The largest cost drivers in a water AMI project

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Introducing our speakers

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Agenda

- Introductions
- Water AMI components and cost considerations
- Common issues at water meter location
- Water meter location sample survey
- Tacoma Water experience (full survey)
- Q&A

Advanced metering infrastructure (AMI)

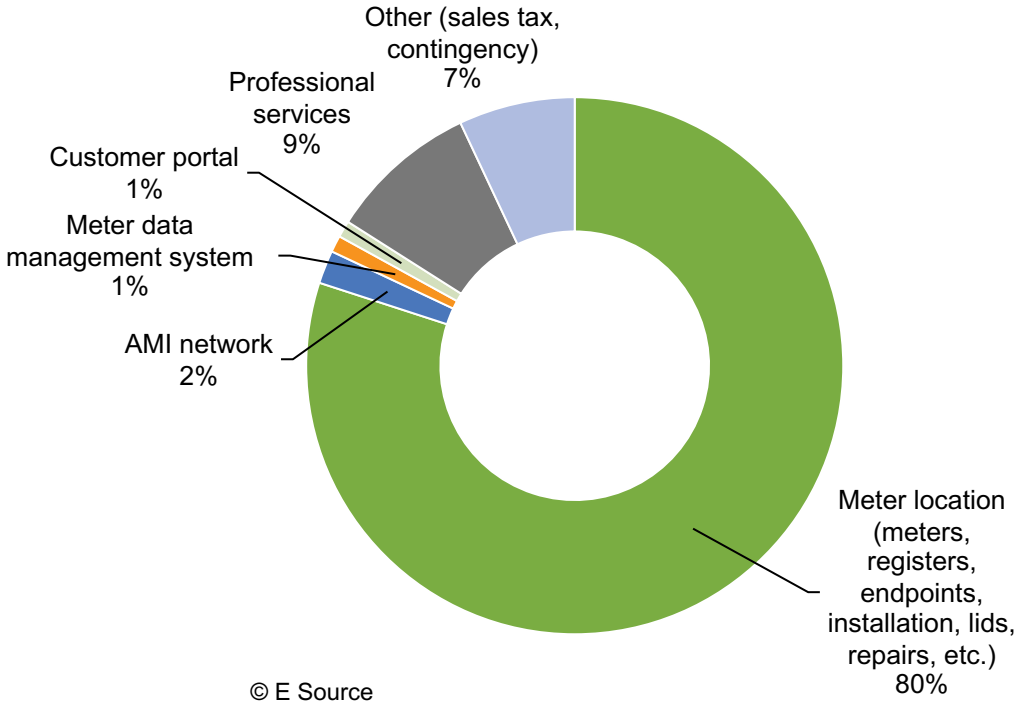
Hardware

Network

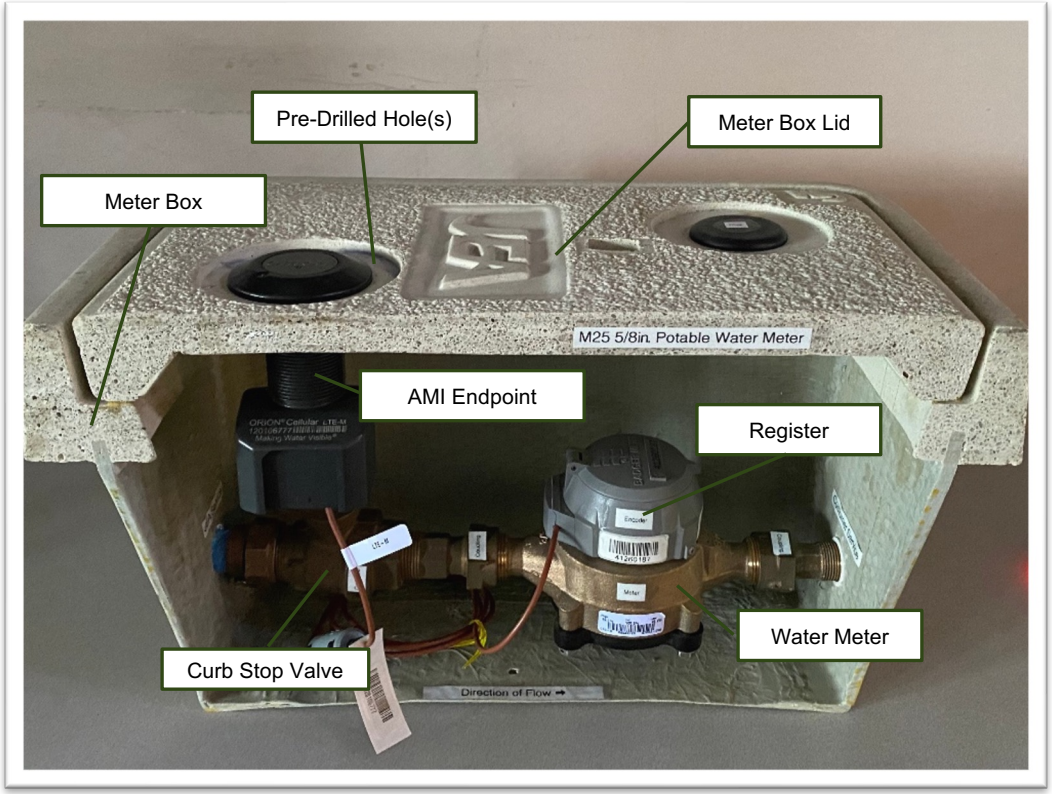
Software and data management

AMI allows **two-way communication** between a customer's meter and the utility and provides **near-real-time information** about water usage that can be used for **billing, system monitoring, and analytics purposes**

Typical water AMI project cost breakdown



Components at the meter location



In addition:

- Water service line—utility and customer side
- Remote disconnect valve (if applicable)
- Existing dirt, standing water, foreign objects in meter box
- Installation labor

Common issues found at meter locations

- Utility database field errors
- Damaged components
- Meter buried or obstructed
- Equipment incompatibility
- Meter box obstruction of meter components
- Existing leaks

Survey provides a better understanding at the meter location

Consideration	Sample survey	Full survey	No survey
Survey duration	1 to 2 months	Dependent on utility size; can be up to a year or longer	Not applicable
Survey cost and level of effort	Lower compared to full survey	Highest	Not applicable
Data quality (for procurement purposes)	Reasonable representation of current meter location demographics	Provides most precise meter location data	Legacy meter location data may be highly inaccurate
