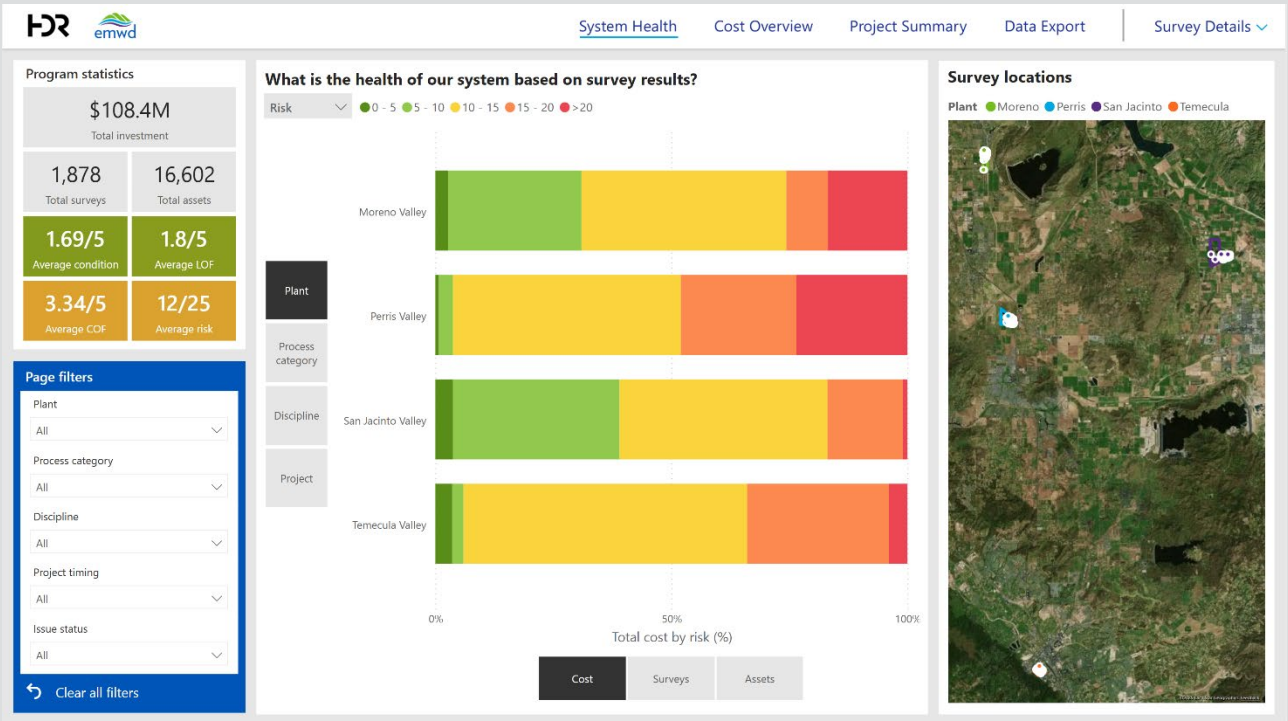

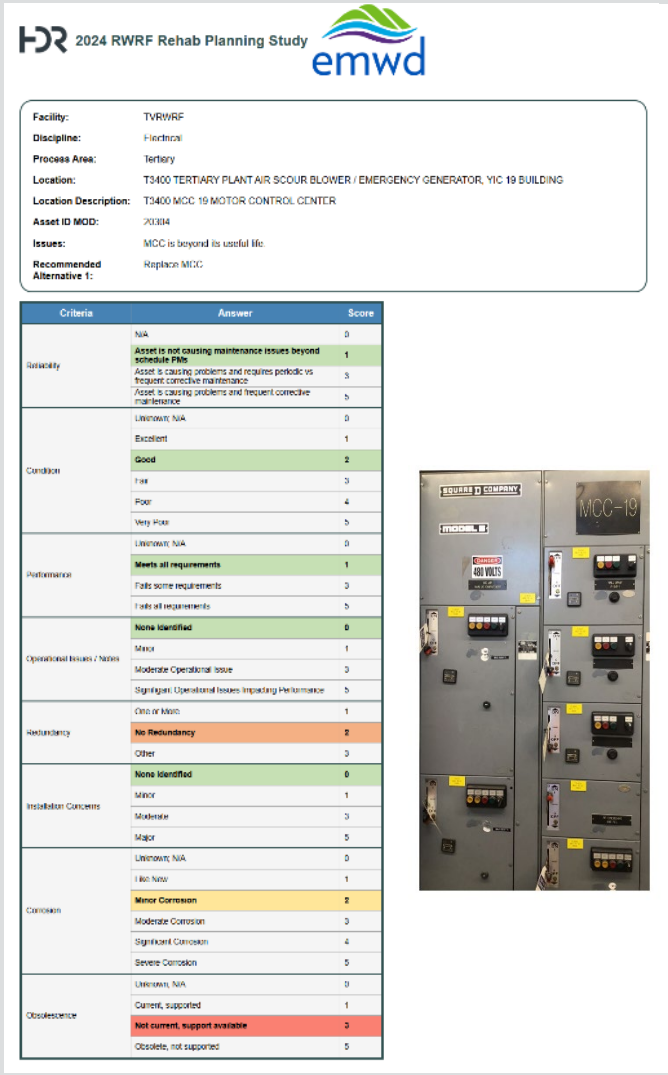

Enhancing Asset Management through Digital Condition Assessment and Data Visualization

Michael Flores, Utility Management Services SoCal Area Lead

Presenter

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HDR

Utility Management Services

SoCal Area Leader

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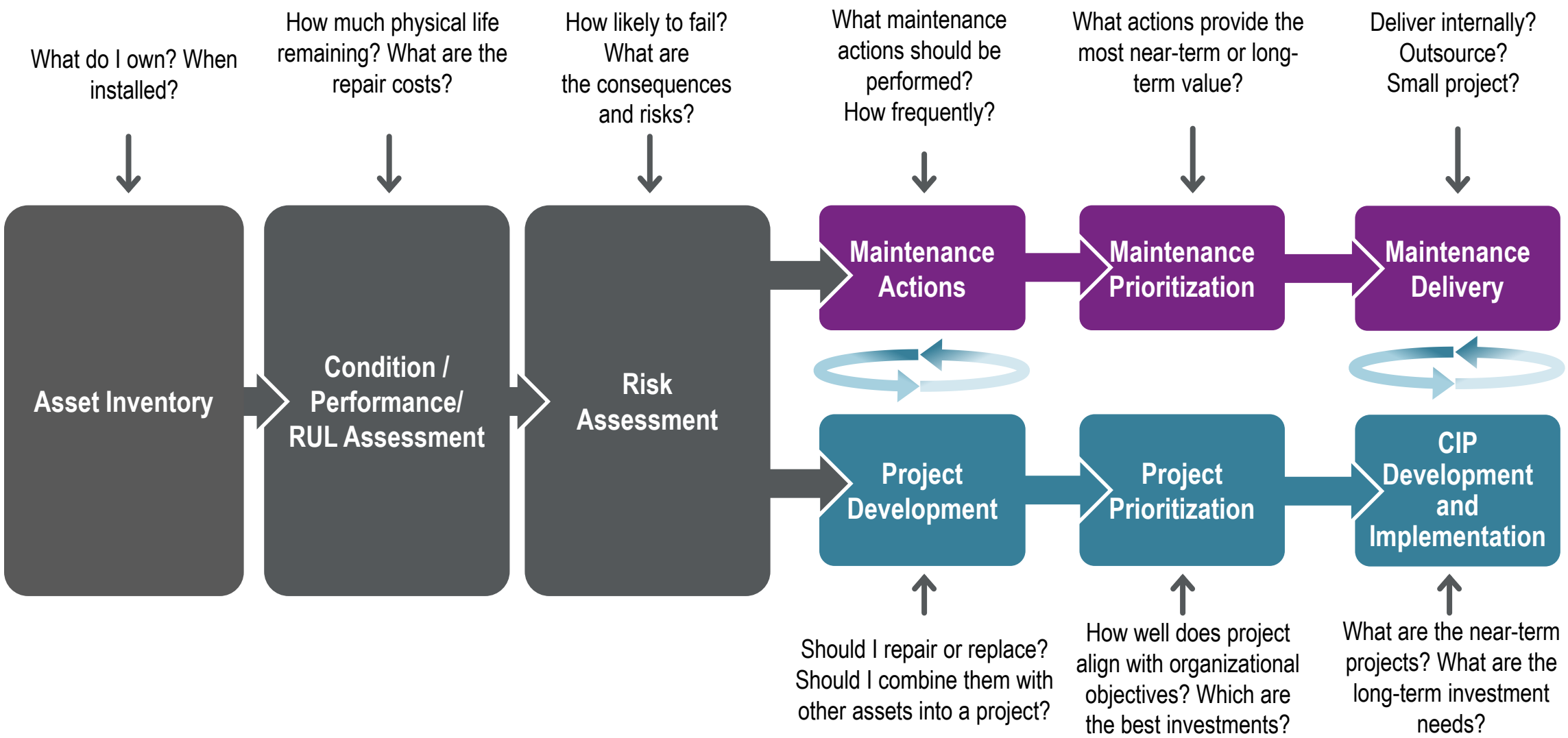
01

Background

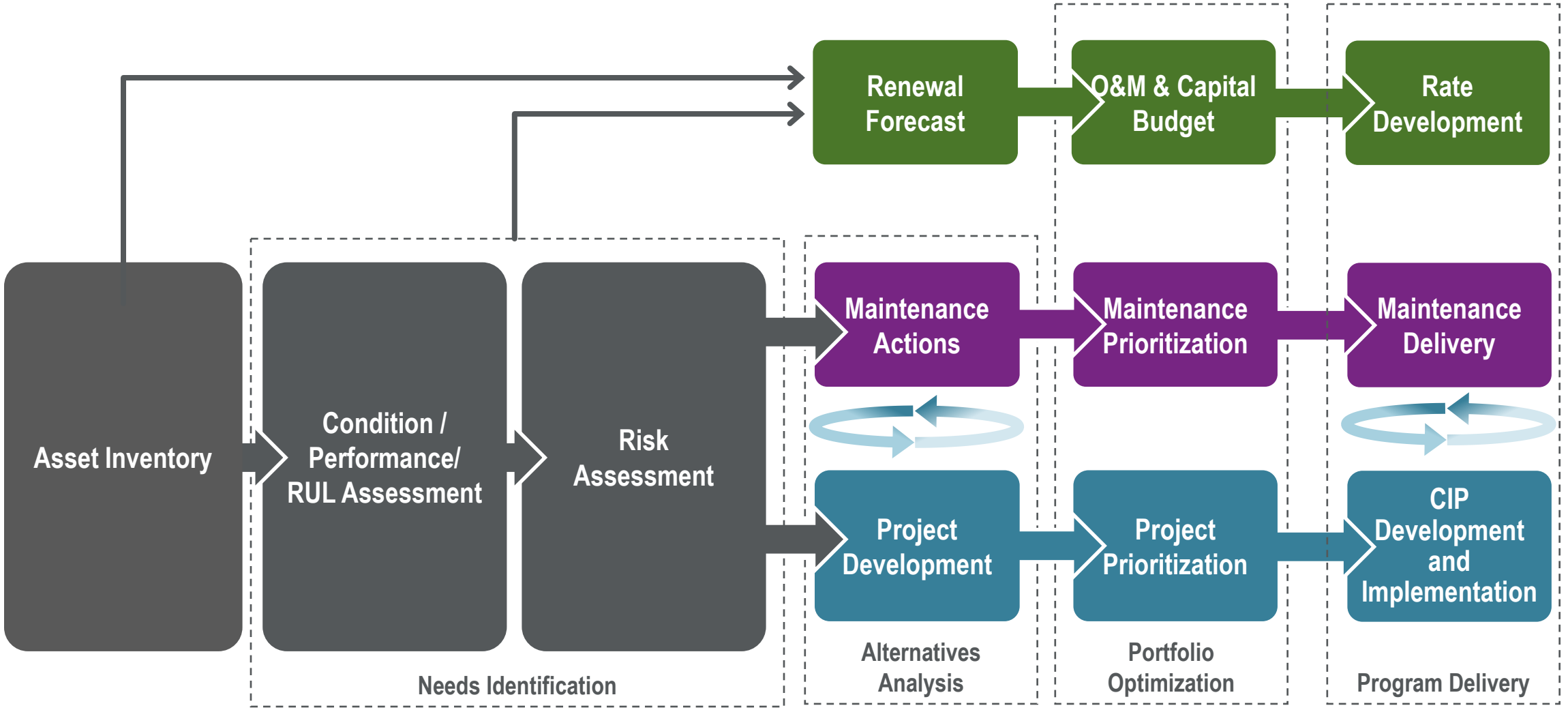
Value of Performing Assessment

- Detect deterioration and foresee needs
- Prioritize future renewal activities
- Develop living plan
- Facilitates coordination with planned upgrades and expansions

