

11/16/2022

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# Pump Optimization: San Jose Water's Application of the AVEVA PI System

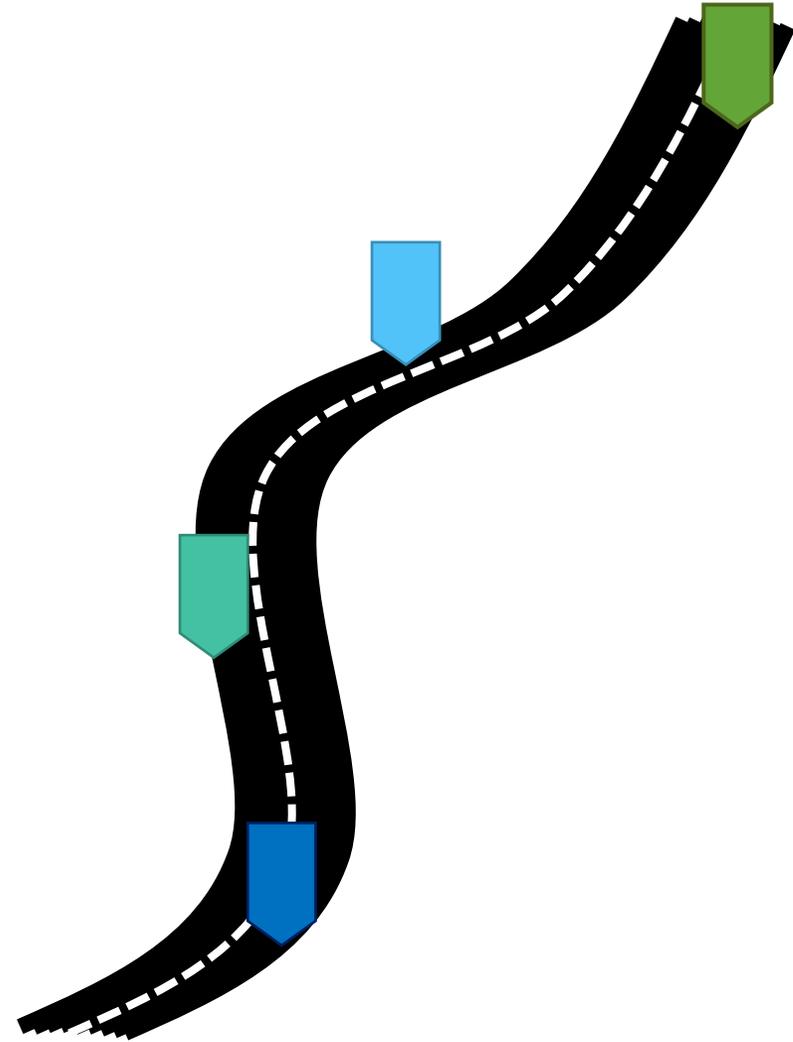
Ethan Smith

Blake Chetcuti

**AVEVA**

# Roadmap

- About SJW
- The Problem
- The Solution
  - Implementation
  - Application
- Initial/Expected Results
- Next Steps
- Live Demo
- Questions





SAN JOSE WATER

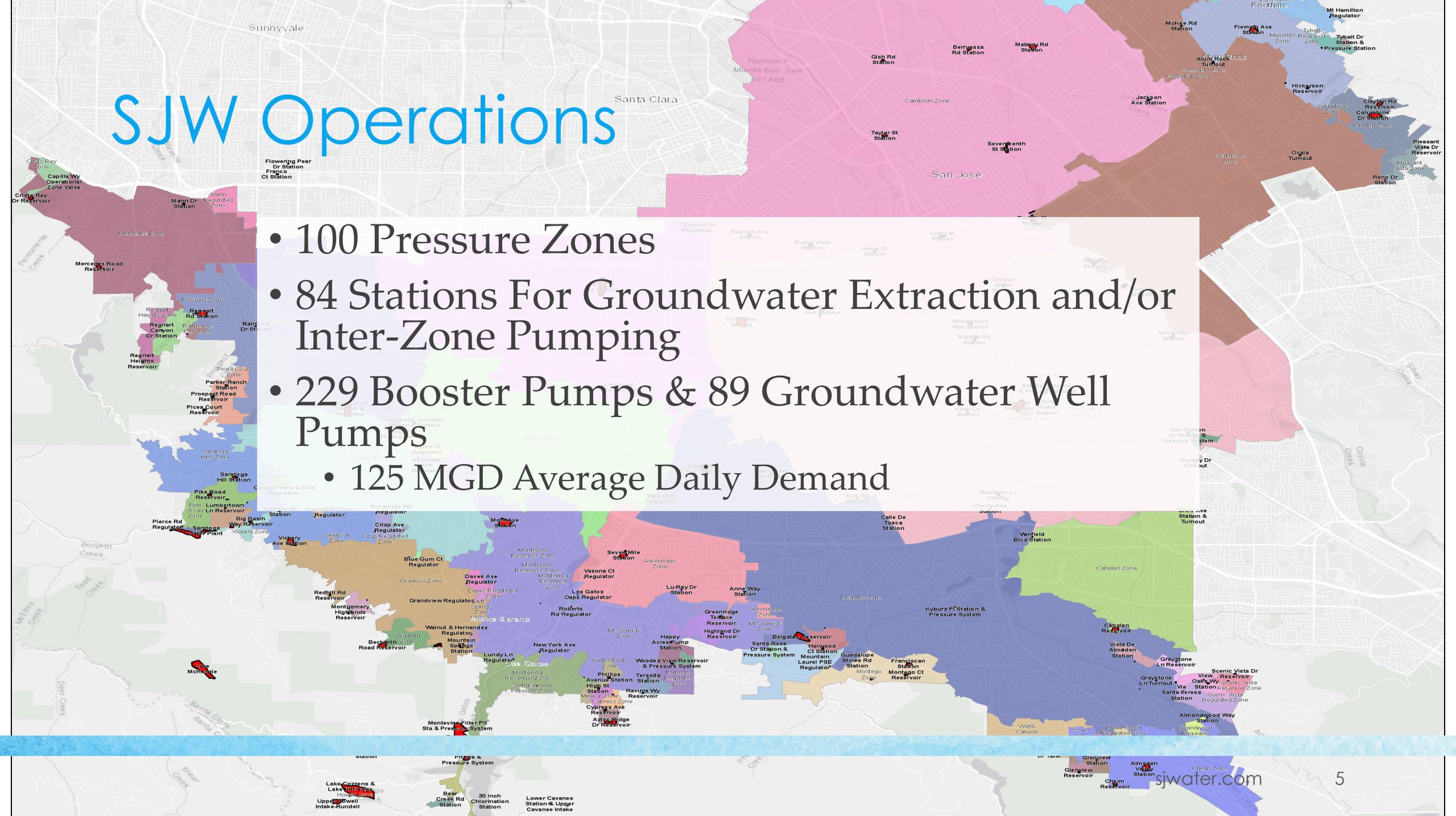
# About SJW





# SJW Operations

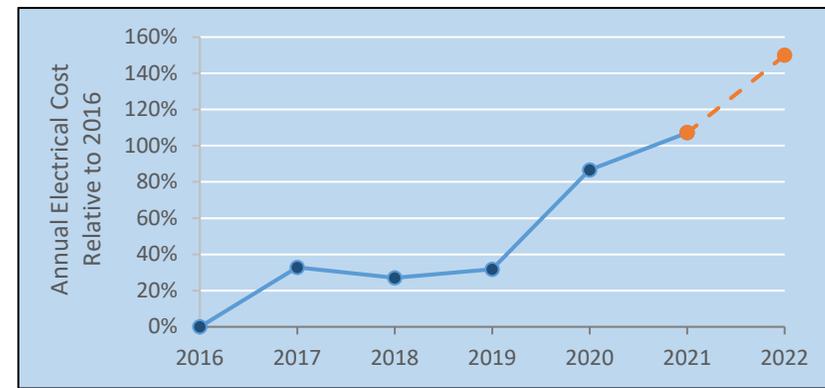
- 100 Pressure Zones
- 84 Stations For Groundwater Extraction and/or Inter-Zone Pumping
- 229 Booster Pumps & 89 Groundwater Well Pumps
- 125 MGD Average Daily Demand



