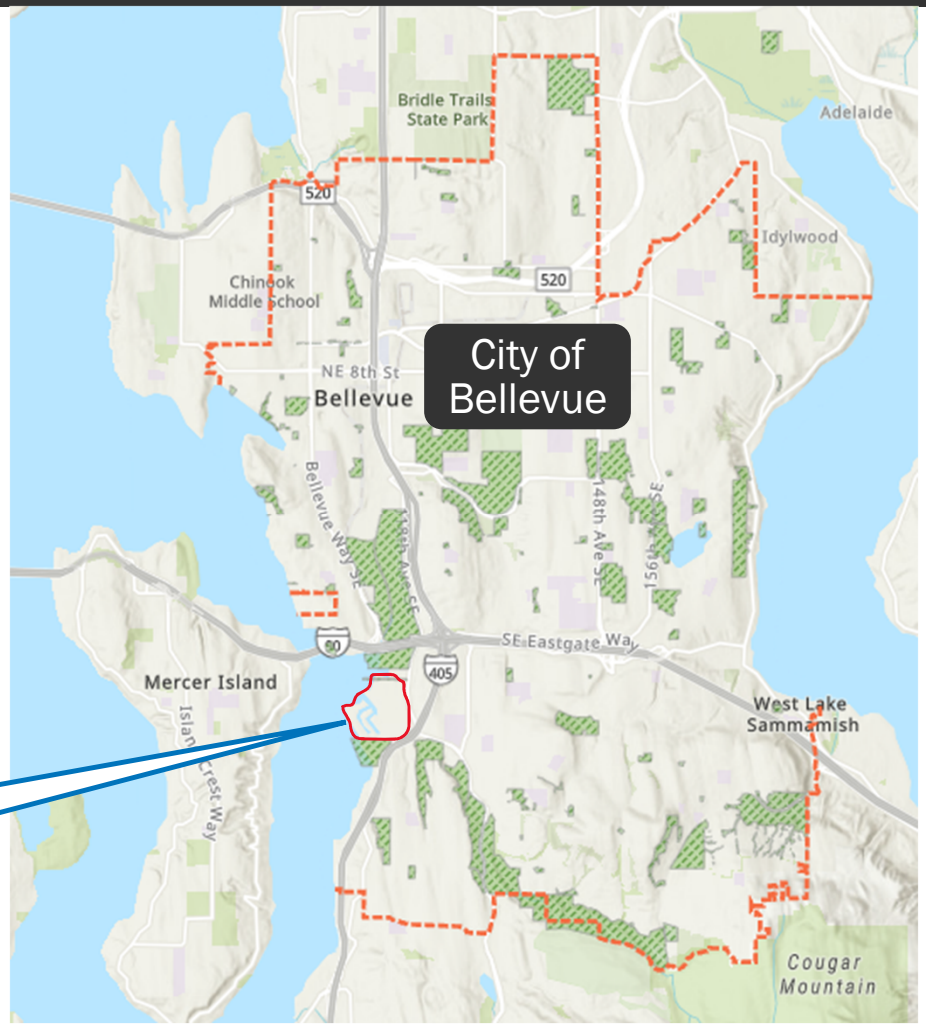
BCA – Business Case Analysis
MODA – Multi Objective Decision Analysis

Project Background

- City of Bellevue's Business Case Analysis Process
  - Make Responsible Capital Infrastructure Decisions
- S-16 Newport Shores Project



Background – The Project Location



Newport Shores Sewer Basin

Newport Shores Yacht Club



Parametrix

Background – The Project Elements



- Newport Shores Sewer Basin
- Newport PS
- Newport LS
- Gravity Canal Crossing

Project Context

- Aging Infrastructure Beyond Useful Life
- Capacity Constraints
- Operational Risks
- Construction Complexities