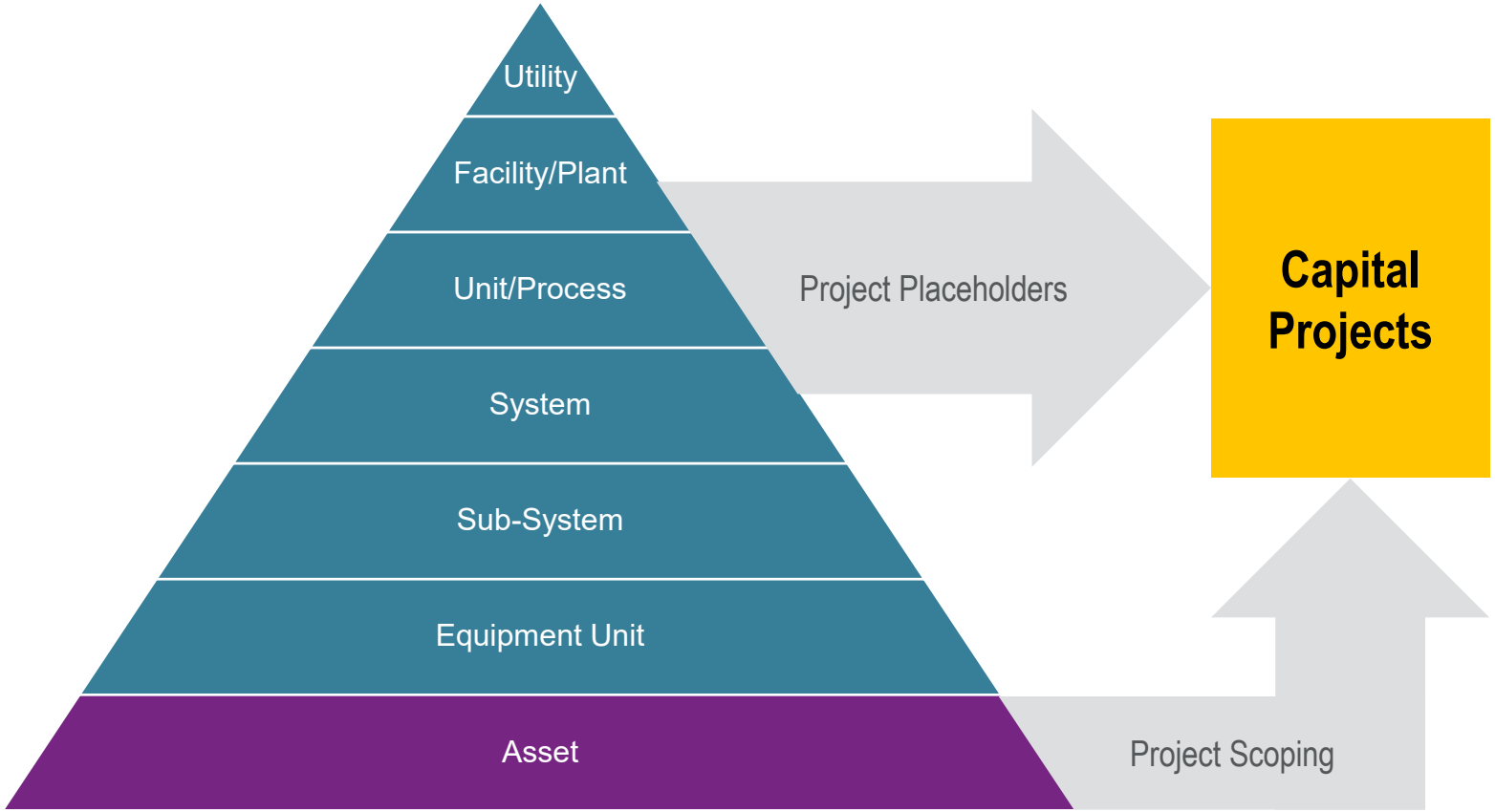
Sound Planning Involves Answering a Set of Questions



Investment Planning is Key to Improved Coordination



Planning Goals and Objectives Drive Assessment Strategy



Planning Goals & Objectives

- *Drives Overall Assessment Focus, Level and Methods*

Asset Hierarchy & Classes

- *Assessment Level can Vary by Asset Type and Criticality*

Data

- *Code-Based*
- *Linked to Process Location or Asset*

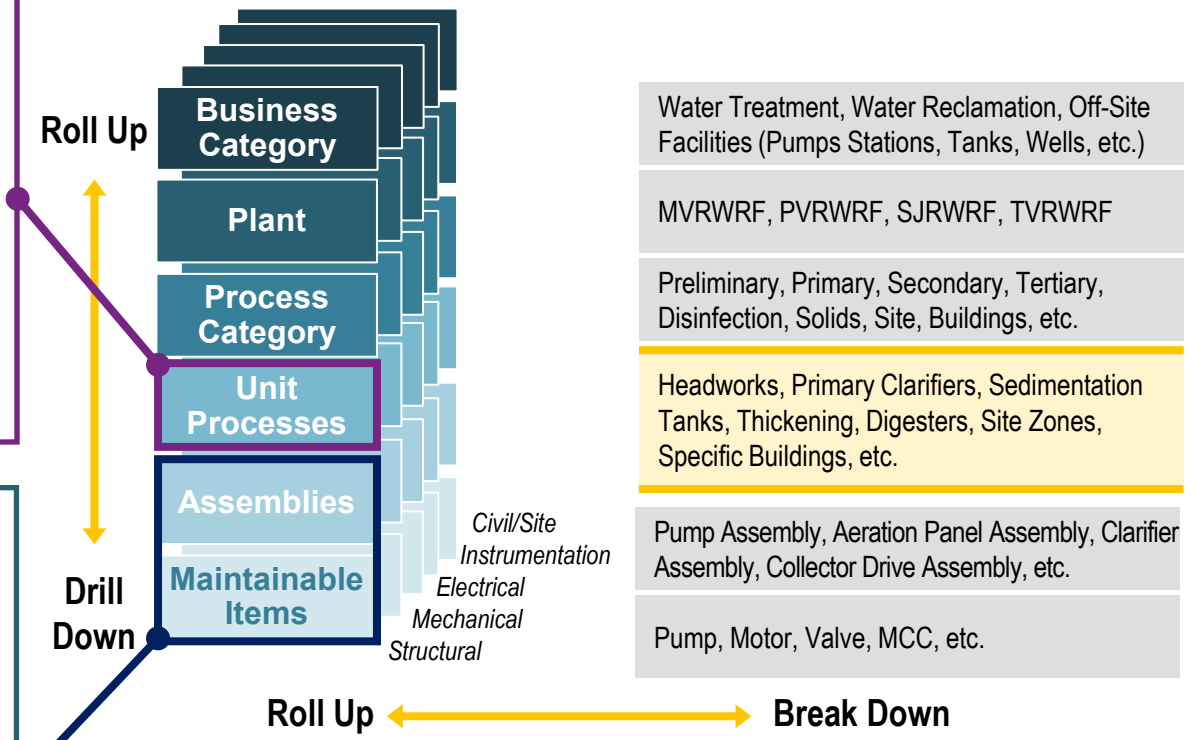
Assessment and Planning Can Be Performed at Different Levels and Serve Different Purposes

Process Level

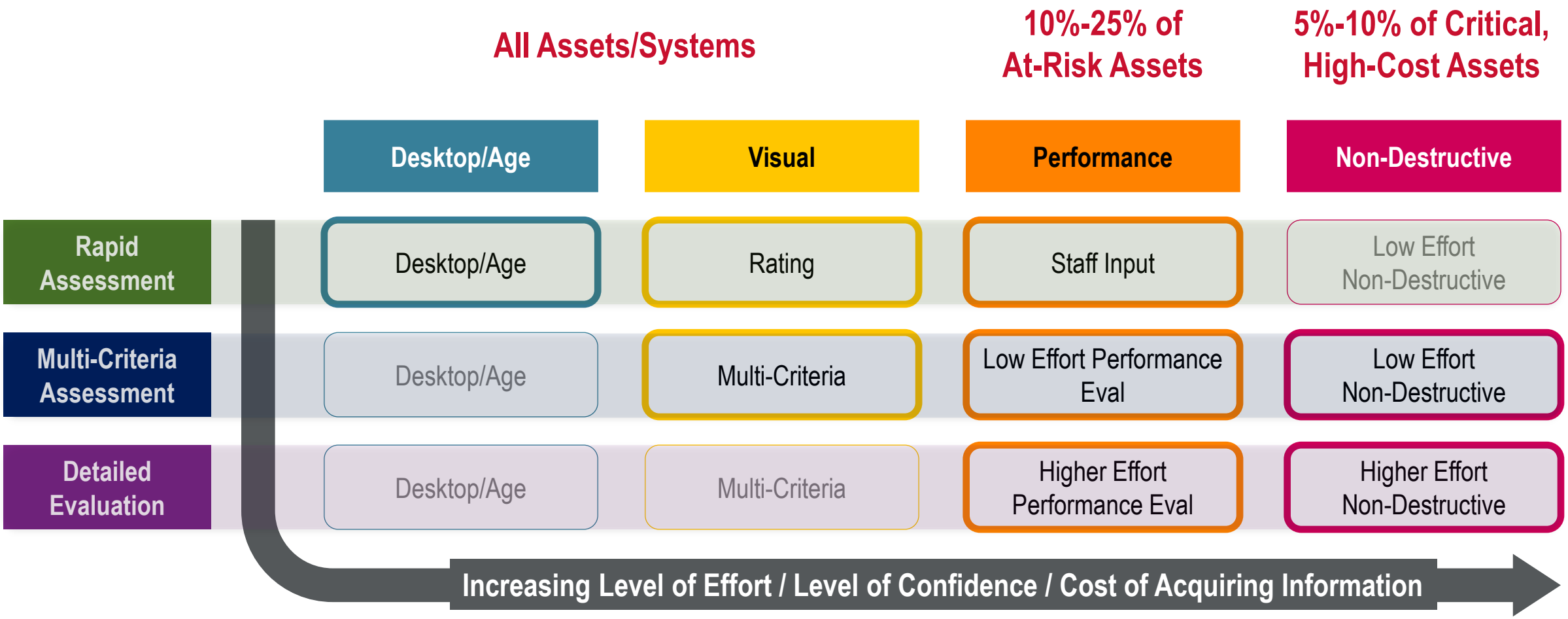
- Identify Rehab Needs at the Process Level
- Characterize Programmatic Trade Level Improvements
  - Process/Mechanical – Process optimization, system replacements
  - I&C – System upgrades
  - Electrical – Support system needs
- Support Analysis of Facility Planning Alternatives