# The Problem



# Costs of Pumping



- 92% of Energy Use
  - 43,000 MWh / \$9.3 M annually
  - ESG Goal – reduce GHG 50% by 2030

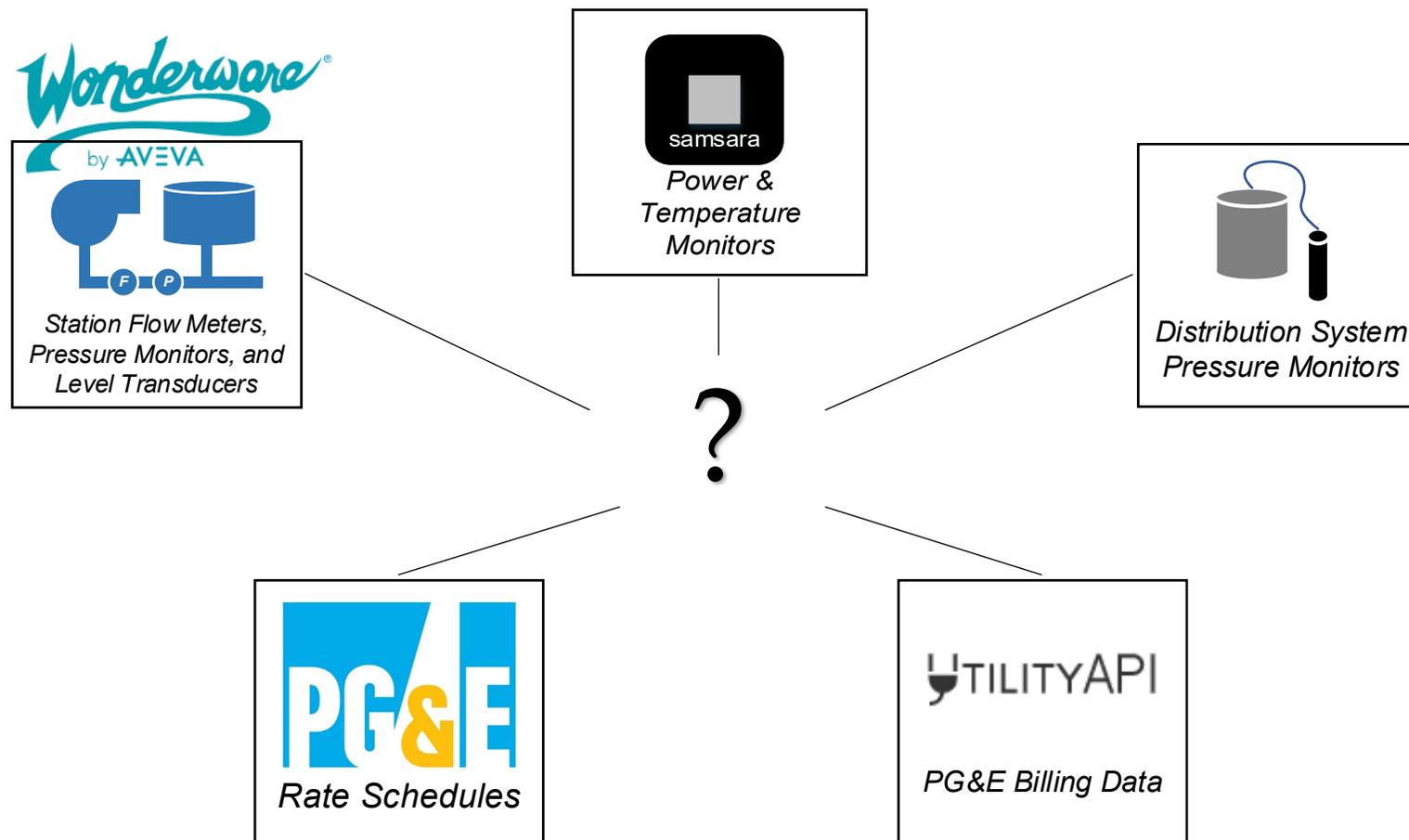


- Limited Monitoring = Reactive Maintenance
  - System Strain
  - Service Interruption
  - More Costly Repair/Replacement



- Pump Prioritization Reliant on Field Efficiency Tests
  - Resource demanding
  - Infrequent
    - Data is Often 2-5 Years Old