Deployment impact (due to meter location issues)	Low potential for unexpected delays	Lowest potential of unexpected delays	Highest potential for delays
Overall risk	Low potential for cost/labor overruns	Lowest potential for cost/labor overruns	High potential for cost/labor overruns

Water meter location survey

Purpose

- Provide an understanding of the meter population's current state
  - Conditions of meters, lids, boxes, etc.
- Identify potential issues that may impact AMI deployment
  - Planning and budget
  - Unplanned material or additional work needed

Methodology and planning

- Assessment
  - Size and location of the service territory
  - Route and cycles
  - Customers serviced and types of faculties
  - Accessibility and difficulty
- Meter selection
  - Statistical sampling—method of selecting a subset of meters from the population to estimate characteristics of a whole population
    - Random selection
  - High confidence level and low margin of error
    - How many?

Routes	Meters	Location Difficulty	Additional Notes
01	359	Accessible	Canyon Terrain
02	385	Hard to locate and full of dirt	
03	366	Accessible	
04	292	Hard to locate/full of dirt	
05	284		
06	344	Accessible	Mostly in ally
07	362		
08	469		
09	515		
10	530		
11	249		
12	275		
12327	1		
13	268		Mostly parkway - with meters in front
14	269		
15	501	Inaccessible/worst meters	Most complicated with meter box issues. Traffic issues.
16	415	Accessible	Apartment complex
17	361		
18	437		
19	417		Flat - do 19 and 20 and it would represent 19 thru 23
20	357		
21	396		
22	360		
23	400		
24	398		Apartments / Commerical
25	413		
26	301		West Hollywood, a lot of apartment complex - master meters with 3/4 inch meters.
27	322	Worst meter conditions	
28	248	Accessible	
29	439		West Hollywood, good commercial area.
30	413		
31	414	Worst meter conditions	
35	35	Accessible	
40	2		
Meters Total	11,597		