Asset Level

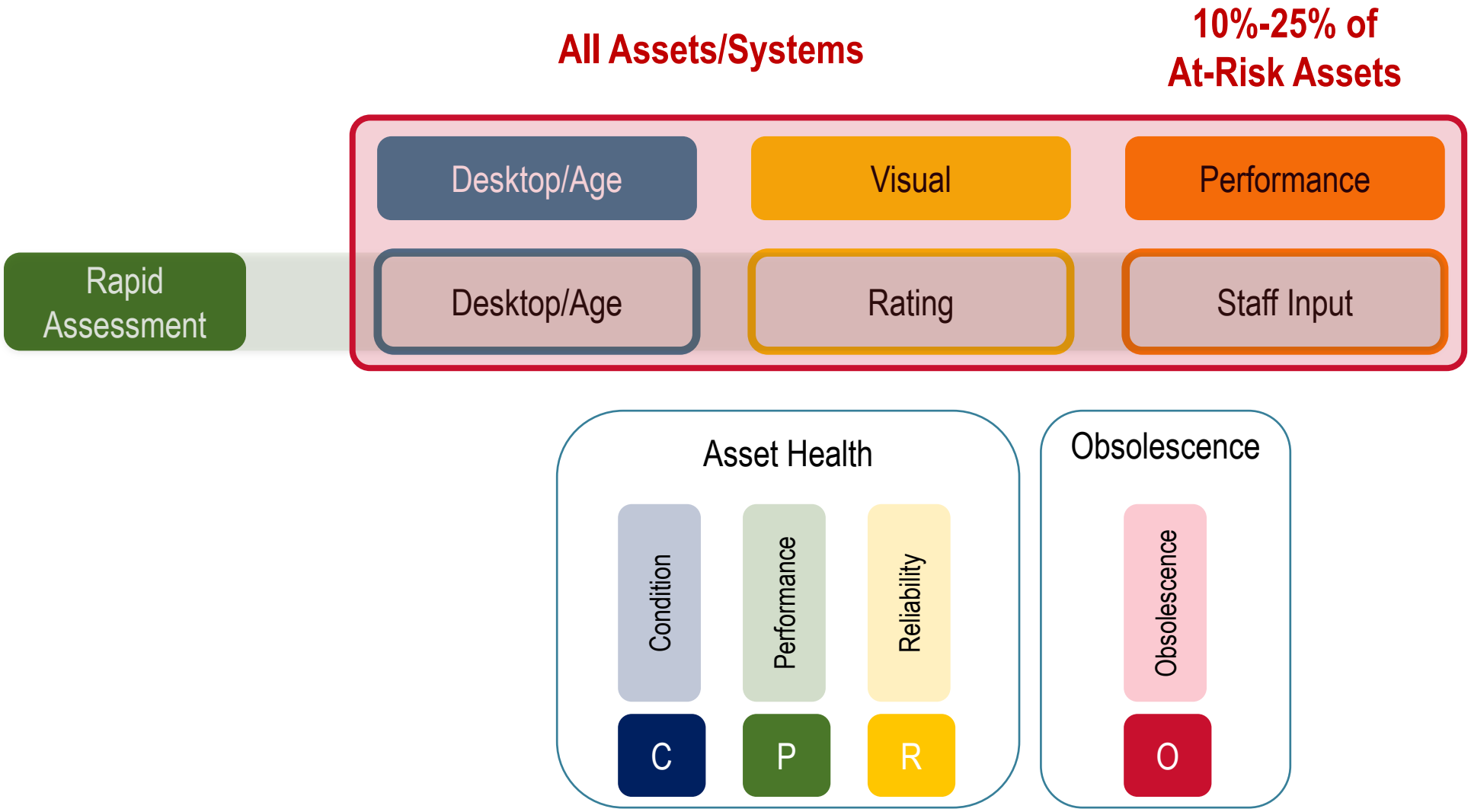
- Provide Detailed Data on Specific Assets as Needed
- Investment Action Coordination
  - Capital Assets
  - Maintenance Assets
- Refine Rehab Project Scoping and Cost Estimates



Data Collection Level of Detail Linked with Level of Confidence Necessary to Achieve Planning Objectives



Scale Data Collection to Meet Needs and Reduce Cost



02

Data Collection

Design Assessment Structure to Meet Objectives, Organize Data and Speed Data Collection

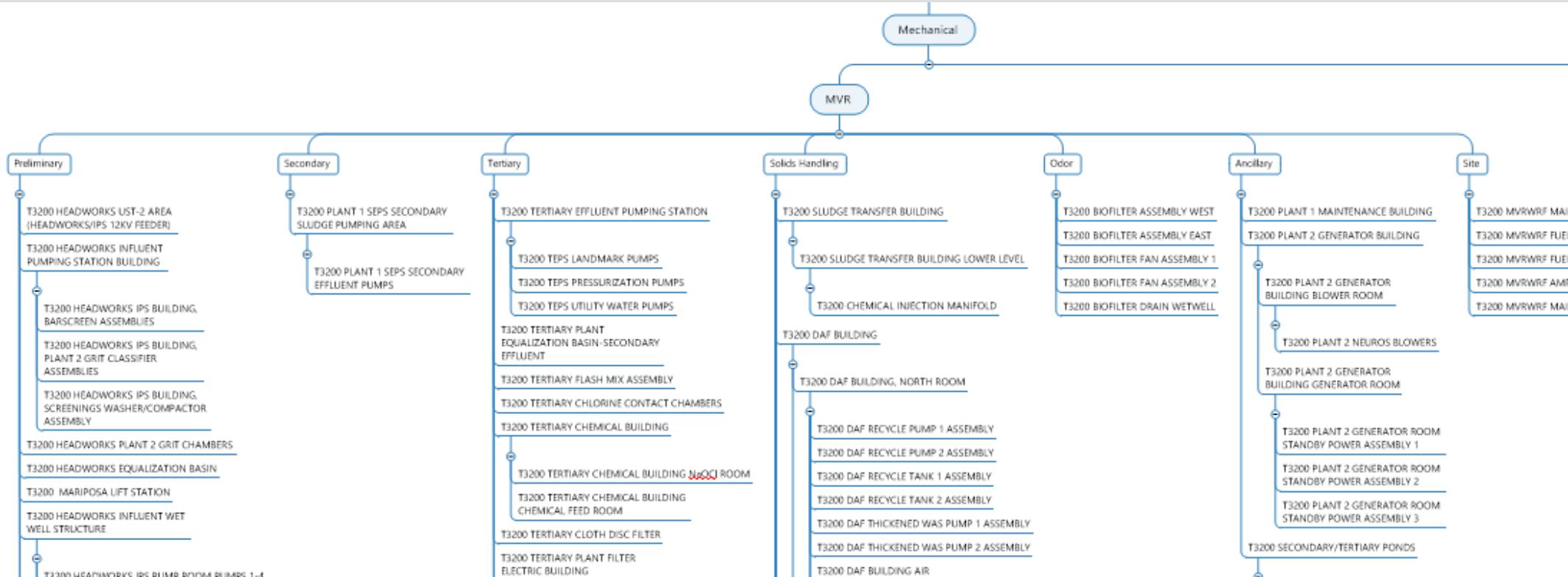
Structure levels become pulldown field in assessment form

Business Category

Plant

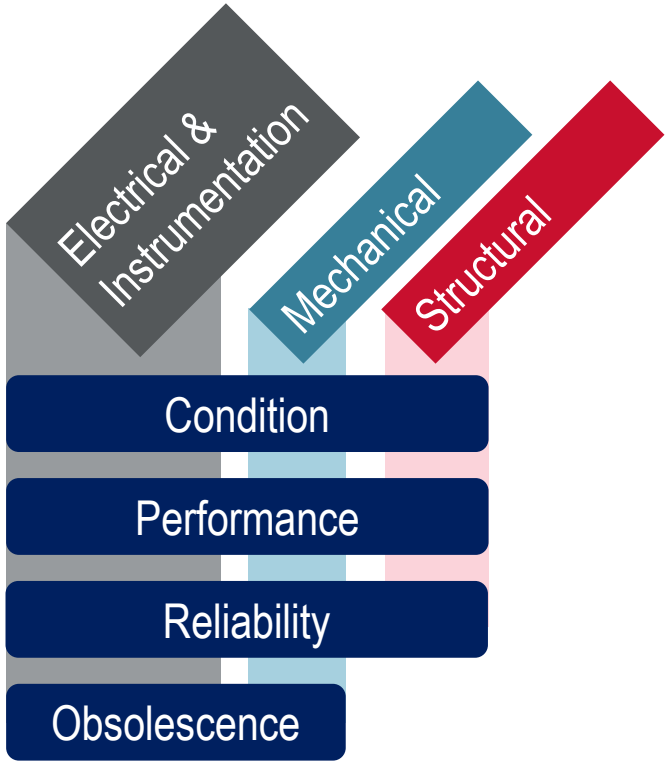
Process Category

Unit Processes



Create Assessment Criteria to Standardize Assessment and Improve Ability to Analyze Data

Ratings



Potential Failure Indicators

Electrical & Instrumentation

- Corrosion
- Thermal Damage
- Installation Concerns

Mechanical

- Corrosion
- Noise
- Temperature
- Vibration
- Piping Condition
- Maintenance Access
- Usage

Structural

- Alkali Silica Reaction
- Cracking
- Rust Staining
- Spalling

Issues

- Operational
- Safety
- Security
- Actionable

Conduct Pre-Inspection Interviews with Facility Staff to Identify Emergent Issues and Focus Assessments

01

Coordinate

Pre-Assessment interviews with staff allow for coordination of inspection days and what staff is required to be on-site

02

Identify Issues

Interviewing operations to identify areas and assets they have concerns about prior to visiting the sites

03

Document

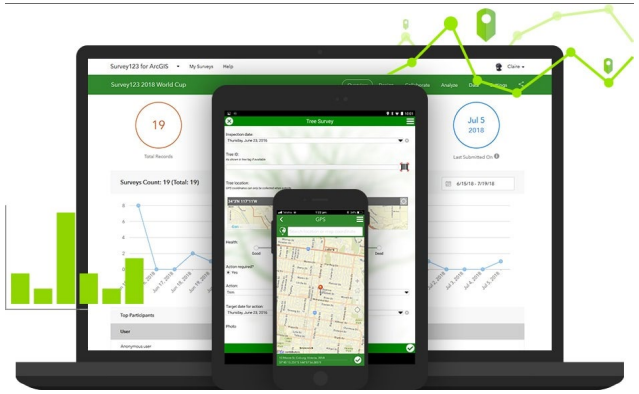
Provide assessment team with issues identified during pre-assessment meetings to factor into assessment findings