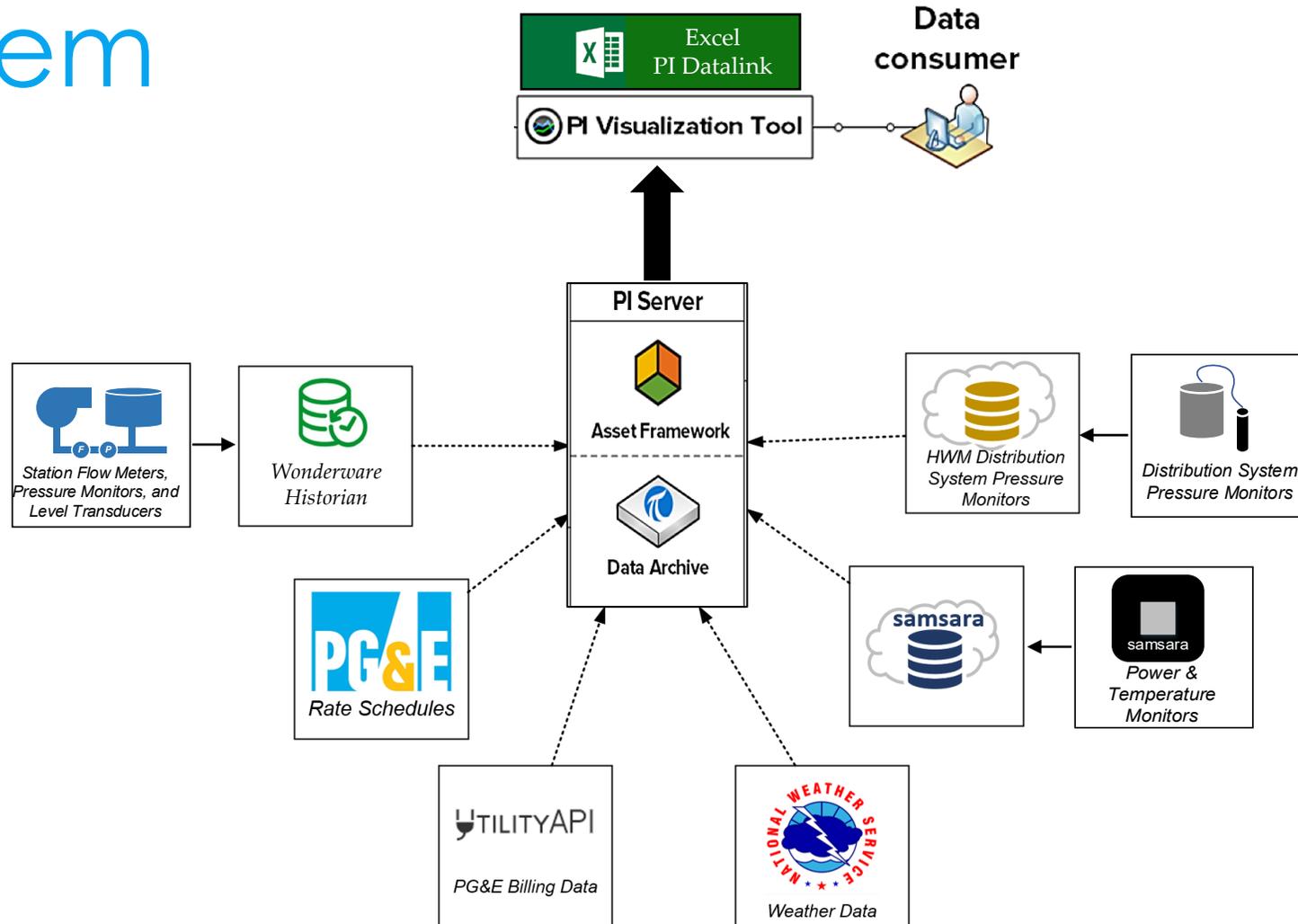
# Independent Data Sources



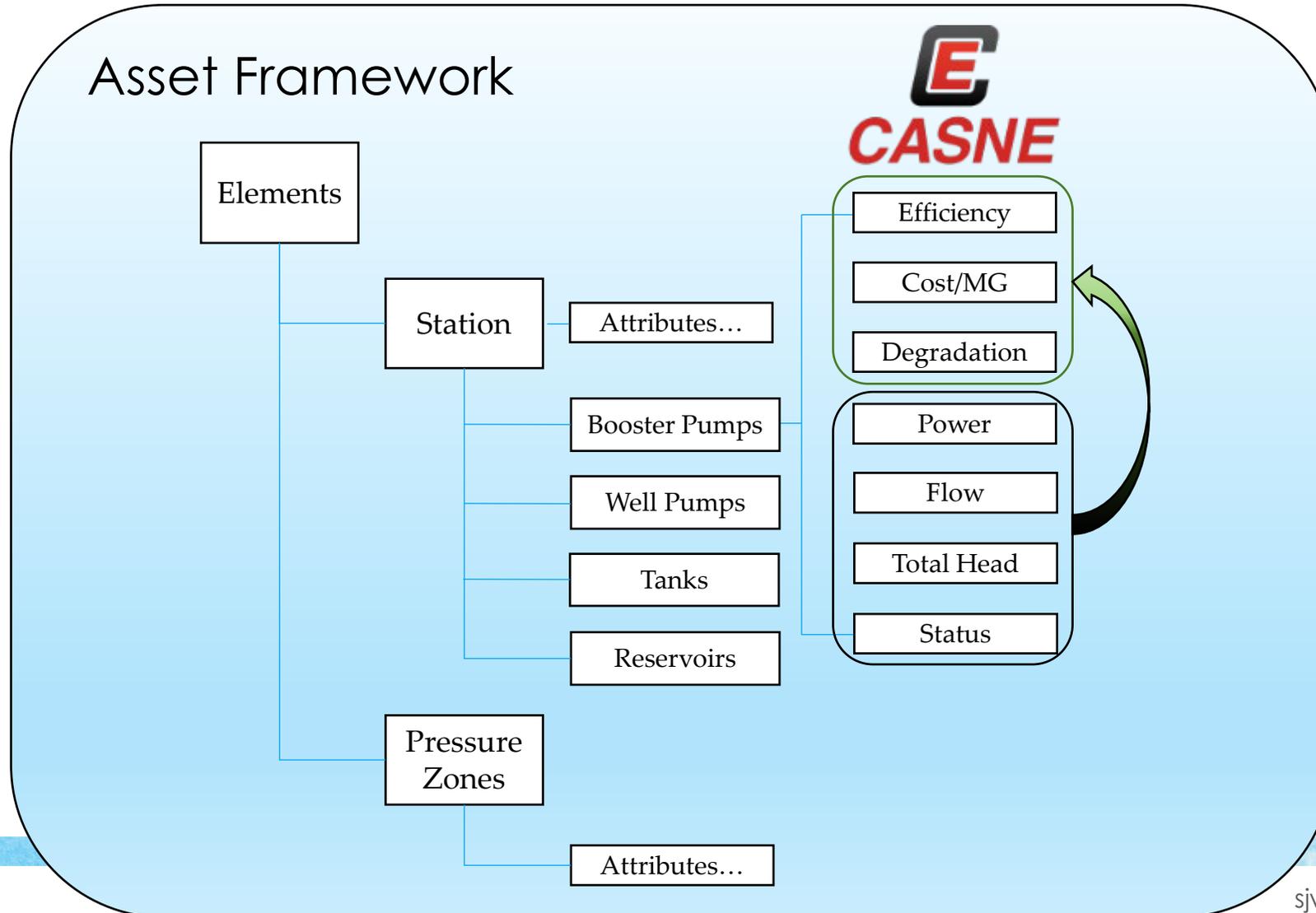
# The Solution



# PI System



# Implementation



# Dashboards

## AVEVA™ PI Vision™

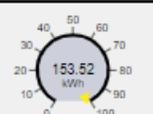


**Buena Vista Station**  
 Well with Booster Station  
On

PG&E Info	
Rate Schedule	B20S
Current Rate Charge	0.1324 \$/kWh
Current Rate Category	Off Peak
Bill Start Date	8/1/2022 12:00:00 AM
Bill End Date	9/1/2022 12:00:00 AM
Actual Bill Total	\$ 59,477
Actual vs Estimate	2.4 %
Estimated Bill Total	\$ 58,022


**Local Weather**  
 San Jose International Airport  
 10/22/2022 1:48:00 PM

Temperature	88 °F
Last Hr Precipitation	0.00 in
Wind Speed & Deg.	14.99 mph 330 °
Humidity	40.5 %
Conditions	Mostly Cloudy

**15 Min Energy Consumption**  


153.52 kWh

**Navigation Pane**

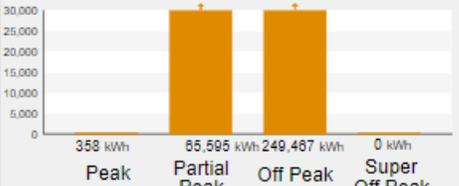
- [System Overview](#)
- [System Schematic](#)
- Individual Pump Displays**
- [Boosters](#) | [Wells](#)
- Pump KPI Comparison Displays**
- [Boosters](#) | [Wells](#)
- Station Overview Displays**
- [Booster Only Stations](#) | [Direct Well Pumper](#)
- [Stations w/o KPIs](#) | [Reservoir/Tank Only](#)