Inspection criteria

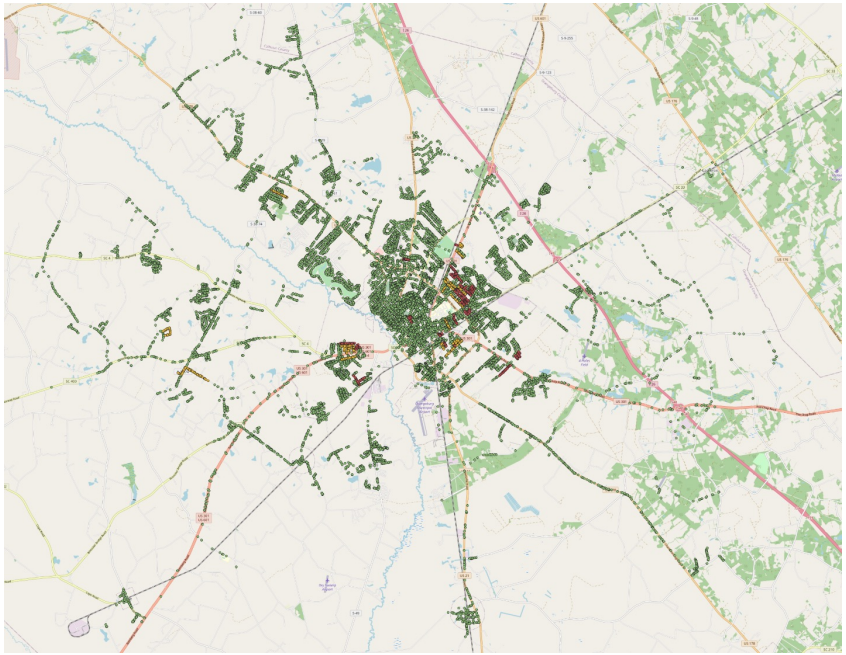
Condition	Options	Description
Lid material	- Polymer - Composite - Concrete - Metal	- Poly with steel flap or composite with a poly or metal flap should be indicated
Lid conditions	- Excellent - Acceptable - Poor	- Like new - Minor wear and tear - Cracks, break, hazardous
Box conditions	- Excellent - Acceptable - Poor	- Little to no wear - Minor wear and tear - Cracks, damaged, hazardous
Box grading	- Above grade - At grade - Below grade	- Protrudes—tripping hazard - Leveled with the ground - Dips—fall/trip hazard
Debris level	- Below the meter - Partially covers meter body - Covers meter body - Meter completely buried	- Debris is below the meter - Debris partially covers the meter body - Debris covers the meter body (register exposed) - Debris covers the entire meter (body and register)

Additional inspection recommendation

- Shutoff valve
- Meter location sitting
- Adaptors and connectors
- Multiply meter in the same pit
- Meter lay lengths

Survey results and RFP

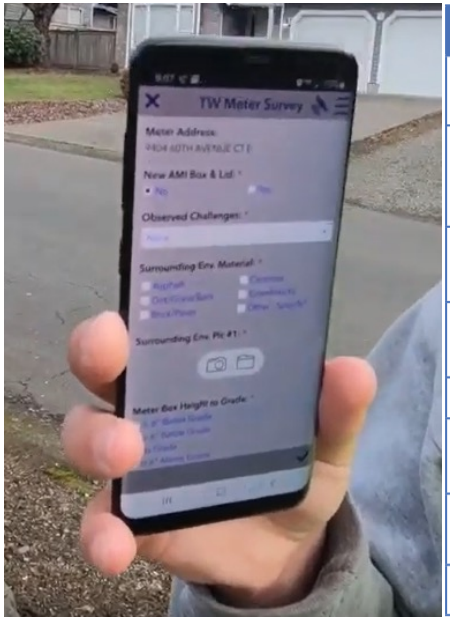
- Results
  - Extrapolate counts and percentages over the whole meter population
  - Counts and percentages of results from the survey for each criteria category
  - Raw data collected
  - Esri field maps
- RFP responses
  - Include quantities in the proposal
  - Consider responses in the evaluation



Why Do A Meter Box Survey Before AMI Deployment

- Main Driver Procurement of Material:
  - Uncertain Number Meter Boxes lids/ types.
  - Meter Box Condition.
  - Meter box compatibility with AMI new meters and transmitters.
  - Determining quantities of material to order
- Limiting Risk :
  - Location of Meters Boxes hard surface/soft surface
  - Older Meter Box Lids not supported by manufactures how many what to do?
  - Slowing down Deployment
  - Acquiring Meter Boxes/Lids Supply Chain Issues.
  - Budgeting for preparing Meter Boxes and Lids for AMI
  - New Meter and Transmitter Clearance / Will it Fit?

Decision: Perform Survey Internal vs External (Decided Internal Using ESRI Survey 123)



Data Collected	Purpose
Access impediments (e.g., a gate, dog, safety concern, structure built over the box)	Identified if utility actions were needed prior to the meter installation vendor (MIV) installing meters.
Locations without a meter or meter setter	If these items are missing, the MIV would not be able to exchange the meter. Some vicinities are known to be without meter setters, but the locations and number of services with this issue were unknown.
Meter box position	Identified if meter boxes needed to be lowered, raised or moved due to safety concerns.
Surrounding environment and meter box location (e.g., asphalt driveway, concrete sidewalk, planter strip)	Helped identify meter boxes that needed to be moved and lids that needed to be modified to accommodate the AMI communication module.
Meter box and lid condition	Identified needed repairs before the MIV installed meters.
Meter box type	Identified the size and style of lid replacements, and whether the box had adequate room for the new meter and AMI communication module.
Lid material and type	Identified the size and style of lid replacements for the AMI communication module.
Photos of meter box location and inside the box	Helped with analyzing the data and provided reference for future use.

