MAY 7, 2026

Successful Implementation of a Condition Assessment Program

SCOTT JAUCH
EMPLOYEE OWNER
CONDITION ASSESSMENT REGIONAL PRACTICE LEAD

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Agenda

01	02	03	04
Risk-based Investment Planning	Effective Infrastructure Assessment	Implementation of Infrastructure Programs	Importance of Data

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What is Risk-based Investment Planning?

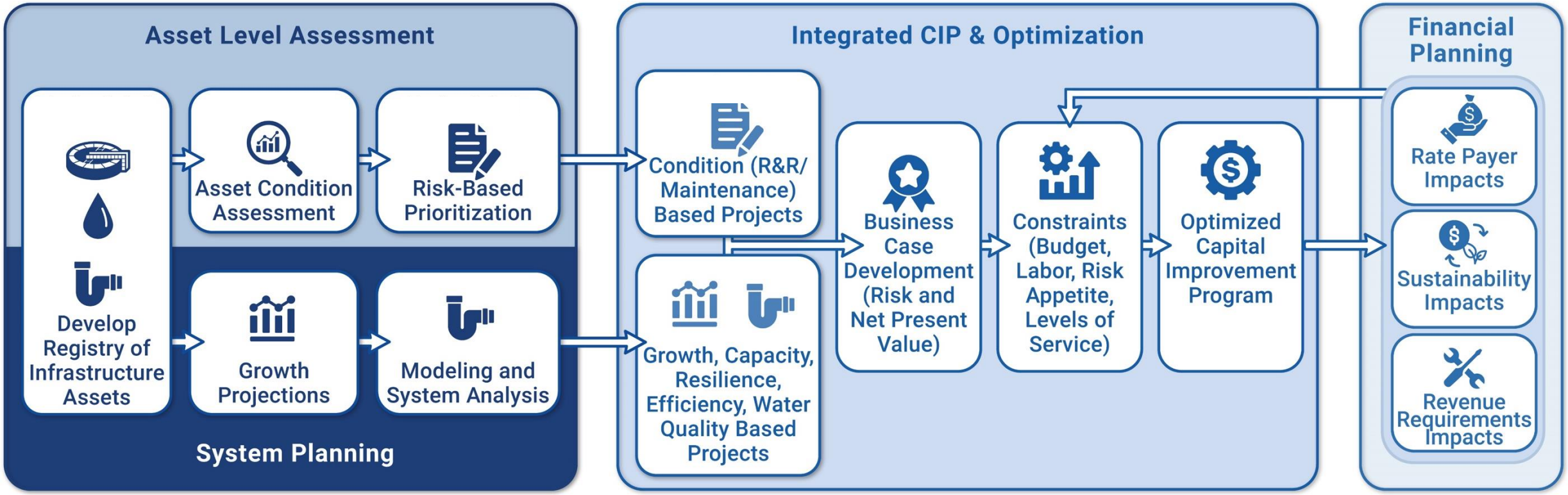
The Need for Robust, Risk Based Planning



- Operations & Maintenance Costs
- Investment Targets
- Impact of Construction Delays
- Funding Types
- Levels of Service
- Demand
- Aging Infrastructure
- Safety

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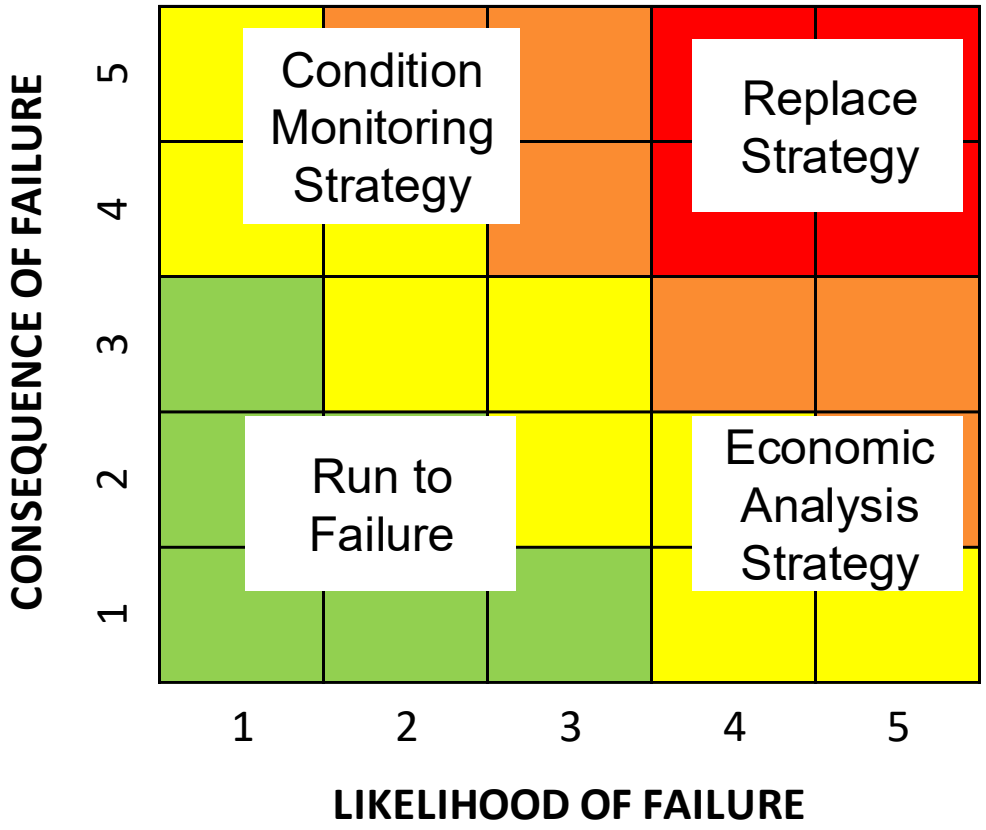
Risk-based Investment Planning Approach



Risk Model to Target Maintenance, Rehab, & Replacement

Consequence of Failure	Probability of Failure 1	2	3	4	5
5	33	195	196	99	167
4	491	103	432	41	268
3	442	467	33	460	19
2	85	171	296	456	226
1	117	188	88	2	416

Consequence of Failure	Probability of Failure 1	2	3	4	5
5	$ 106	$ 624	$ 627	$ 317	$ 534
4	$ 1,571	$ 330	$ 1,382	$ 131	$ 858
3	$ 1,414	$ 1,494	$ 106	$ 1,472	$ 61
2	$ 272	$ 547	$ 947	$ 1,459	$ 723
1	$ 374	$ 602	$ 282	$ 6	$ 1,331

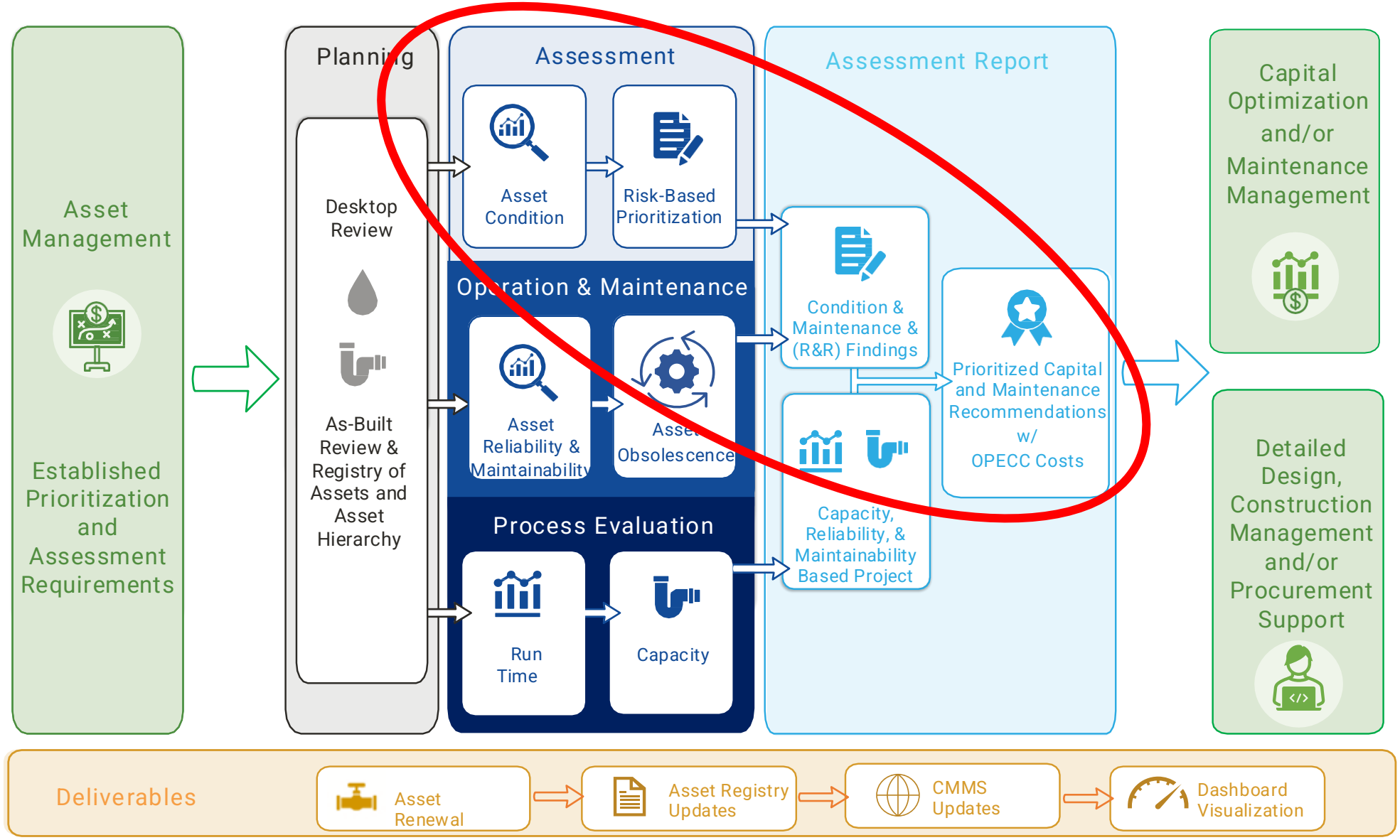


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How do I Assess Infrastructure Condition Cost Effectively?

