

DISSECTING AN AMI DATASET

Tools for Data Driven
Problem Solving





Traditional Meter Reading

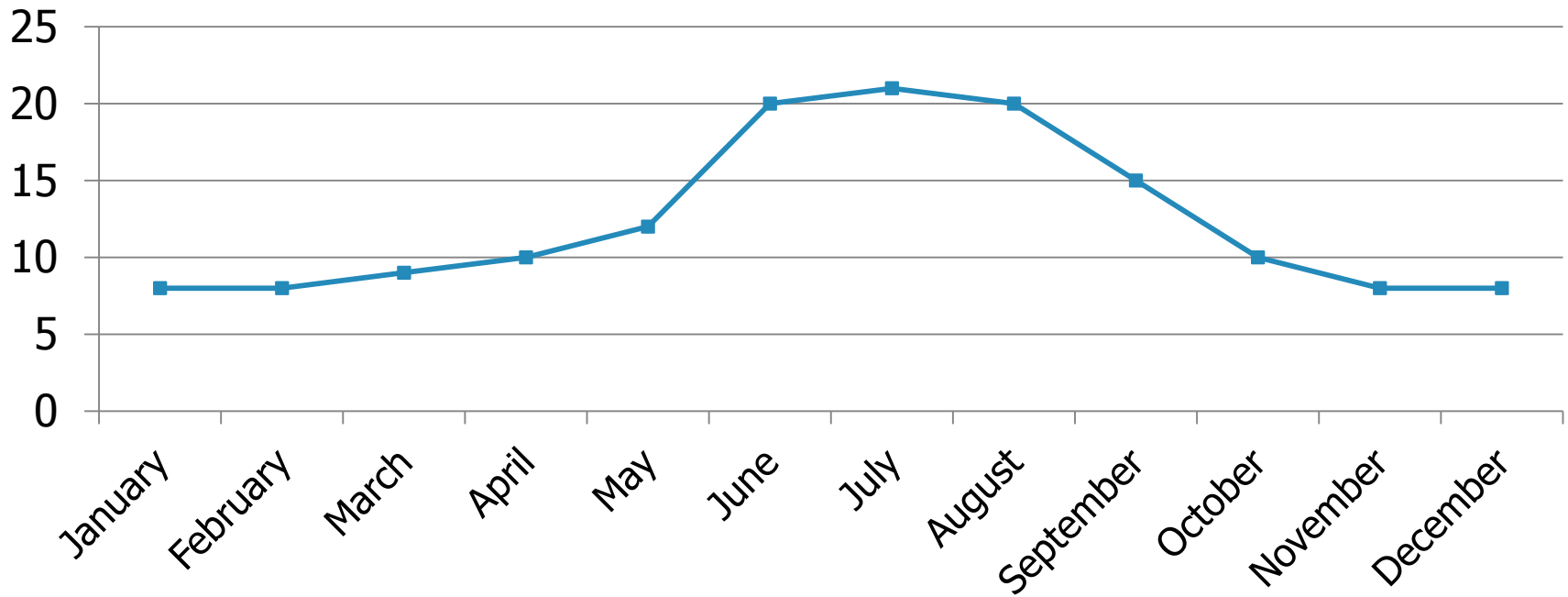


- **Monthly Billing**
- **Monthly Reading**
- **Simple Annual Usage Profile**



TRADITIONAL ANALYSIS METHODS

Consumption in CCF



AUTOMATED METER INFRASTRUCTURE

Opportunity

- & -

Challe

A NEW NORMAL



**WELCOME TO
BIG DATA**

WHAT IS BIG DATA?