- **Hired temp staff, using cell phones, and real time dashboard to manage**
- **Determined what data was critical to collect**
- **Training of Staff – pictures of lids, access issues**
- **Dashboards for tracking progress**

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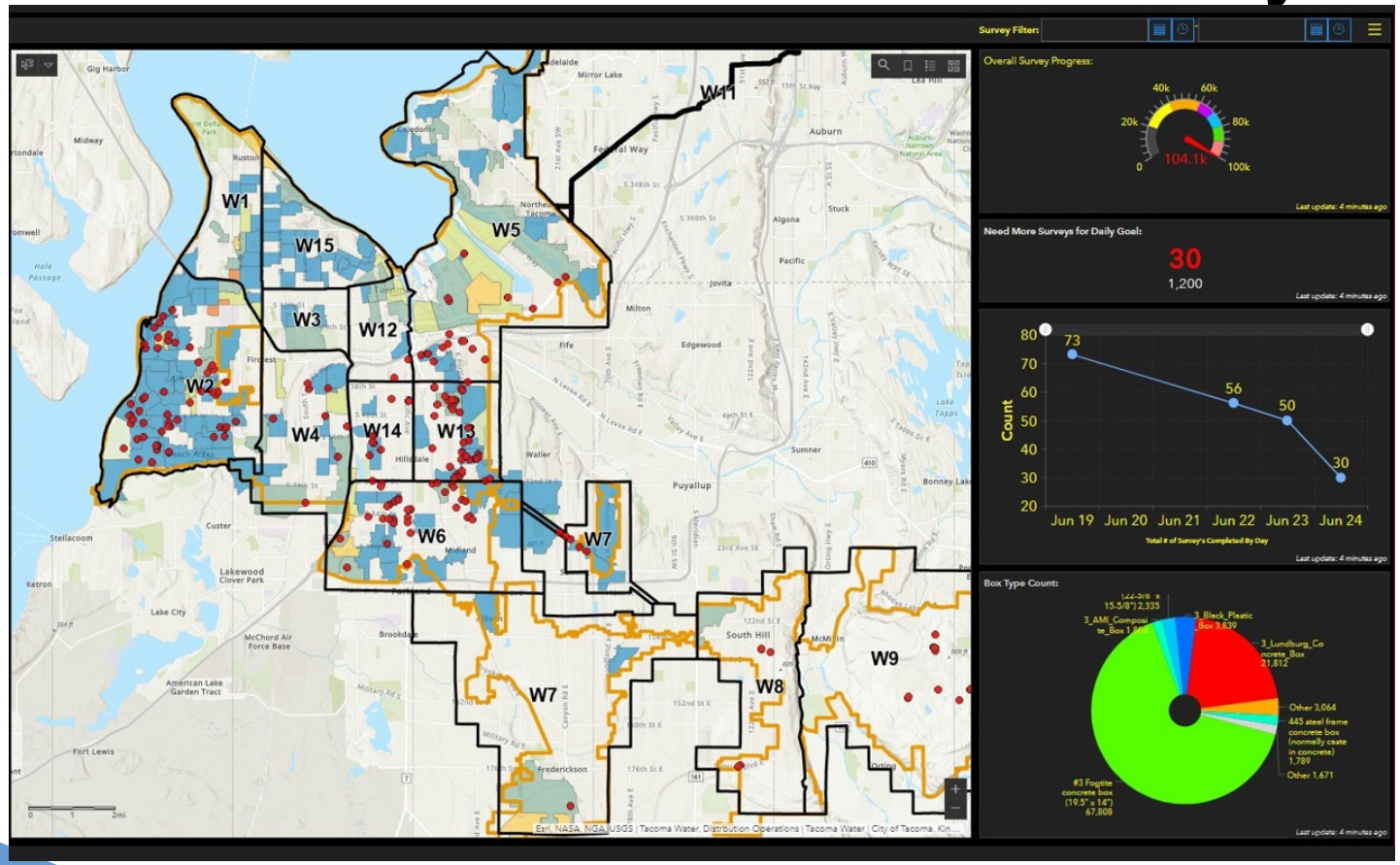
Created Dashboards for Meter Box Survey