**Overall Pump Performance**  
 OPE & Cost per Million Gal

<b>Booster Pumps</b>	<span style="color: green; font-weight: bold;">On</span>	<b>Last Cycle Avg</b>
2 of 4 Running		77 % OPE
		87 \$/MG
<b>Well Pumps</b>	<span style="color: green; font-weight: bold;">On</span>	<b>Last Cycle Avg</b>
3 of 9 Running		88 % OPE
		99 \$/MG

**PG&E ToU Max kW Demands**  

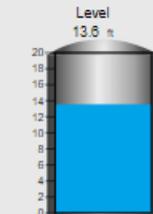

Peak: 3 kW    Partial Peak: 849 kW    All Categories: 876 kW

**PG&E ToU kWh Totals**  


Peak: 358 kWh    Partial Peak: 65,595 kWh    Off Peak: 249,467 kWh    Super Off Peak: 0 kWh

Period: 9/1/2022 12:00:00 AM - 10/1/2022 12:00:00 AM

Total Energy Consumption  
315,421 kWh

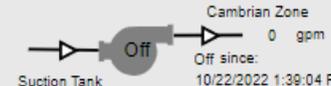


Level: 13.6 ft

Buena Vista Suction Tank

**Booster Pumps**

**Buena Vista B-1**



Design Flow: 2,500 US gal/min  
Data Status: Complete  
Operational Status: Normal

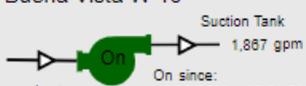
Real-Time	Last Cycle Avg
0 % OPE	59 % OPE
0 \$/MG	69 \$/MG

Field Test OPE: 76.2 %  
Test Date: 3/5/2018



**Well Pumps**

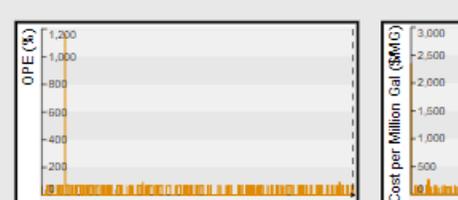
**Buena Vista W-10**



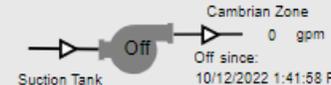
Design Flow: 2,200 US gal/min  
Data Status: Complete  
Operational Status: Normal

Real-Time	Last Cycle Avg
0 % OPE	67 % OPE
0 \$/MG	127 \$/MG

Field Test OPE: 68.2 %  
Test Date: 9/24/2018



**Buena Vista B-2**



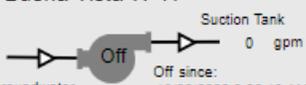
Design Flow: 3,000 US gal/min  
Data Status: Complete  
Operational Status: Normal

Real-Time	Last Cycle Avg
0 % OPE	62 % OPE
0 \$/MG	65 \$/MG

Field Test OPE: 82.9 %  
Test Date: 8/29/2020



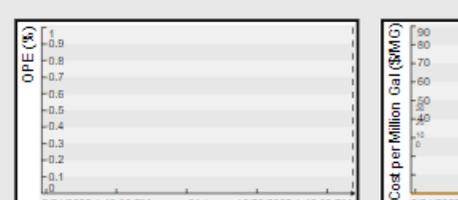
**Buena Vista W-11**



Design Flow: 2,300 US gal/min  
Data Status: Missing Inlet Pressure  
Operational Status: Normal

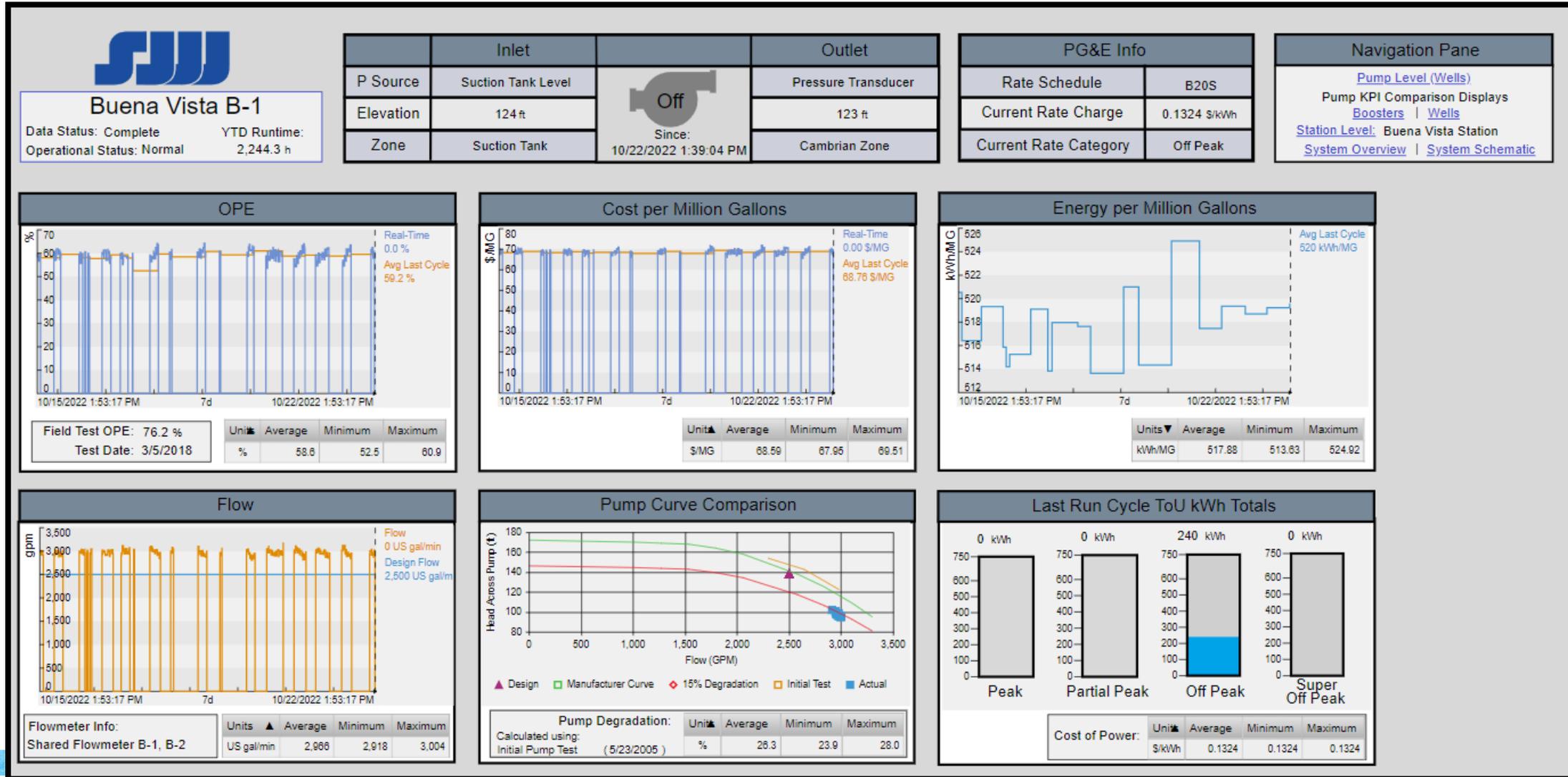
Real-Time	Last Cycle Avg
0 \$/MG	78 \$/MG