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Condition Assessment Approach



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Condition Assessment Drivers

Needs-Driven:

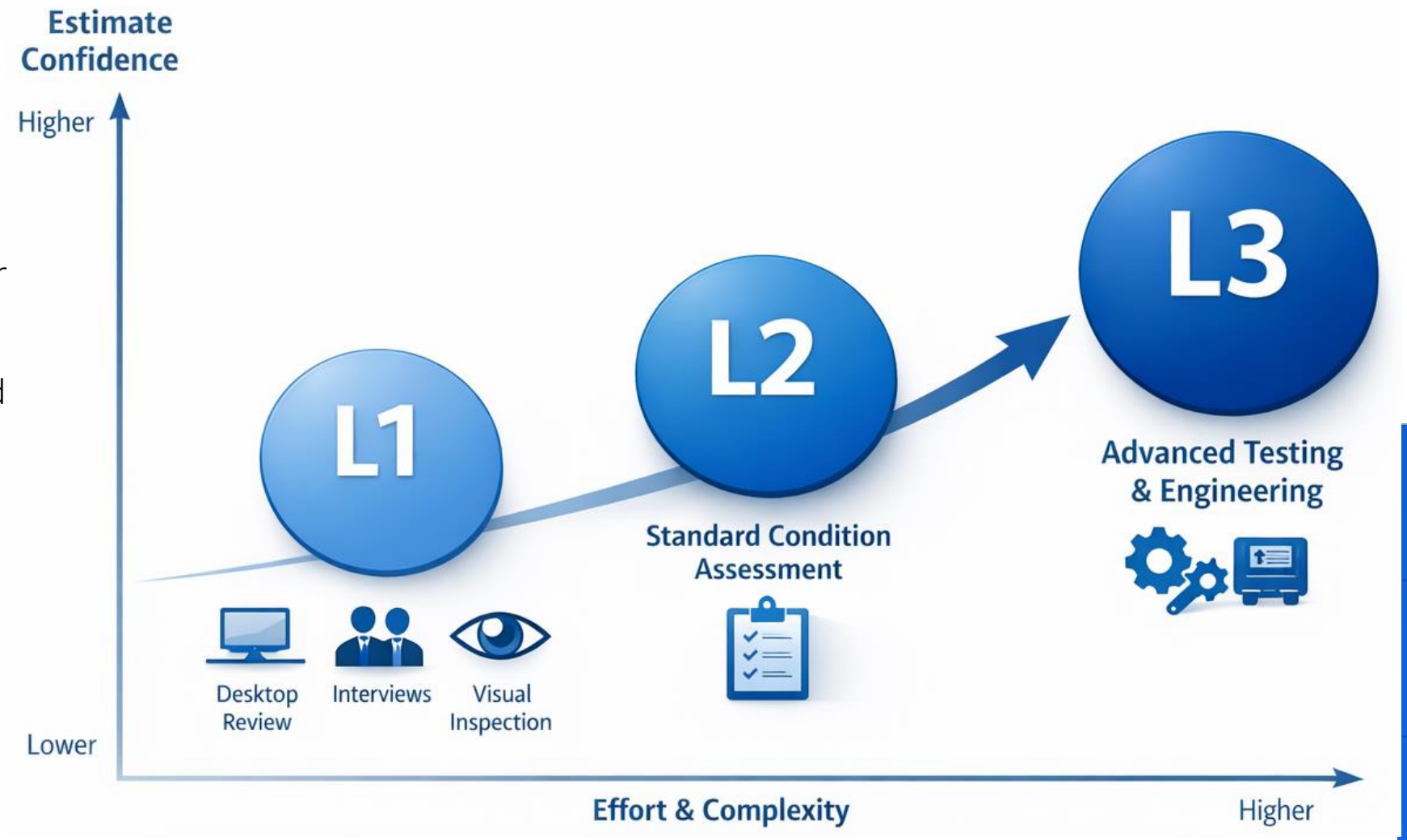
Tailored LOS definitions aligned to your goals or regulatory driver

Phased Approach:

Desktop first, targeted advanced testing as needed

Value Focused:

Quantifiable data at lowest practical cost

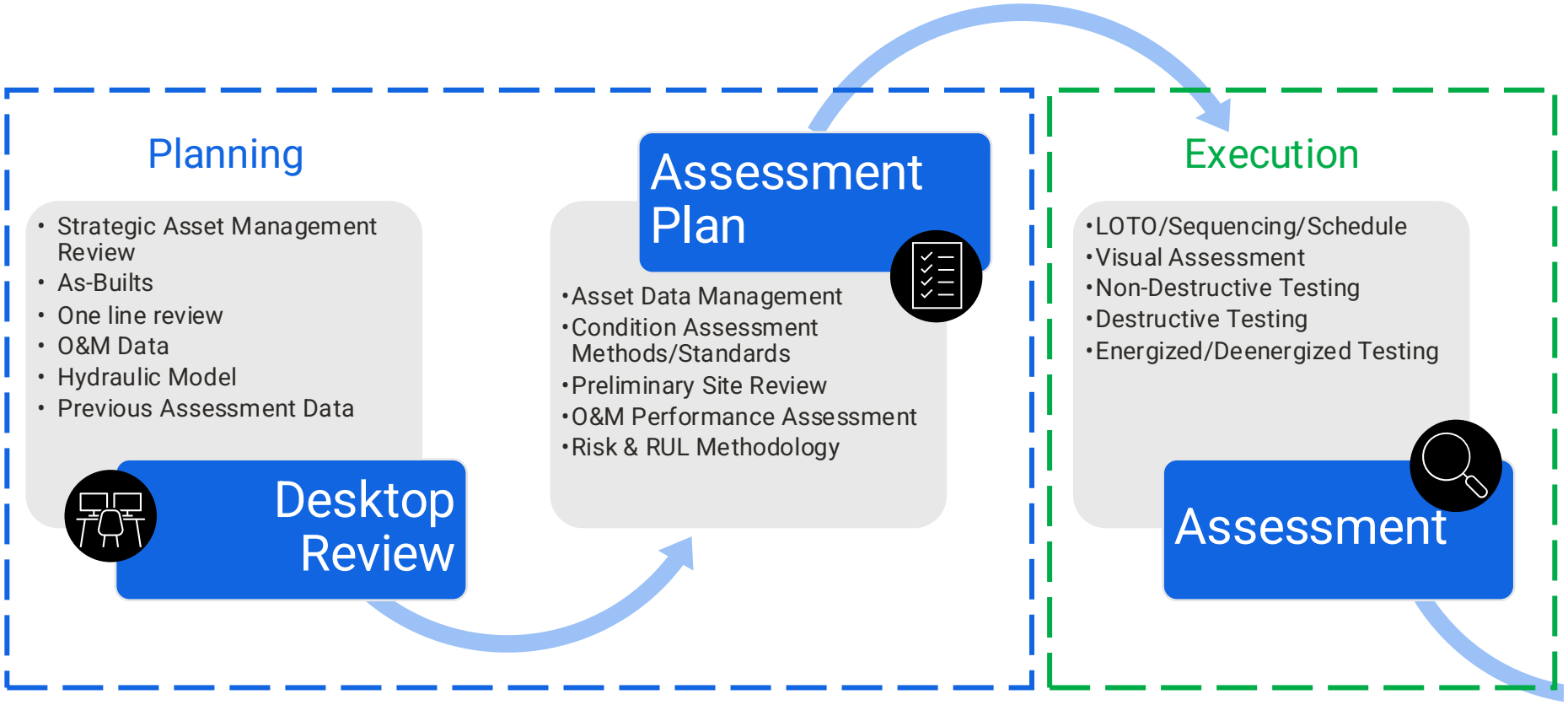


Condition Assessment Approach

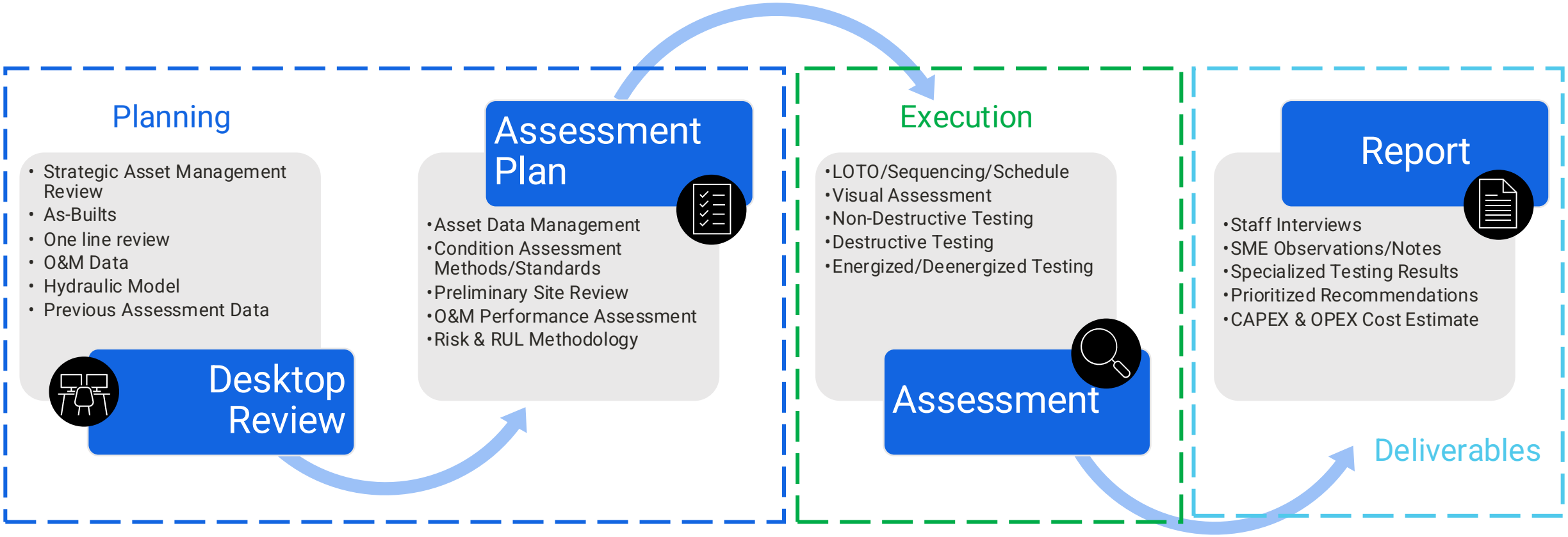
Condition Assessment Approach



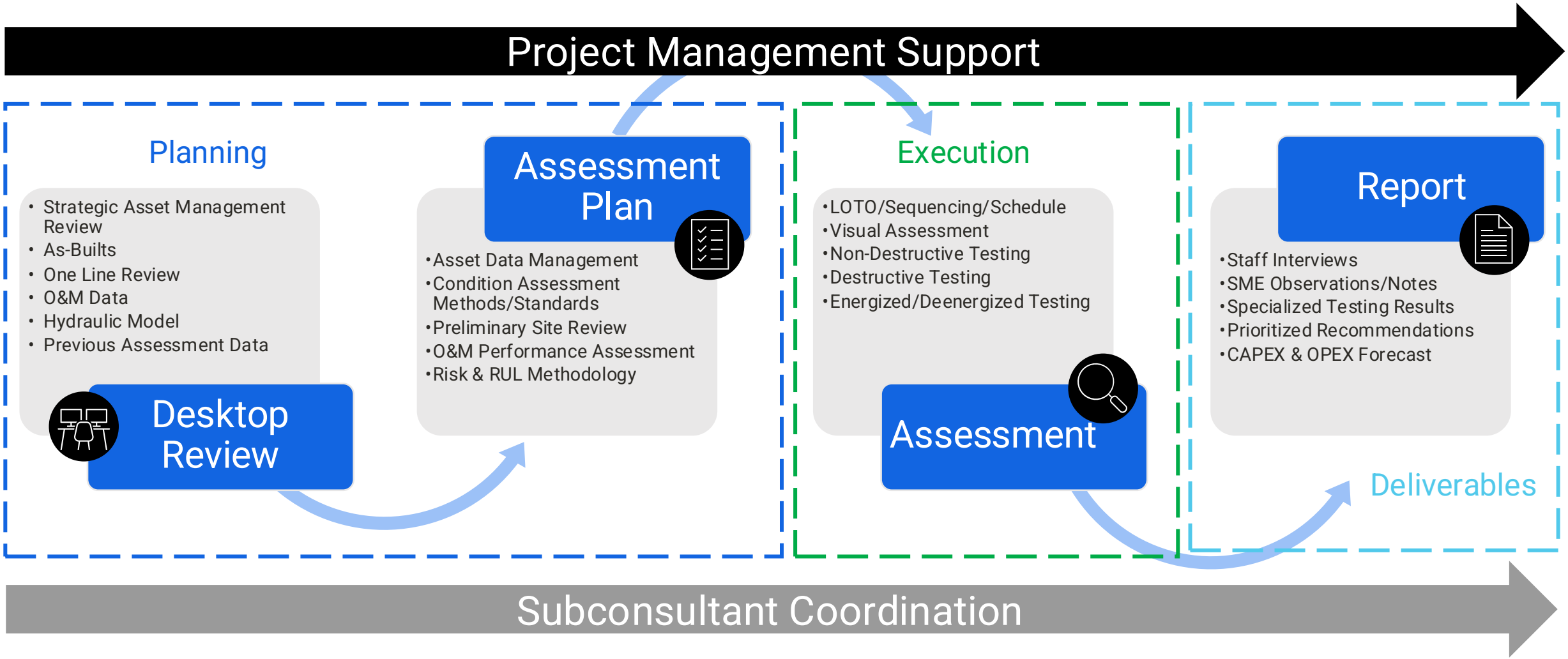
Condition Assessment Approach



Condition Assessment Approach

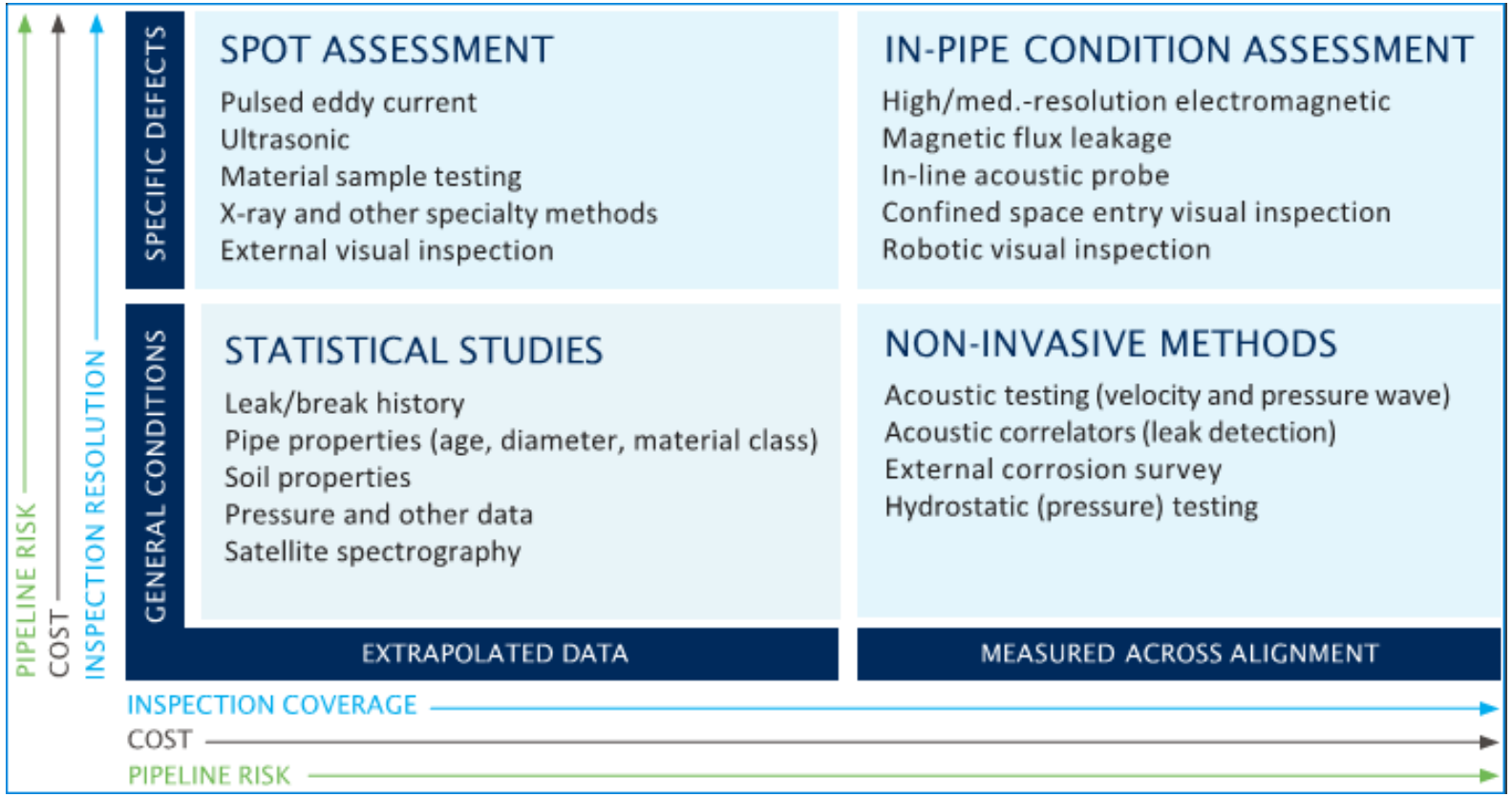


Condition Assessment Approach



Planning – Linear Assets

Inspection Technology Comparison Matrix



Assessment Plan

- Asset Data Management
- Condition Assessment Methods/Standards
- Preliminary Site Review
- O&M Performance Assessment
- Risk and RUL Methodology

Desktop Review

- Strategic Asset Management Review
- As-Builts
- One line review
- O&M Data
- Hydraulic Model
- Previous Assessment Data

Planning – Vertical Assets

Inspection Technology Comparison Matrix

Asset Class	Visual Inspection	Infrared Thermography	Vibration Analysis	Oil Analysis	Dissolved Gas Analysis	Motor Circuit Analysis	Switch Operability	Insulation Resistance	Contact Resistance	Load Testing	Breaker Testing	Hi-Pot Testing	Doble Testing
Breaker	■						●		●		●		
Instrument	■												
Controls	■												
Generator	■		●	●						◆			
MCC	■	●						◆	◆			◆	
Meter	■												
Motor	■		●	●		●							
Motor Starter Control	■	●						◆	◆				
Panel	■	●											
Switchgear	■	●					●	●	●			◆	
Transformer	■			●	●							◆	◆
Transfer Switch	■						●	●	●		●		
UPS	■									◆			

■ L1 Visual Assessment
● L2 Baseline Assessment
◆ L3 Specialized Assessment

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Planning – Vertical Assets

Inspection Technology Comparison

Assessment Method	Asset State	Cost	Information Obtained
Visual Inspection	In-service	Low	Identifies visible defects such as overheating signs, insulation damage, corrosion, and loose connections.
Infrared Thermography	In-service	Low	Detects abnormal heat patterns caused by loose connections, overloads, or failing components.
Vibration Analysis	In-service	Low	Identifies mechanical imbalance, misalignment, and bearing issues in rotating electrical equipment.
Oil Analysis	In-service	Low	Evaluates contamination, moisture, and dielectric health of insulating oil.
Dissolved Gas Analysis	In-service	Low	Detects electrical and thermal faults inside oil-filled transformers by analyzing fault gases.
Motor Circuit Analysis	Out-of-service	Medium	Identifies stator, rotor, insulation, and circuit weaknesses in electric motors.
Switch Operability	Out-of-service	Medium	Verifies proper movement, function, and responsiveness of electrical switching devices.
Insulation Resistance	Out-of-service	Medium	Measures insulation health by detecting moisture, deterioration, or contamination.