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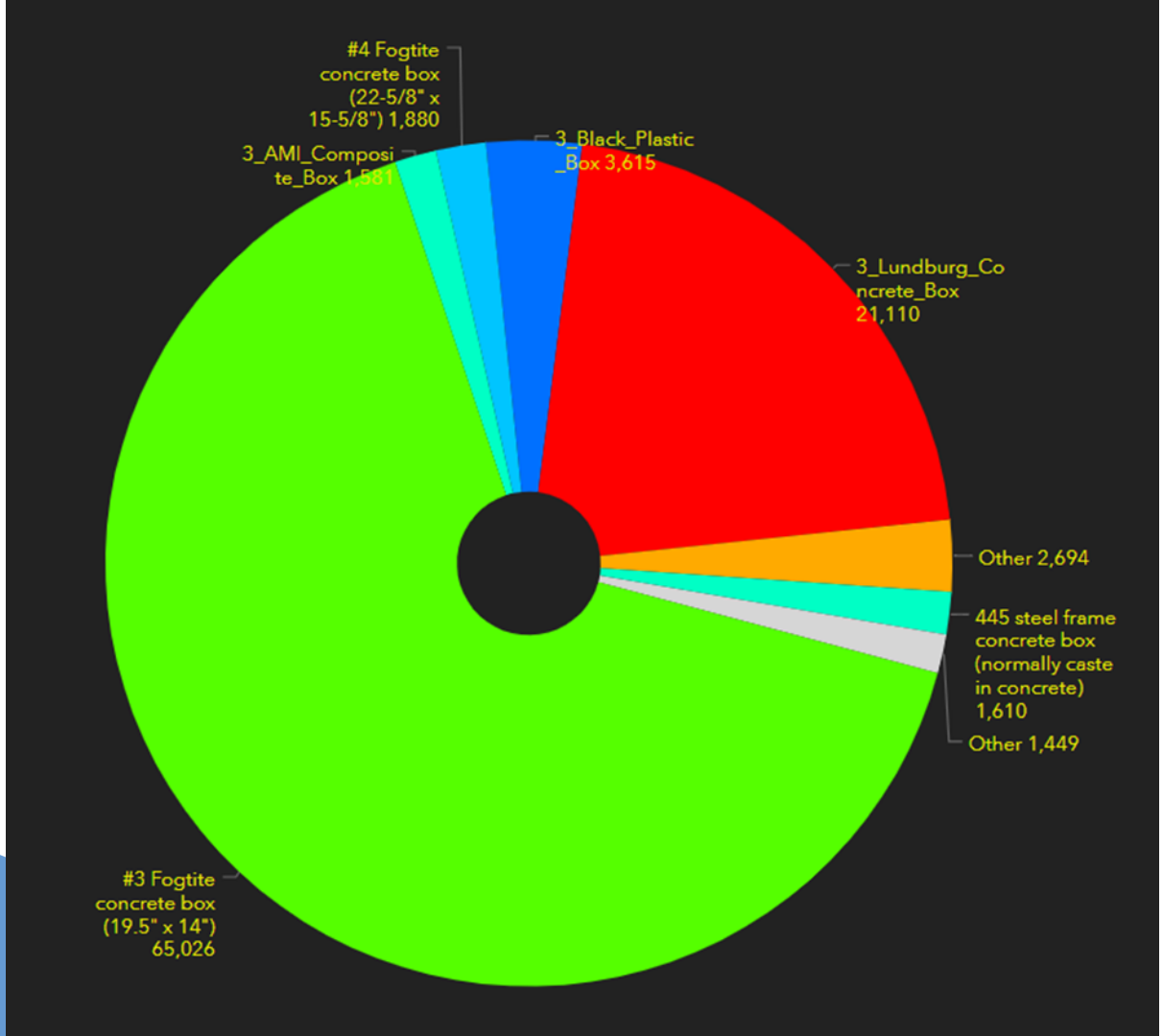

Information From Survey

- 102,000-Meters, Meter Boxes and lids inspected, Identified Material and Type
- Inspection took 5,288 hours to complete or 3.1 minutes per inspection
- 77,000-meter boxes had no issues. While 25,000 required further attention
    - Shallow, hard service
    - Shallow, soft service
    - Access issues
    - Meter Box conditions
- Of the 25,000 issues, 1,754 required Work Orders for corrective repairs.