12
Annual Reads



X **365** **X**
Daily Reads



24
Hourly Reads

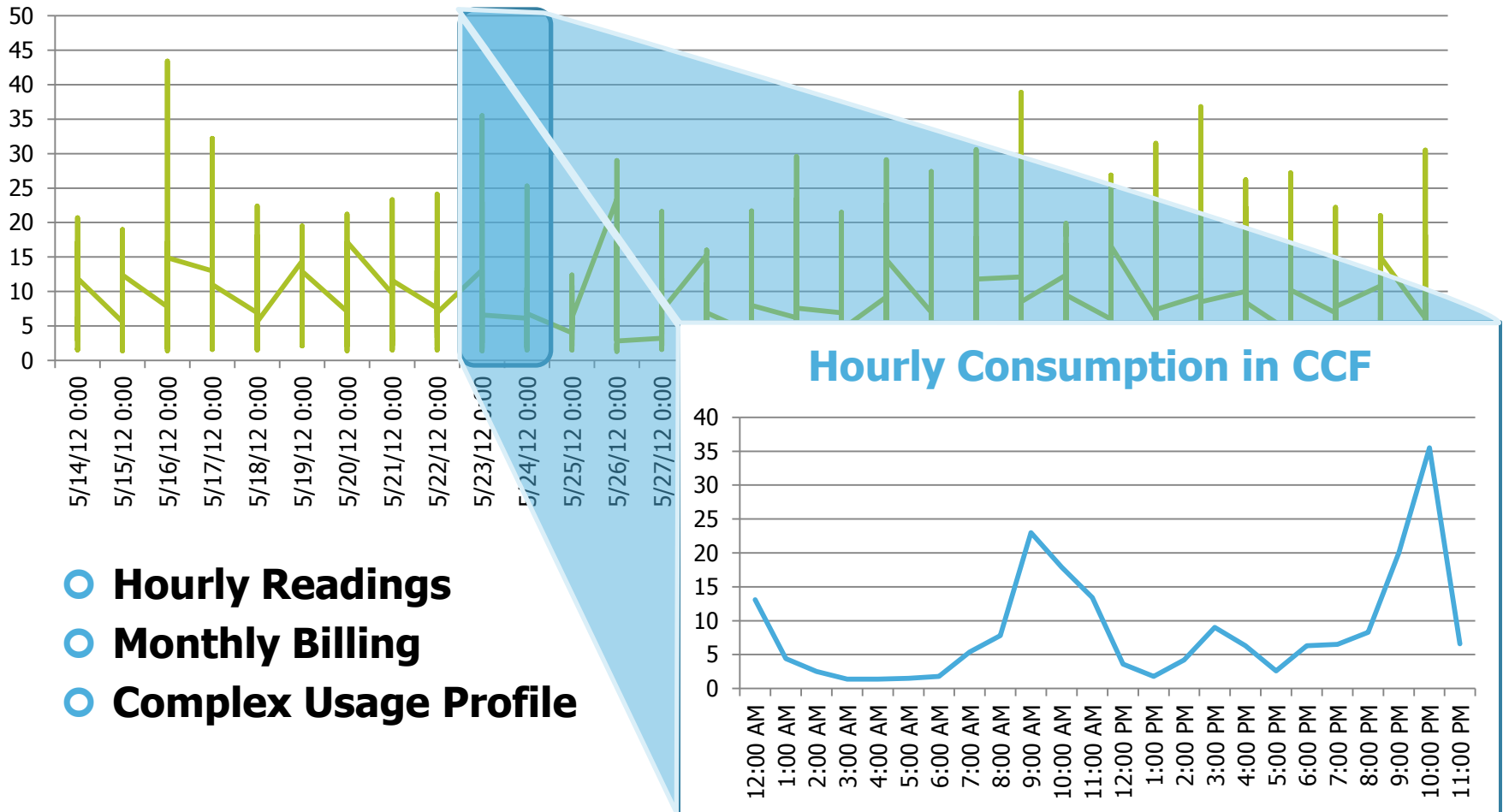
8,760
Hourly Reads



12
Monthly Bills

LOOKING FOR NEEDLES IN A NEEDLE STACK

Daily Consumption in CCF



- Hourly Readings
- Monthly Billing
- Complex Usage Profile

NEW TOOLS FOR BIG DATA





TOOL NUMBER 1 TIME SCALE WINDOWS

UniPro v.2.6.0

SENSUS Sensus Universal Programmer

Programming | Defaults | **Data** | Accuracy Test | Reports | Error Log | Help

Controls | Graph | **Tabular**

Date	Time	Min Flow	Max Flow	Consumption
7/7/2012	12:00 AM	0.0157	0.5053	5.9
7/7/2012	1:00 AM	0.0130	0.5410	6.0
7/7/2012	2:00 AM	0.0151	0.5756	6.2
7/7/2012	3:00 AM	0.0141	0.5367	5.9
7/7/2012	4:00 AM	0.0116	0.4903	6.0
7/7/2012	5:00 AM	0.0099	0.5609	5.7
7/7/2012	6:00 AM	0.0127	6.6754	31.0
7/7/2012	7:00 AM	1.3601	2.1468	91.8
7/7/2012	8:00 AM	0.0104	4.6184	68.1
7/7/2012	9:00 AM	0.0127	6.8480	6.8
7/7/2012	10:00 AM	0.0103	0.5455	6.1
7/7/2012	11:00 AM	0.0131	4.2707	6.9
7/7/2012	12:00 PM	0.0137	10.0132	6.9
7/7/2012	1:00 PM	0.0127	0.5040	6.2
7/7/2012	2:00 PM	0.0255	1.0236	6.1
7/7/2012	3:00 PM	0.0176	8.0502	7.4

Statistics:

Average Flow: 0.8907
 Average Consumption: 53.4
 Total Consumption: 39171.9
 Max. Flow: 23.6423
 Min. Flow: -0.0198

Units: Cubic Feet/Hour

Data Export
 Include Header
 Include Statistics
 Comma Delimited
 Export