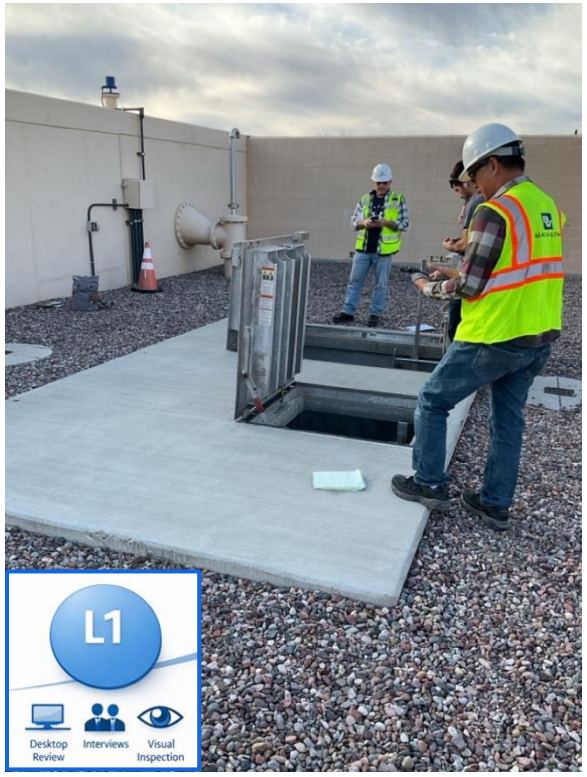
Assessment Plan

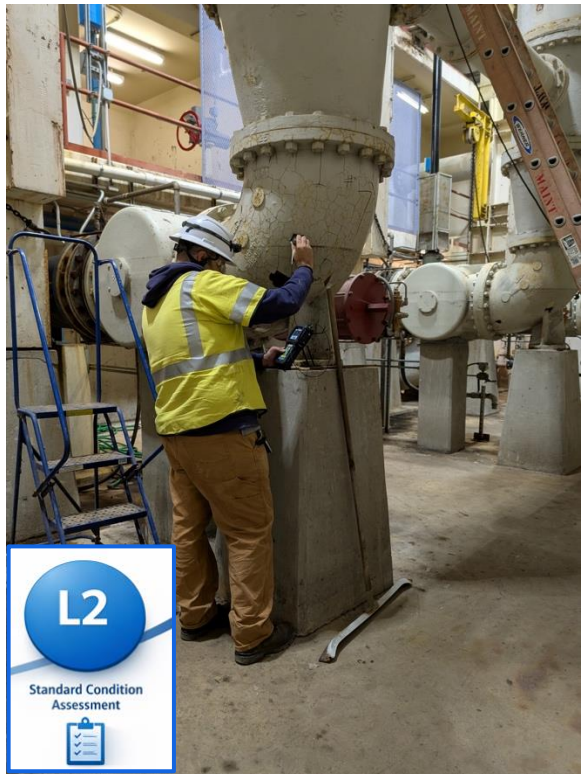
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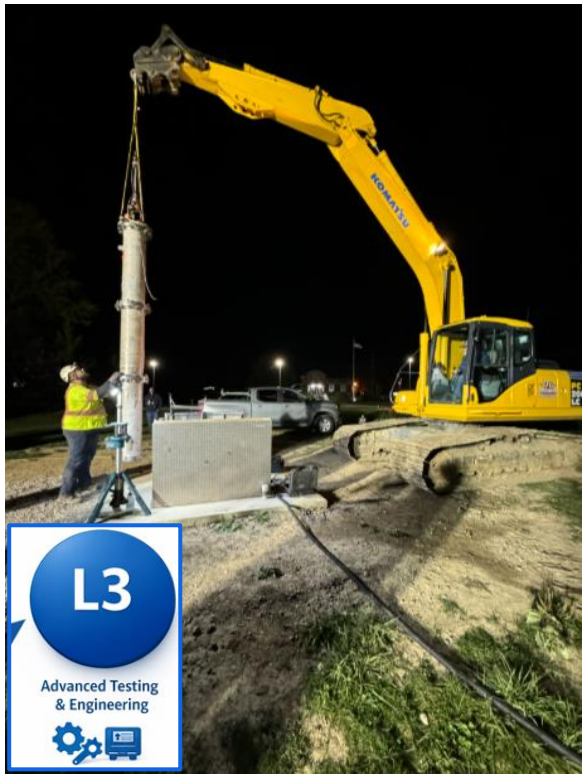
Desktop Review

- Strategic Asset Management Review
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- O&M Data
- Hydraulic Model
- Previous Assessment Data

Execution







- LOTO/Sequencing/Schedule
- Visual Assessment
- Non-Destructive Testing
- Destructive Testing
- Energized/Deenergized Testing

Assessment

Execution

Maintenance of Plant Operations (MOPO):

Step by step procedure for execution of inspection & operational activities broken down into the following:

- Maintaining operations during outage (e.g., flow diversion)
- Isolation plan (e.g., LOTO)
- Step-by-step work sequencing while preparing for & inspecting the asset (e.g., tool insertion & extraction)
- Return to service activities (e.g., flushing)

CITY OF ELYRIA

48" PCCP Electromagnetic Inspection
Shutdown & Inspection MOPO

		Date MOPO submitted:	1/9/2024
		Project Start Date	6/4/2024
		Approximate Duration	35 Hours

DRAFT

City of Elyria - 48-inch PCCP Transmission Main		MOPO written by:	Adam Covey (Black & Veatch)
Pipe length/volume:	3.9 miles of 48 inch, 2.0M gallons	Phone:	440-785-8868
Site/Location:	3628 W Erie Ave, Lorain, OH 44053 to Cooper Foster Park Rd, Lorain, OH	**City Project Manager**	**Stephen Canfield**
PROJECT #:	**414869**	Phone:	440-935-3012

Pre-work Items

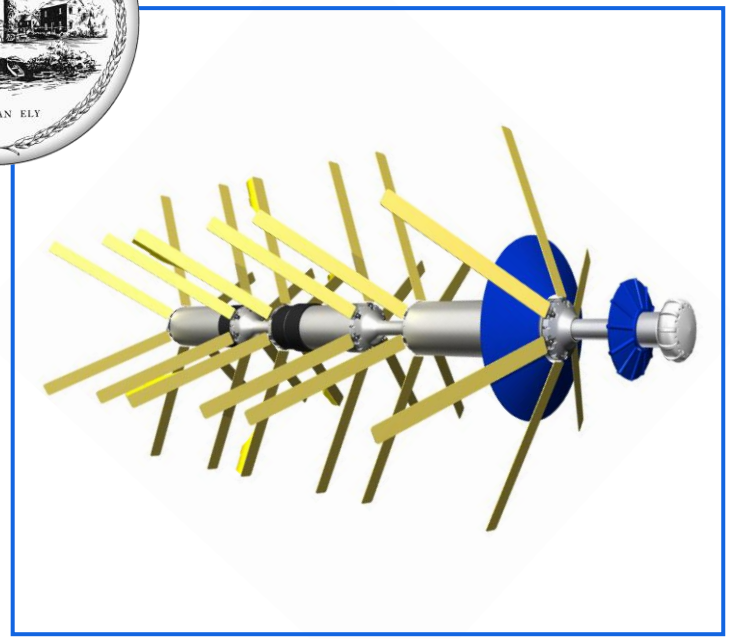
	Activity	Start Time	Date	City of Elyria / Black & Veatch / Pure Technologies

Retrieval Net Set Up

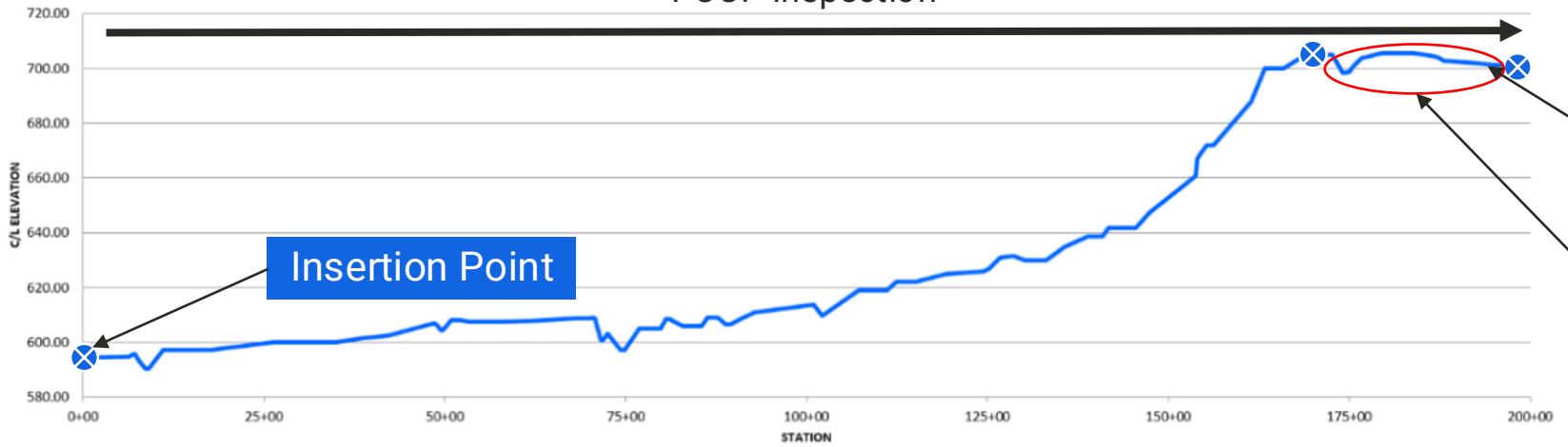
Item	Activity	Start Time	Date	City of Elyria / Black & Veatch / Pure Technologies
1	**To Maintain Supply and Flush a Dead End Main** Begin flushing hydrants on Avon Lake Interconnection	7:00 AM	Tuesday, June 4, 2024	**City of Elyria Crew 1** **(Crew Contact Name XXX-XXX-XXXX)**
2	Slowly open 20" and 24" gate valves to open the Avon Lake interconnection line and confirm interconnection is open	7:15 AM	Tuesday, June 4, 2024	**City of Elyria Crew 1** **(Crew Contact Name XXX-XXX-XXXX)**
3	Begin flushing hydrant west of W Ridge Rd & Milan Elyria Rd intersection **Completed Maintaining Supply Measures**	7:45 AM	Tuesday, June 4, 2024	**City of Elyria Crew 1** **(Crew Contact Name XXX-XXX-XXXX)**
4	**Begin Isolation of Southern Retrieval Section -** Slowly close 36" BFV (Butterfly Valve) at Middle Ridge Rd and Old West Ridge Rd. Allow at least 10 minutes to close	8:00 AM	Tuesday, June 4, 2024	**City of Elyria Crew 2** **(Crew Contact Name XXX-XXX-XXXX)**
5	Slowy close 36" gate valve south of Cooper Foster Park Rd. Allow at least 10 minutes to close **Completed Isolation of Southern Retrieval Section**	8:30 AM	Tuesday, June 4, 2024	**City of Elyria Crew 4** **(Crew Contact Name XXX-XXX-XXXX)**