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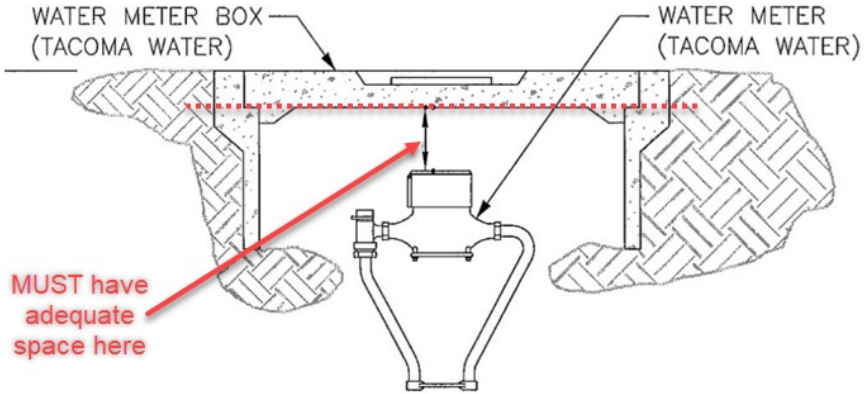
Used Meter Types To Determine Height Compared to New AMI Meter Information Used in Survey for Clearance

- **Will the new meter fit?**



- New Meter: SENSUS AccuStream
- Old Meter: several types and generations
- Bottom line: 2” or more = enough space for Transmitter

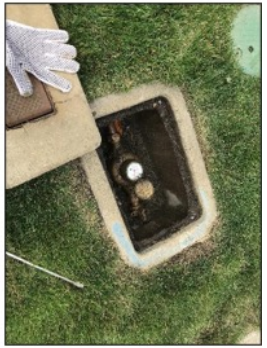
Meter Model	# Existing in system	Meter Size	Difference
accuStream	**a few hundred**	**5/8**	**0.0**
Badger	**11,636**	**5/8**	**-0.8**
Hersey 430 II		**5/8**	**0.3**
Sensus SR/Rockwell	**16,009**	**5/8**	**1.2**
Sensus SR II	**7,626**	**5/8**	**0.3**
Neptune std	**49,450**	**5/8**	**0.7**
Neptune std pre-2011		**5/8**	**0.3**
Iperl	**1,127**	**5/8**	**-0.8**
accuStream	a few hundred	3/4	0.0
Hersey 430 II		3/4	-0.1
Sensus SR/Rockwell	800	3/4	0.9
Sensus SR II	74	3/4	0.4
Neptune std	533	3/4	0.0
Iperl	388	3/4	-0.7
accuStream	a few hundred	1	0.0
Hersey 430 II		1	-0.2
Sensus SR/Rockwell	800	1	1.3
Sensus SR II	52	1	0.1
Neptune std	535	1	0.0
Iperl	113	1	-0.1

Existing Inventory Based on Survey Used Information for Meter Box and Lid Contracts

Carson black plastic box

#3 Fogtite concrete box (19.5" x 14")

#4 Fogtite concrete box (22-5/8" x 15-5/8")

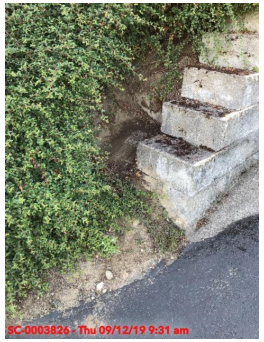


Brooks concrete box (thin wall, 1-3/8")

Lundburg concrete box (thick wall, 2.5")