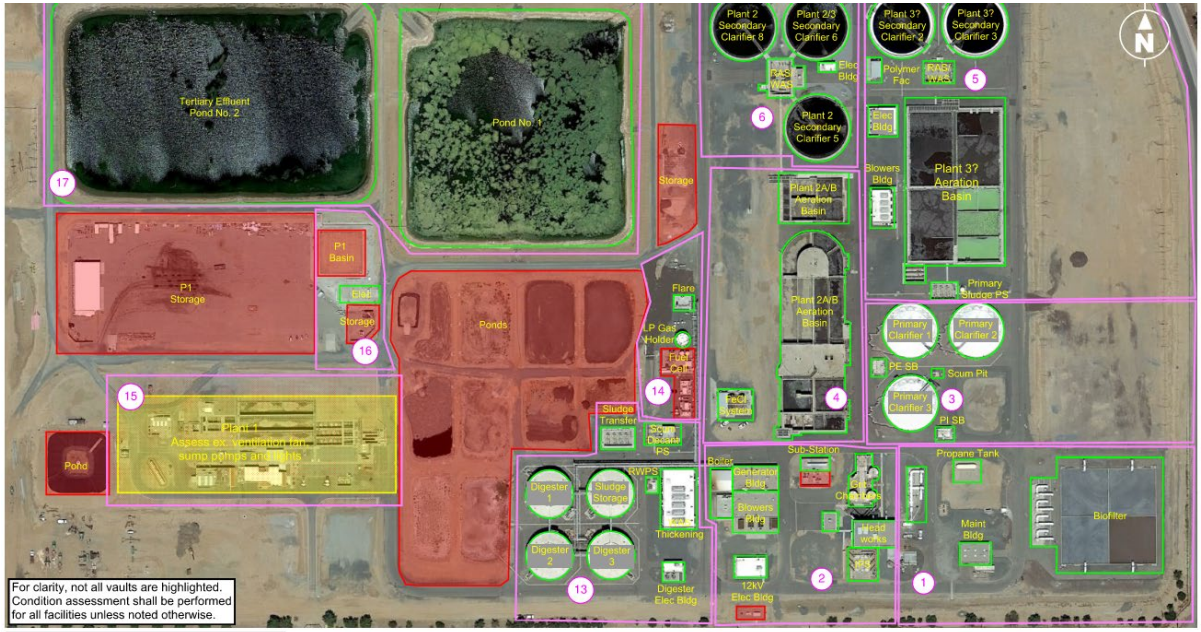
Train Assessment Team on Process, Practices and Forms

Once forms are finalized, meet with survey teams prior to field assessment work

Review hierarchy, assets, and locations the teams will be assessing

Walk through steps of surveying multiple “dummy” records to confirm teams are collecting all necessary data





Create Assessment Forms Using Mobile Data Collection Tools for Digital Data Capture

King County Condition Assessment Form - Carnation WWTP (Mechanical)

Metadata

Date

Thursday, February 20, 2025

GIS Location

Position source access error

King County Facilities

Select Treatment Plant
- (•) CTP OVERALL
- ( ) BWTP OVERALL

Select a Process Area *
- ( ) CTP OVERALL
- (•) CTP HEADWORKS BUILDING
- ( ) CTP MEMBRANE STRUCTURE
- ( ) CTP AERATION BASINS
- ( ) CTP CHEMICAL BUILDING
- ( ) CTP OPERATIONS BUILDING

Select a Sub-Discipline *
- ( ) BUILDING
- (•) PROCESS

Select an Asset Type *
- ( ) MOTOR
- (•) ODOR CONTROL UNIT
- ( ) SAMPLER
- ( ) SCREEN

Select an Asset *
- ( ) ODOR CONTROL UNIT 1
- (•) ODOR CONTROL UNIT 2
- ( ) NEW ASSET

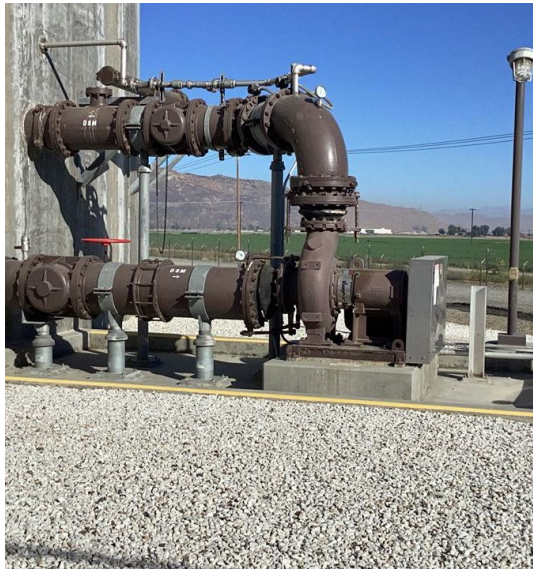
Asset Reference Information

HP:	RPM: 1790	TDH: 229	GPM: 3000
CFS:	Power (Watts):	SIZE DIAMETER (in): 14	MATERIAL:
PIPE MATERIAL:	GALLONS:	MILLION GALLONS:	VOLTAGE:
VOLTAGE 2:	KILOVOLTS AMPERE:	AMPERE CURRENT:	MILLIAMPERE:
PHASE:	Model:	Installation year: 1990	Comment:

Include Photo Capture Protocols as Photos Are Extremely Valuable for Evaluation and Cost Estimation

When assessing assets in the field, require at minimum:

- One Perspective Photo
- One Close-Up Photo
- Any additional photos that will help during post assessment analysis and recommendations
- Capture a photo caption for specific observations or context



Perspective Photo

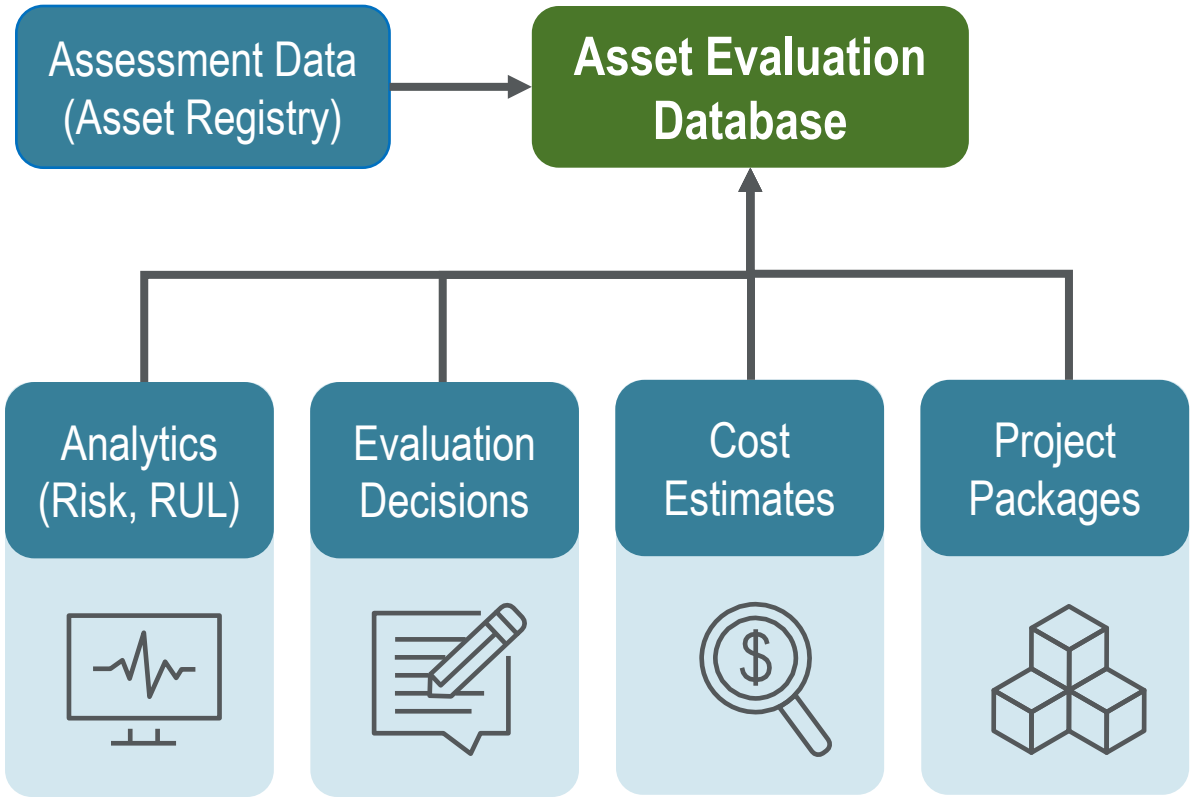
Close-Up

Close-Up

Close-Up

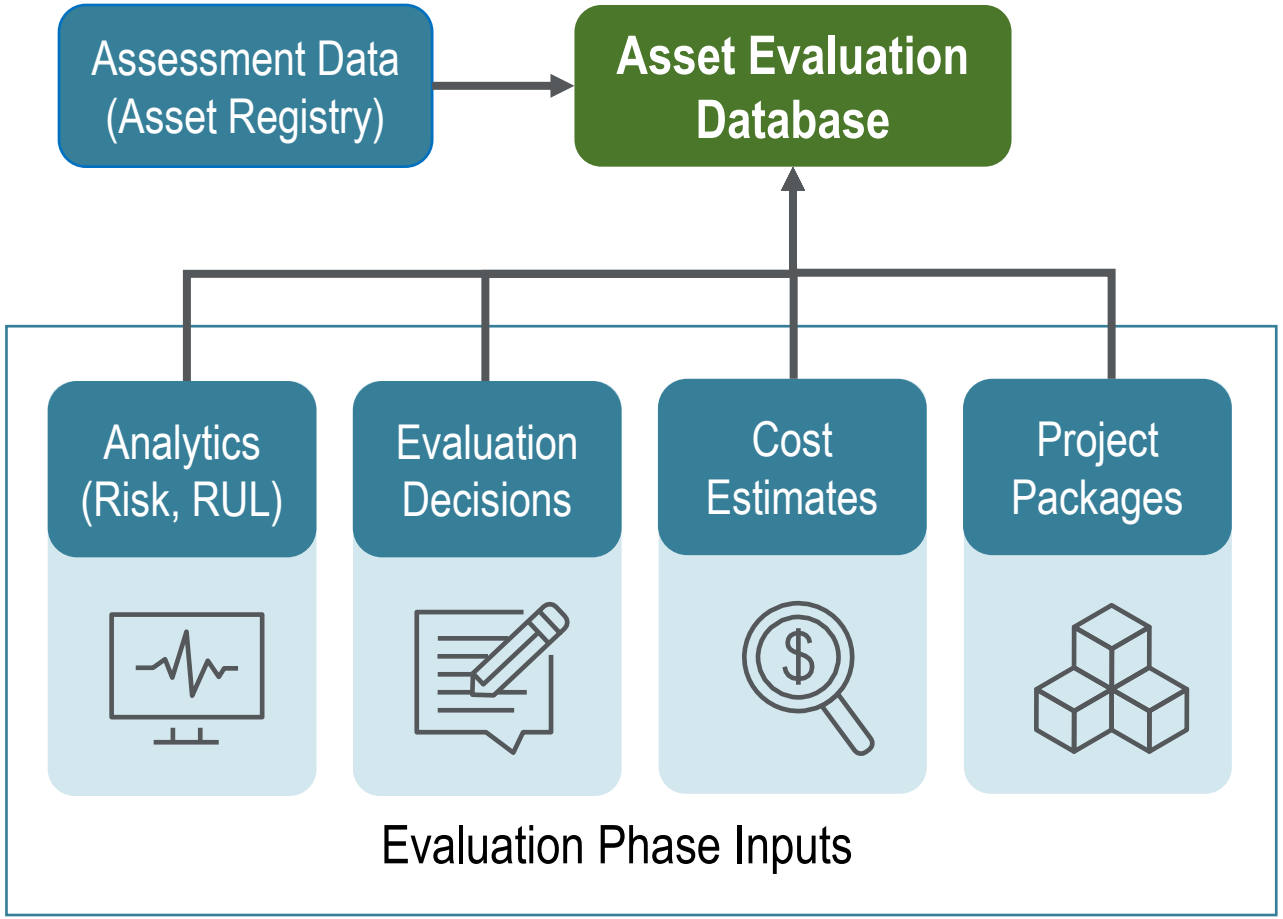
03

Evaluation Phase Inputs



Centralize Data Collected at Every Step of Assessment and Evaluation to Streamline Planning and Reporting