Execution – Linear Assets





PCCP Inspection



Retrieval Point

Depressurize segment for retrieval

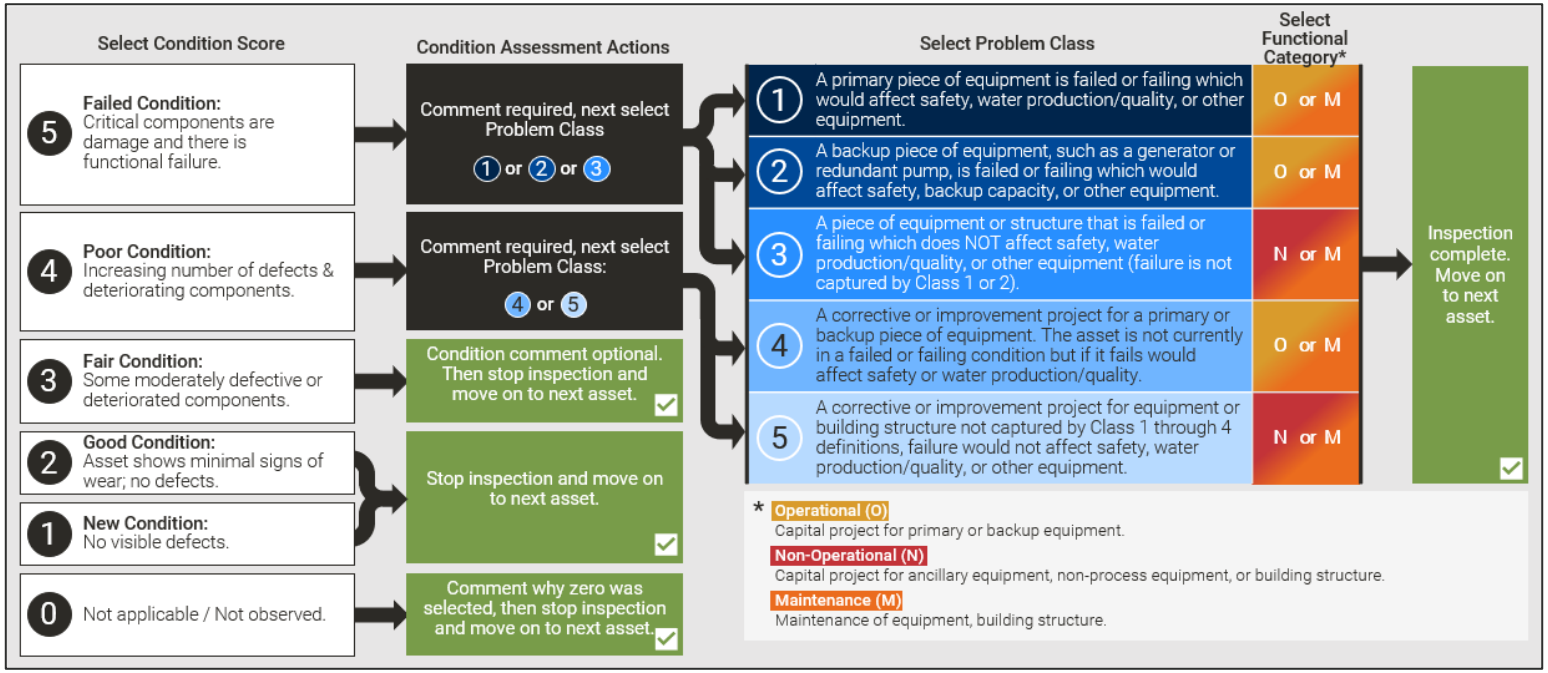
Insertion Point

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Execution – Vertical Assets

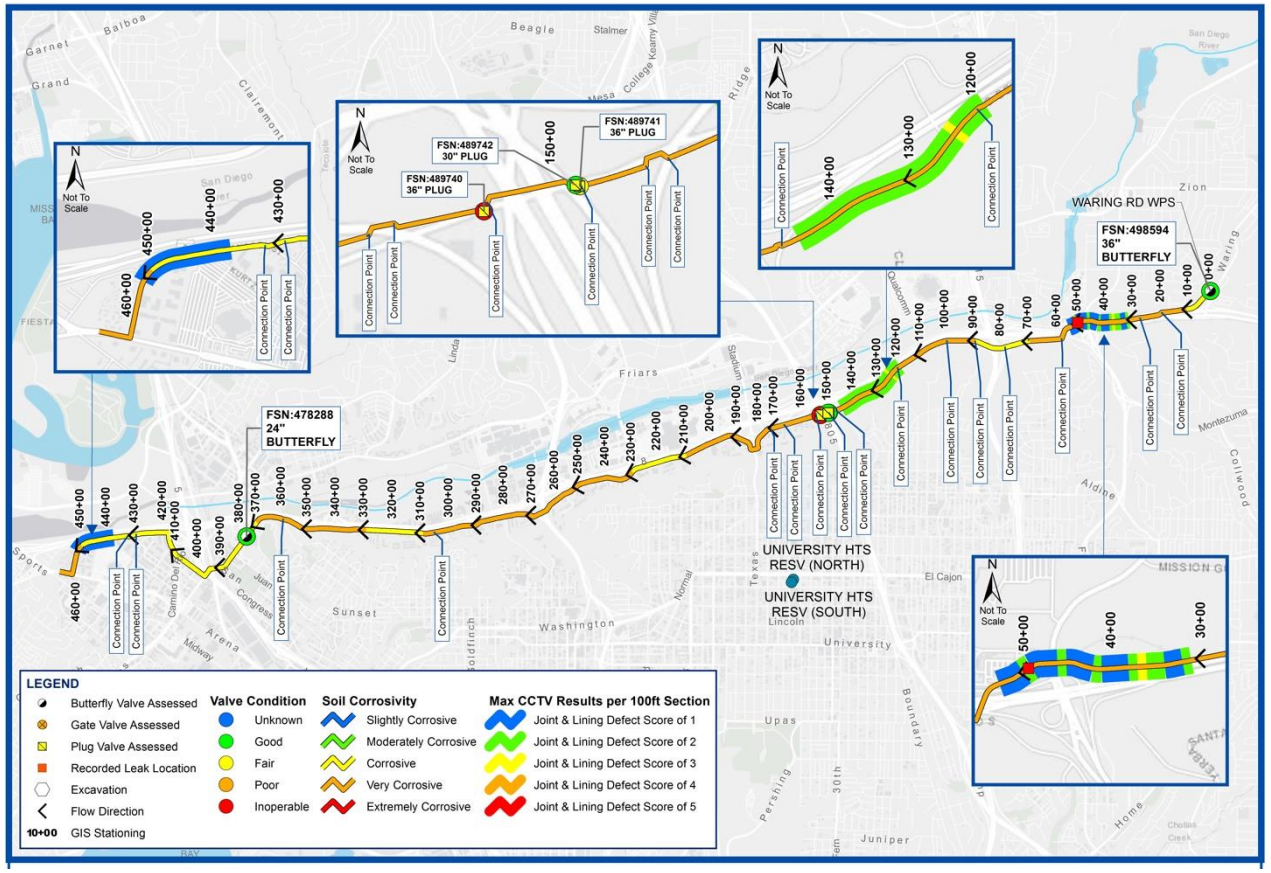






Deliverables

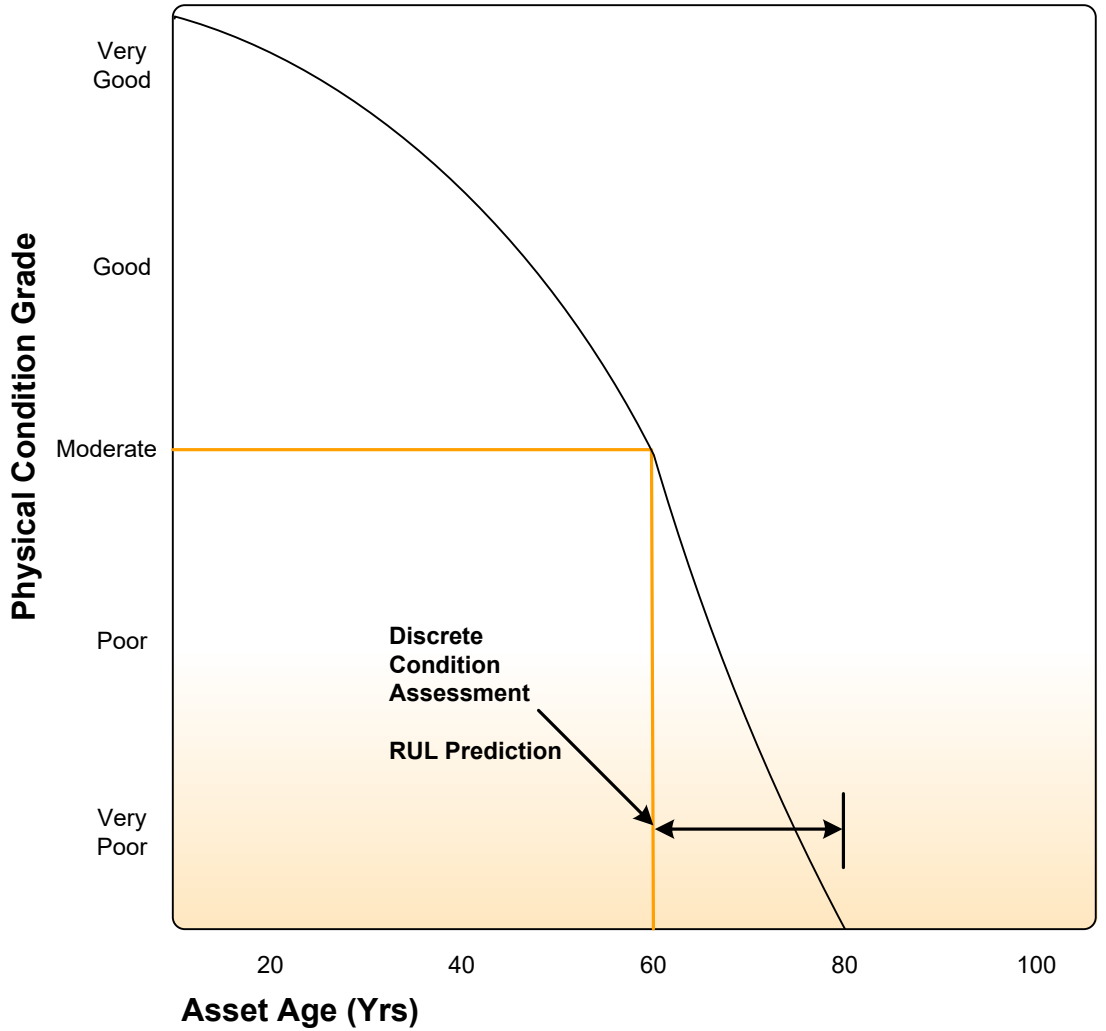
Concise Visualization of Results



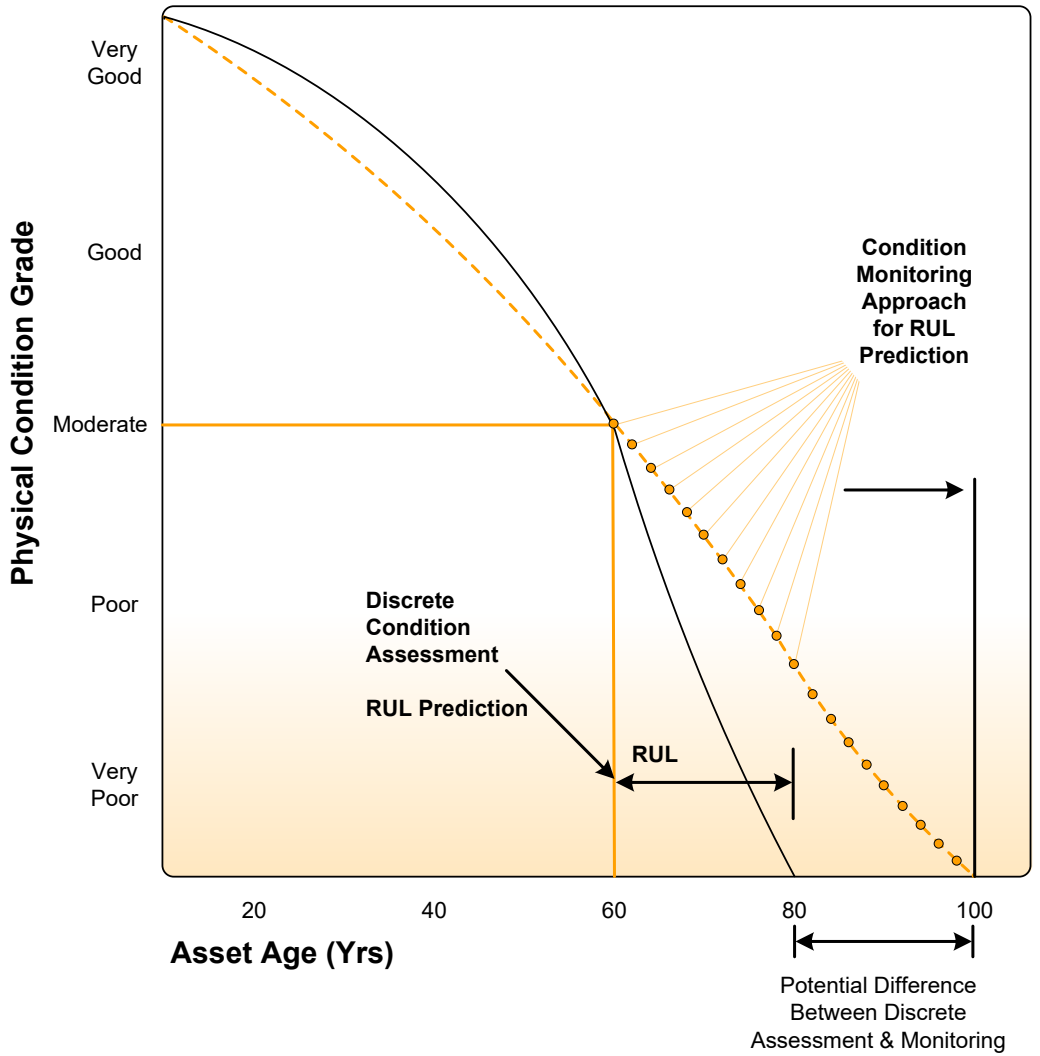
Report

- Staff Interviews
- SME Observations/Notes
- Specialized Testing Results
- Prioritized Recommendations
- CAPEX & OPEX Cost Estimate

Assessing Useful Remaining Life



Using Condition to Extend Useful Remaining Life



Condition assessment may allow deferral of replacement

4

Implementing Infrastructure Programs

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Procurement and Required Personnel