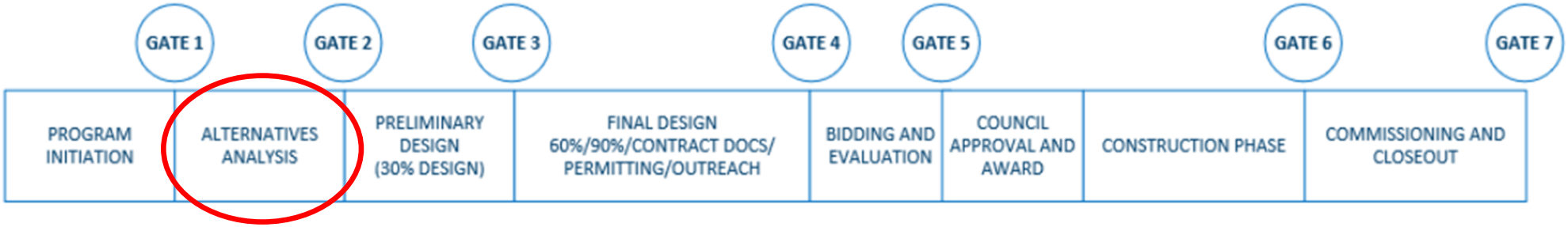


Typical BCA Approach

- Development of Alternatives
- Target is 4 to 8 Alternatives
- Screening Analysis >10 Alternatives

4. Develop Alternatives

- ✓ Conduct brainstorming session
- ✓ Determine consequences of no action/limited action alternative
- ✓ If more than 10 alternatives, conduct screening analysis
- ✓ Do strategy stable for Multi-Decision Alternatives
- ✓ Calculate life cycle costs (NPV) for each alternative



The Complexity Snapshot

- Multiple Wastewater Infrastructure Elements
  - PS, LS, FM, and Gravity Mains
- Lake Washington Canal Crossing
- Tight ROW and Subsurface Risks
- High-end Home Community





Why Alternatives Lists/Matrices Are Challenging

- Not Independent Alternatives ➡ Interdependent System Decisions
- Every Choice Affects Another in Some Way
- How to Focus and Narrow Alternatives to Consider

	Asset								
	Newport Pumps Station		Newport Lift Station			Newport PS FM	10" Dry FM	Gravity Sewer Cascade Keys	
Alternative	Retrofit Existing Pump Station	In-place Replacement	Retrofit Existing Lift Station	In-Place Replacement	New Lift Station Location Replacement	Parrallel Replacement	Connection to Newport LS	Replace Gravity Sanitary - Maintain Canal Crossing, Maintain Canal Crossing	Replace Gravity Sanitary Sewer - Flow to LS, Abandon Canal Crossing
Combination 2	x		x			x		x	
Combination 3		x		x		x		x	
Combination 4	x			x		x		x	
Combination 5		x	x			x		x	
Combination 6		x			x	x	x		x
Combination 7		x			x	x	x		x
Combination 8		x			x	x		x	
Combination 9									
Combination 10									

Parametrix

The Real Problem

- The Potential For Too Many Alternative Combinations
- MODA Goal ➡ 10 Alternatives or Less
- Misalignment Across City Core Team



"Of course we can make fast decisions ... once we have considered the 4872 factors."