Field Test OPE: 71.8 %  
Test Date: 7/28/2019

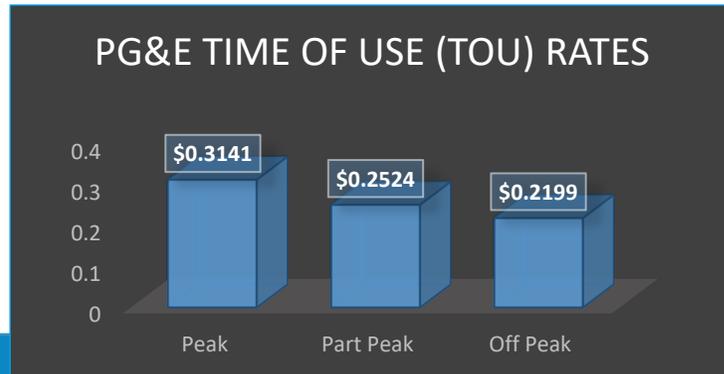


# Dashboards

AVEVA™ PI Vision™



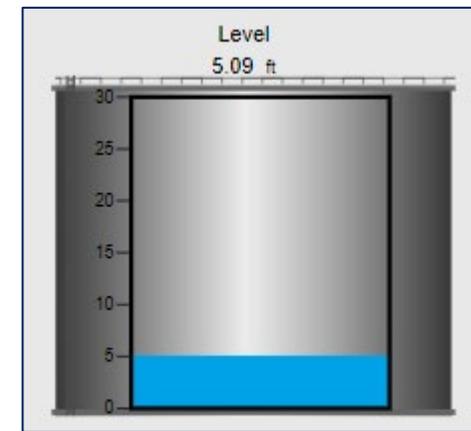
# Application: Alerts



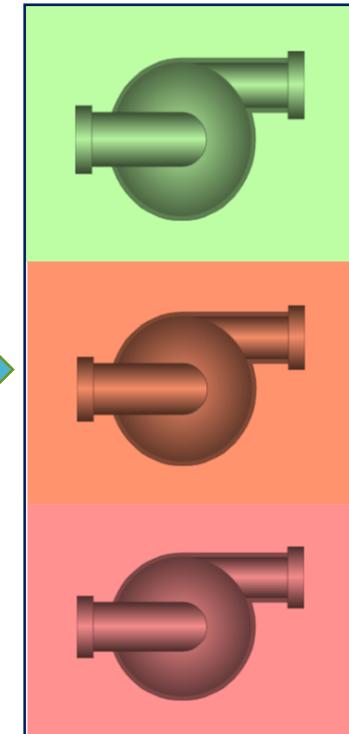
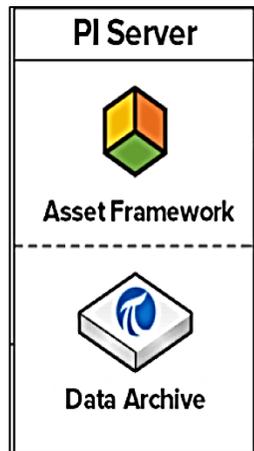
- Pump On @ Peak ToU
- Pump Degradation > 20%
- Runtime Since Last Service > Threshold
- Pct. Diff. Electric Bill vs Estimate > 5%



# Application: Automated Pump Ranking



## AVEVA InTouch HMI



# Initial/Expected Results



# Cost Savings

**ENERGY STATEMENT** Account No: 1023456789-0  
www.pge.com/MyEnergy Statement Date: mm/dd/yyyy  
Due Date: mm/dd/yyyy

**2 Service For:** RESIDENTIAL CUSTOMER  
1234 MAIN STREET  
ANYTOWN, CA 00000

**3 Your Account Summary**

Amount Due on Previous Statement	\$57.87
Payment(s) Received Since Last Statement	-57.87
Previous Unpaid Balance	\$0.00
Current Charges	\$58.09
Current Credits	5.81
<b>Total Amount Due by XX/XX/20XX</b>	<b>\$63.90</b>

**4 Questions about your bill?**  
Monday-Friday 7 a.m.-9 p.m.  
Saturday 8 a.m.-6 p.m.  
Phone: 1-800-743-5000  
www.pge.com/MyEnergy

**5 Ways To Pay**  
www.pge.com/waystopay

**6 Your Enrolled Programs**  
CARE Discount

**7**

**8 Monthly Billing History**

**9 Important Messages**  
Neighborhood payment centers: Did you know it's FREE to pay your PG&E bill at any of our 600 authorized neighborhood payment centers? Payments made by 5 p.m. will post to your PG&E account the same day. Locations and times of operation may be more convenient for your schedule. Call 1-888-743-6911 to find a location near you.

Please return this portion with your payment. No staples or paper clips. Do not fold. Thank you.

**10** 99901234567890100000xxxxxx000000xxxxxxx

Account Number: 1023456789-0	Due Date: mm/dd/yyyy	Total Amount Due: \$63.90	Amount Enclosed: \$
---------------------------------	-------------------------	------------------------------	------------------------

RESIDENTIAL CUSTOMER  
1234 MAIN STREET  
ANYTOWN, CA 00000

PG&E  
BOX 997300  
SACRAMENTO, CA 95899-7300

Page 1 of 4

- PI Alert → 5% Overcharge from Electric Utility
  - ~\$320,000 Past Charges
  - ~\$440,000 Future Annual Savings

# Estimated Future Savings/Benefits

- Peak  Off Peak  30%  Cheaper Rate
- Prioritizing Most Efficient Pump  \$53/MG 
- \$53/MG \* 2,680 MG  **\$143,000 / Year**
  - 206 Tons of  CO<sub>2</sub>
- Pump Failure Prevention

# Summary

## Challenge

- Data Silos
- Limited Monitoring
- High Electrical Costs
- Infrequent Performance Indicators

## Solution

### AVEVA PI System

- Single Integrative Data Archive
- Process and Performance Monitoring
- Advanced Analytics
- Powerful Visualization via PI Vision
- Customized Alerts
- Exportable Analytics Data

## Benefits

- Synthesized Data Streams
- Condition Based Maintenance
- Increased Efficiency
- Reduced Electrical Costs
- Lower Carbon Footprint
- Real-time Efficiency Driven Pump Prioritization
- Estimated ROI < 1 Yr

# Next Steps



# Integration with Asset Management



# Pressure Zone Dashboard

KPI Summary

KPI Summary

KPI Summary

KPI Summary

KPI Summary

# Live Demo





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## Blake Chetcuti

Operations Supervisor

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# Questions?

Please wait for the microphone.  
State your name and company.



# Please remember to...

Navigate to this session in the mobile app to complete the survey.



# Thank you!

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The Company shall not be obliged to disclose any revision to these forward-looking statements to reflect events or circumstances occurring after the date on which they are made or to reflect the occurrence of future events.

 [linkedin.com/company/aveva](https://www.linkedin.com/company/aveva)

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#### ABOUT AVEVA

AVEVA is a global leader in industrial software, sparking ingenuity to drive responsible use of the world's resources. The company's secure industrial cloud platform and applications enable businesses to harness the power of their information and improve collaboration with customers, suppliers and partners.