- **Dedicated Personnel**
  - Project Manager = 1
  - Engineer = 1
  - Field Support = 2 to 8

- **Statements to consider for Consultant support:**
  - Don’t have experience with infrastructure assessment.
  - First attempt at implantation of long-term management
  - Don’t have resources and/or time to devote

- **Statements to consider for Contractor support:**
  - Don’t have construction crews to support

- **Consultant support:**
  - Risk assessment
  - Assessment goals and decision making
  - Unbiased guidance
  - Data analysis and recommended repairs
  - Long-term management planning

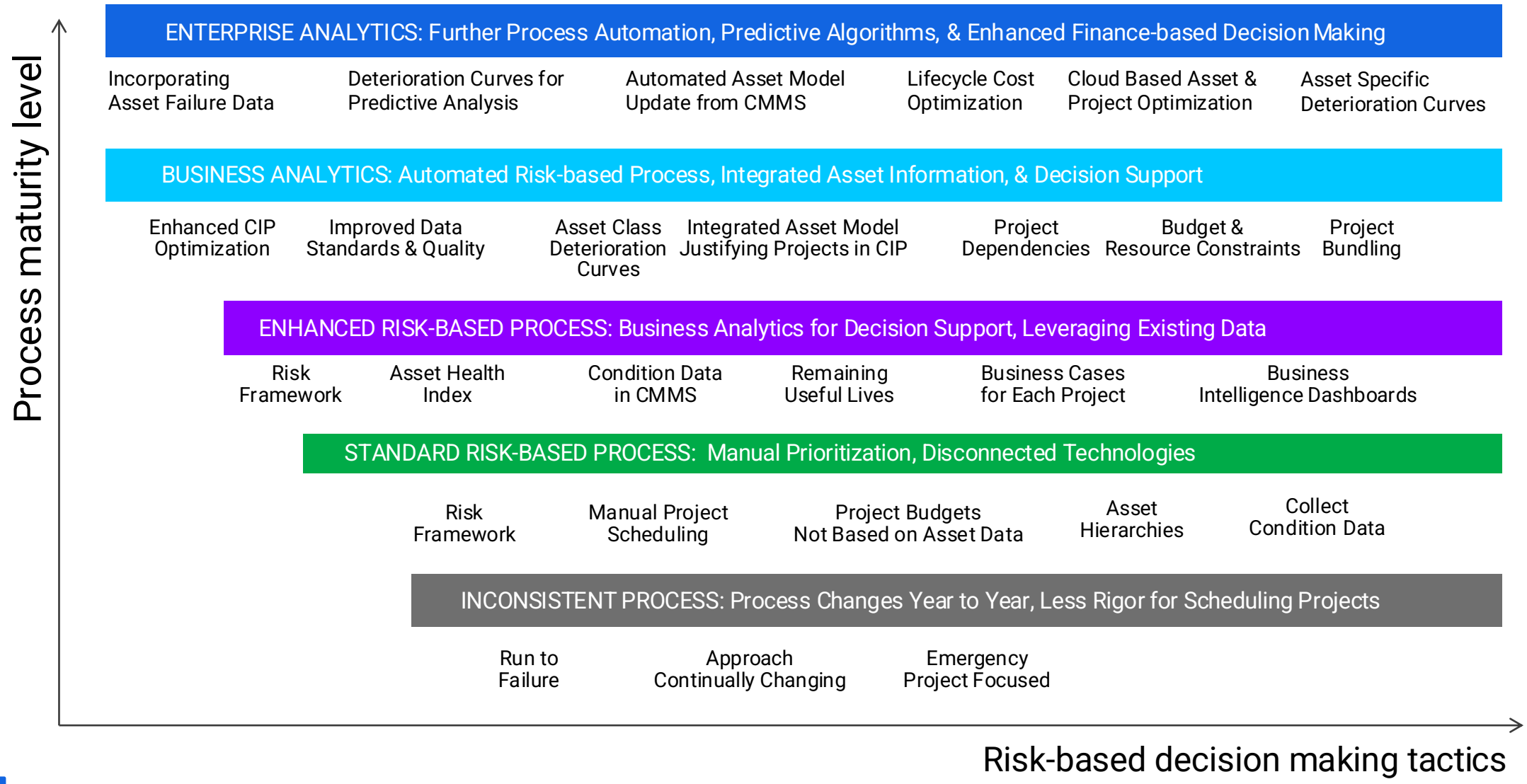
- **Contractor support:**
  - Infrastructure audits (valves, etc.)
  - Material repair and replacements
  - Civil support