This Photo by Unknown Author is licensed under CC BY-NC-ND

Parametrix

Why This Matters

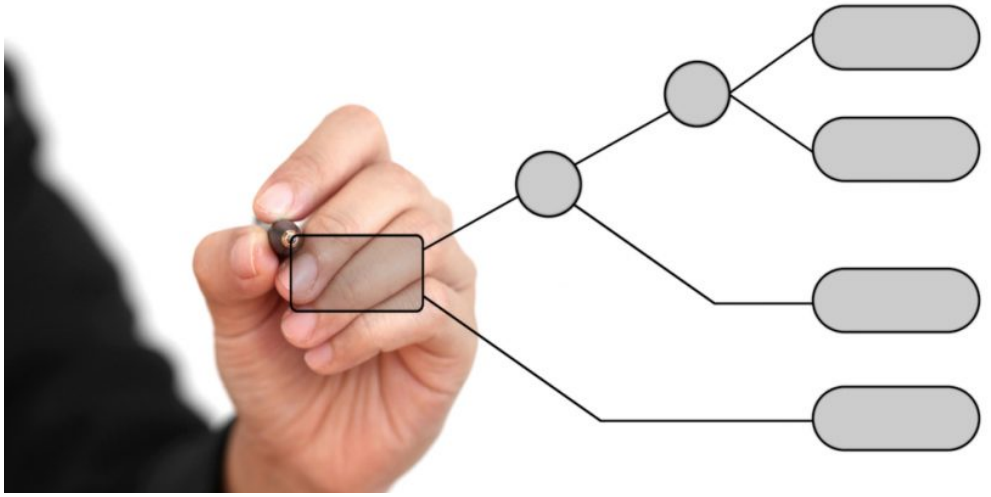
- Unclear Alternative Screening Structure
- Delayed Decisions and Rework
- Reduced Clarity for Leadership



Decision Trees:
An Approach to Screen Alternatives Before Evaluation

- Narrowing Alternative Combinations
- Alternative Screening Structure
- Evaluation Fatigue





It uses a **"divide and conquer"** approach to break complex decision-making into a series of simpler, binary (or multiple) choices.

Parametrix

Decision Trees: Controlling Complexity Before Analysis

The Issue

- Alternatives being defined too early
- Combinations explosion (LS+PS+FM+canal crossing)
- No clear structure for eliminating infeasible paths

The Shift

- Define decision points first, not alternatives
- Break problem into key decision points
- Eliminate infeasible branches (options) early
- Carry forward only viable options and alternatives

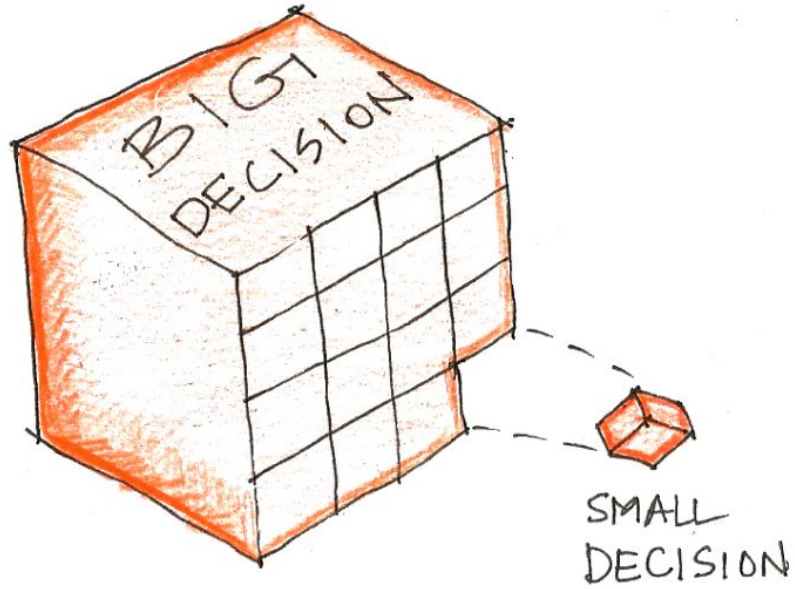
Key Decision Points

- What Risks and Challenges Need to be Addressed
  - Canal Crossing
  - Newport LS Location
  - FM Alignment



