USING GIS & AMI TECHNOLOGY TO FURTHER TACOMA WATER'S SMART WATER PROGRAM

AWWA CONFERENCE PRESENTATION BY:

COREY BEDIENT

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AGENDA:

- **Smart Water Journey**
- **AMI Project Deployment /ESRI Technology**
  1) Meter box and lid survey
  2) Survey evaluation and categorization App for "real-time" data capture monitoring
  3) Meter box upgrade planning and work management by area App
  4) Deployment audit (Private/Public) partnership work process
  5) Next day AMI active status updates in main BlueWave (GIS Web Viewer technology by GeoCortex now called VertiGIS)
- **Next Steps & Future**

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SMART WATER NETWORK DEFINED

What is it?

A fully integrated set of data-driven components and solutions which allow water utilities to optimize all aspects of their water system.

Why is the water industry pursing it?

Smart water solutions improve the efficiency, longevity, and reliability of a utility's underlying physical assets by better measuring, collecting, analyzing, and acting upon a wide range of network events.

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LAYERS OF SMART WATER NETWORK

Solutions that integrate data analytics, modeling, communication channels, sensing devices with the network in near real time.
Common Operating View | Digital Twin

AMI – Headend systems	Hydraulic Model	**GIS - ESRI**	Dash Boards Tableau, Smartsheet	SCADA – supervisory control and data acquisition	
AMI Flexnet Network	3rd Party Cloud Solutions	**ESRI Survey 123, GeoEvent**	Manual	Cellular	Fiber

Metering and equipment which measures parameters such as flow, pressure, noise, water quality. Includes remote controlled equipment such as actuators

Pumps, Pipes, Pressure Reducing Valves, Tanks, etc

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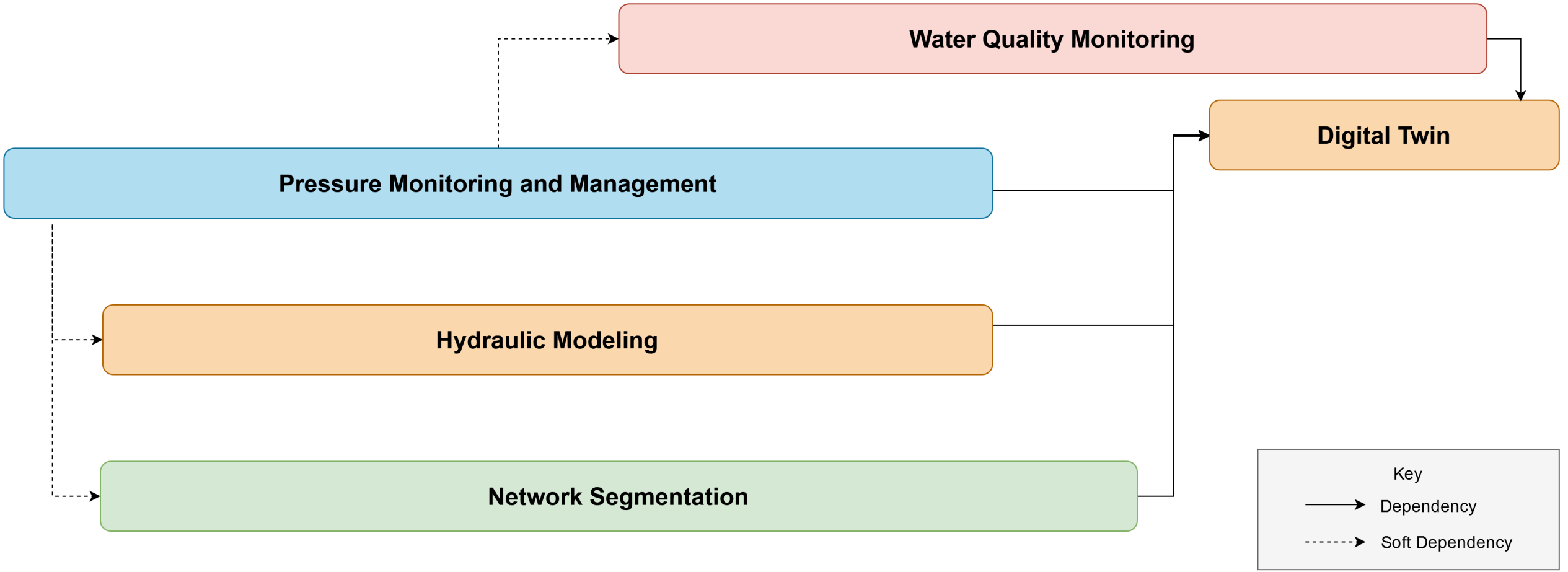
HIGH LEVEL SMART WATER JOURNEY



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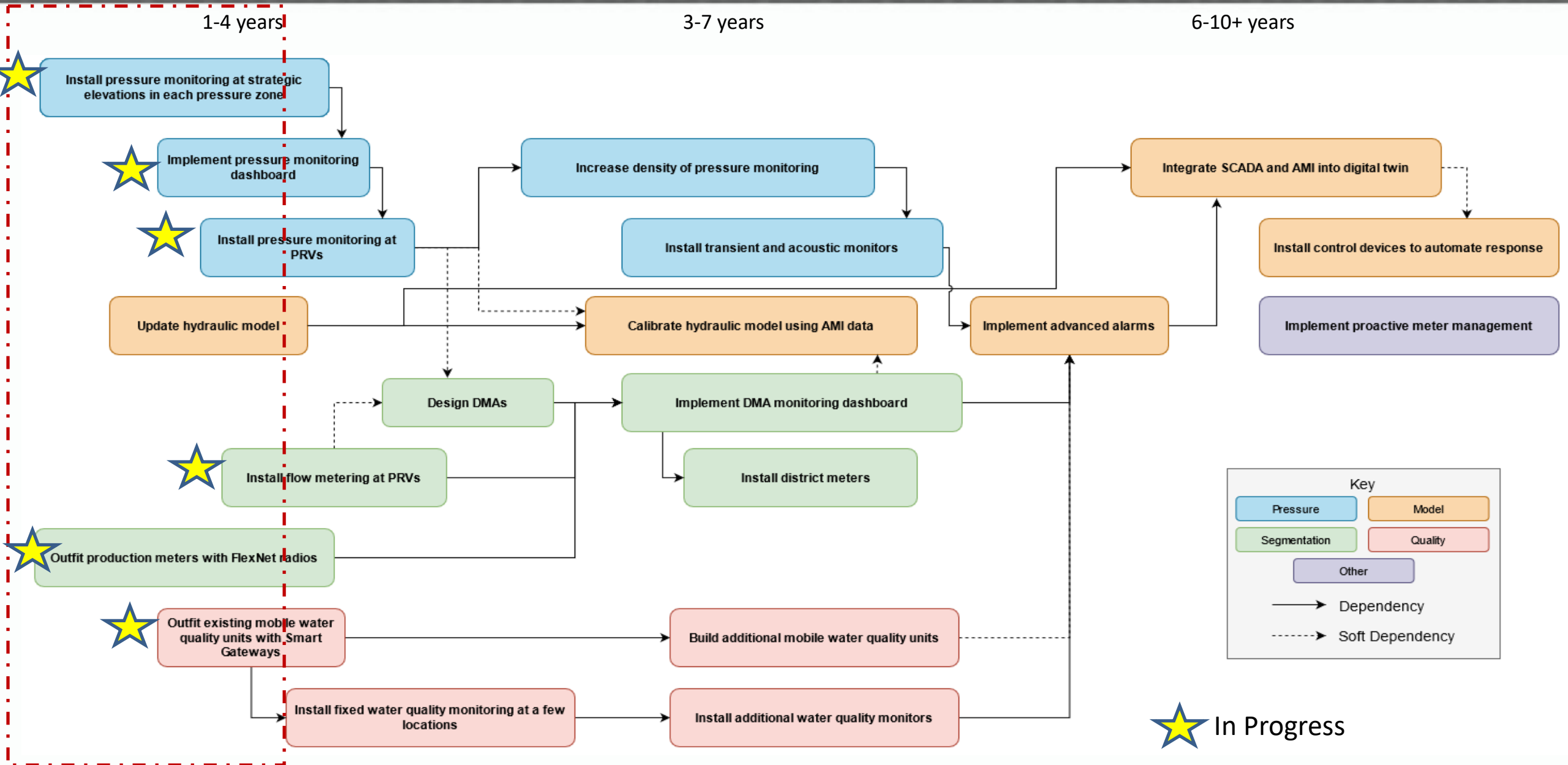
SMART WATER NETWORK ROADMAP PROGRESS