Comm Status: █ Data Transfer Progress: Meter Detected: **OMNI** Exit

Redetect



TOOL NUMBER 2

EXPORT AND FILTER

Boise Hills Maple St Apt.csv - Microsoft Excel

	A	B	C	D	E	F	G	H	I	J	K
1	Date	Time	Min Flow	Max Flow	Consumption				Average Flow		0.1177
2	6/11/2012	12:00 AM	0.0021	1.3673	6.9				Average Consumption		7.1
3	6/11/2012	1:00 AM	0.0019	1.1131	2.4				Total Consumption		5163.5
4	6/11/2012	2:00 AM	0.0019	1.6079	3.2				Max Flow		2.7134
5	6/11/2012	3:00 AM	0.0022	0.9489	1.8						
6	6/11/2012	4:00 AM	0.0023	0.9648	1.9				Earliest		
7	6/11/2012	5:00 AM	0.0023	1.6229	2				Latest		
8	6/11/2012	6:00 AM	0.0023	1.2863	2				Units	Cubic Feet/Hour	
9	6/11/2012	7:00 AM	0.0023	1.4293	4.3						
10	6/11/2012	8:00 AM	0.0022	1.5931	14.3						
11	6/11/2012	9:00 AM	0.0039	1.7811	22.2						
12	6/11/2012	10:00 AM	0.0022	1.3566	13.4						
13	6/11/2012	11:00 AM	0.0022	1.6079	14.4						
14	6/11/2012	12:00 PM	0.0023	1.8825	12.2						
15	6/11/2012	1:00 PM	0.0024	1.5367	7.4						
16	6/11/2012	2:00 PM	0.0023	1.2676	3.1						
17	6/11/2012	3:00 PM	0.0024	1.4842	3.4						
18	6/11/2012	4:00 PM	0.0036	1.5035	7.7						
19	6/11/2012	5:00 PM	0.0025	1.3892	6.8						
20	6/11/2012	6:00 PM	0.0023	1.0429	4.7						
21	6/11/2012	7:00 PM	0.0021	1.2316	3.4						
22	6/11/2012	8:00 PM	0.0017	1.7541	4.8						



SENSUS UniPro - CSV Data Extract

ANSWER BIGGER QUESTIONS

FLOW REVERSALS?