Focus Areas

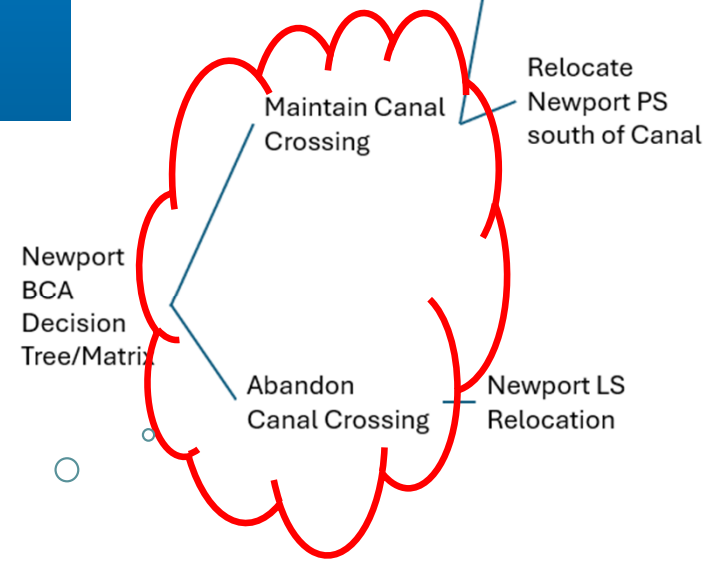
- Break Into Smaller Elements
  - Defined Project Areas
  - Alternatives/Options by Project Area
  - Phasing Considerations
  - Noted Alignment of Project Areas