GIS/ESRI IS FOUNDATIONAL TO THE SMART WATER JOURNEY

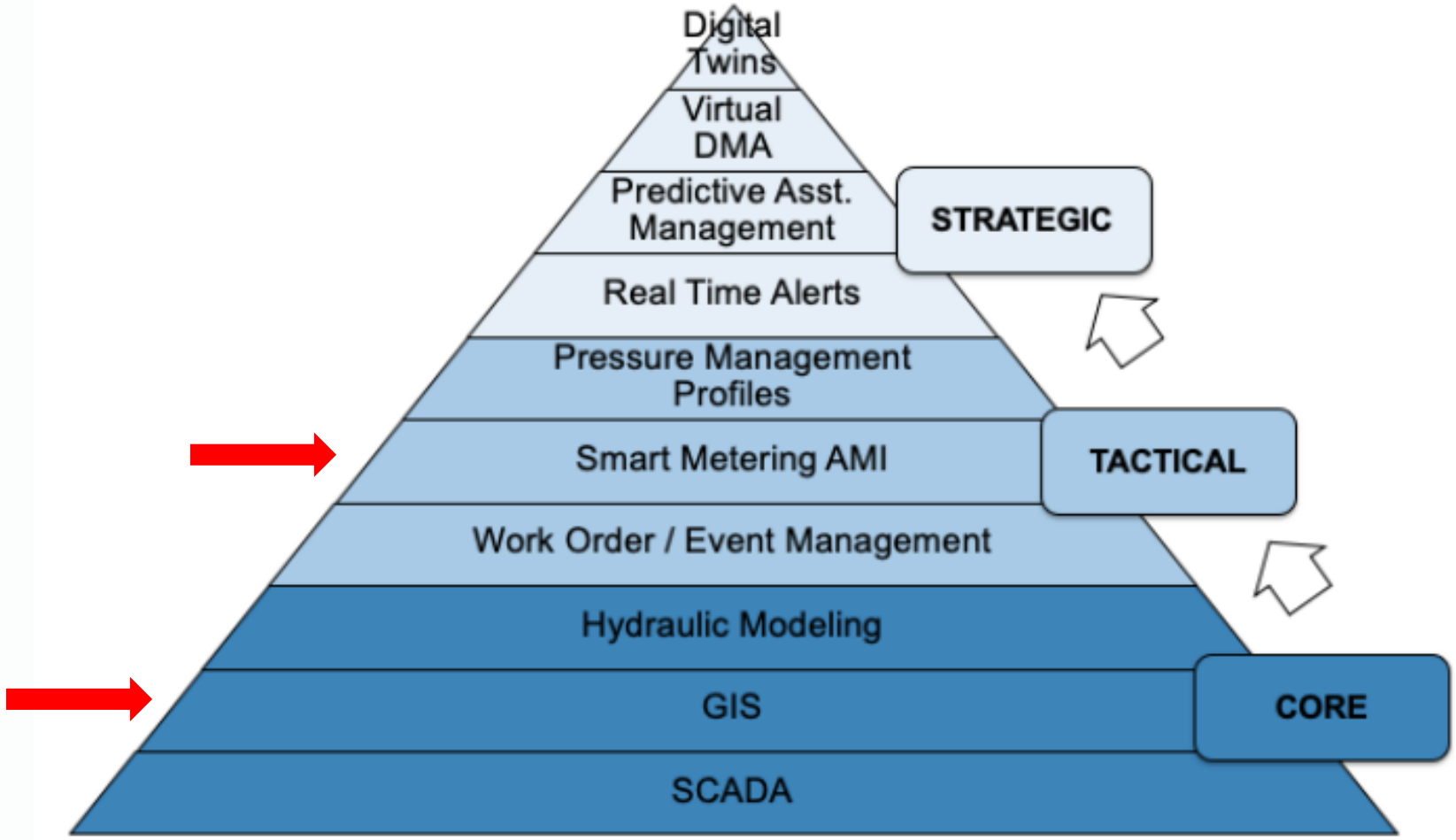


Figure 1: The digital journey pyramid

-GIS and Scada are fundamental building blocks

*Figure from Sensus

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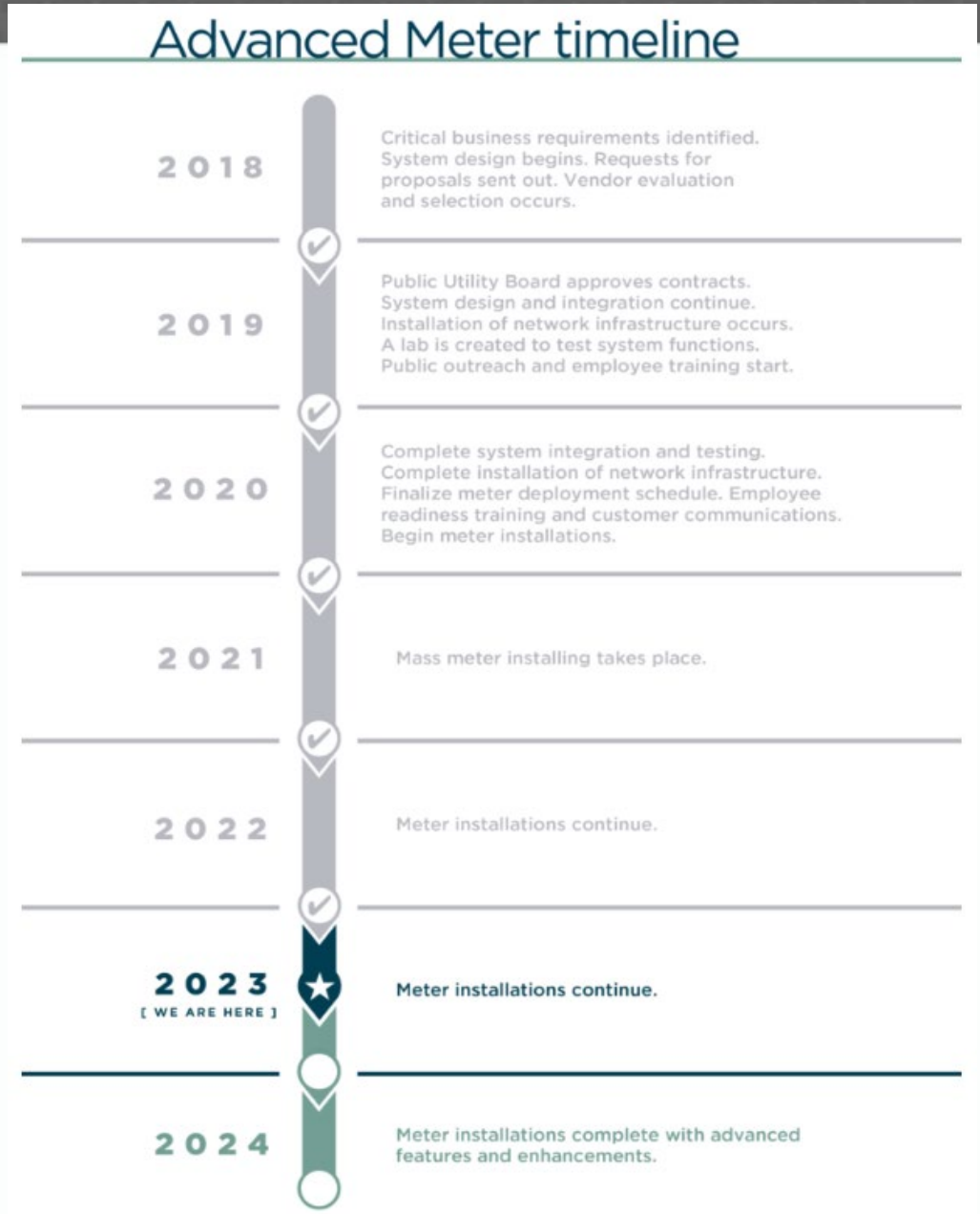
USING ESRI TO BETTER COLLET AND ACT ON DATA

EXAMPLES FROM AMI DEPLOYMENT:

1. Meter box and lid survey
2. Survey evaluation and categorization
3. Meter box upgrade planning and work management by area
4. Deployment QA/QC partnership work process
5. Next day AMI active status updates



AMI Meter Survey Project

Lack of Data about our Meter Boxes:

- Caused a large variation in the Water portion of the AMI Project Costs
- Too many unknown factors
- *Literally guessing on the costs for the water part of the AMI project*

So we decided to do a survey…

- We released an RFP for the Survey Work
  - 3 proposals were submitted from firms outside of Washington
  - All were expensive and paper based – between $800K to $900K
  - None of the submissions could meet the December 30th 2019 deadline
- Decided to Use Survey123 and ArcGIS Online
  - Hired temporary project staff
  - Created our own electronic Survey
  - Budget of $480K - Goal of 80K surveys done by December 30th 2019

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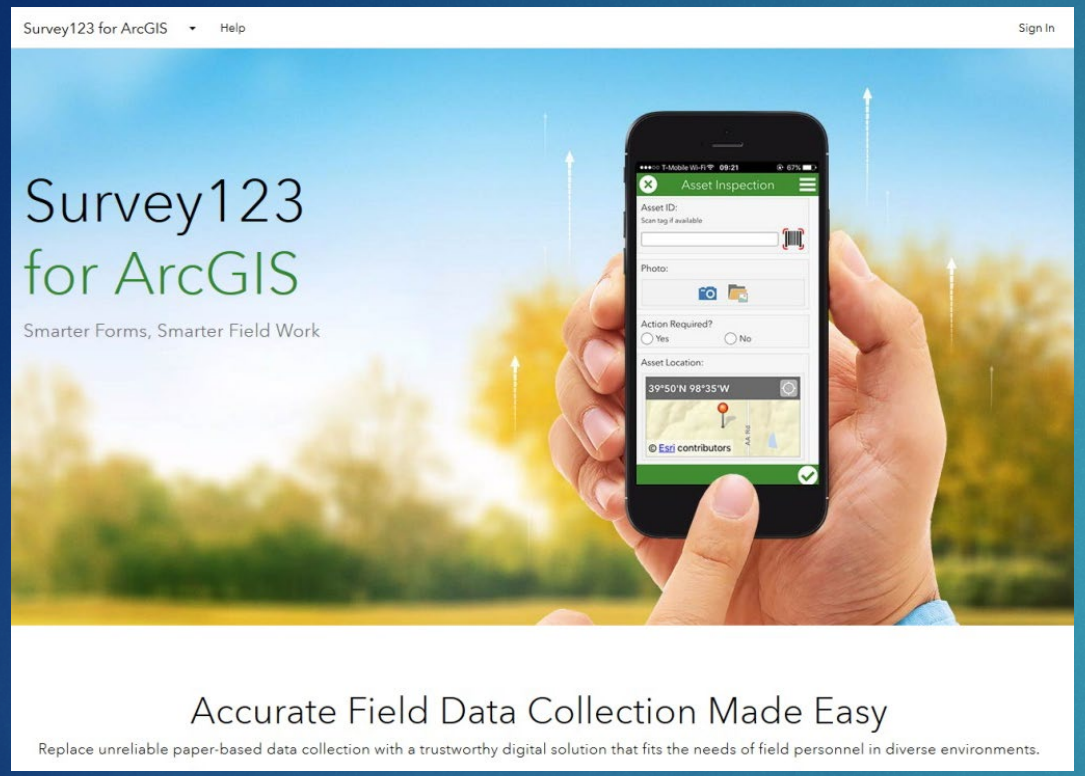
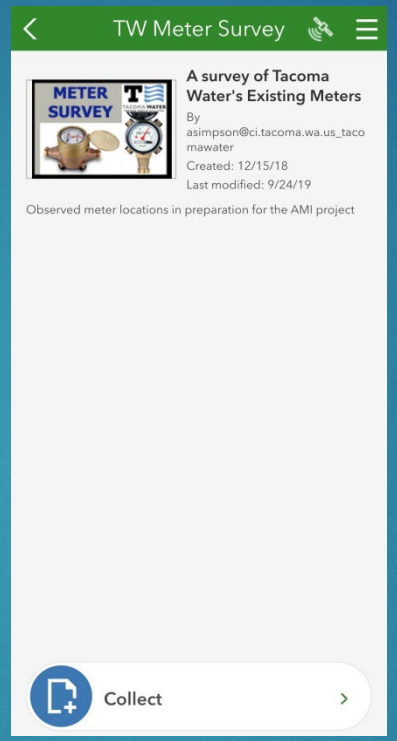
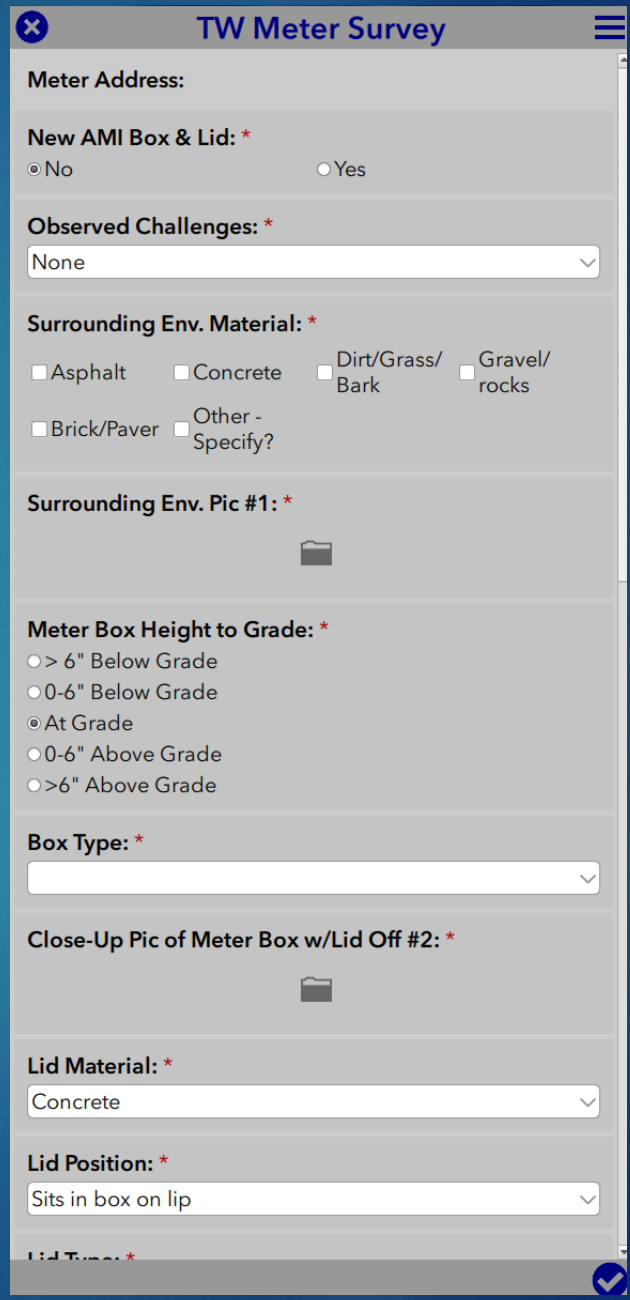
AMI Meter Survey Project (Survey123)