445 steel frame concrete box

Challenges Discovered from Survey



Meter Hiding

Meter Underwater

Meter on its Side

Meter Yoke Misaligned

Landscaping Burying Meter

Deep Service Lines

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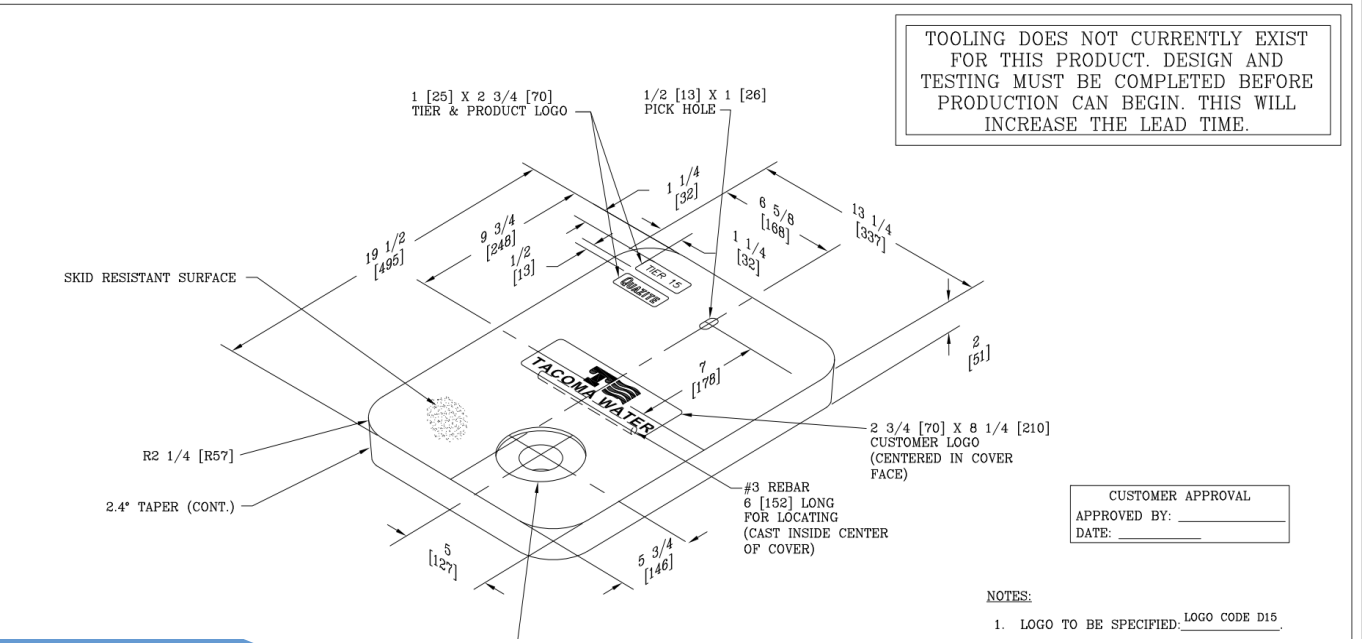
Created Meter Lids Standards Based Upon Existing Lids / Boxes From Survey



- Engineered drawing for contract RFP Meter Box Lids
- Updated standards ANSI, Tier, ADA Compliance

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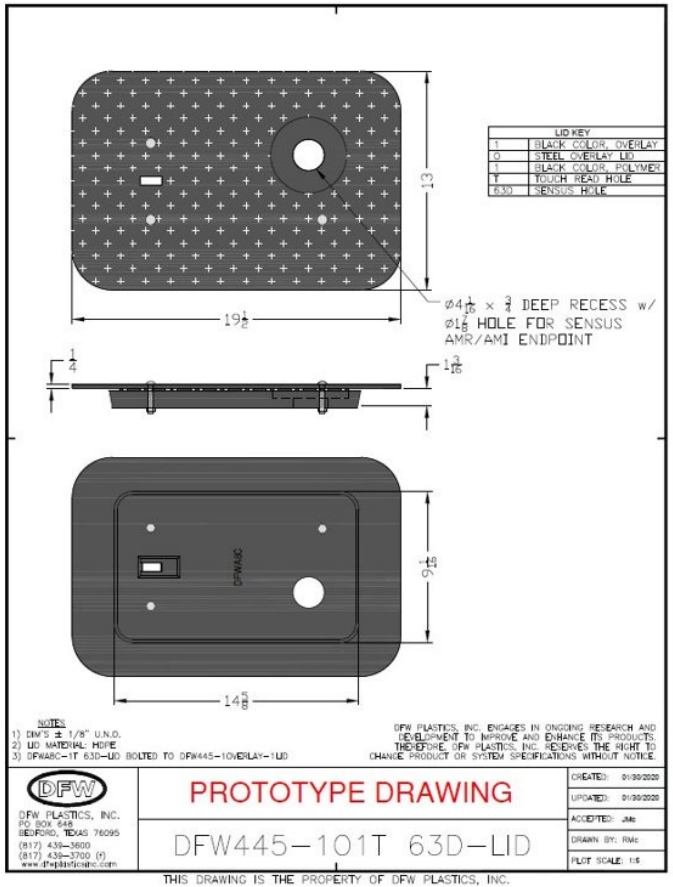
Three Types of New Quazite Meter Box Lids / 95% of Lid Replacements