- **Problem**
  - Data stored in multiple locations making analysis and reporting laborious
- **Solution**
  - Consolidate assessment and evaluation phase data
  - Provide means for consistent data collection

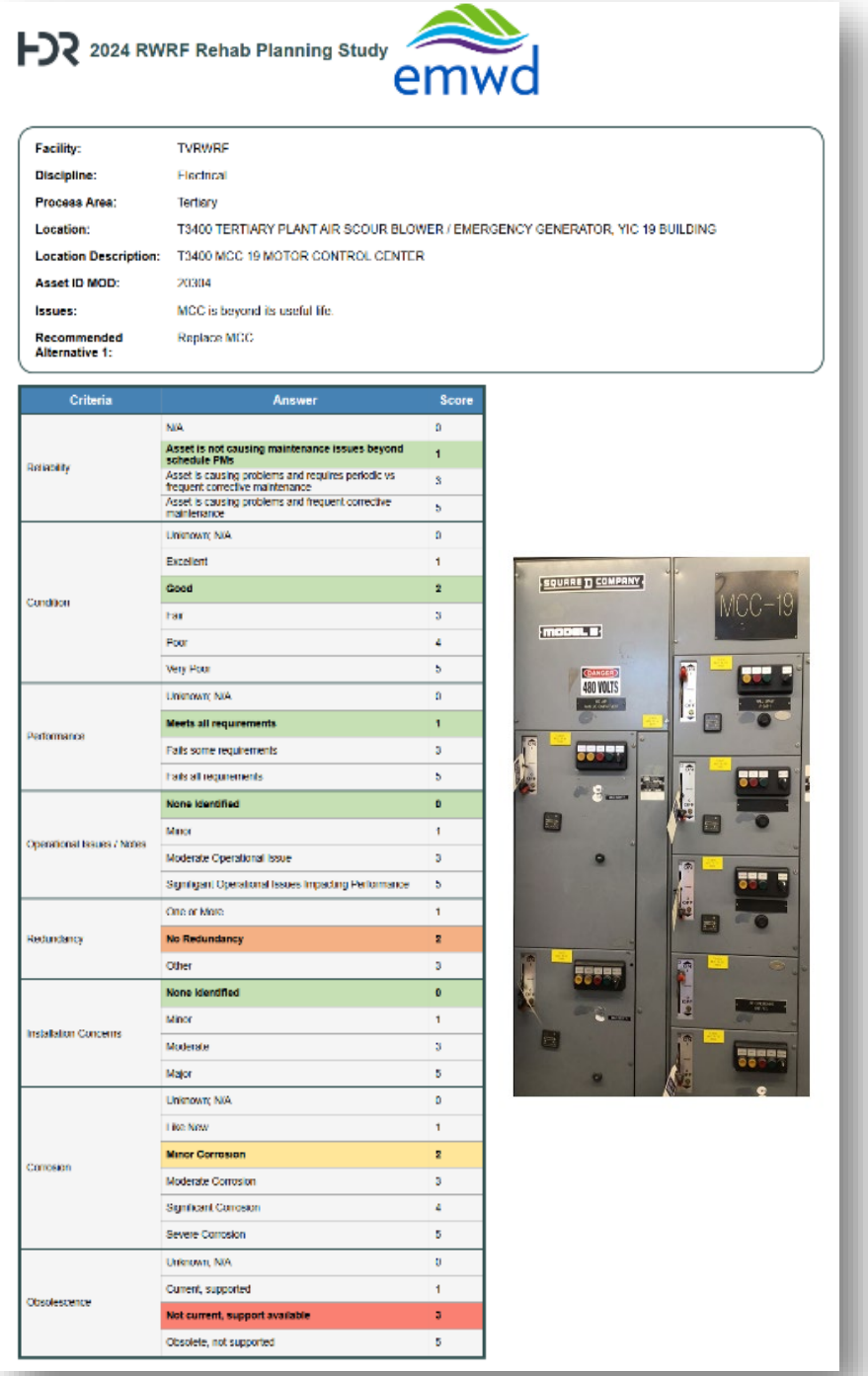


Creates one "source of truth"

Becomes compiled data for dashboards and reporting

Use this approach for asset health assessment and asset management planning

Use Data Visualization and Reporting to Simplify and Streamline Evaluation Phase Decision-Making



2024 RWRF Rehab Planning Study

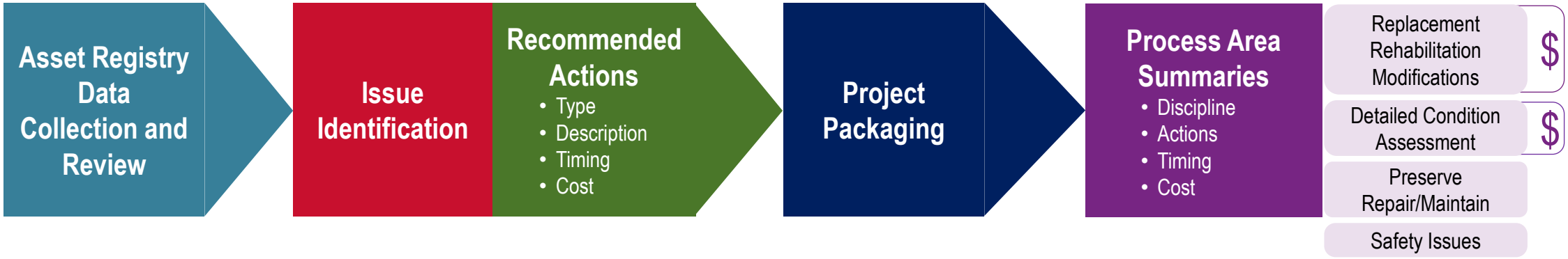
emwd

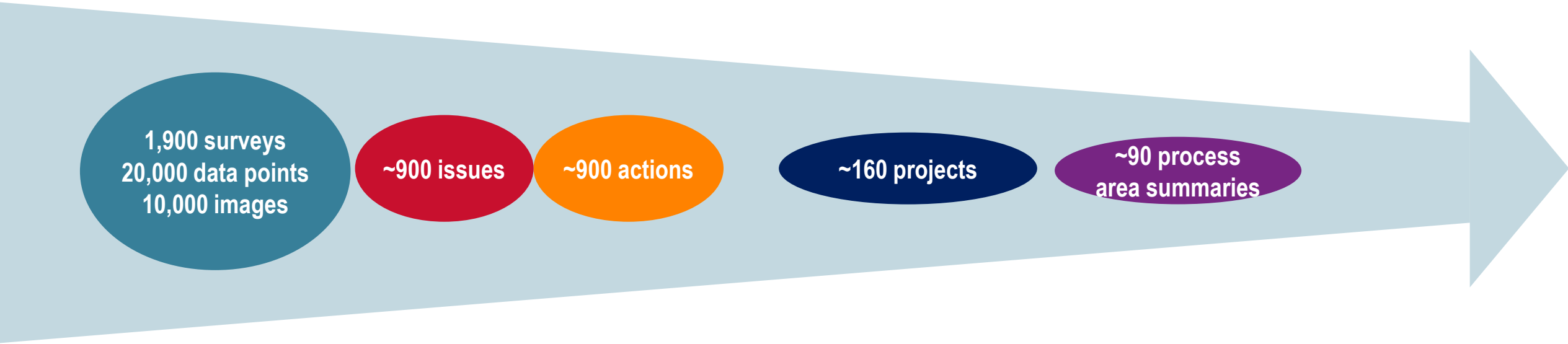
Facility:	TVRWRF
Discipline:	Electrical
Process Area:	Tertiary
Location:	T3400 TERTIARY PLANT AIR SCOUR BLOWER / EMERGENCY GENERATOR, YIC 19 BUILDING
Location Description:	T3400 MCC 19 MOTOR CONTROL CENTER
Asset ID MOD:	20304
Issues:	MCC is beyond its useful life
Recommended Alternative 1:	Replace MCC

Criteria	Answer	Score
Reliability	N/A	0
	Asset is not causing maintenance issues beyond schedule PMs	**1**
	Asset is causing problems and requires periodic vs frequent corrective maintenance	3
	Asset is causing problems and frequent corrective maintenance	5
Condition	Unknown, N/A	0
	Excellent	1
	Good	**2**
	Fair	3
	Poor	4
	Very Poor	5
Performance	Unknown, N/A	0
	Meets all requirements	**1**
	Fails some requirements	3
	Fails all requirements	5
Operational Issues / Notes	**None Identified**	**0**
	Minor	1
	Moderate Operational Issue	3
	Significant Operational Issues Impacting Performance	5
Redundancy	One or More	1
	No Redundancy	**2**
	Other	3
Installation Concerns	**None Identified**	**0**
	Minor	1
	Moderate	3
	Major	5
Corrosion	Unknown, N/A	0
	Like New	1
	Minor Corrosion	**2**
	Moderate Corrosion	3
	Significant Corrosion	4
	Severe Corrosion	5
Obsolescence	Unknown, N/A	0
	Current, supported	1
	Not current, support available	**3**
	Obsolete, not supported	5

Issue	Brief statement documenting observed issues/deficiencies in surveyed location
Action	Recommended actions and improvements to address issues
Timing	Recommended horizon to deliver the action
Cost	Estimated cost to deliver the action

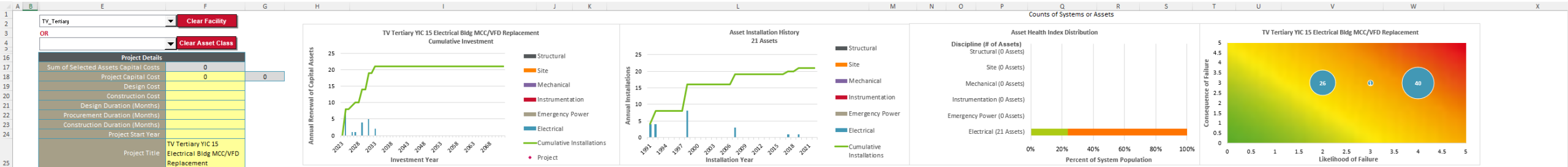
Focus Each Step on Transforming Data to Decisions