Parametrix

Decision Tree Progression

- Key Decision Points
  - Canal Crossing

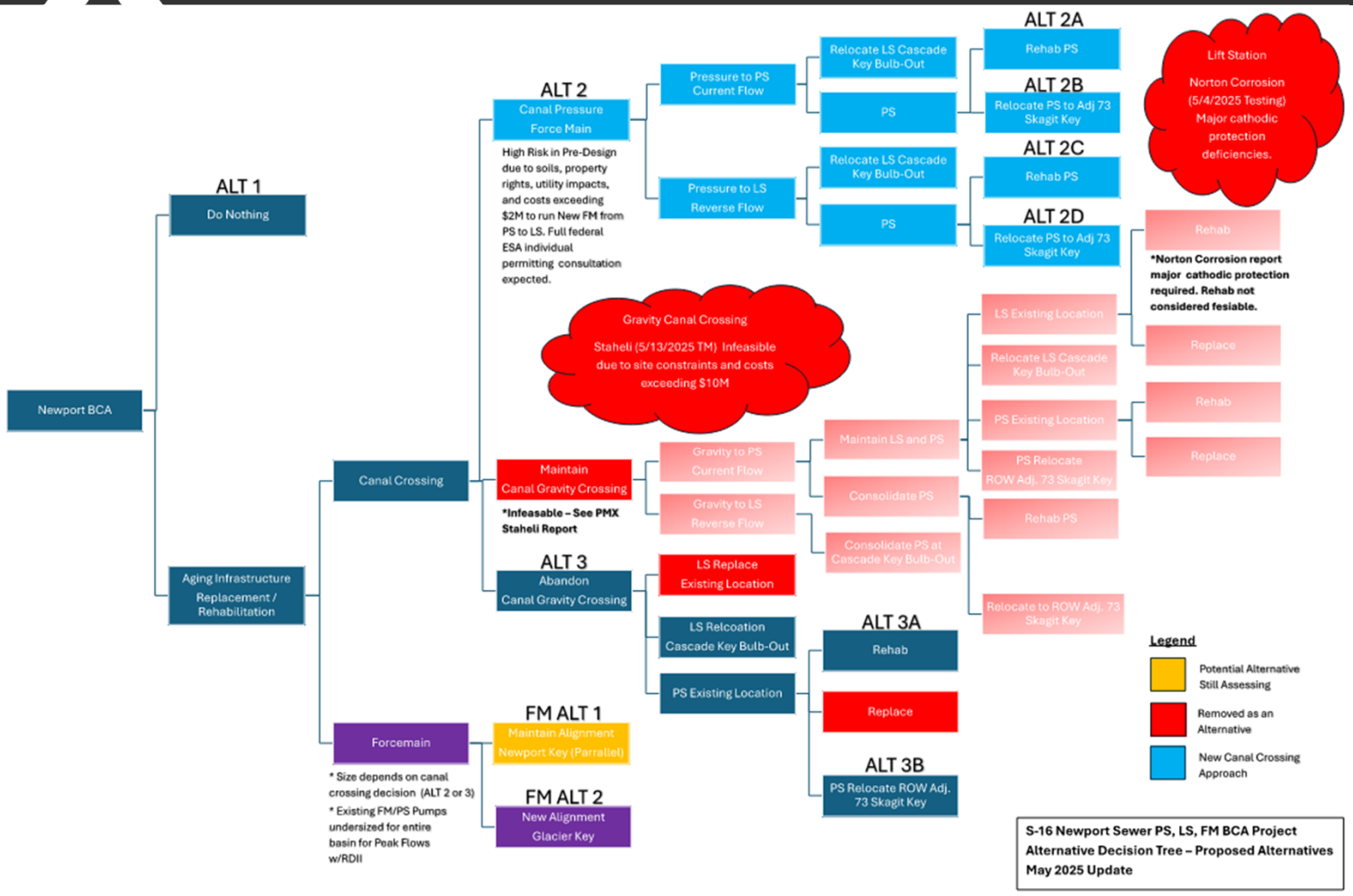


Key Decision Point

Newport BCA Decision Tree

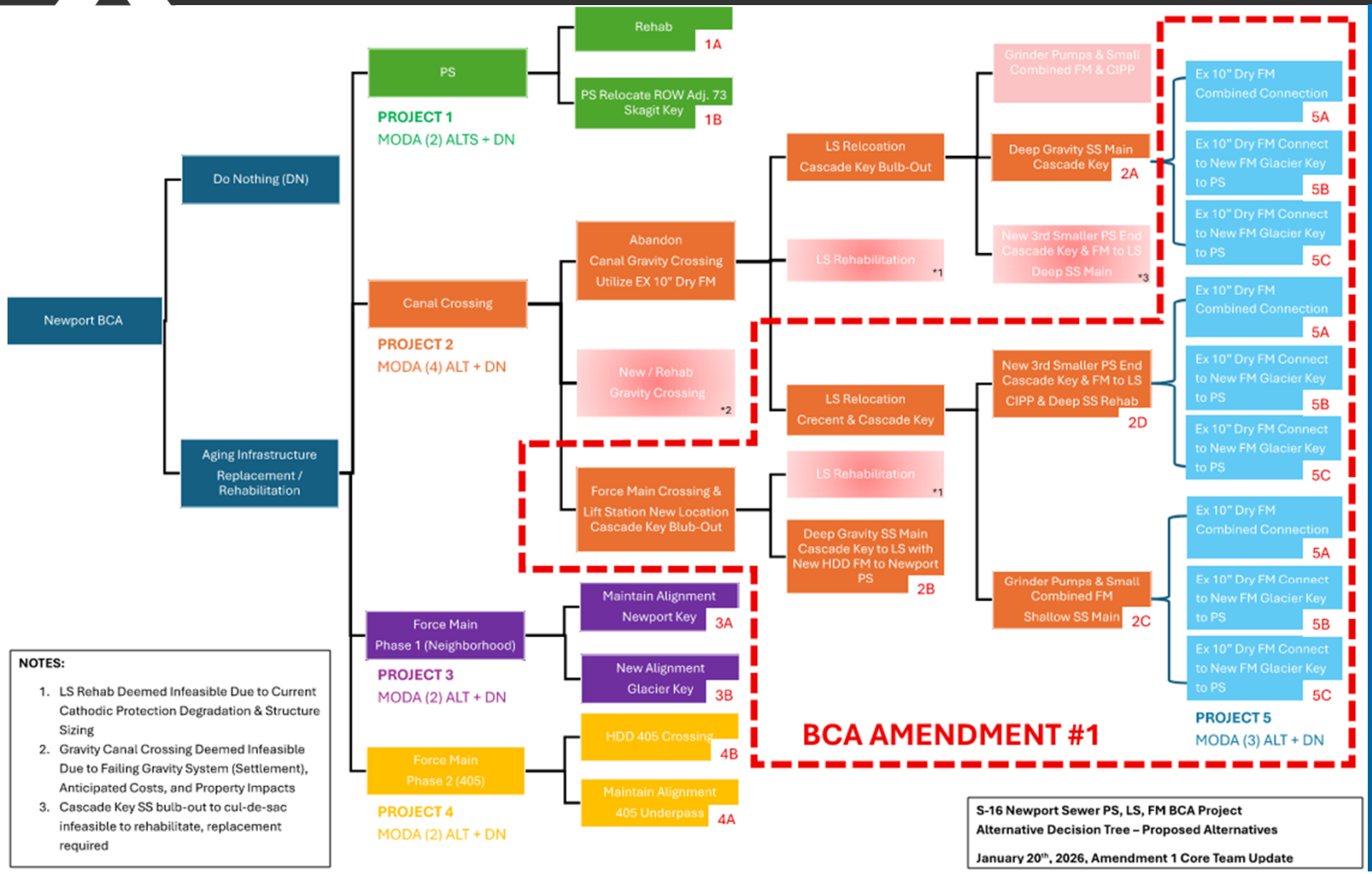
Parametrix

Decision Tree Progression



- Screening in Action
- Before vs After

Decision Tree Progression



NOTES:

1. LS Rehab Deemed Infeasible Due to Current Cathodic Protection Degradation & Structure Sizing
2. Gravity Canal Crossing Deemed Infeasible Due to Failing Gravity System (Settlement), Anticipated Costs, and Property Impacts
3. Cascade Key SS bulb-out to cul-de-sac infeasible to rehabilitate, replacement required

S-16 Newport Sewer PS, LS, FM BCA Project
Alternative Decision Tree – Proposed Alternatives

January 20th, 2026, Amendment 1 Core Team Update

- Final Screened Alternatives