Over 20,000 enterprises in over 100 countries rely on AVEVA to help them deliver life's essentials: safe and reliable energy, food, medicines, infrastructure and more. By connecting people with trusted information and AI-enriched insights, AVEVA enables teams to engineer efficiently and optimize operations, driving growth and sustainability.

Named as one of the world's most innovative companies, AVEVA supports customers with open solutions and the expertise of more than 6,400 employees, 5,000 partners and 5,700 certified developers. With operations around the globe, we are headquartered in Cambridge, UK and listed on the London Stock Exchange's FTSE 100.

Learn more at [www.aveva.com](https://www.aveva.com)



## All Pump and Storage Stations

System Overview

Overall Pump Performance			
OPE & Cost per Million Gal			
Pump Run Status		Last Cycle Avg	
Boosters	16 of 108	73 % OPE	224 \$/MG
Wells	17 of 90	75 % OPE	195 \$/MG



### Navigation Pane

- [System Schematic](#)
- [Individual Pump Displays](#)
- [Boosters](#) | [Wells](#)
- [Pump KPI Comparison Displays](#)
- [Boosters](#) | [Wells](#)
- [Station Overview Displays](#)
- [Booster Only](#) | [Well with Booster](#) | [Direct Well Pumper Stations w/o KPIs](#) | [Reservoir/Tank Only](#)

#### Booster Only Stations

Station Name	Last Cycle Avg
<b>Alum Rock Station</b>	
Booster Pumps: 0 of 2 Running <span>Off</span>	226 \$/MG
<b>Azores Station</b>	
Booster Pumps: 0 of 3 Running <span>Off</span>	236 \$/MG
<b>Cambrian Avenue Station</b>	
Booster Pumps: 0 of 4 Running <span>Off</span>	65 % OPE 197 \$/MG
<b>Canyon View Drive Station</b>	
Booster Pumps: 0 of 1 Running <span>Off</span>	No Data \$/MG
<b>Columbine Drive Station</b>	

#### Well with Booster Stations

Station Name	Last Cycle Avg
<b>Bascom Avenue Station</b>	
Booster Pumps: 0 of 3 Running <span>Off</span>	65 % OPE 70 \$/MG
Well Pumps: 0 of 4 Running <span>Off</span>	33 % OPE Calc Failed \$/MG
<b>Breeding Avenue Station</b>	
Booster Pumps: 1 of 2 Running <span>On</span>	42 % OPE 170 \$/MG
Well Pumps: 1 of 3 Running <span>On</span>	374 \$/MG
<b>Buena Vista Station</b>	
Booster Pumps: 2 of 4 Running <span>On</span>	77 % OPE 87 \$/MG
Well Pumps: 3 of 9 Running <span>On</span>	68 % OPE 99 \$/MG

#### Direct Well Pumper Stations

Station Name	Last Cycle Avg
<b>Grant Street Station</b>	
Well Pumps: 0 of 2 Running <span>Off</span>	49 % OPE 228 \$/MG
<b>McLaughlin Road Back Station</b>	
Well Pumps: 0 of 3 Running <span>Off</span>	690 \$/MG
<b>McLaughlin Road Front Station</b>	
Well Pumps: 1 of 3 Running <span>On</span>	345 \$/MG
<b>Needles Station</b>	
Well Pumps: 1 of 3 Running <span>On</span>	136 % OPE 156 \$/MG
<b>Senter Road Station</b>	

#### Pump Stations w/o KPI data

- Almaden Valley Station
- Almondwood Way Station
- Anne Way Station
- Big Basin Way Station
- Branham Lane Station
- Canyon Creek Drive Station
- Dutard Station
- Franciscan Station
- Gish Road Station
- Graystone Heights Station
- Happy Acres Station
- Harwood Road Station

#### Reservoir/Tank Only Stations

- Aztec Ridge Drive Station
- Batista Station
- Bayview Drive Station
- Beatrice Circle Station
- Beckwith Road Station
- Belgatos Station
- Cahalan Station
- Cheim Station
- Clayton Road Station
- Crothers Road Station
- Dow Drive Station
- Dutard Heights Reservoir Station

Station Level (Booster/Well)

Asset: Buena Vista Station



## Buena Vista Station

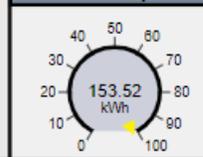
Well with Booster Station



PG&E Info	
Rate Schedule	B20S
Current Rate Charge	0.1324 \$/kWh
Current Rate Category	Off Peak
Bill Start Date	8/1/2022 12:00:00 AM
Bill End Date	9/1/2022 12:00:00 AM
Actual Bill Total	\$ 59,477
Actual vs Estimate	2.4 %
Estimated Bill Total	\$ 58,022

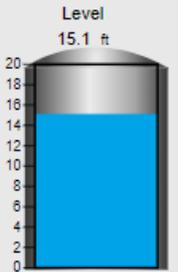
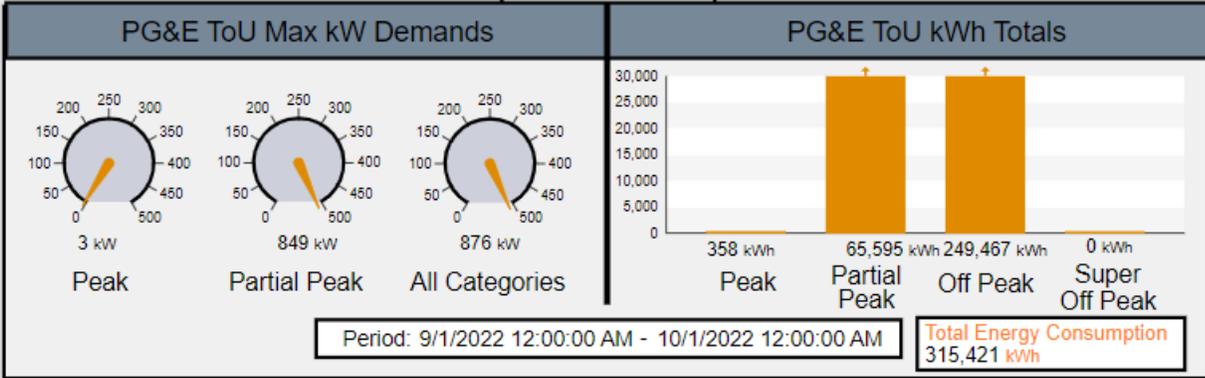
Local Weather	
San Jose International Airport 10/22/2022 1:19:15 PM	
Temperature	68 °F
Last Hr Precipitation	0.00 in
Wind Speed & Deg.	19.69 mi/h 300 °
Humidity	43.6 %
Conditions	Mostly Cloudy and Windy

### 15 Min Energy Consumption



Navigation Pane	
<a href="#">System Overview</a>	
<a href="#">System Schematic</a>	
Individual Pump Displays	
<a href="#">Boosters</a>   <a href="#">Wells</a>	
Pump KPI Comparison Displays	
<a href="#">Boosters</a>   <a href="#">Wells</a>	
Station Overview Displays	
<a href="#">Booster Only Stations</a>   <a href="#">Direct Well Pumper</a>	
<a href="#">Stations w/o KPIs</a>   <a href="#">Reservoir/Tank Only</a>	