Project Packaging, Timing and Risk

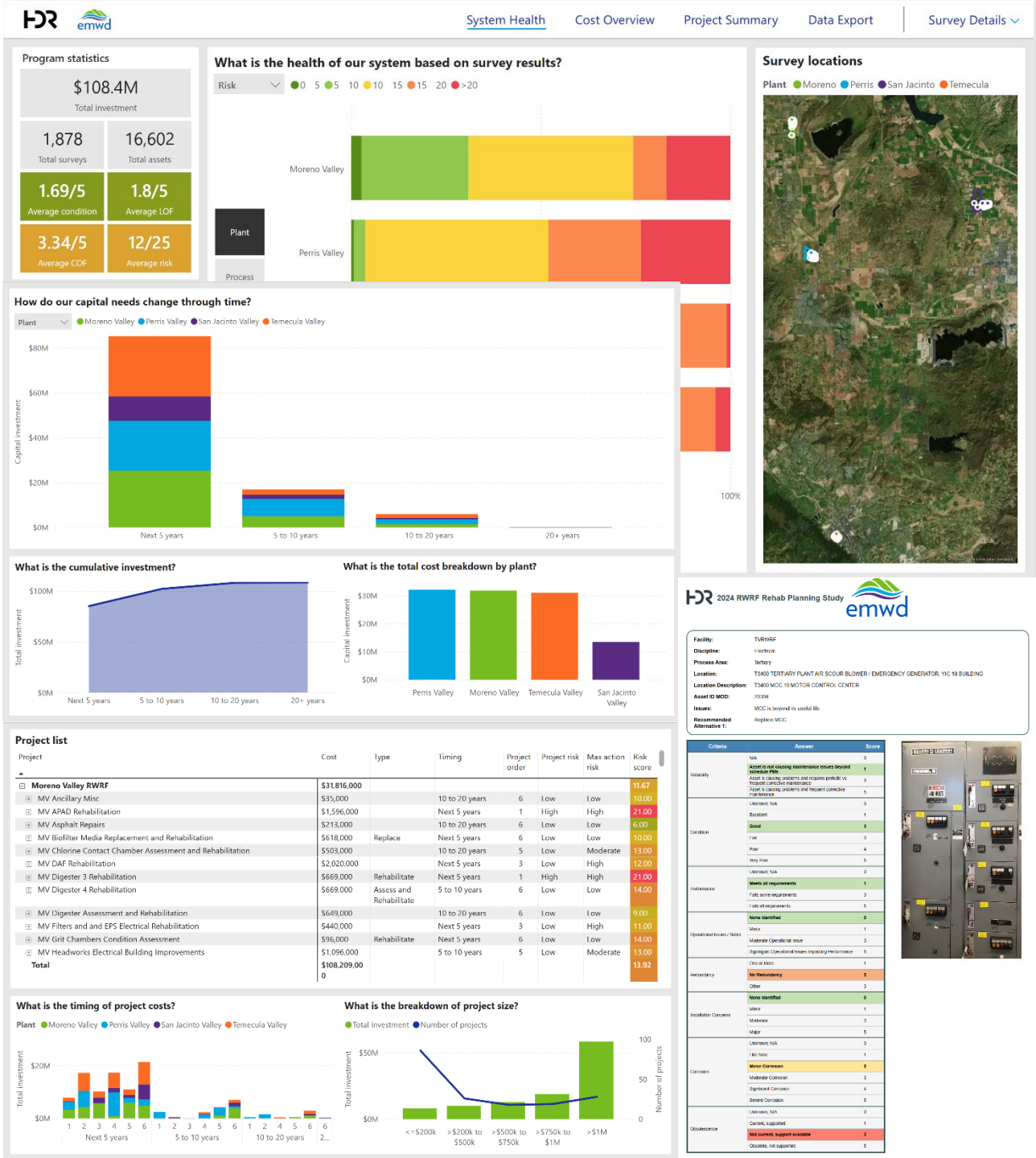
- Primary strategy – Package actions within facility process areas with similar timing and/or same shutdown.
- Secondary strategy – Package across multiple process areas when improvements have a common work type.



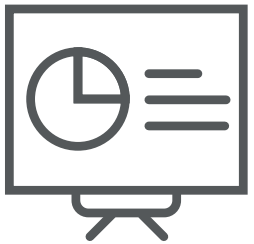
Asset Number (Manual)	SurveyID	Facility Name	Process Category	Level 3 -Description	Survey Level	Survey Location	Survey Location Description	Discipline	AH	LOF	COF	Alt 1 Type	Alt 1 Capital Cost	Alt 2 Capital Co	Alt 1 Timi	Alt 1 Horiz	Issue Status	Number of Projects Containing Asse	Project Name
	1362	TV	Tertiary	T3400 TERTIARY PLANT AIR SCOUR BLOWER / EMERGENCY GENE	4	1516	T3400 TERTIARY BACKWASH AIR SCOUR BLOWER ROOM	Electrical	2	2	4	No Action			0		No Action Identified	0	
	1367	TV	Tertiary	T3400 TERTIARY PLANT DENITE AREA	3	20007	T3400 TERTIARY PLANT DENITE AREA	Electrical	2	2	4	Replace	$24,000		Next 5 years	Near-Term	Unaddressed - Project	1	TV Tertiary Denite Electrical and Mecha
	1380	TV	Tertiary	T3400 TERTIARY PLANT CHEMICAL STORAGE AND PUMPS	3	20123	T3400 TERTIARY PLANT CHEMICAL STORAGE AND PUMPS	Electrical	3	3	2	No Action			0		No Action Identified	0	
	1381	TV	Tertiary	T3400 TERTIARY PLANT CHEMICAL STORAGE AND PUMPS	4	20126	T3400 CHEMICAL BUILDING (YIC 18)	Electrical	2	2	2	No Action			10 to 20 years	Long-Term	No Action Identified	0	
	1382	TV	Tertiary	T3400 TERTIARY PLANT AQUA DISC ZONE	3	20127	T3400 TERTIARY PLANT AQUA DISC ZONE	Electrical	2	2	4	Repair/Maintain			5 to 10 years	Mid-Term	Unaddressed - Other	0	
	1383	TV	Tertiary	T3400 TERTIARY PLANT DISINFECTION NaOCl	4	20132	T3400 NaOCl BUILDING	Electrical	2	2	5	Replace	$319,000		Next 5 years	Near-Term	Unaddressed - Project	1	TV NaOCl Building Rehabil
	1384	TV	Tertiary	T3400 TERTIARY PLANT EFFLUENT DISTRIBUTION	4	20134	T3400 TERTIARY EFFLUENT PUMP STATION (TEPS)	Electrical	2	2	4	Replace	$335,000		Next 5 years	Near-Term	Unaddressed - Project	1	TV TEPS Motors Replacer
	1388	TV	Tertiary	T3400 TERTIARY PLANT DENITE AREA	6	20292	T3400 DENITRIFICATION FACILITY MCC 3A	Electrical	2	2	4	Replace	$255,000		Next 5 years	Near-Term	Unaddressed - Project	1	TV Tertiary Denite Electrical and Mecha
	1389	TV	Tertiary	T3400 TERTIARY PLANT DENITE AREA	6	20293	T3400 DENITRIFICATION FACILITY MCC E	Electrical	4	4	4	Replace	$442,000		Next 5 years	Near-Term	Unaddressed - Project	1	TV Tertiary Denite Electrical and Mecha
X	1393	TV	Tertiary	T3400 TERTIARY PLANT YIC 15 ELECTRICAL BUILDING	4	20300	T3400 MCC 15 MOTOR CONTROL CENTER	Electrical	4	4	5	Replace	$378,000		Next 5 years	Near-Term	Unaddressed - Project	1	TV Tertiary YIC 15 Electrical Bldg MCC/
X	1394	TV	Tertiary	T3400 TERTIARY PLANT YIC 15 ELECTRICAL BUILDING	4	20301	T3400 MCC 16 MOTOR CONTROL CENTER	Electrical	4	4	5	Replace	$250,000		Next 5 years	Near-Term	Unaddressed - Project	1	TV Tertiary YIC 15 Electrical Bldg MCC/
X	1395	TV	Tertiary	T3400 TERTIARY PLANT YIC 15 ELECTRICAL BUILDING	4	20302	T3400 MCC 17 MOTOR CONTROL CENTER (SWITCHGEAR)	Electrical	3	3	5	Replace	$904,000		Next 5 years	Near-Term	Unaddressed - Project	1	TV Tertiary YIC 15 Electrical Bldg MCC/
	1396	TV	Tertiary	T3400 TERTIARY PLANT CHEMICAL STORAGE AND PUMPS	5	20303	T3400 CHEMICAL BUILDING MCC 18	Electrical	3	3	2	Replace	$1,024,000		Next 5 years	Near-Term	Unaddressed - Project	1	TV Tertiary Chemical Building MCC
	1397	TV	Tertiary	T3400 TERTIARY PLANT AIR SCOUR BLOWER / EMERGENCY GENE	5	20304	T3400 MCC 19 MOTOR CONTROL CENTER	Electrical	2	2	4	Replace	$1,672,000		Next 5 years	Near-Term	Unaddressed - Project	1	TV Tertiary Air Scour Blower Electric
X	1398	TV	Tertiary	T3400 TERTIARY PLANT YIC 15 ELECTRICAL BUILDING	4	20307	T3400 MCC 20 MOTOR CONTROL CENTER	Electrical	4	4	5	Replace	$58,000		Next 5 years	Near-Term	Unaddressed - Project	1	TV Tertiary YIC 15 Electrical Bldg MCC/
	1401	TV	Tertiary	T3400 TERTIARY PLANT DENITE AREA	6	20310	T3400 DENITRIFICATION BUILDING YIC 3/4A-X	Electrical	2	2	4	No Action			10 to 20 years	Long-Term	No Action Identified	0	
	1405	TV	Tertiary	T3400 TERTIARY PLANT YIC 15 ELECTRICAL BUILDING	4	20316	T3400 YIC 15	Electrical	0	0	5	No Action			20+ years	Long-Term	Planned	0	
	1407	TV	Tertiary	T3400 TERTIARY PLANT AIR SCOUR BLOWER / EMERGENCY GENE	5	20318	T3400 GENERATOR / BLOWER BUILDING YIC 19	Electrical	2	2	4	No Action			10 to 20 years	Long-Term	No Action Identified	0	
	1408	TV	Tertiary	T3400 TERTIARY PLANT AIR SCOUR BLOWER / EMERGENCY GENE	5	20319	T3400 GENERATOR / BLOWER BUILDING YIC 19A/B	Electrical	2	2	4	No Action			10 to 20 years	Long-Term	No Action Identified	0	
	1409	TV	Tertiary	T3400 TERTIARY PLANT DENITE AREA	4	20389	T3400 YIC 3/4 DENITRIFICATION FACILITY	Electrical	3	3	4	Replace	$308,000		Next 5 years	Near-Term	Unaddressed - Project	1	TV Tertiary Denite Electrical and Mecha