What Changed

- Fewer Alternatives Entering the MODA Process
- Clear Tradeoffs
- Visual Narrative
- Faster Alignment ➡ Clear Recommendation
- Stakeholder Alignment



Parametrix

Lessons Learned

- Sometimes Simple Best
- Focus on Decision Points, Not Alternatives
  - What Challenge Needs to Addressed
- Break Into Smaller Elements
- Screen Early, Not Late
  - Need Stakeholder Buy-in
- Communication is Paramount
  - Visual Clarity
  - High-Level Overview and Summary



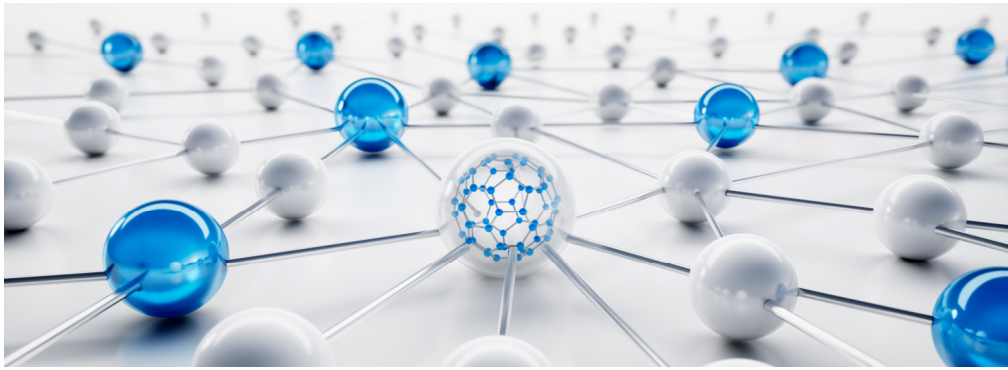
ParametriX

Transferability

- Keep it Simple
- Determine Key Decision Points
- Breakdown Into Smaller Elements
- Clear Communication



"**Better decisions** don't come from more analysis—they come from **better structure**"



Questions?



Contact:
Joe Foote, PE, PMP – JFoote@parametrix.com