4

Why Good Data Is Essential……

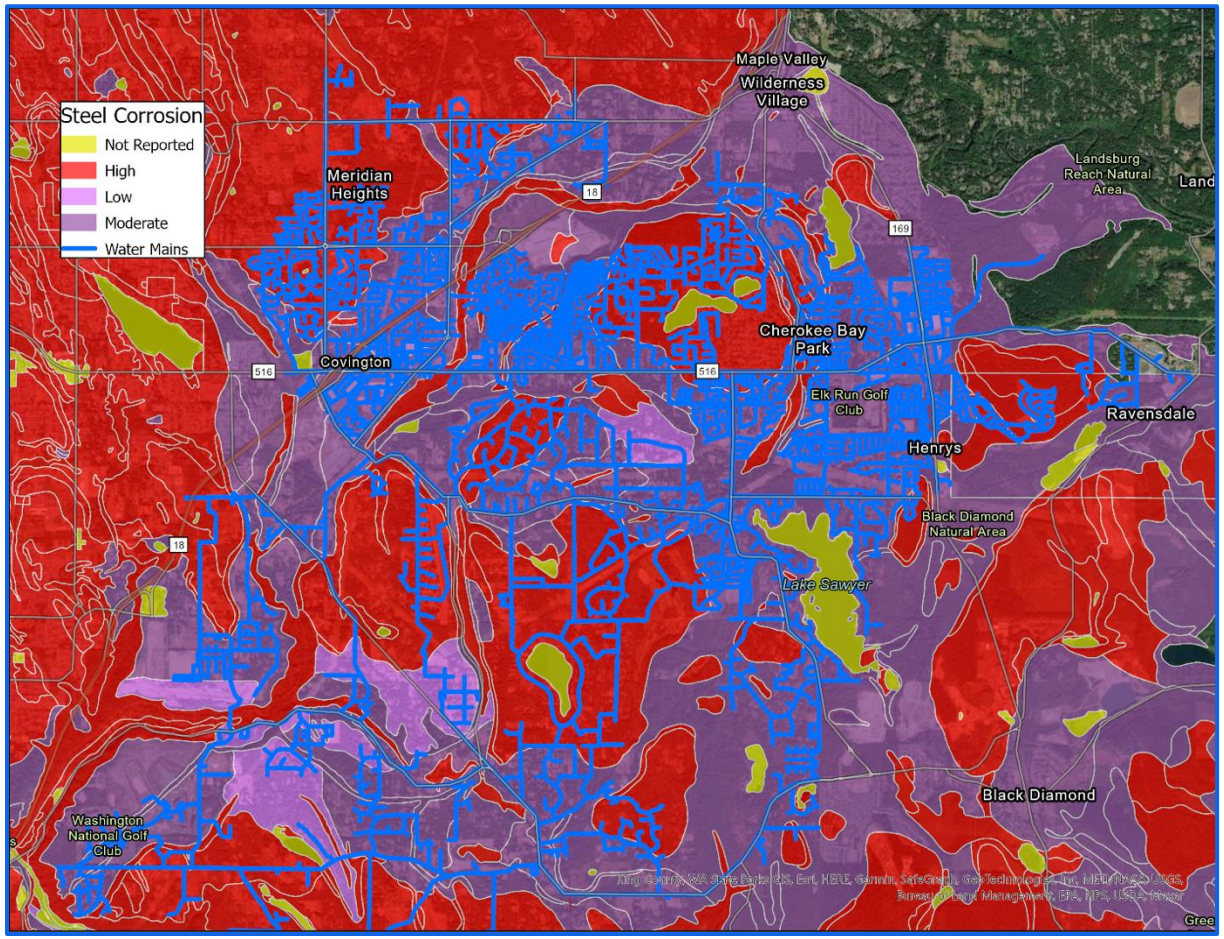
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Decision making maturity level



Leveraging Modern Prioritization Tools

Covington Water District
Vision of Tomorrow | Action Today



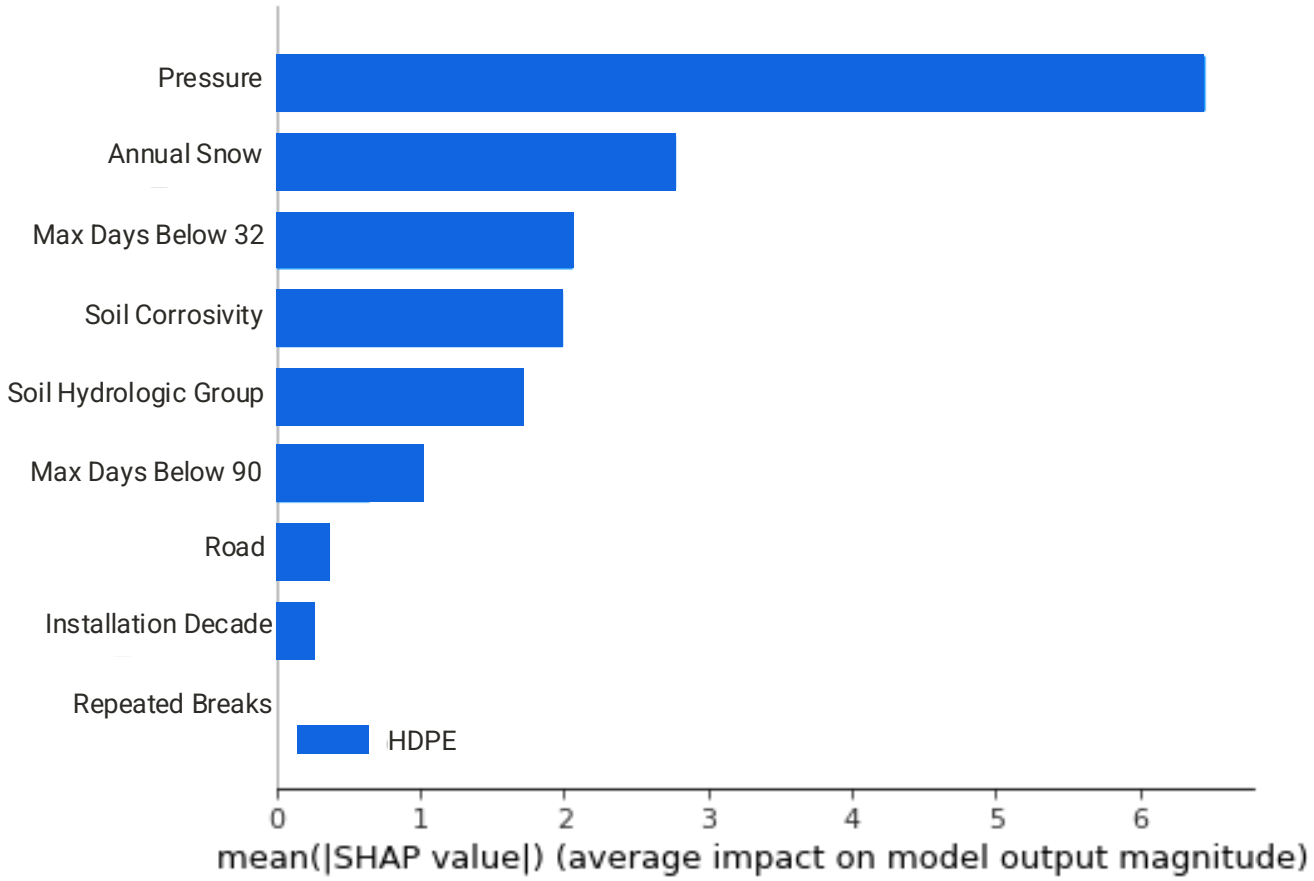
Material Type	DI	CI	PVC	AC	GALV
# of Breaks	3	3	0	0	2
# of Pipes & Service Leads	9,653	1,244	183	300	11

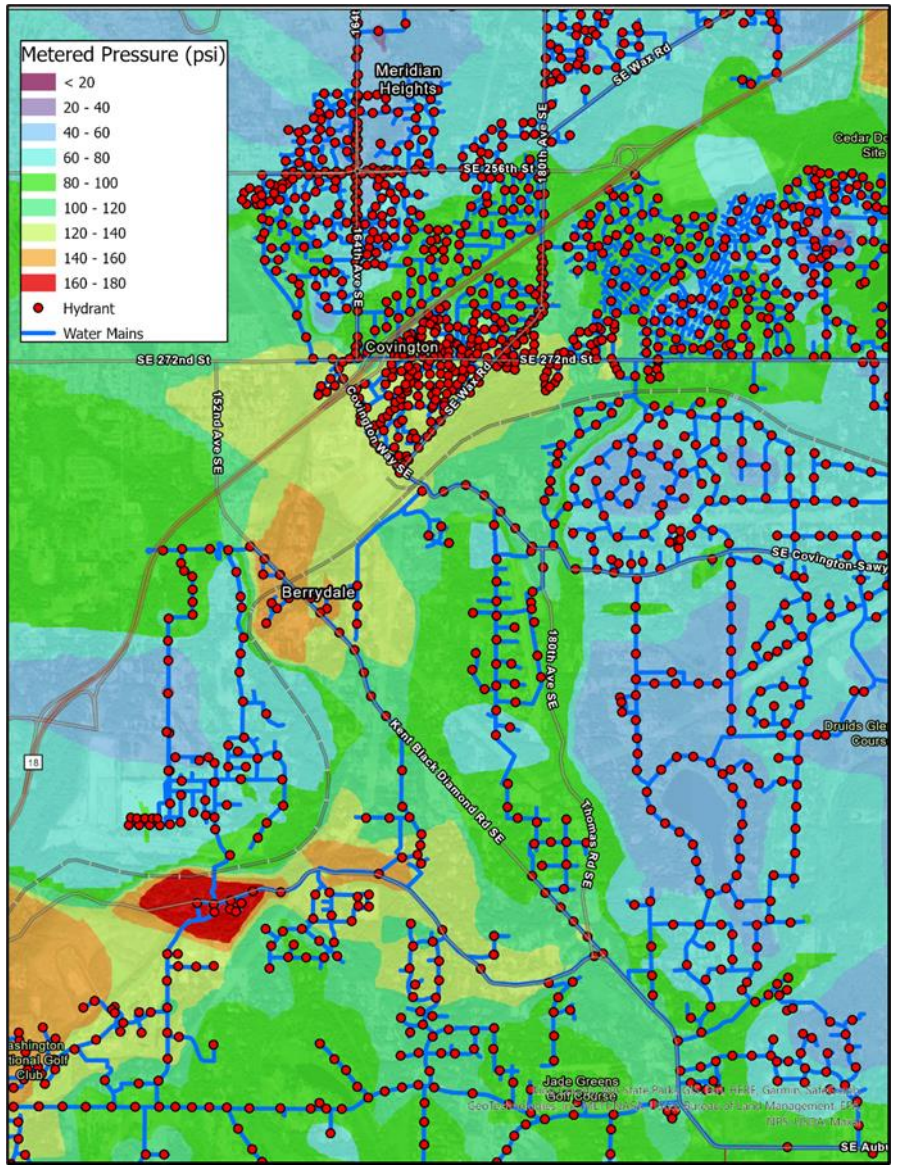
Copper	Unknown	Brass	HDPE	PVCO
65	0	11	62	0
5,115	1	5,832	22,656	49