X	1414	TV	Tertiary	T3400 TERTIARY PLANT YIC 15 ELECTRICAL BUILDING	3	20395	T3400 TERTIARY PLANT YIC 15 ELECTRICAL BUILDING	Electrical	2	2	5	Modification	$19,000		Next 5 years	Near-Term	Unaddressed - Project	1	TV Tertiary YIC 15 Electrical Bldg MCC/
	1415	TV	Tertiary	T3400 TERTIARY PLANT DENITE AREA	6	20397	T3400 DENITRIFICATION BUILDING, DENITE PUMP #4 VFD	Electrical	2	2	4	Modification	$12,000		Next 5 years	Near-Term	Unaddressed - Project	1	TV Tertiary Denite Electrical and Mecha
	1416	TV	Tertiary	T3400 TERTIARY PLANT DENITE AREA	6	20398	T3400 DENITRIFICATION BUILDING, DENITE PUMP #5 VFD	Electrical	2	2	4	Modification	$12,000		Next 5 years	Near-Term	Unaddressed - Project	1	TV Tertiary Denite Electrical and Mecha
	1417	TV	Tertiary	T3400 TERTIARY PLANT CHEMICAL STORAGE AND PUMPS	5	20400	T3400 CHEMICAL BUILDING, OCC PUMP 1 VFD	Electrical	2	2	2	Repair/Maintain			10 to 20 years	Long-Term	No Action Identified	0	
	1418	TV	Tertiary	T3400 TERTIARY PLANT CHEMICAL STORAGE AND PUMPS	5	20401	T3400 CHEMICAL BUILDING, OCC PUMP 2 VFD	Electrical	2	2	2	Repair/Maintain			20+ years	Long-Term	No Action Identified	0	
X	1419	TV	Tertiary	T3400 TERTIARY PLANT YIC 15 ELECTRICAL BUILDING	4	20453	T3400 MAIN DISTRIBUTION PANEL	Electrical	2	2	5	Replace	$570,000		Next 5 years	Near-Term	Unaddressed - Project	1	TV Tertiary YIC 15 Electrical Bldg MCC/
	1423	TV	Tertiary	T3400 TERTIARY PLANT FILTER BACKWASH PONDS & PUMP STATI	4	2198	T3400 TERTIARY FILTER BACKWASH PUMP STATION	Electrical	3	3	4	Replace	$99,000		Next 5 years	Near-Term	Unaddressed - Project	1	TV Filter Backwash Electrical Re
	1426	TV	Tertiary	T3400 TERTIARY PLANT CLARIFICATION / CHEMICAL ZONE	4	3153	T3400 TERTIARY CLARIFICATION ZONE	Electrical	3	3	2	Repair/Maintain			5 to 10 years	Mid-Term	No Action Identified	0	
	1427	TV	Tertiary	T3400 TERTIARY PLANT GRAVITY FILTERS	3	3155	T3400 TERTIARY PLANT GRAVITY FILTERS	Electrical	3	3	4	Replace	$247,000		Next 5 years	Near-Term	Unaddressed - Project	1	TV Gravity Filters Actuators Re
	1428	TV	Tertiary	T3400 TERTIARY PLANT DISINFECTION NaOCl	3	3157	T3400 TERTIARY PLANT DISINFECTION NaOCl	Electrical	3.6	4	5	Replace	$49,000		Next 5 years	Near-Term	Unaddressed - Project	1	TV NaOCl Building Rehabil
	1429	TV	Tertiary	T3400 TERTIARY PLANT DISINFECTION NaOCl	3	3157	T3400 TERTIARY PLANT DISINFECTION NaOCl	Electrical	2	2	5	Replace			Next 5 years	Near-Term	Unaddressed - Other	0	
	1430	TV	Tertiary	T3400 TERTIARY PLANT EFFLUENT DISTRIBUTION	3	3178	T3400 TERTIARY PLANT EFFLUENT DISTRIBUTION	Electrical	2	2	4	Repair/Maintain			5 to 10 years	Mid-Term	No Action Identified	0	
	1431	TV	Tertiary	T3400 TERTIARY PLANT SLUDGE DRYING BEDS & SUPERNATE WE	3	3183	T3400 TERTIARY PLANT SLUDGE DRYING BEDS & SUPERNATE WET WELL	Electrical	3	3	2	Replace	$38,000		Next 5 years	Near-Term	Unaddressed - Project	1	TV Tertiary Sludge Drying Bed
	1432	TV	Tertiary	T3400 TERTIARY PLANT AIR SCOUR BLOWER / EMERGENCY GENE	4	3192	T3400 GENERATOR / BLOWER BUILDING YIC 19 ELECTRIC ROOM	Electrical	3	3	4	No Action			20+ years	Long-Term	No Action Identified	0	
	1438	TV	Tertiary	T3400 TERTIARY PLANT AIR SCOUR BLOWER / EMERGENCY GENE	4	32663	T3400 EMERGENCY GENERATOR ROOM	Electrical	2	2	4	Replace	$14,000		Next 5 years	Near-Term	Unaddressed - Project	1	TV Tertiary Air Scour Blower Electric
	1455	TV	Tertiary	T3400 TERTIARY PLANT YIC 15 ELECTRICAL BUILDING	4	35209	T3400 DENITE PUMP 1, VFD 50 HP P911-1	Electrical	2.6	3	5	Replace			Next 5 years	Near-Term	Addressed	0	
	1456	TV	Tertiary	T3400 TERTIARY PLANT YIC 15 ELECTRICAL BUILDING	4	35210	T3400 DENITE PUMP 2, VFD 50 HP P911-2	Electrical	2.6	3	5	Replace			Next 5 years	Near-Term	Addressed	0	
	1457	TV	Tertiary	T3400 TERTIARY PLANT YIC 15 ELECTRICAL BUILDING	4	35213	T3400 DENITE PUMP 3, VFD 50 HP P911-3	Electrical	2.6	3	5	Replace			Next 5 years	Near-Term	Addressed	0	
X	1458	TV	Tertiary	T3400 TERTIARY PLANT YIC 15 ELECTRICAL BUILDING	4	35223	T3400 YIC 15 ELECTRICAL BUILDING TRANSFORMER 45 KVA	Electrical	2	2	5	Replace	$32,000		Next 5 years	Near-Term	Unaddressed - Project	1	TV Tertiary YIC 15 Electrical Bldg MCC/
X	1459	TV	Tertiary	T3400 TERTIARY PLANT YIC 15 ELECTRICAL BUILDING	4	35224	T3400 YIC 15 ELECTRICAL BUILDING LOAD CENTER LPE	Electrical	2	2	5	Replace	$34,000		Next 5 years	Near-Term	Unaddressed - Project	1	TV Tertiary YIC 15 Electrical Bldg MCC/
	1460	TV	Tertiary	T3400 TERTIARY PLANT AIR SCOUR BLOWER / EMERGENCY GENE	5	35240	T3400 TRANSFORMER	Electrical	2	2	4	Replace	$32,000		Next 5 years	Near-Term	Unaddressed - Project	1	TV Tertiary Air Scour Blower Electric
	1461	TV	Tertiary	T3400 TERTIARY PLANT AIR SCOUR BLOWER / EMERGENCY GENE	5	35242	T3400 LOAD CENTER LPB	Electrical	2	2	4	Replace	$14,000		5 to 10 years	Mid-Term	Unaddressed - Project	1	TV Tertiary Air Scour Blower Electric