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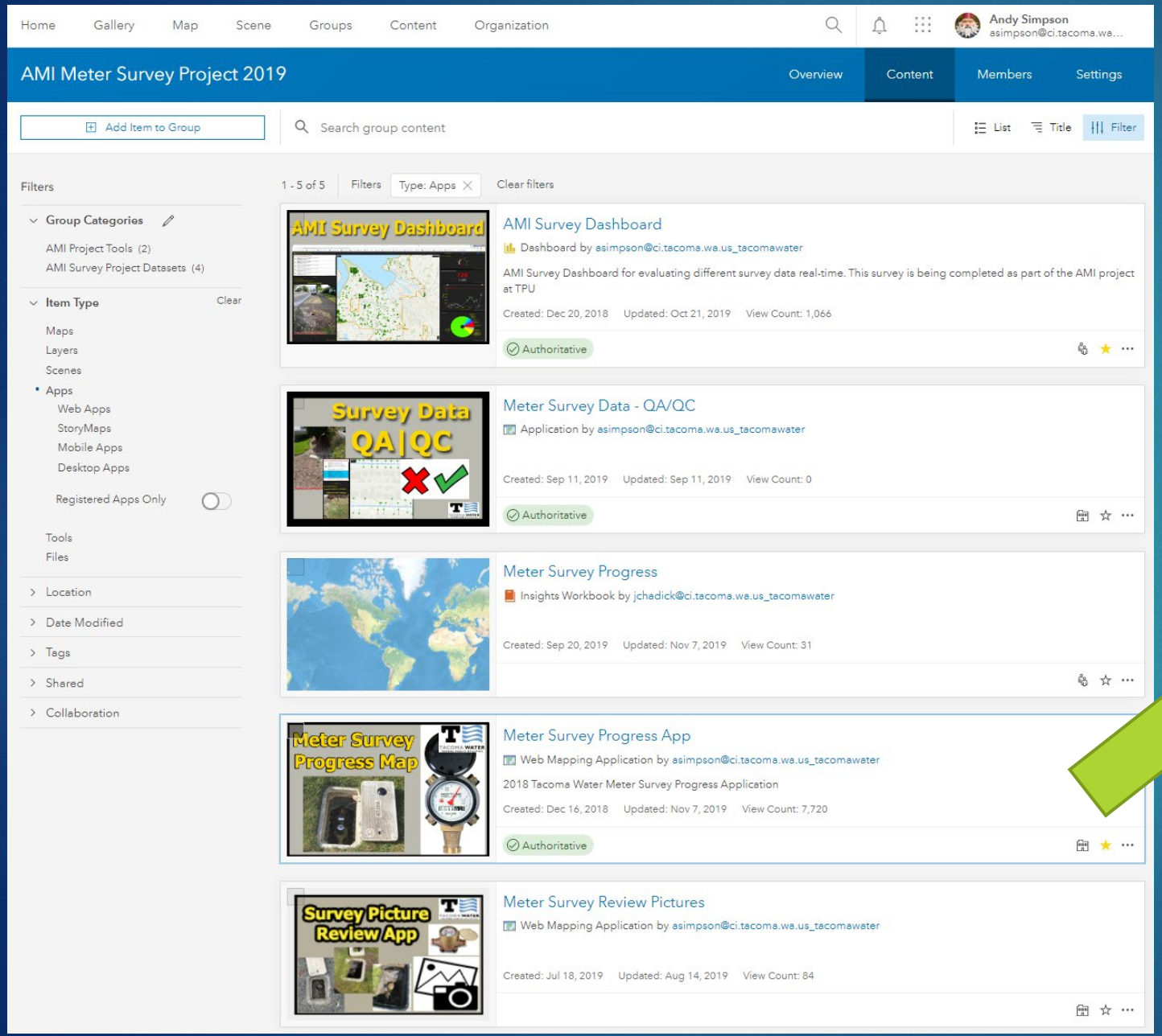
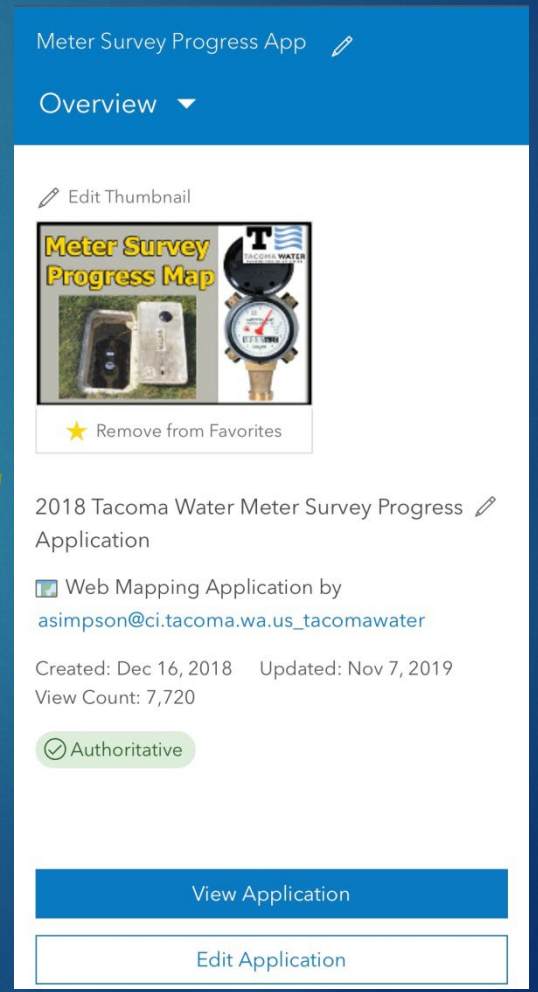
AMI Meter Survey Project (AGOL)



- Meter Survey Progress App (AGOL)



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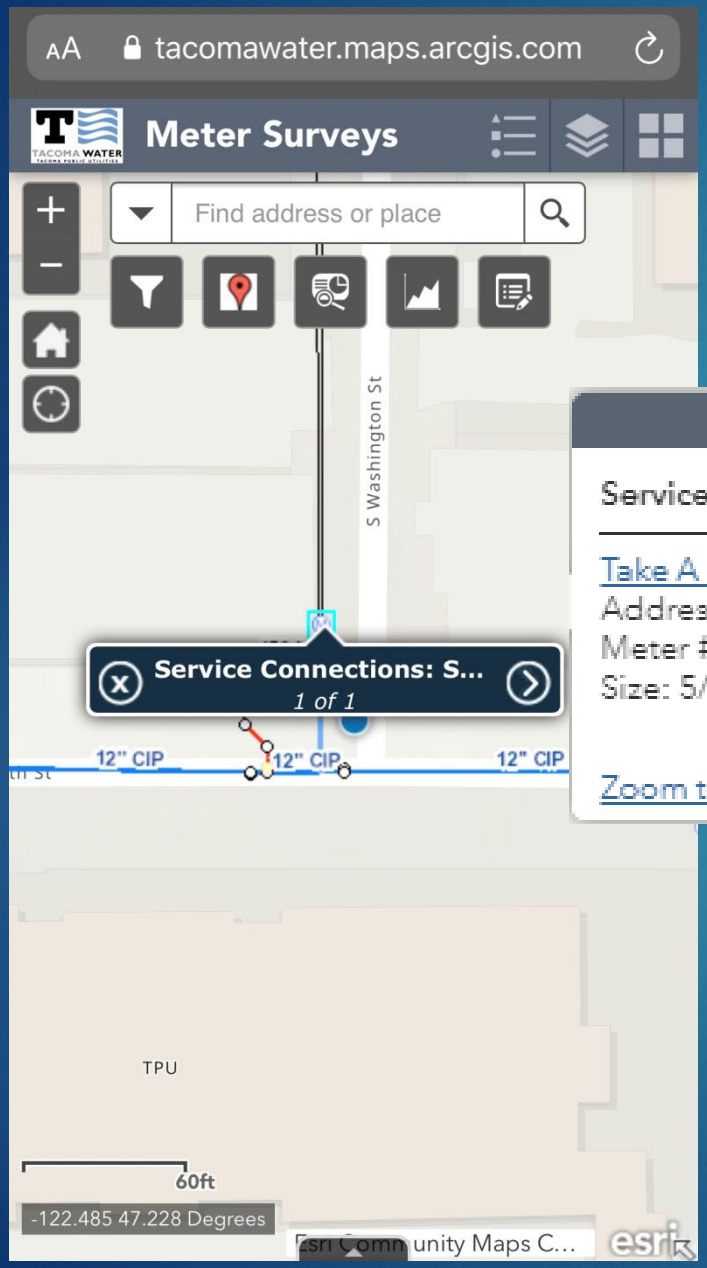
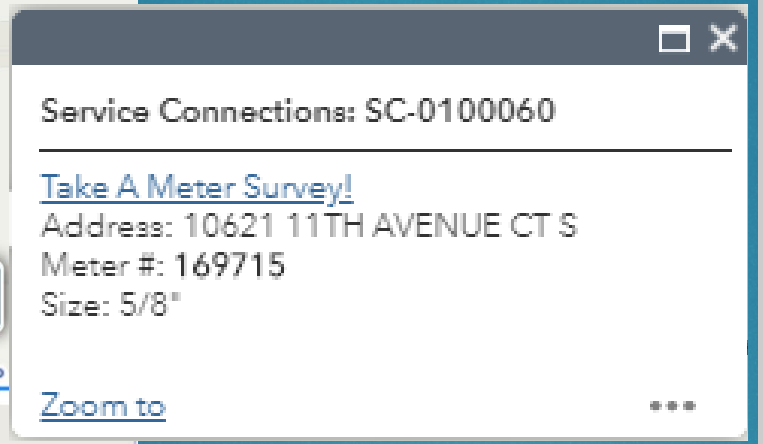
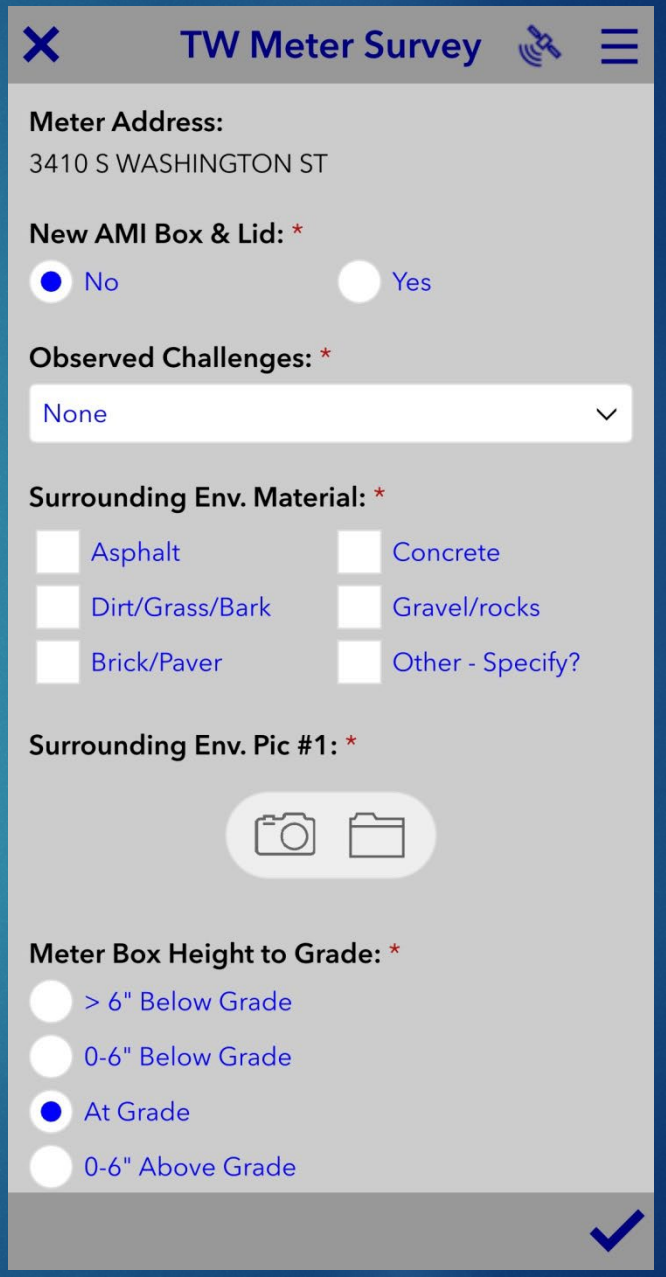
Meter Survey Progress App (IPhone)