METER
ACCURACY?

METER

SIZE?

THEFT?

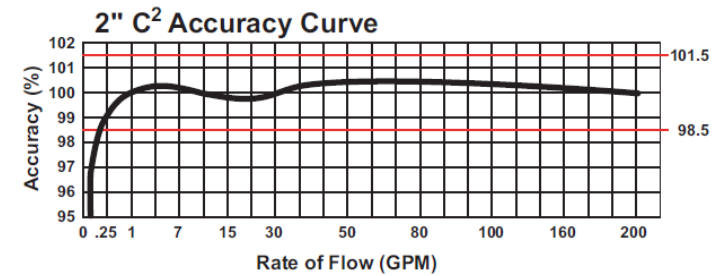
CONSUMPTION PATTERNS?

TAKE THE NEXT STEP

QUESTION: IS THIS METER THE RIGHT SIZE?

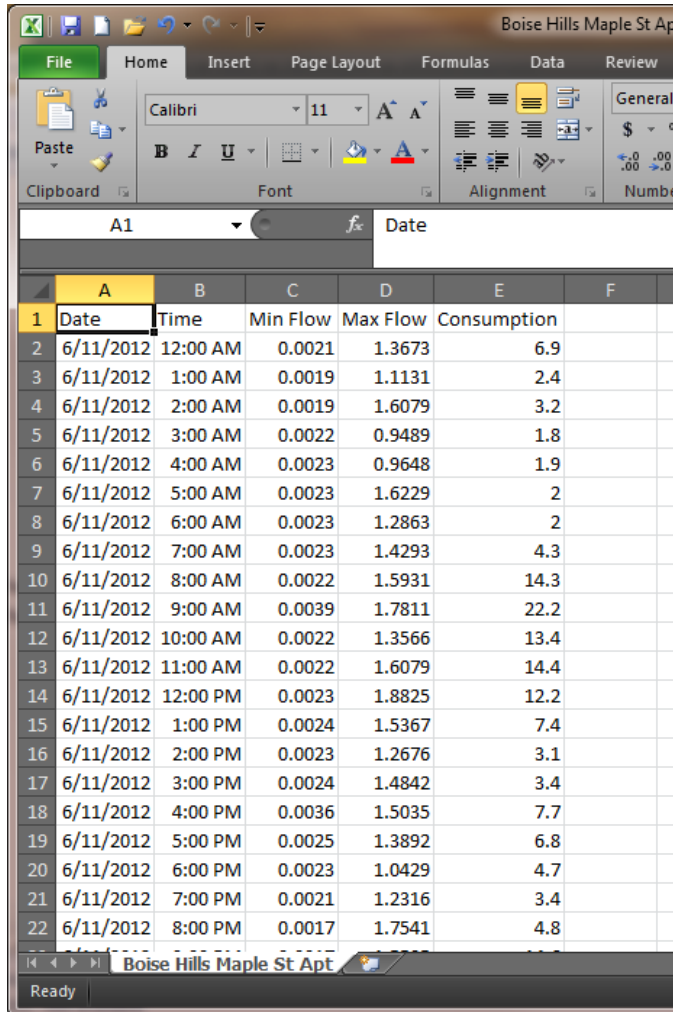
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4	6/11/2012	2:00 AM	0.0019	1.6079	3.2				Max Flow		2.7134
5	6/11/2012	3:00 AM	0.0022	0.9489	1.8				Earliest		
6	6/11/2012	4:00 AM	0.0023	0.9648	1.9				Latest		
7	6/11/2012	5:00 AM	0.0023	1.6229	2				Units		Cubic Feet/Hour
8	6/11/2012	6:00 AM	0.0023	1.2863	2						
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18	6/11/2012	4:00 PM	0.0036	1.5035	7.7						
19	6/11/2012	5:00 PM	0.0025	1.3892	6.8						
20	6/11/2012	6:00 PM	0.0023	1.0429	4.7						
21	6/11/2012	7:00 PM	0.0021	1.2316	3.4						
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SENSUS UniPro Data