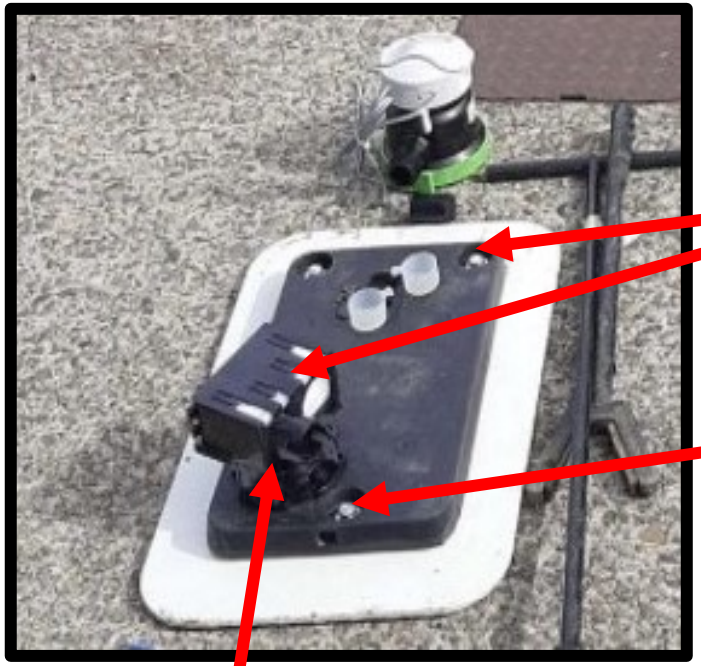
1. 10”x15” Lid

2. 11”x18” Lid

3. 13”x19” Lundberg Lid



445 Steel Lid Replacement About 1,700 in Hard Surfaces / Worked with Manufacturer designed a new Lid



1. Removed carriage bolts
2. Install meter module between steel and composite lids
3. Tighten carriage bolts

Meter transmitter sandwiched between steel lid and composite

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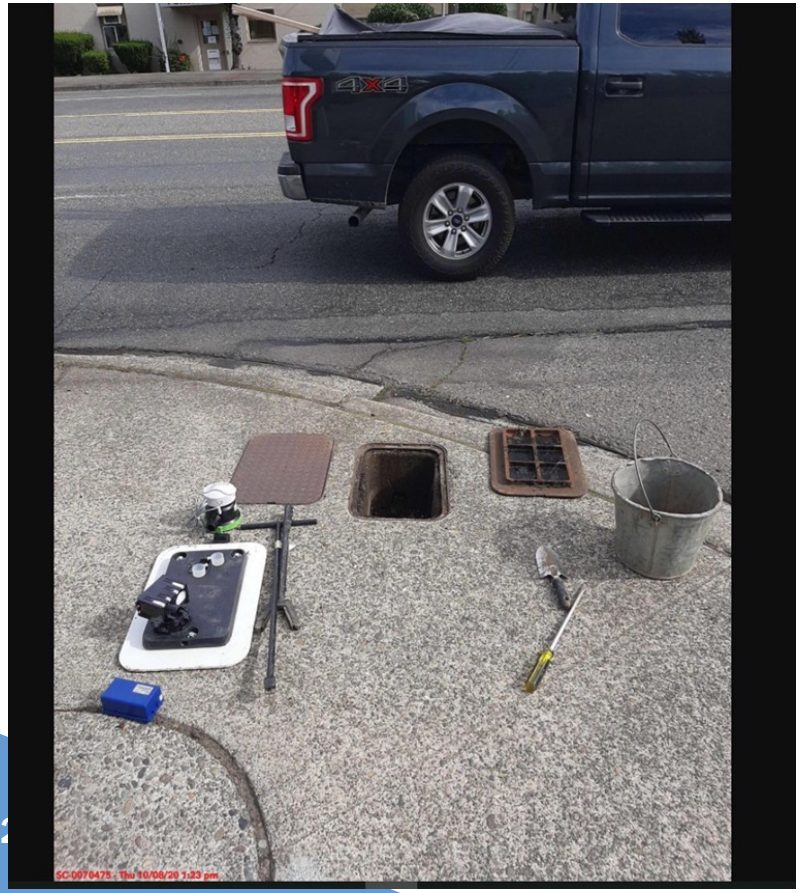
445 Lid Replacement Example



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Lesson Learned From Using a Survey

- Test Fit all New Lids
- Confident quantities of Meter Box lids Allowed for Competitive Bidding
- Lock in Contract Prices and Delivery Times
- Train Survey Staff
- Identifying Challenges What and Where; Addressing Prior to Deployment
- Take Pictures and Attach in Survey 123
- Track Results and Location for Maintenace after Survey
- Thinking Outside the Box Saved $$
    a. Standardized replacement lid specs based on survey quantity results. Contracting we saved 30%
    b. 445 lid solution & savings About 1,700 hard surface replacements Saved ~$3M by not replacing Meter Boxes in hard surfaces

Questions?

Thank you!

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