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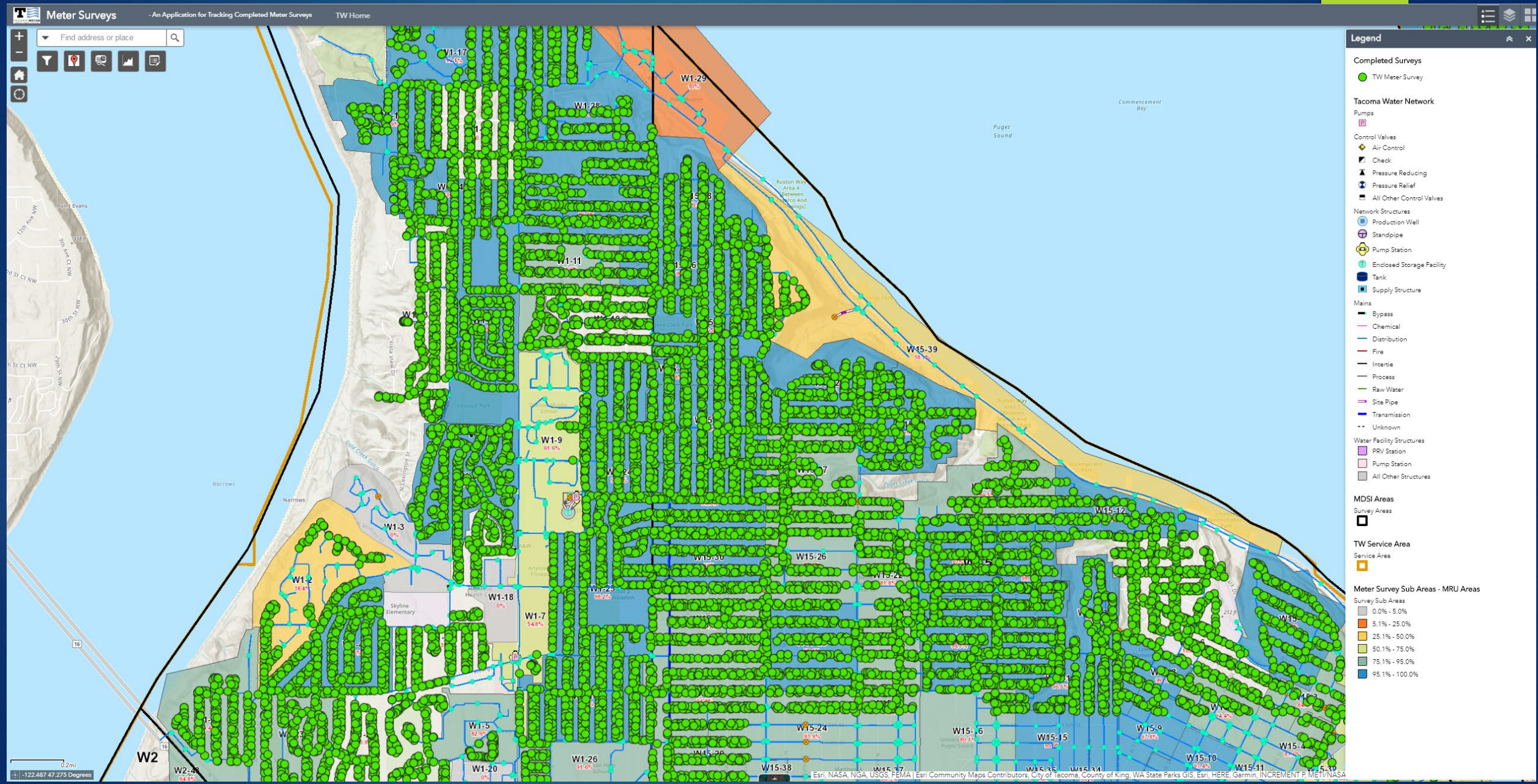
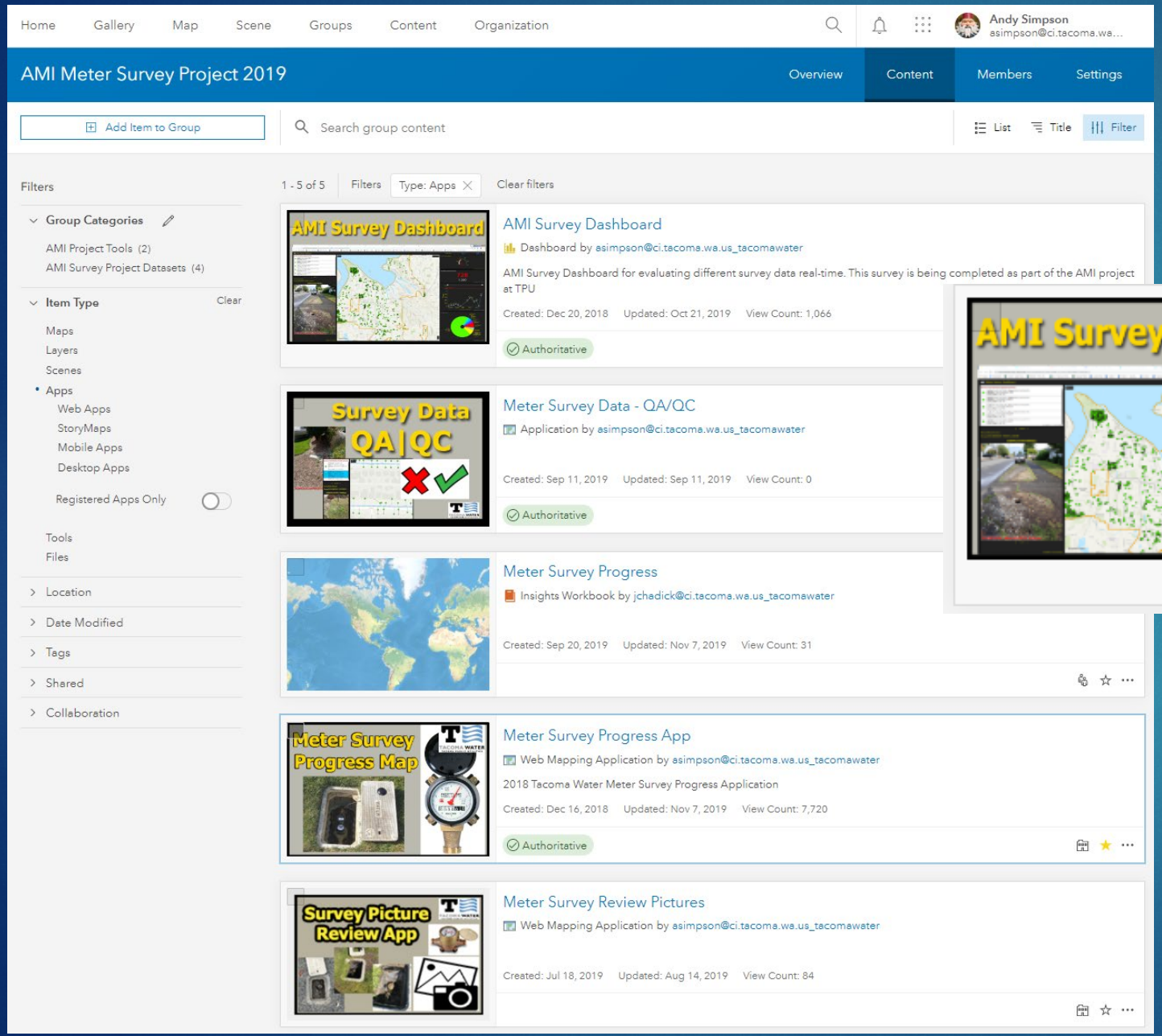
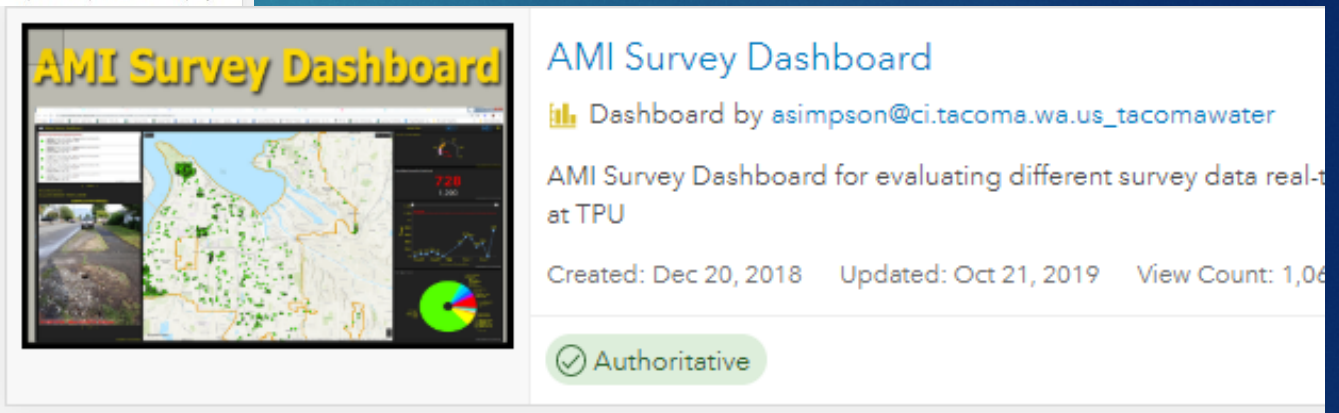
Meter Survey Progress App