START WITH THE EXTRACT

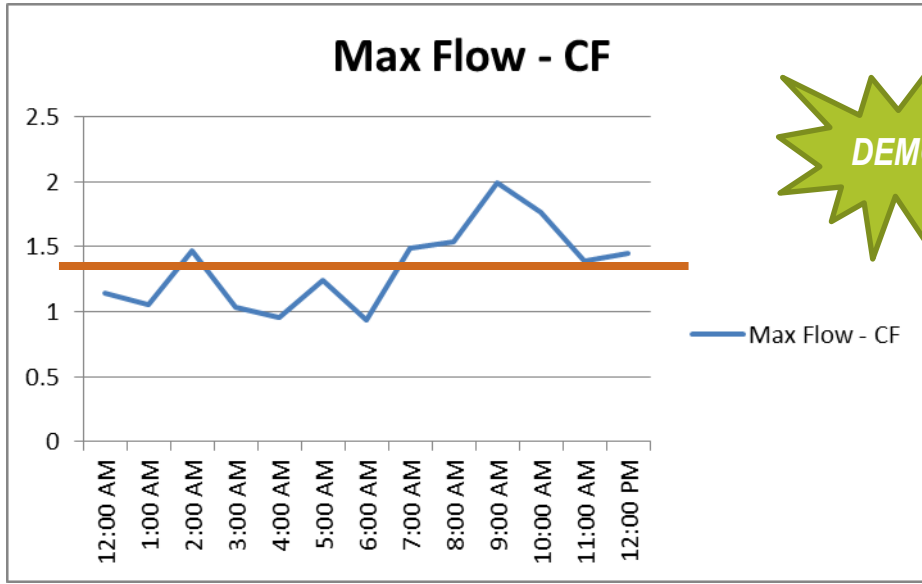


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Answer...

- How Fast did it run in the period?
- What is "Fast" for this Meter?
- How does it compare to other Meters?

How Fast did it run?



TOOL NUMBER 3 SUMMARIZE CONTINUOUS DATA

Trick Question – Where is the Average?

○ **Meaningful Ways to Summarize 'Time'**

- Hourly Minimum, Average, and Maximum
- By Hour, Day, Week, Season, Month, Year

All Averaging Techniques Will Fail to Respond to Trends



How Fast did it run?

Tools for Count Data

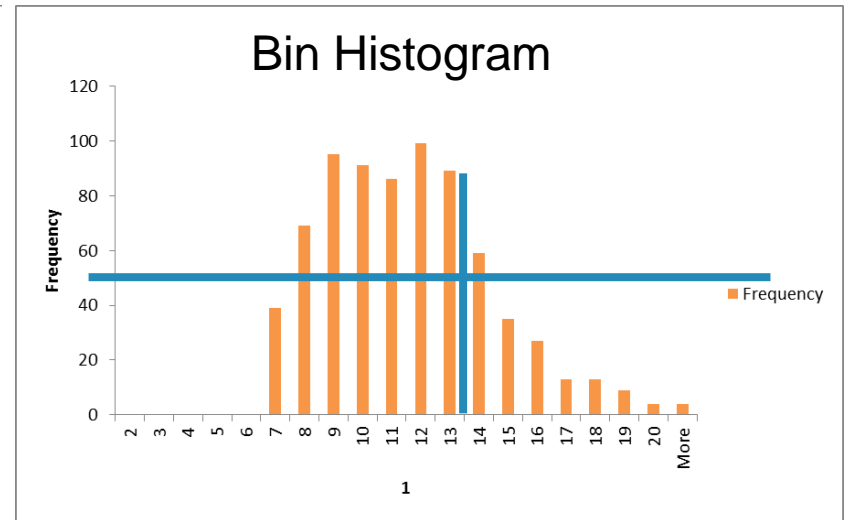
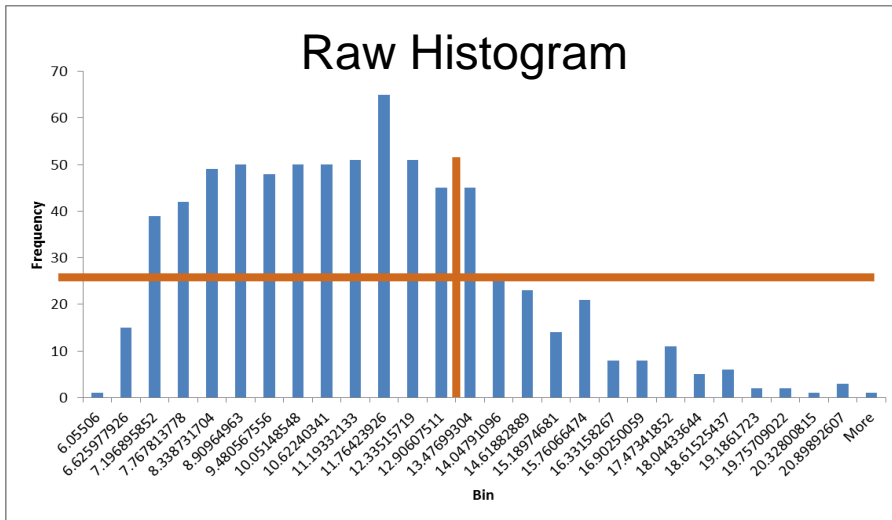