04

Data Visualization



Dashboard Audience



Management

High-level content for quick understanding and communicating

Planners

Tactical decision-making based on rolled-up data

Delivery team

Detailed data on individual assets

Program statistics

$108.4M Total investment	
1,878 Total surveys	16,602 Total assets
1.69/5 Average condition	1.8/5 Average LOF
3.34/5 Average COF	12/25 Average risk

Page filters

Plant: All

Process category: All

Discipline: All

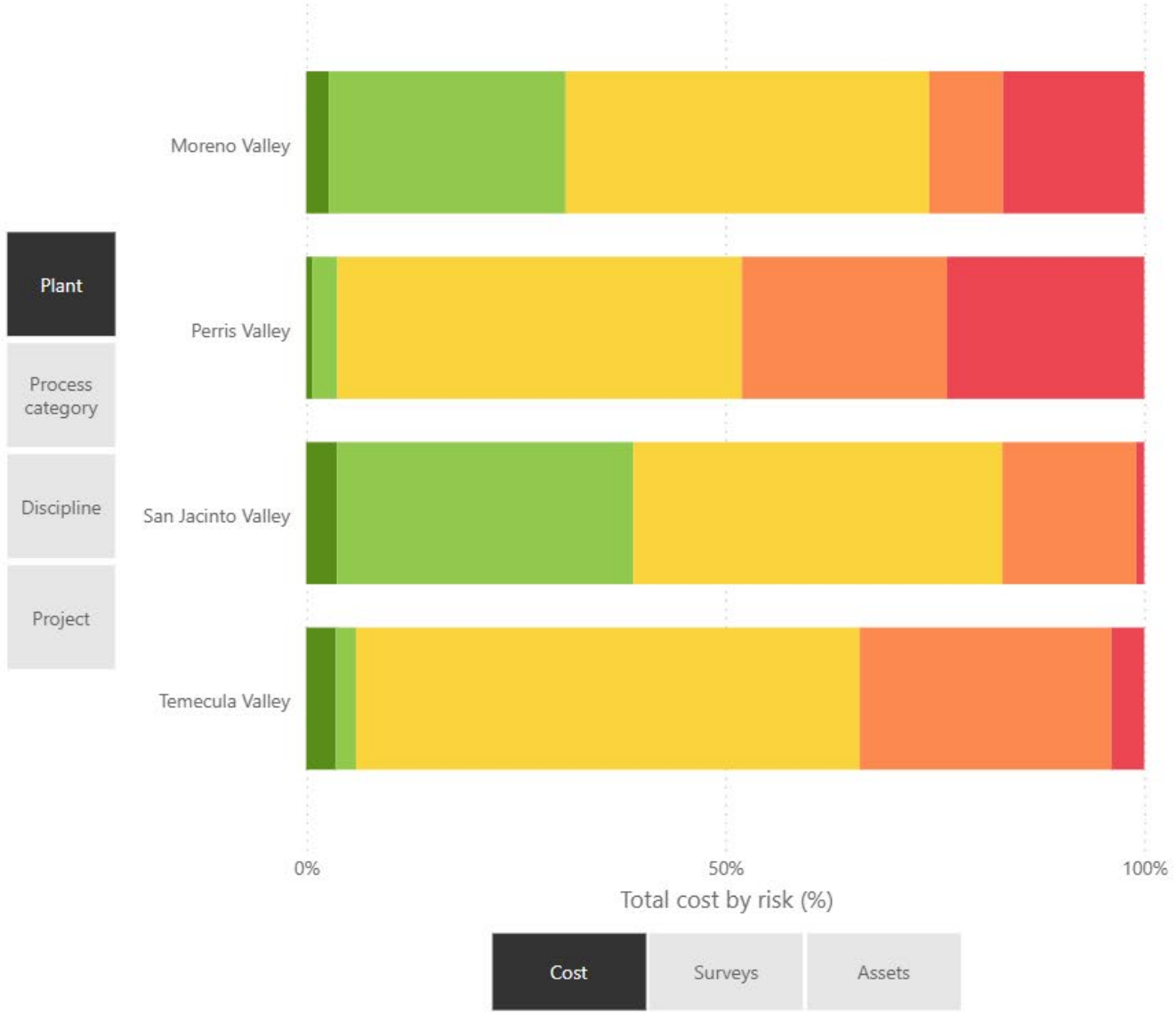
Project timing: All

Issue status: All

Clear all filters

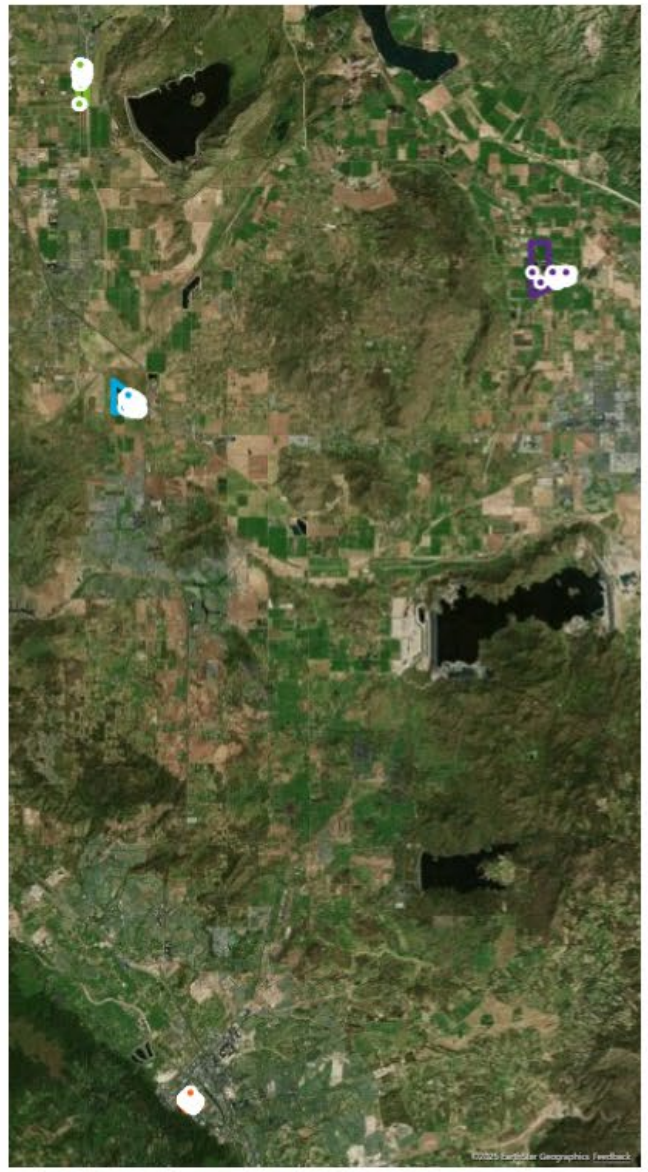
What is the health of our system based on survey results?

Risk: 0 - 5, 5 - 10, 10 - 15, 15 - 20, >20



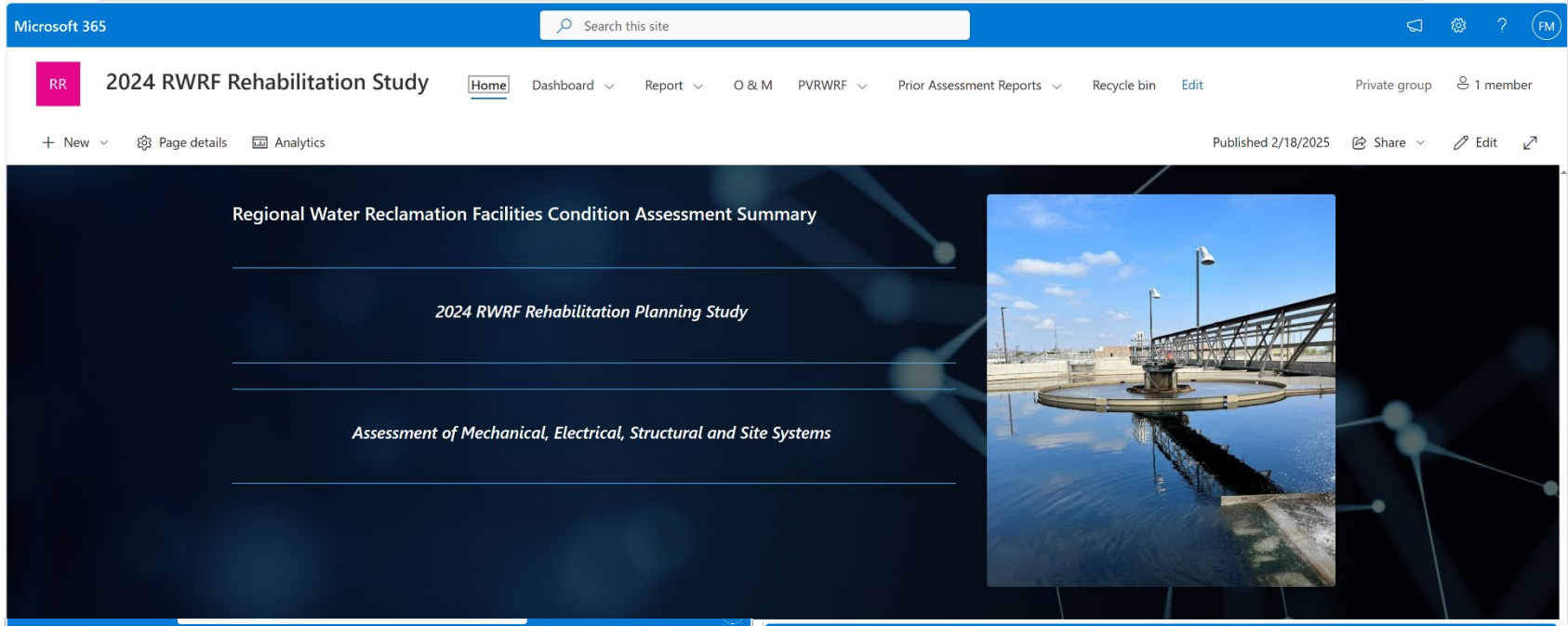
Survey locations

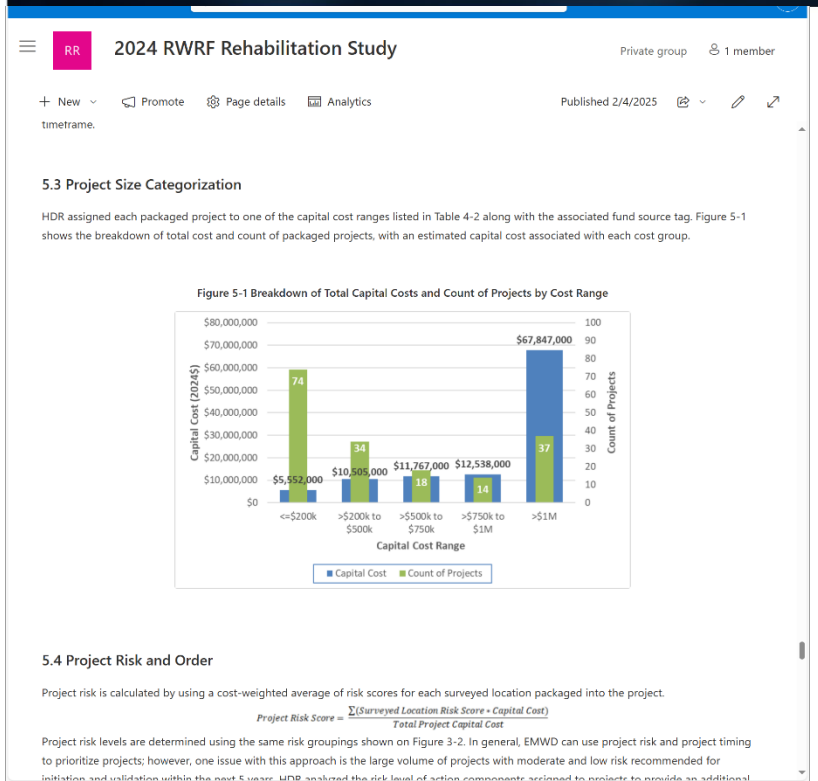
Plant: Moreno, Perris, San Jacinto, Temecula

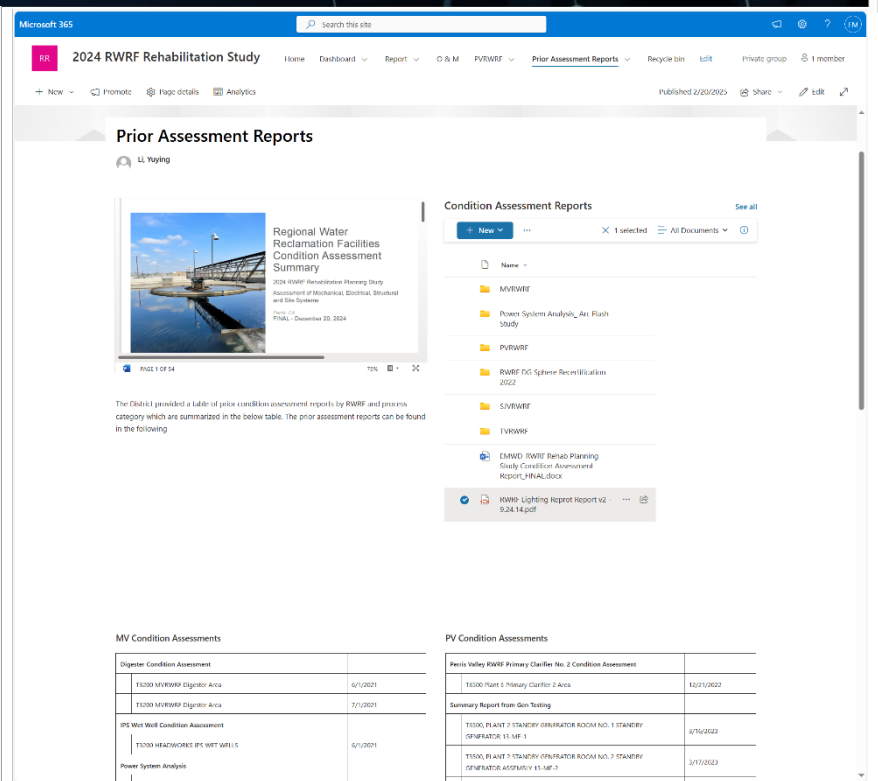


05

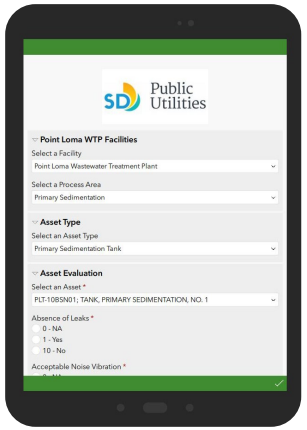
Report Delivery

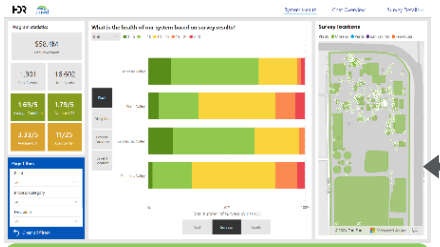






Enhance Asset Management Planning Through Digital Condition Assessment and Data Visualization





Photos (Azure)

Plant Mapping

Power BI

Assessment Data (Asset Registry)

Asset Evaluation Database

Assessment Summaries

Project Area Summaries

Project Summaries

Paginated Reports From Database

Past Assessments

Asset Issues & Actions (SharePoint)

Analytics (Risk, RUL)

Evaluation Decisions

Cost Estimates

Project Packages

Evaluation Phase Inputs

06

Questions