Overall Pump Performance		OPE & Cost per Million Gal	
Booster Pumps		Last Cycle Avg	
3 of 4 Running		77 % OPE	
		87 \$/MG	
Well Pumps		Last Cycle Avg	
4 of 9 Running		68 % OPE	
		99 \$/MG	



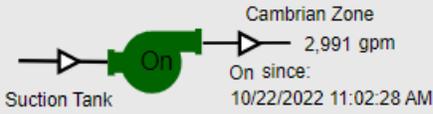
Buena Vista Suction Tank

Station Level (Booster/Well) \* Asset: Buena Vista Station



Booster Pumps

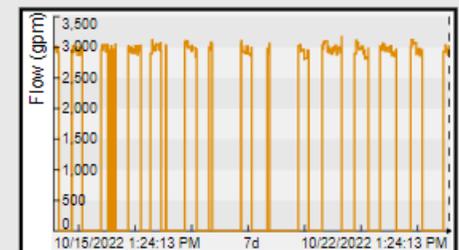
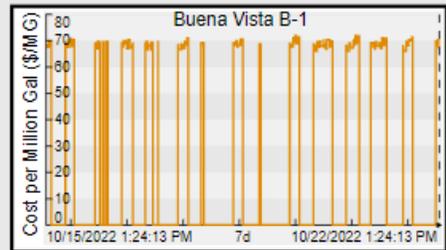
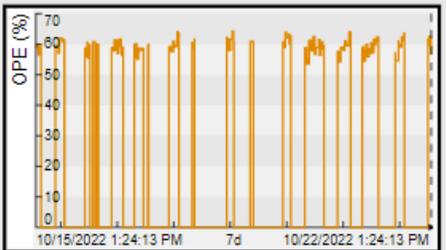
Buena Vista B-1



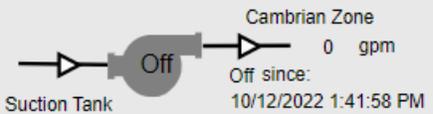
Real-Time	Last Cycle Avg
57 % OPE	59 % OPE
68 \$/MG	69 \$/MG

Field Test OPE: 76.2 %  
Test Date: 3/5/2018

Design Flow: 2,500 US gal/min  
Data Status: Complete  
Operational Status: Normal



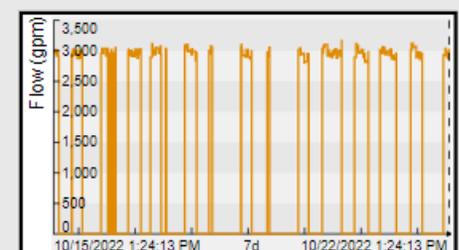
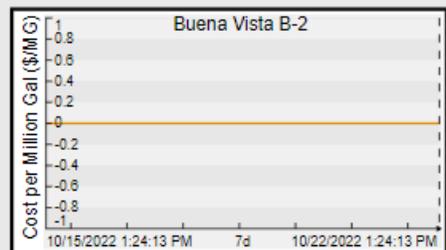
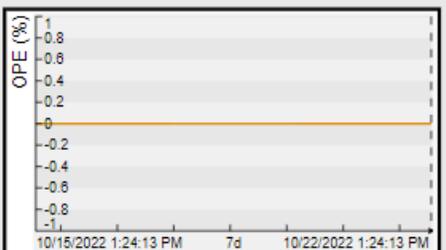
Buena Vista B-2



Real-Time	Last Cycle Avg
0 % OPE	62 % OPE
0 \$/MG	65 \$/MG

Field Test OPE: 82.9 %  
Test Date: 6/29/2020

Design Flow: 3,000 US gal/min  
Data Status: Complete  
Operational Status: Normal



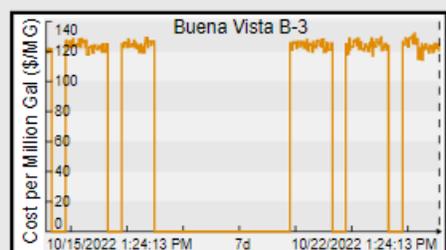
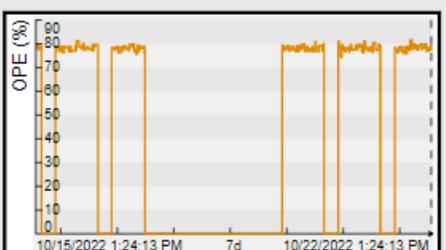
Buena Vista B-3



Real-Time	Last Cycle Avg
79 % OPE	78 % OPE
121 \$/MG	124 \$/MG

Field Test OPE: 84.1 %  
Test Date: 11/2/2020

Design Flow: 2,150 US gal/min  
Data Status: Complete  
Operational Status: Normal





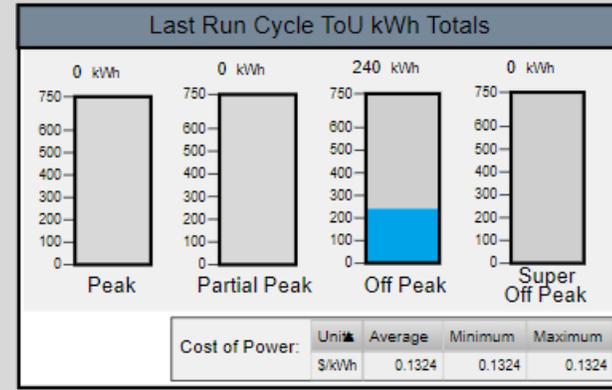
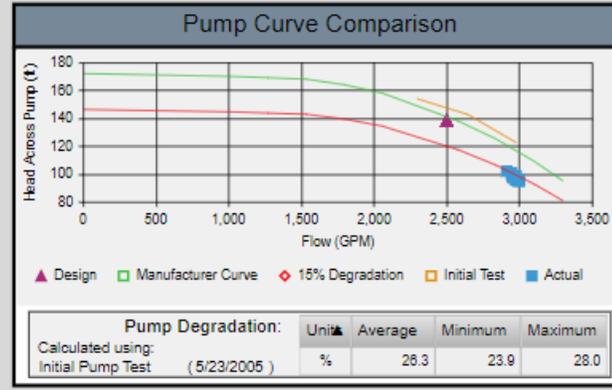
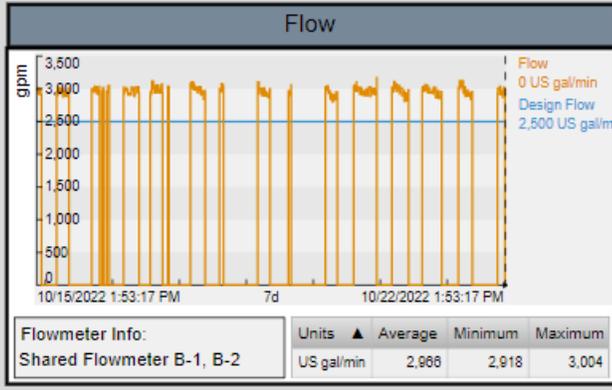
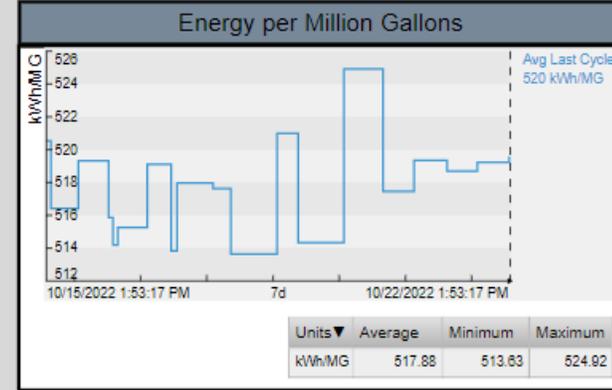
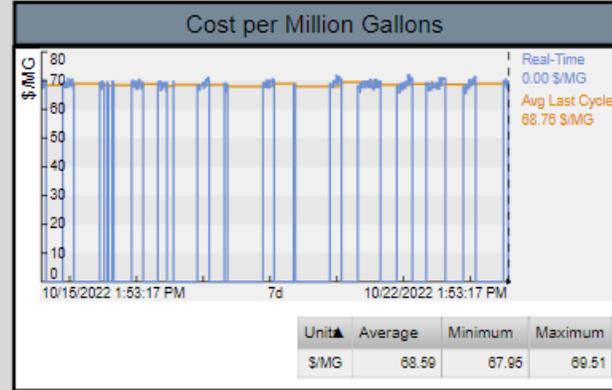
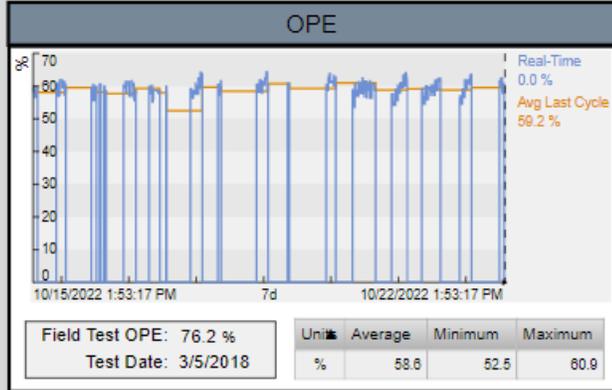
## Buena Vista B-1