Total
146
45,044

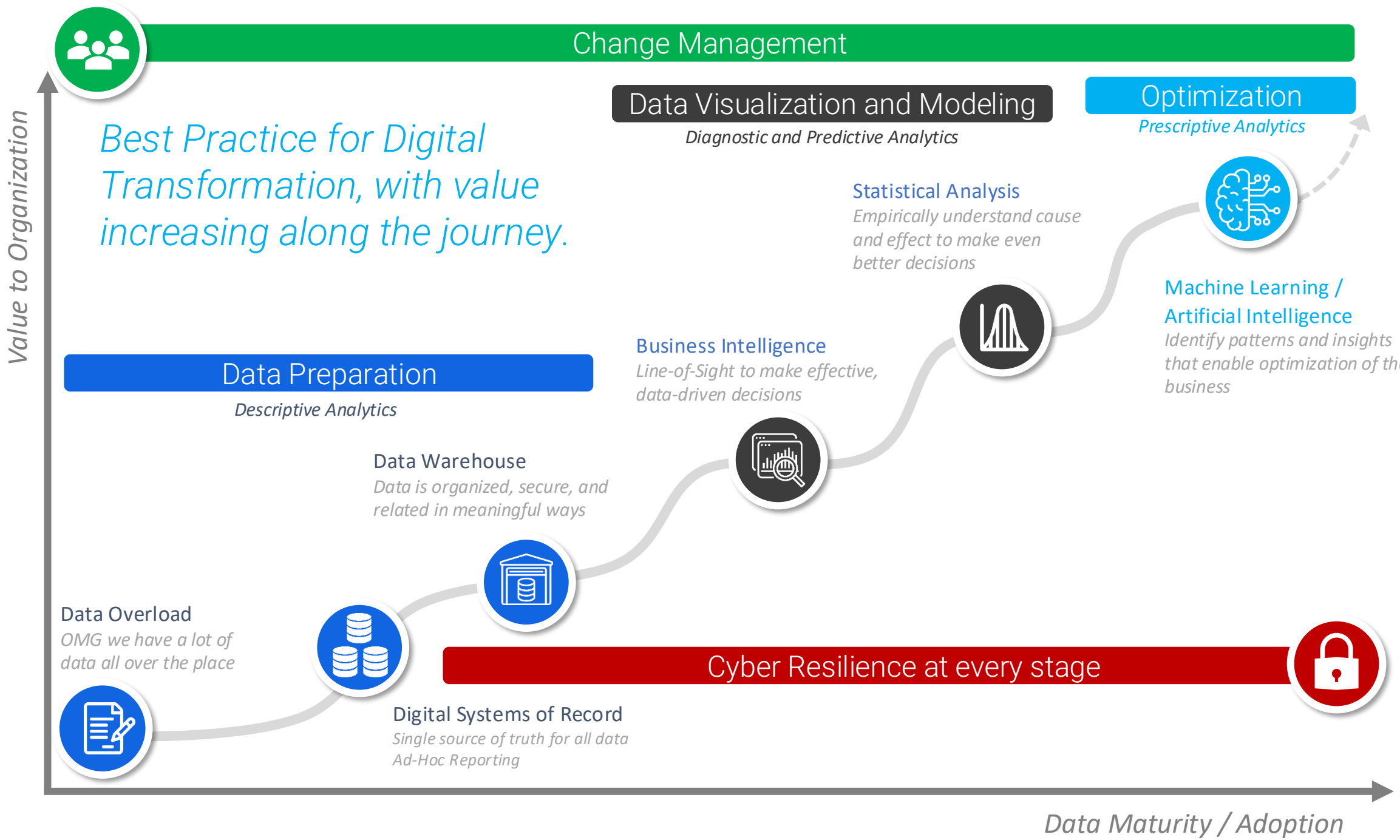
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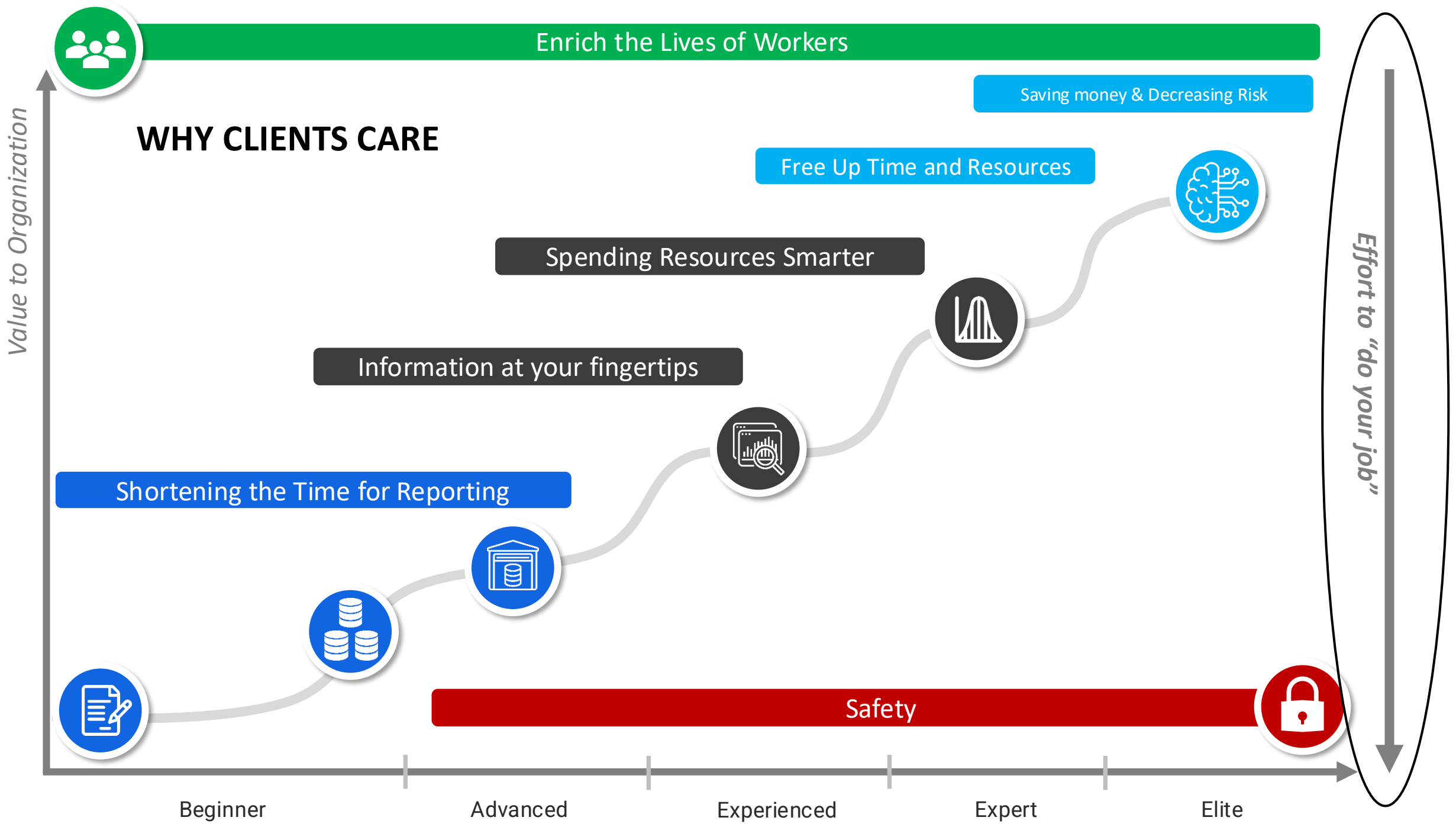
Leveraging Modern Prioritization Tools





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Change Management
Best Practice for Digital Transformation, with value increasing along the journey.
Data Visualization and Modeling
Diagnostic and Predictive Analytics
Optimization
Prescriptive Analytics
Statistical Analysis
Empirically understand cause and effect to make even better decisions
Machine Learning / Artificial Intelligence
Identify patterns and insights that enable optimization of their business
Business Intelligence
Line-of-Sight to make effective, data-driven decisions
Data Preparation
Descriptive Analytics
Data Warehouse
Data is organized, secure, and related in meaningful ways
Data Overload
OMG we have a lot of data all over the place
Digital Systems of Record
Single source of truth for all data
Ad-Hoc Reporting
Cyber Resilience at every stage
Value to Organization
Data Maturity / Adoption


Enrich the Lives of Workers
Saving money & Decreasing Risk
WHY CLIENTS CARE
Free Up Time and Resources
Spending Resources Smarter
Information at your fingertips
Shortening the Time for Reporting
Safety
Value to Organization
Effort to "do your job"
Beginner
Advanced
Experienced
Expert
Elite

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