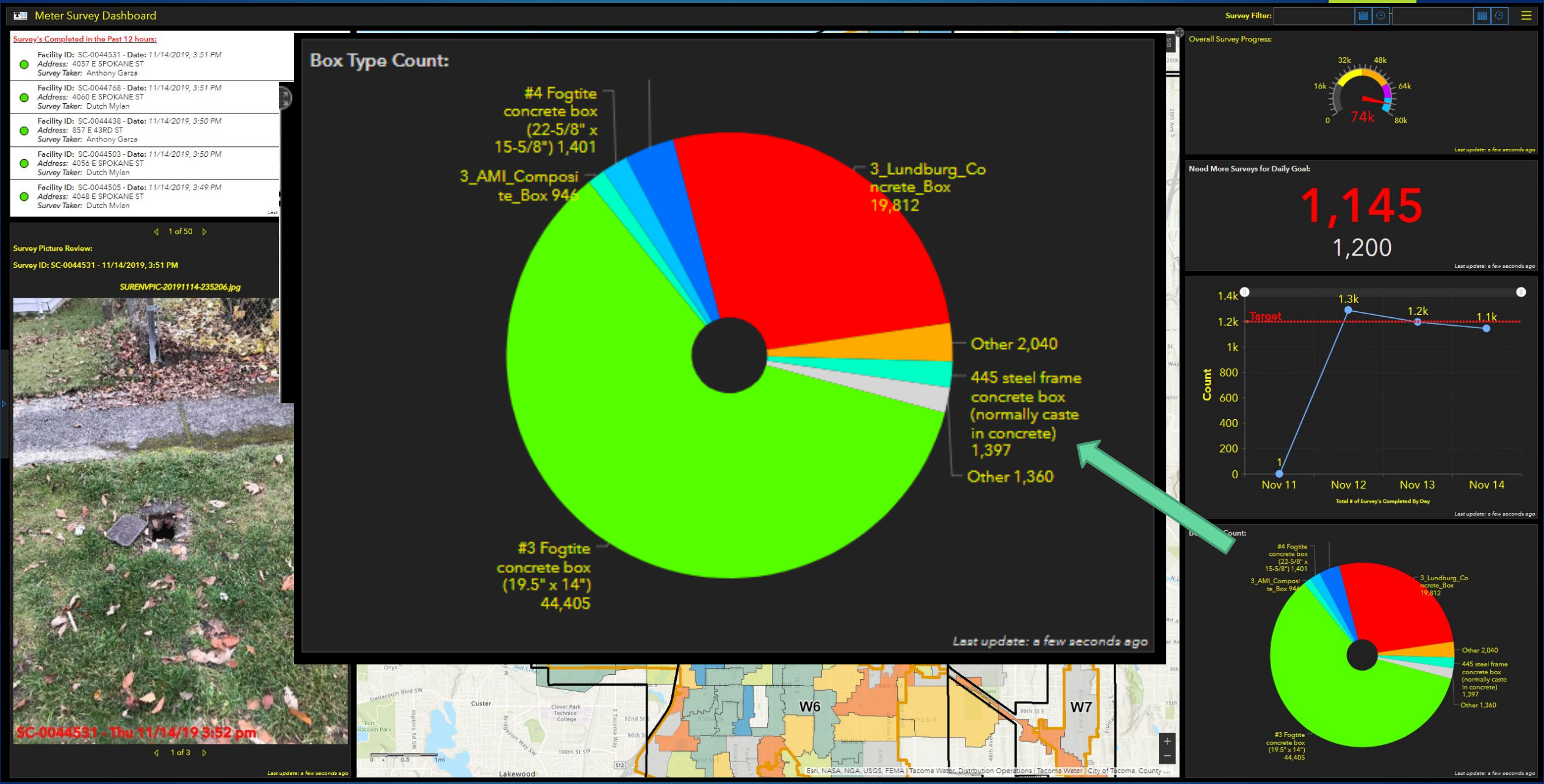
Finding the 445's



- AMI Meter Survey Dashboard



Finding the 445's



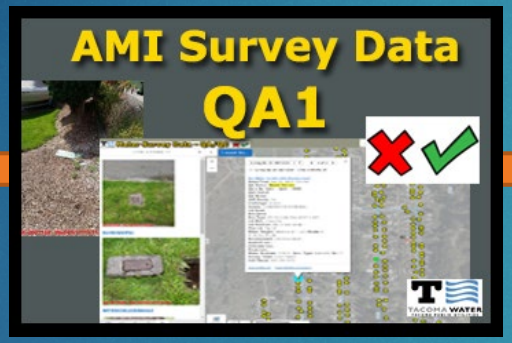
Work Managment

QA 1

QA 2

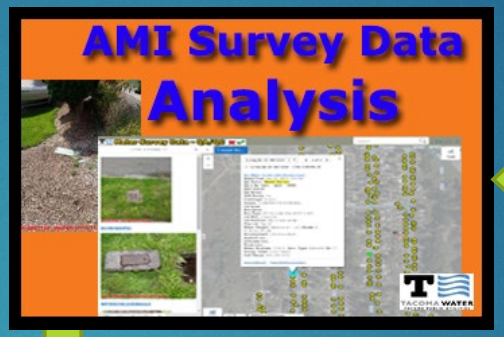
Initial 104k Surveys Completed

Review the Surveys and Pictures



MIV Ready?
- Yes
- No
- Unsure

QA 1 Work Gathered into Projects and sent to SAP

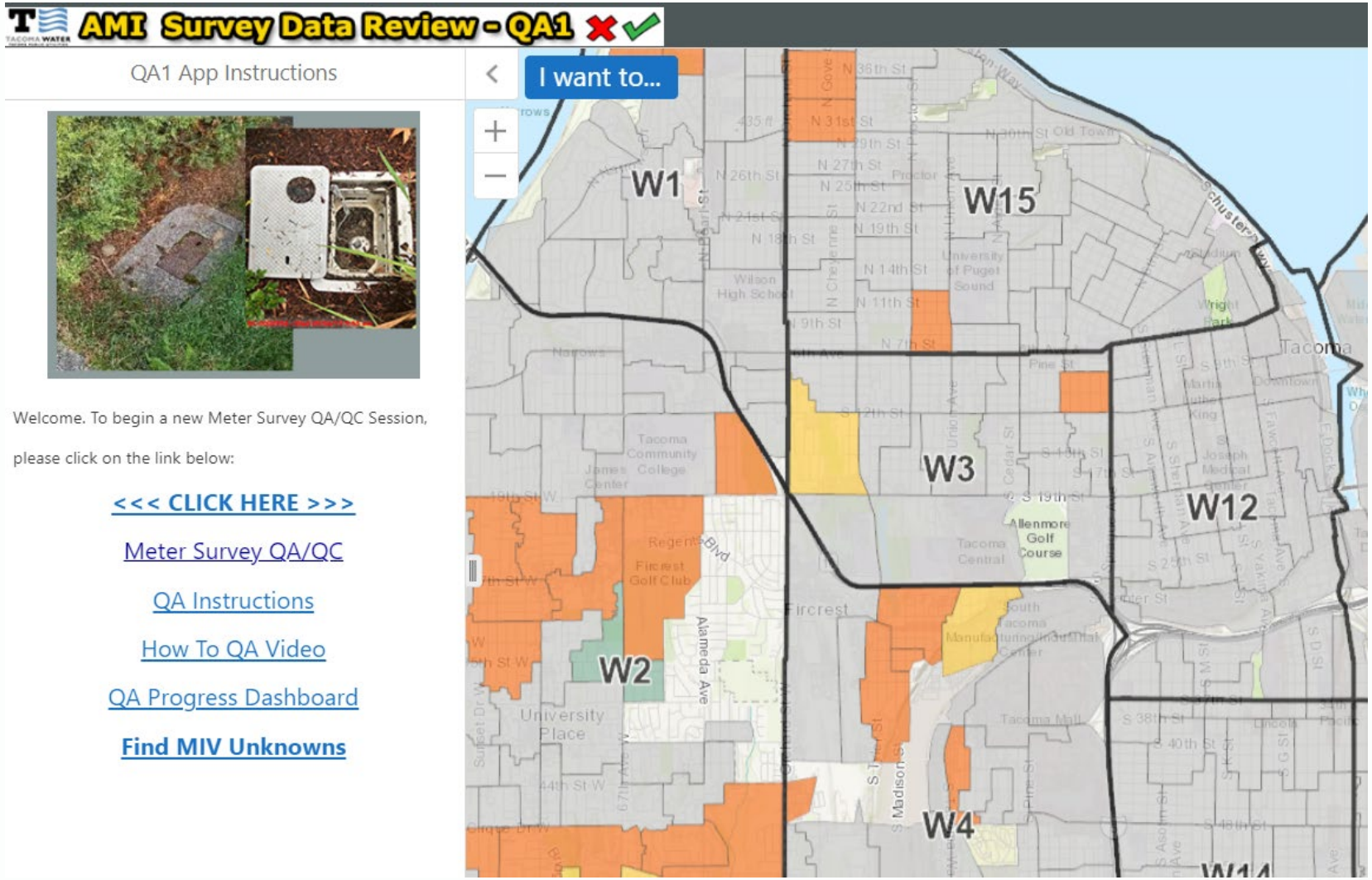


>> SAP Notif. & Work Force Assignments Created

>> Workforce Assignments and SAP Notif. (W2) Evaluated and parsed into buckets

Ready for AMI Deployment

AMI METER BOX SURVEY EVALUATIONS



Benefits

- Enabled field staff to work from home at beginning of COVID-19
- Photos of assets enable evaluation beyond data reported and to validate or correct data

Challenges

- Identifying clear output
- Setting evaluation standards and training

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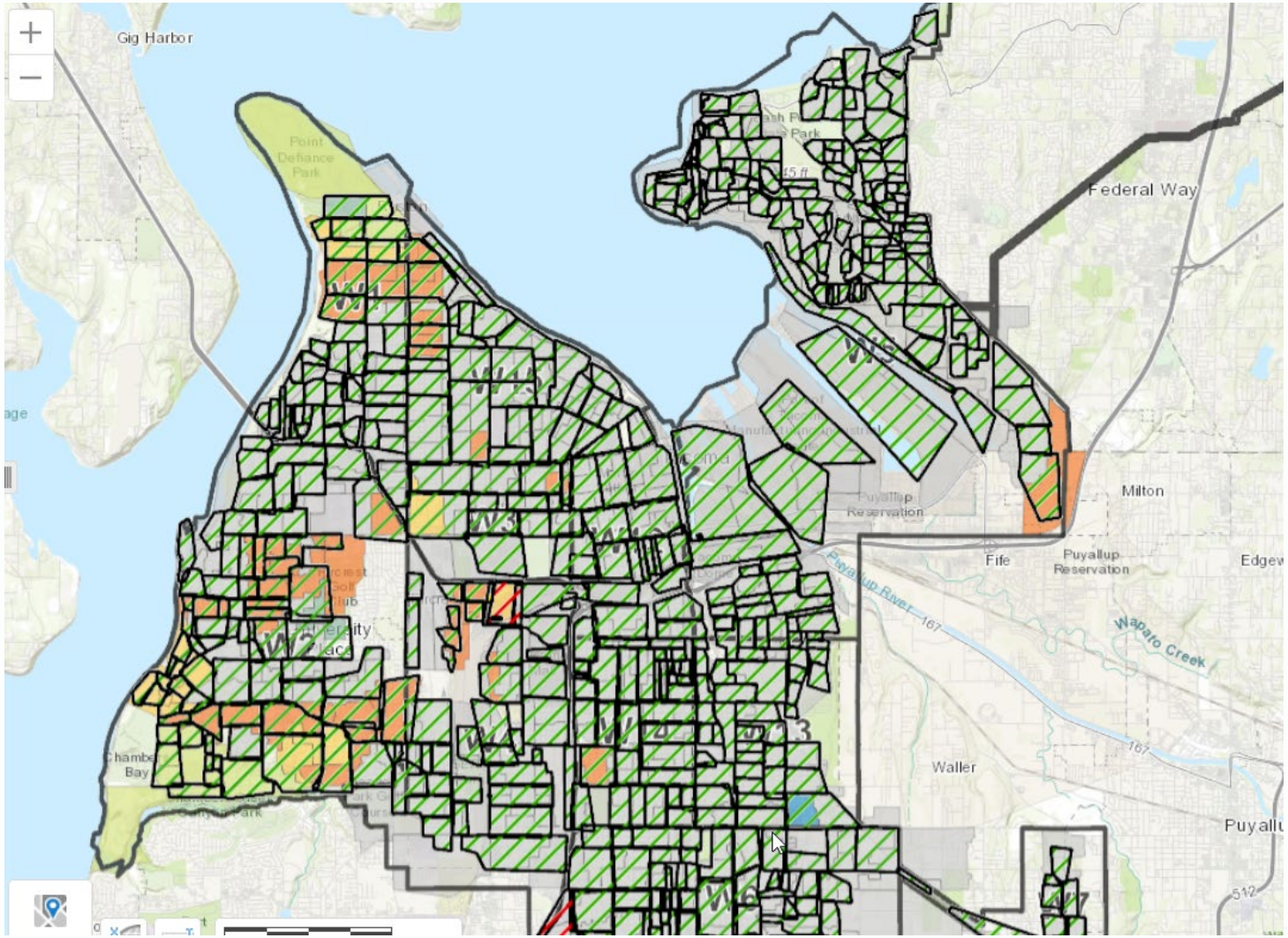
AMI PREP WORK PLANNING BY SUB AREAS



Benefits:

- Planning by area improved efficiency for field staff
- Scripting automated creation of work tasks for field staff

Challenges:

- 20k+ follow up inspections to confirm AMI ready
- 1,790 Work Orders to make service AMI Read
- Multiple status tracking in one view

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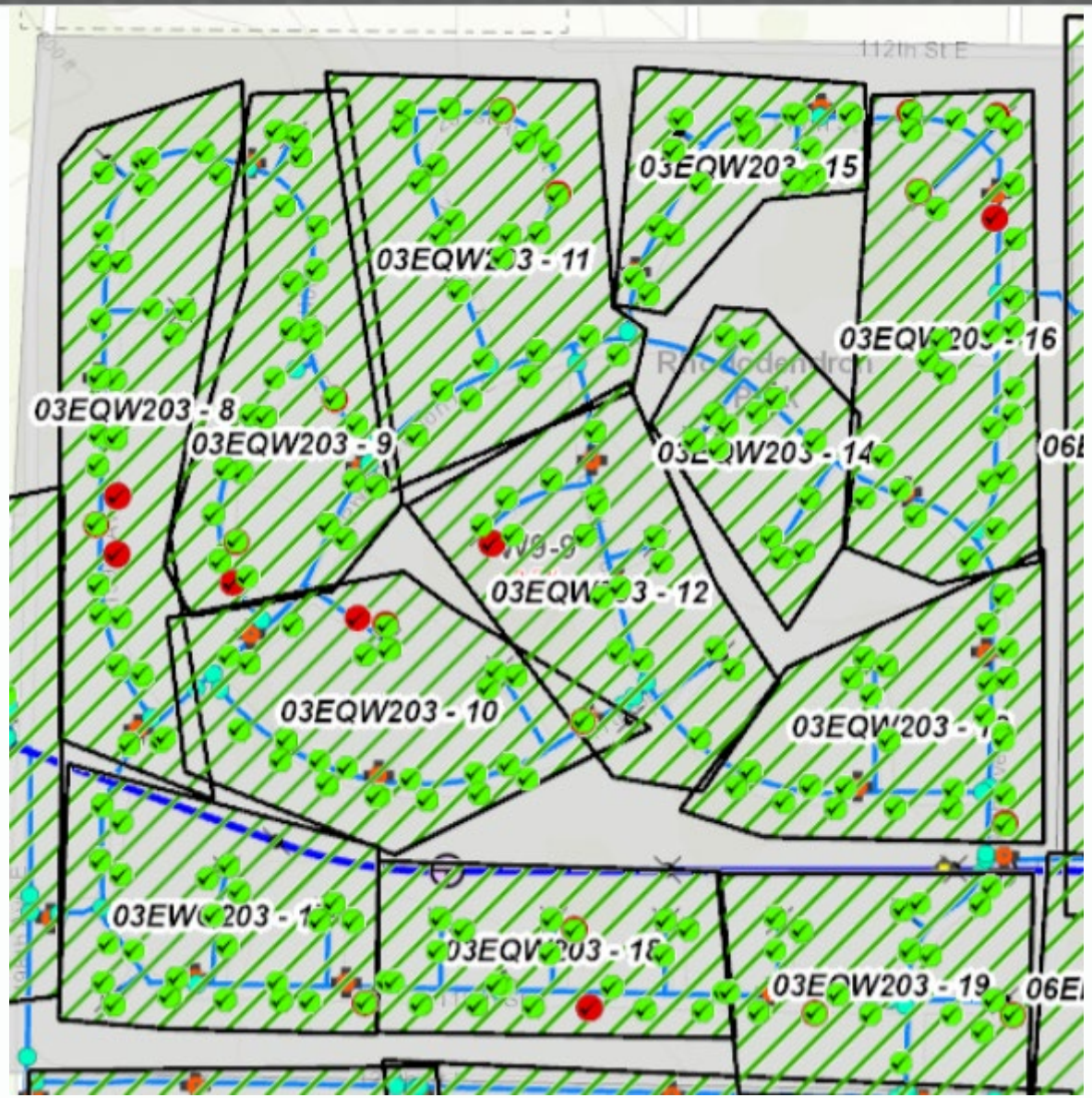
METER BOX IMPROVEMENT WORK MANAGEMENT



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AMI Meter Survey Progress Dashboard

Operational Technology | System & Asset Planning
Manual refresh weekly | Last refresh 4.26.2023
Questions? Contact dmartin@cityoftacoma.org

Total Meter Box Improvements Identified

Total QA2 Percent Complete	Follow On Work Orders Created	Total Follow On Work Complete
99.82%	1,790	1,376

QA2 Complete by W Area

W Area	Count of FL	Total QA2 Identified	QA2 Complete	QA2 In Progress	QA2% Complete
W12	5,139	459	459	0	100.00%
W14	7,596	1,843	1,843	0	100.00%
W4	7,546	846	846	0	100.00%
W13	7,175	958	958	0	100.00%
W6	9,062	3,076	3,076	0	100.00%
W2	11,631	2,004	2,004	0	100.00%
W1	6,549	1,330	1,330	0	100.00%
W15	10,322	853	853	0	100.00%
W3	4,247	345	345	0	100.00%
W5	13,383	3,567	3,567	0	100.00%
W8	5,950	3,537	3,537	0	100.00%
W9	8,402	3,065	3,065	0	100.00%
W10	87	43	0	43	0.00%
Grand Total	97,089	21,926	21,883	43	

Follow On Work Progress by W Area

W Area	Total Follow On Work Identified	Needs Work Order	WO Total	Is Complete?	In Progress	% Complete
W12	153	1	79	79	0	100%
W14	72	0	87	87	0	100%
W4	124	0	123	123	0	100%
W13	88	0	98	98	0	100%
W6	321	0	331	331	0	100%
W2	170	0	145	143	2	99%
W1	63	0	55	29	26	53%
W15	72	0	63	17	46	27%
W7	188	0	169	122	47	72%
W8	133	0	125	118	7	94%
W9	234	0	217	132	85	61%
W10	0	0	0	0	0	
W5	296	2	264	63	201	24%
W3	29	0	34	34	0	100%
Grand Total	1,943	3	1,790	1,376	414	77%