- Histogram Data Analysis
- Frequency Distributions



TOOL NUMBER 4 COUNT CONTINUOUS DATA

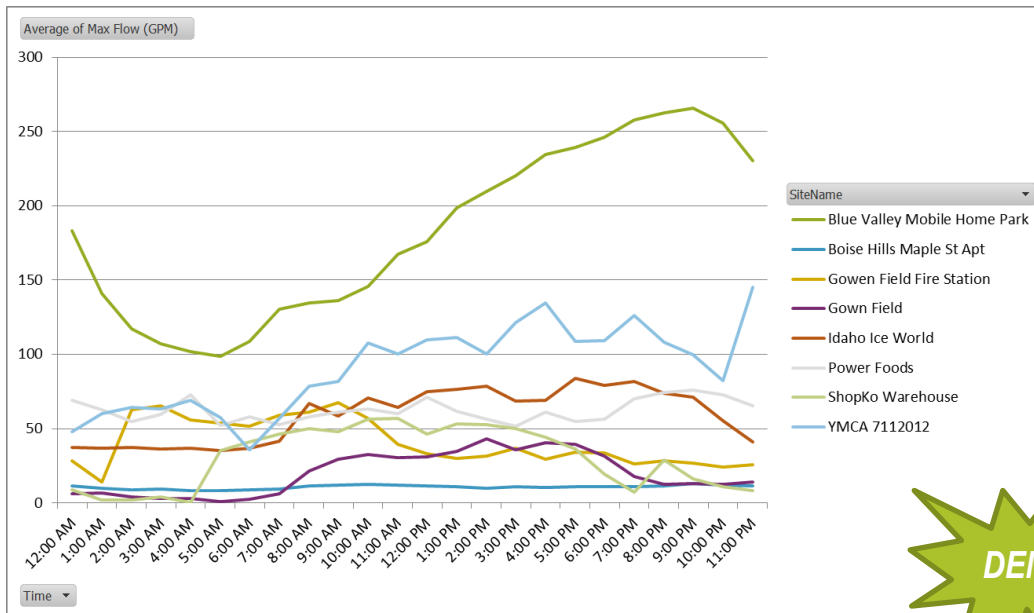
Trick Question – Where is the Average?



How does it compare to other meters?



TOOL NUMBER 5 CATEGORIZE CONTINUOUS DATA



Comparing Individuals in a Group



TIME SCALE WINDOWS



EXPORT AND FILTER



SUMMARIZE CONTINUOUS DATA



COUNT CONTINUOUS DATA



CATEGORIZE CONTINUOUS DATA

QUESTIONS?