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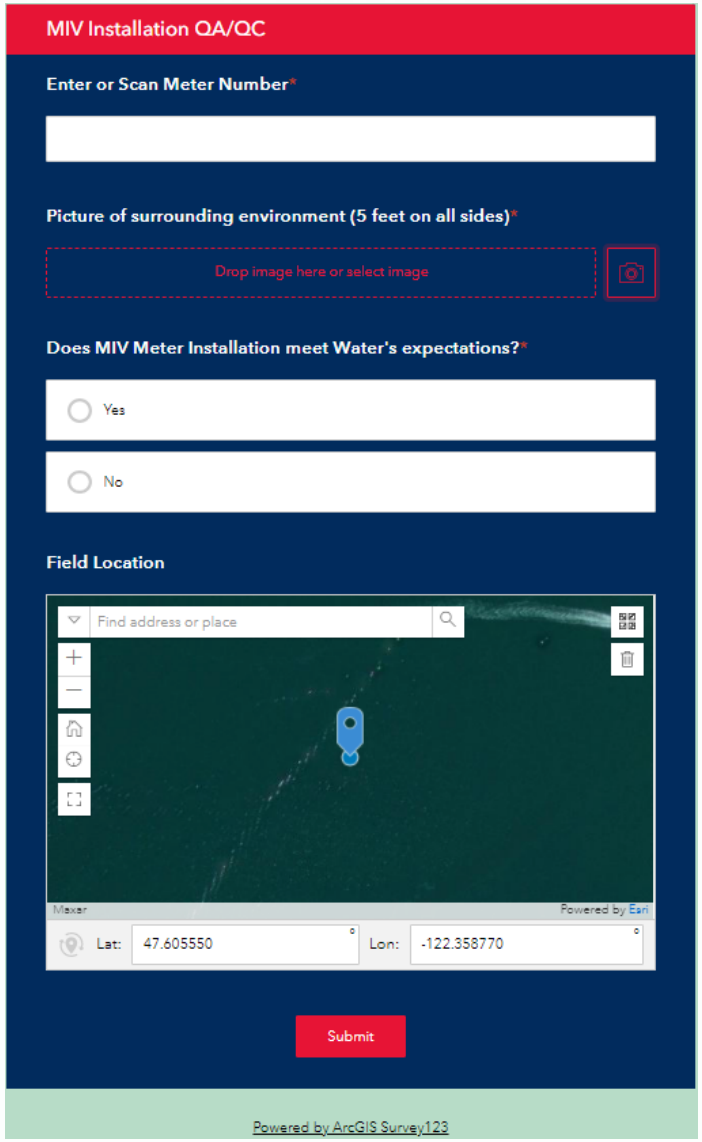
AMI DEPLOYMENT MIV - AUDIT RESOLUTION SURVEY



Benefits:

- Leveraged mobile phone app staff is already familiar with
- Shared environment between Utility and MIV
- Eliminated need for weekly meetings
- Resolution photos eliminated validation field visits

Challenges:

- MIV mobile phone security
- Where and who to audit
- What problem are we trying to solve?

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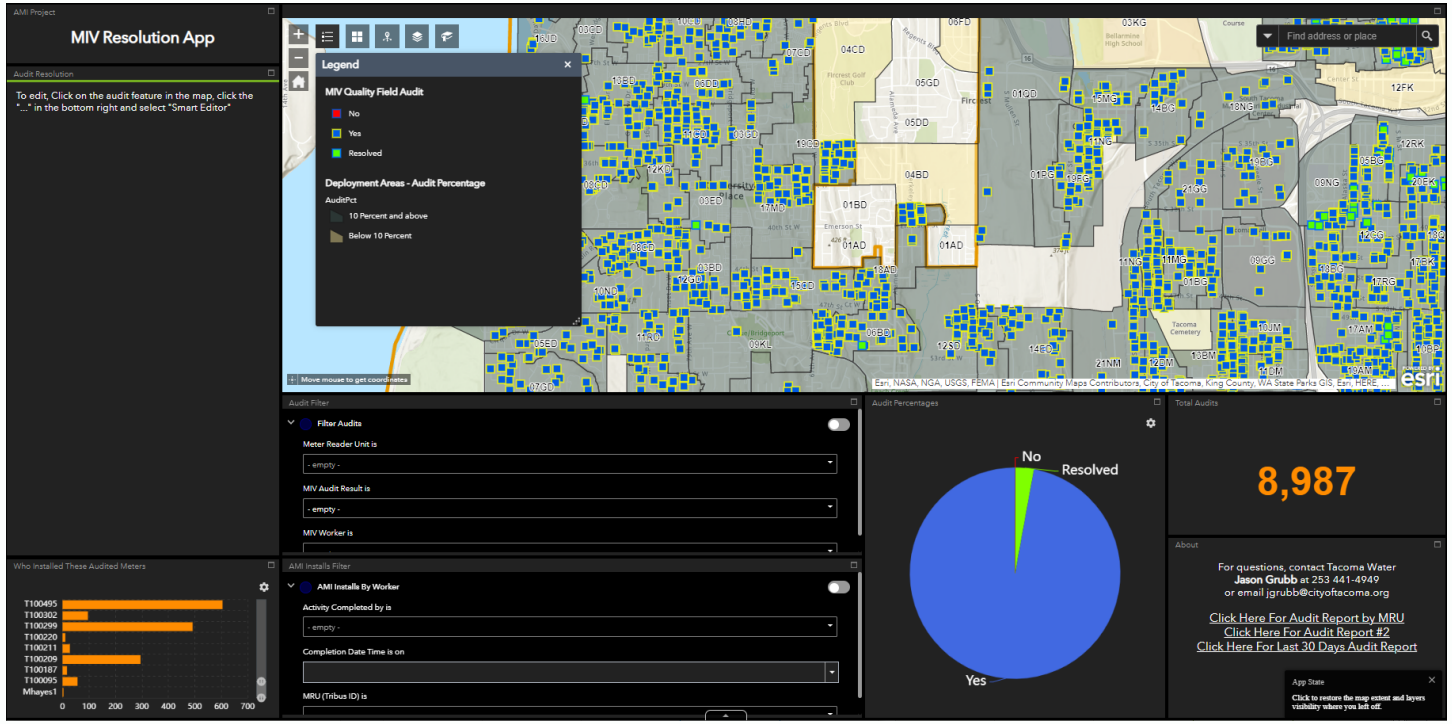
AMI DEPLOYMENT AUDIT RESOLUTION

All Tribus Workers with Installs Last 30 days

Worker	Installs Last 30 days	Most Recent Install Date	Total Installs	10% Audit	30% Audit	Total Audits	Acceptable Fails 10%	Acceptable Fails 30%	Failed Audits	Action
T100299	225	January 12	4541	455	1363	460	46	137	26	Audit For Worker is Complete
T100302	230	January 12	918	92	276	64	10	28	0	Need to complete more audits to reach 10%
T100495	204	January 12	4768	477	1431	563	48	144	24	Audit For Worker is Complete
T100528	206	January 12	4345	435	1304	506	44	131	17	Audit For Worker is Complete
T100538	45	January 10	1686	169	506	272	17	51	6	Audit For Worker is Complete
T100540	222	January 12	4444	445	1334	470	45	134	13	Audit For Worker is Complete
T100541	199	January 11	4373	438	1312	484	44	132	21	Audit For Worker is Complete
T100544	190	January 11	4911	492	1474	580	50	148	29	Audit For Worker is Complete
T100560	192	January 11	4727	473	1419	474	48	142	28	Audit For Worker is Complete
T100720	189	January 12	3239	324	972	296	33	98	3	Need to complete more audits to reach 10%
T100721	244	January 11	3834	384	1151	346	39	116	2	Need to complete more audits to reach 10%
T100796	188	January 11	3208	321	963	231	33	97	1	Need to complete more audits to reach 10%
T100818	226	January 12	917	92	276	27	10	28	0	Need to complete more audits to reach 10%
T100869	199	January 11	2587	259	777	172	26	78	2	Need to complete more audits to reach 10%
Tribus Totals	**2759**		**48498**	**4856**	**14558**	**4945**	**493**	**1464**	**172**	

- Weekly Report for last 30 days of audits by MIV installer. Yellow highlights where more audits are needed to reach 10% goal



- Dashboard could then be used to identify where to audit.
- MIV also used the Dashboard to identify failed audits needing resolution.

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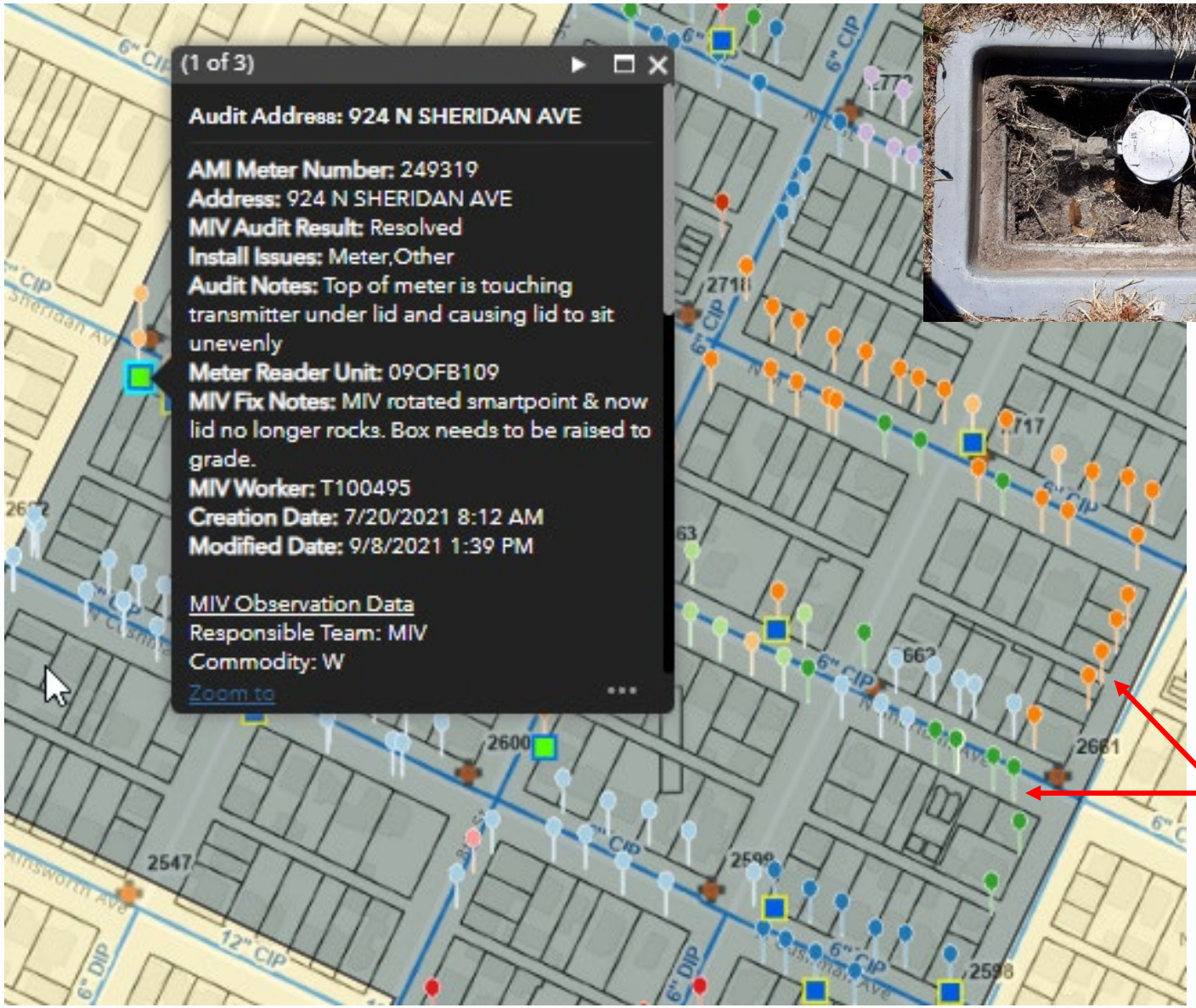
AMI DEPLOYMENT AUDIT RESOLUTION



Audit by Utility

Validation of Resolution

Colors identify individual installers

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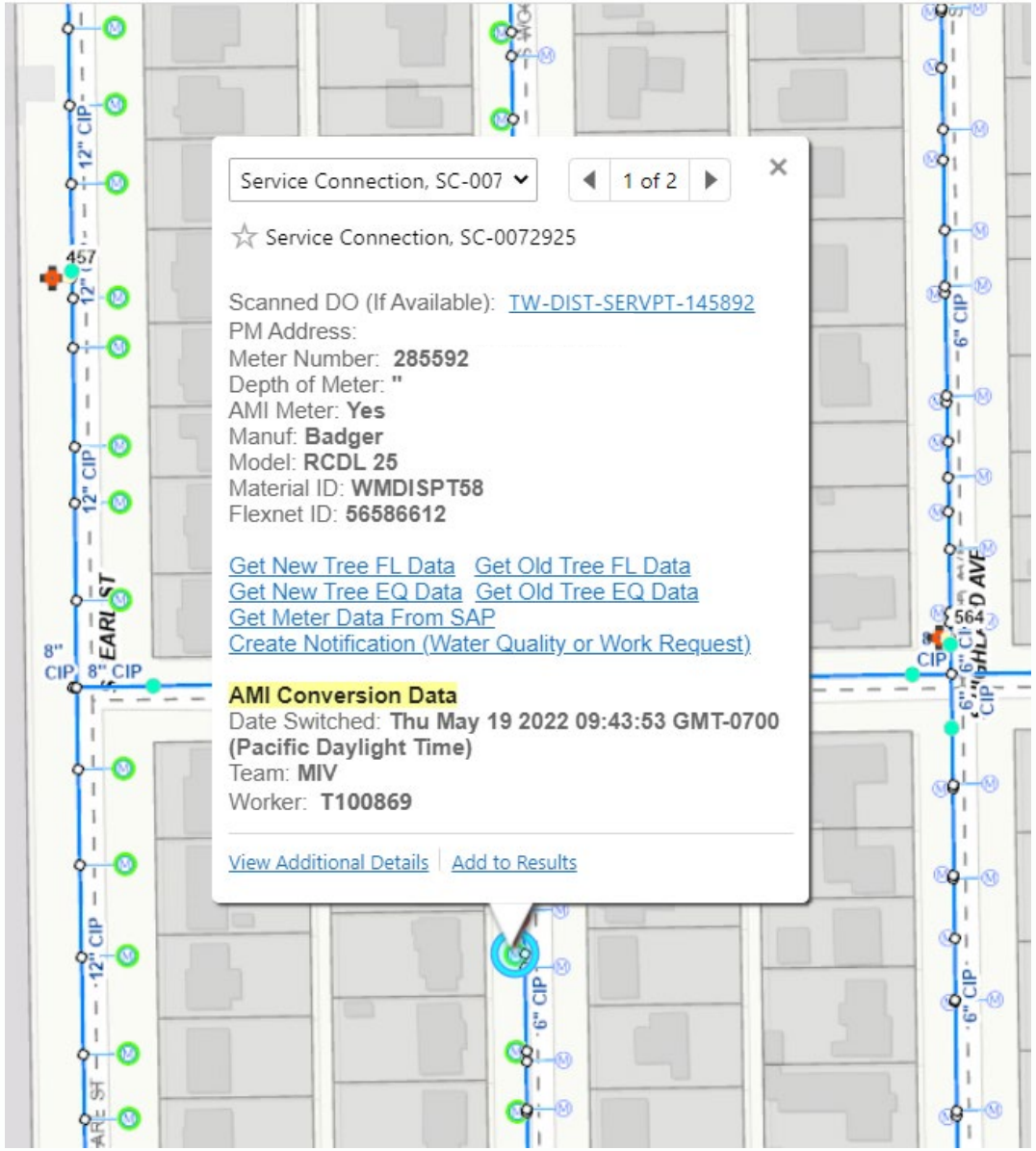
DAILY AMI METER STATUS UPDATES



Benefits

- Platform available to all staff
- Visually identify AMI status
- Quick source for identifying who installed and when for trouble shooting

Challenges

- Data structures in SAP were not readily accessible and took some work to automate
- Multiple status tracking in one view

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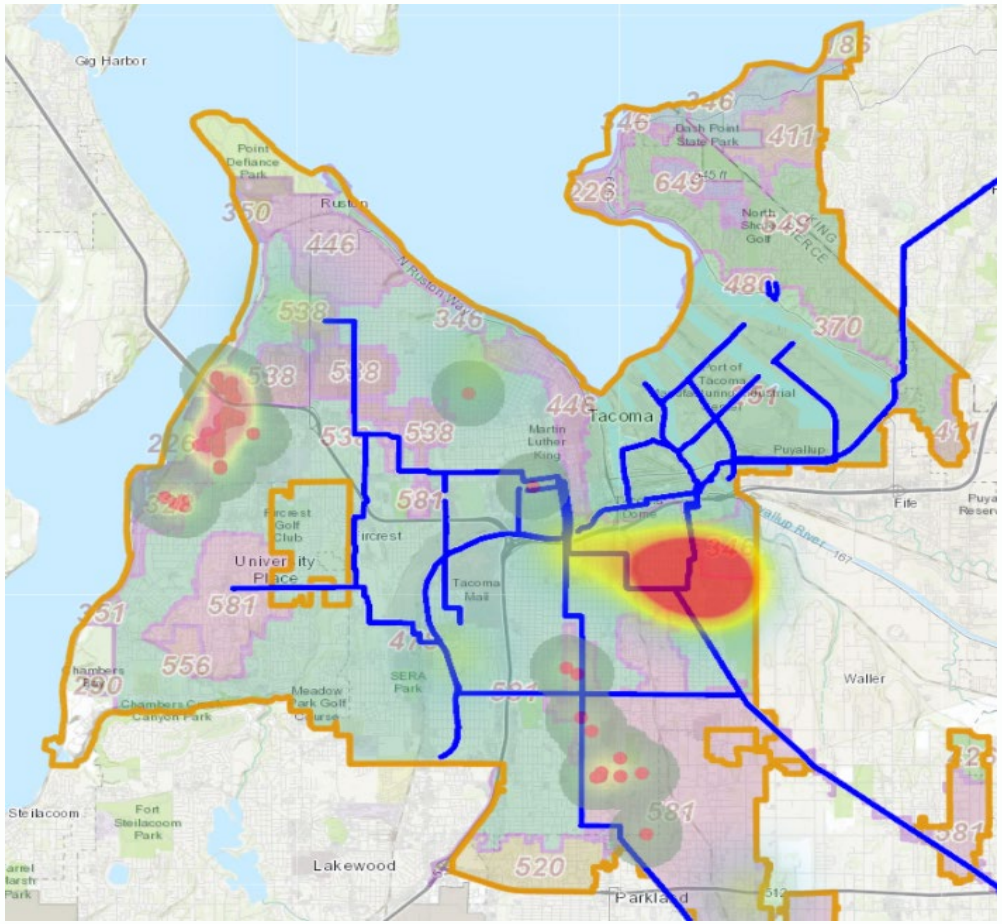
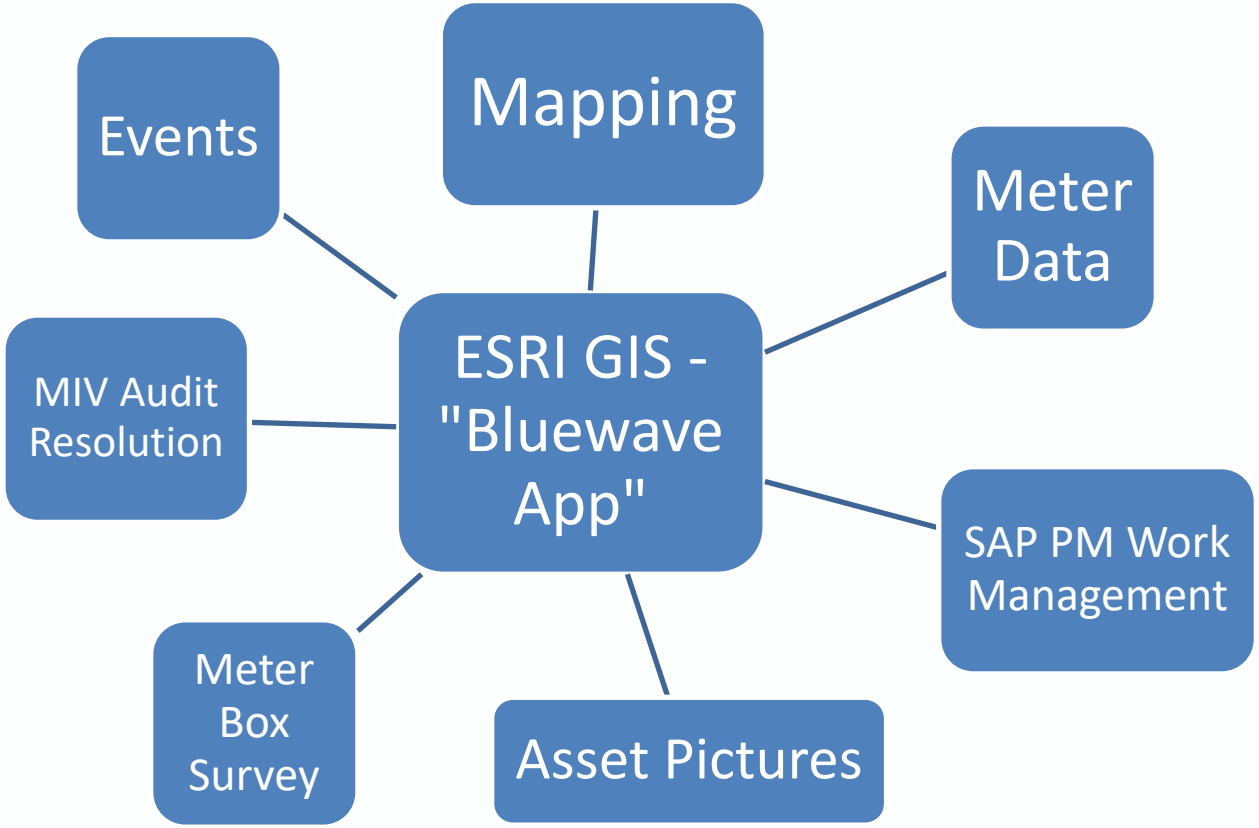
LESSON LEARNED UTILIZING ESRI TO BETTER COLLECT & ACT ON DATA

ESRI has become the hub staff have come to rely upon for asset and meter information.





Can ESRI also become a hub for operational data to better measure, analyze & act on system events?

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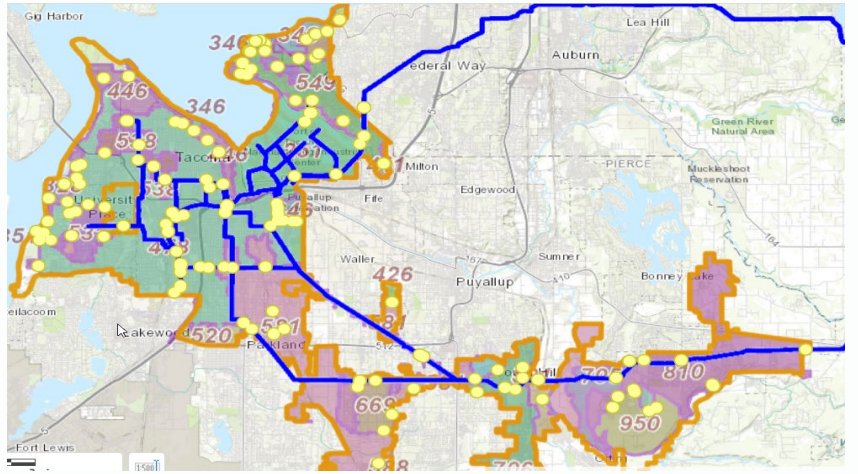
THE BIG PICTURE – BRINGING IT ALL TOGETHER

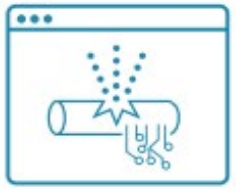
1. COMMON OPERATING VIEW (2025-26)

- Sensors from multiple sources available in one operational view.
- Near real time refresh rate
- Foundational sources: SCADA, AMI, Quality, ESRI
- Compare dynamic sensor to static modeled values



2. DIGITAL TWIN: DYNAMIC INTEGRATED MODEL (2029-30)

A digital twin is the **assimilation of data and a computer model** that helps operators **understand how a physical asset, process or system should be performing**, and helps to **predict performance under changing conditions.**



Detect and diagnose anomalies

Test different scenarios

Predict outcomes

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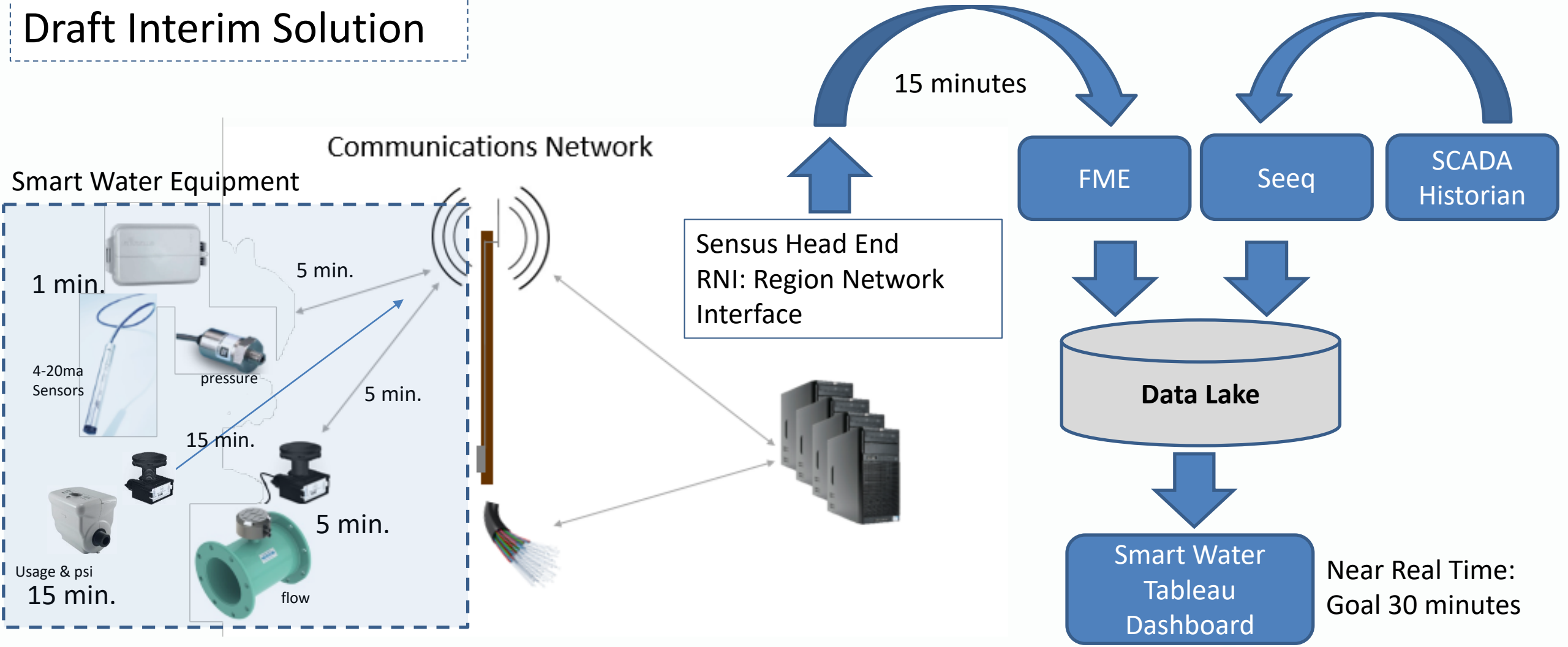
LEVERAGING FLEXNET NETWORK FOR NEAR REAL TIME AWARENESS

Draft Interim Solution



- 1-15 minute sample rate
- 5-15 minute transmission rate

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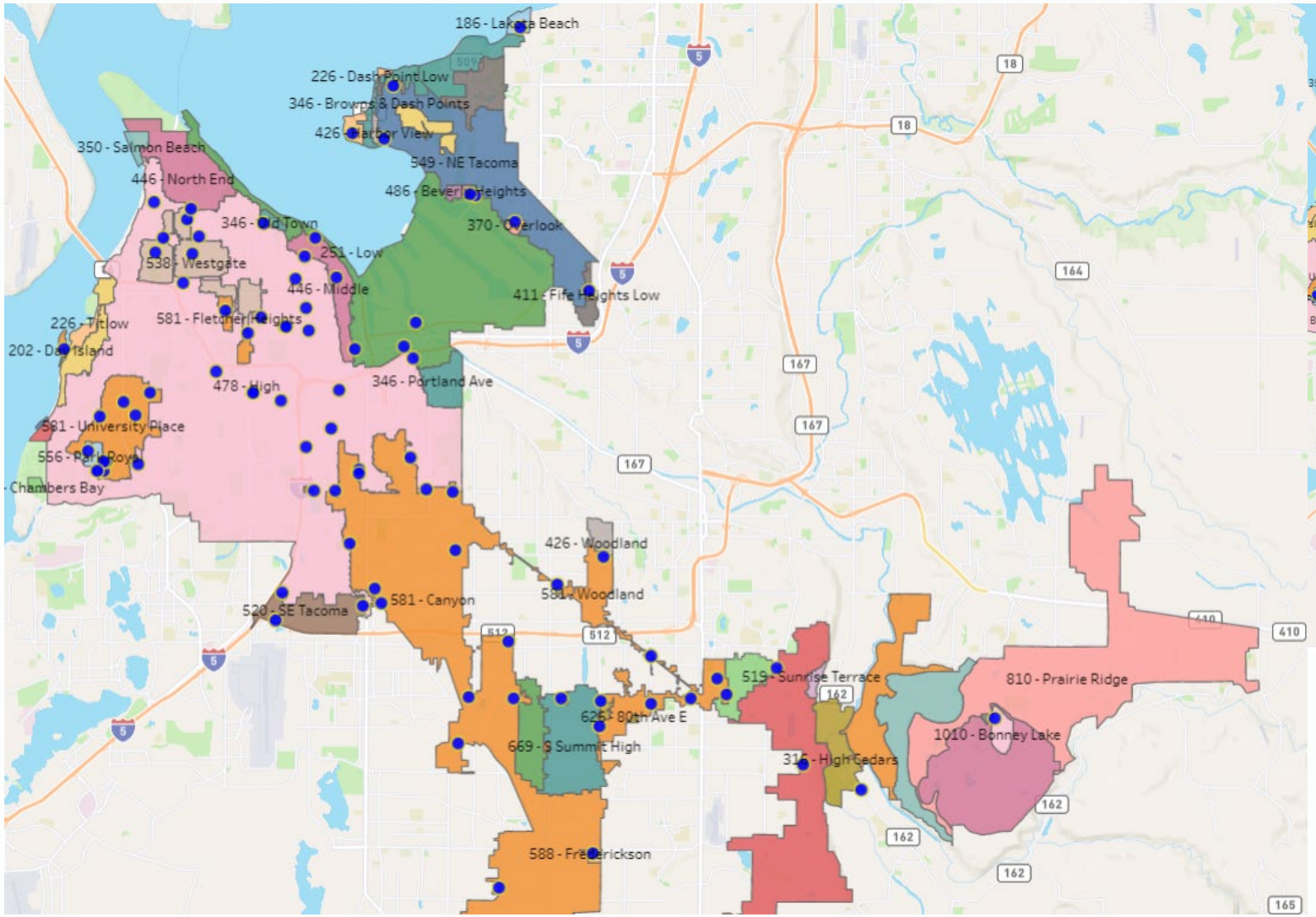
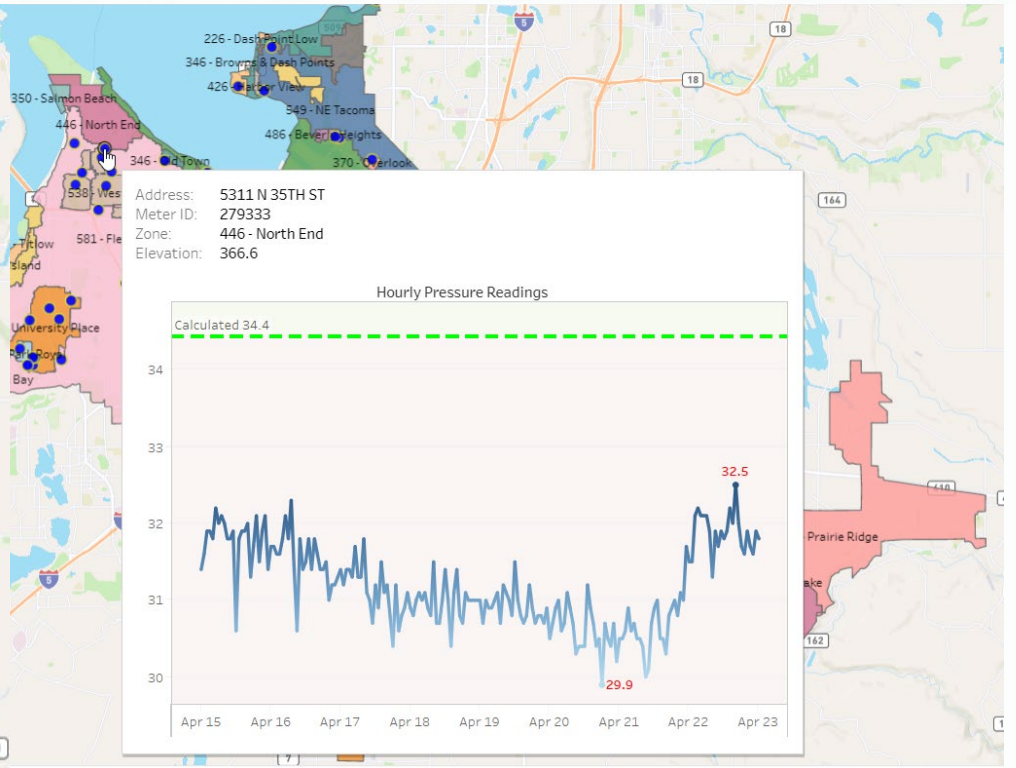
DRAFT TABLEAU DASHBOARD





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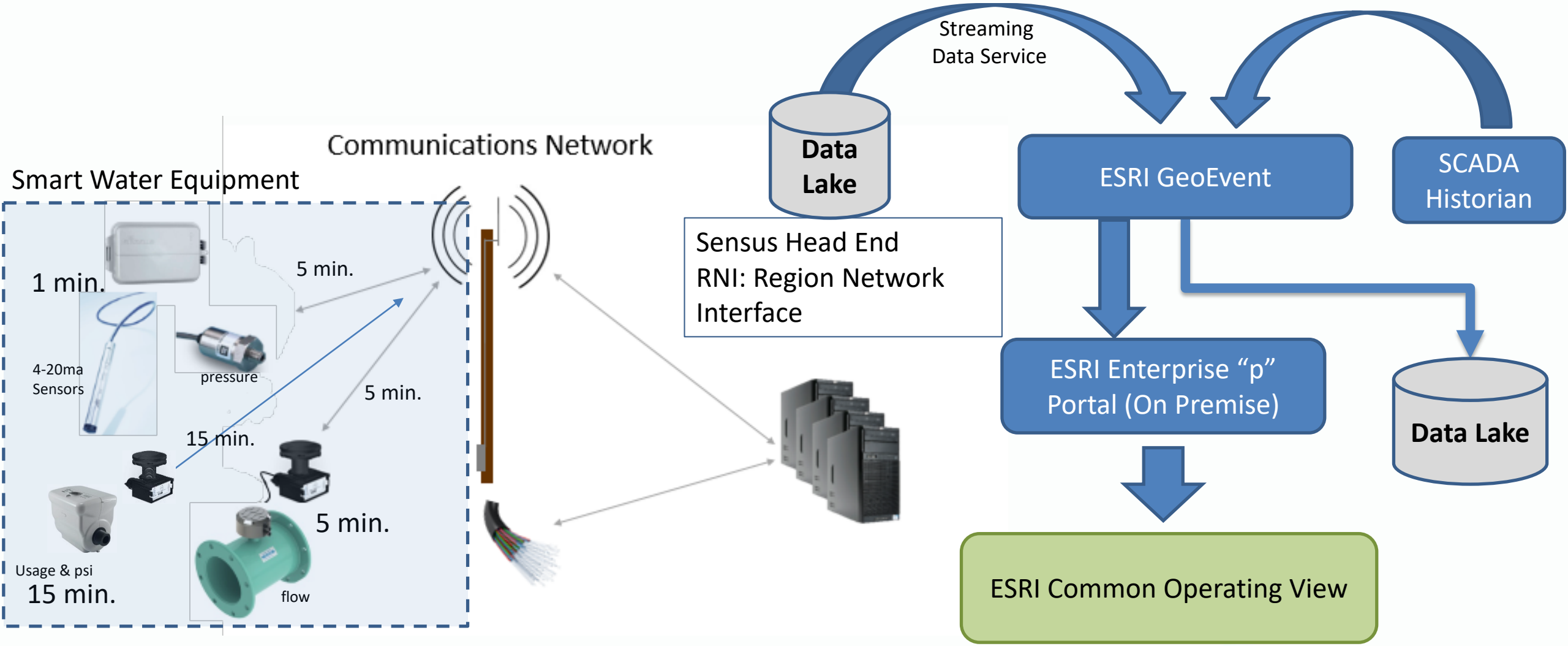
FUTURE STATE – TO INVESTIGATE



- 1-15 minute sample rate
- 5-15 minute transmission rate

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NEXT STEPS ON THE JOURNEY

1. Continue installing sensors at strategic sites throughout the distribution system
2. Pilot GeoEvent architecture with AMI sensors from Sensus Headend (RNI)
3. Evaluate ESRI pilot as possible platform for Common Operation View

Keys to success

- Start simple, add complexity as understanding matures
- Don’t be afraid to fail; fail small and quickly
- Expand access to the sensor data to more staff
- Consistent progress is better than no progress
- Refresh the roadmap vision as technology changes

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QUESTIONS?

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