Data Status: Complete YTD Runtime: 2,244.3 h  
Operational Status: Normal

	Inlet	 Off Since: 10/22/2022 1:39:04 PM	Outlet
P Source	Suction Tank Level		Pressure Transducer
Elevation	124 ft		123 ft
Zone	Suction Tank		Cambrian Zone

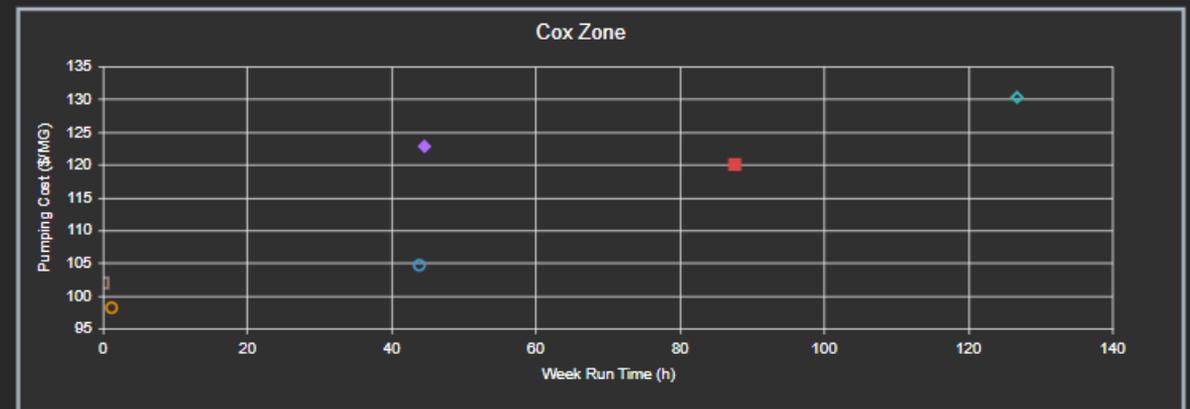
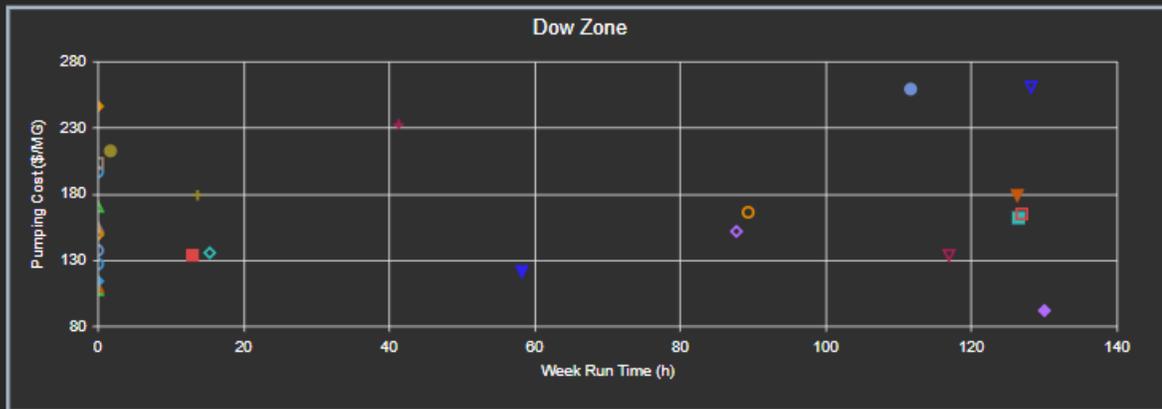
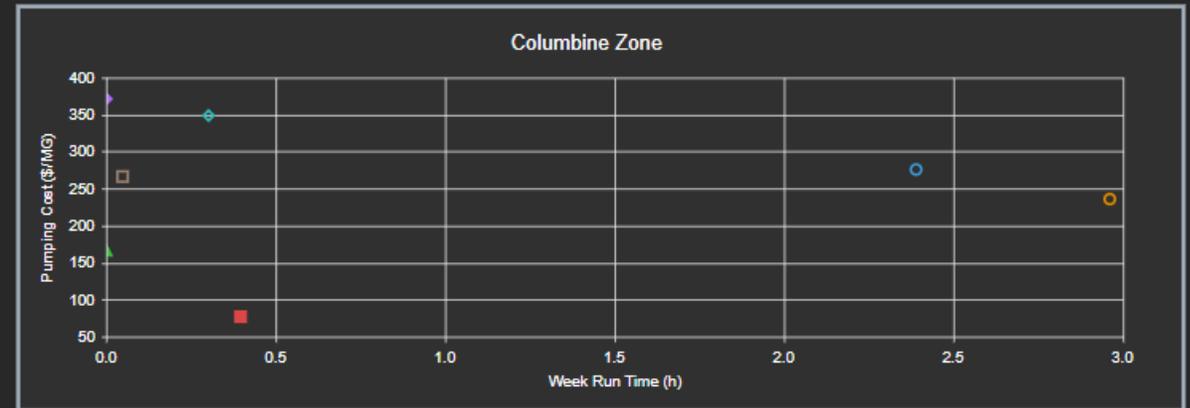
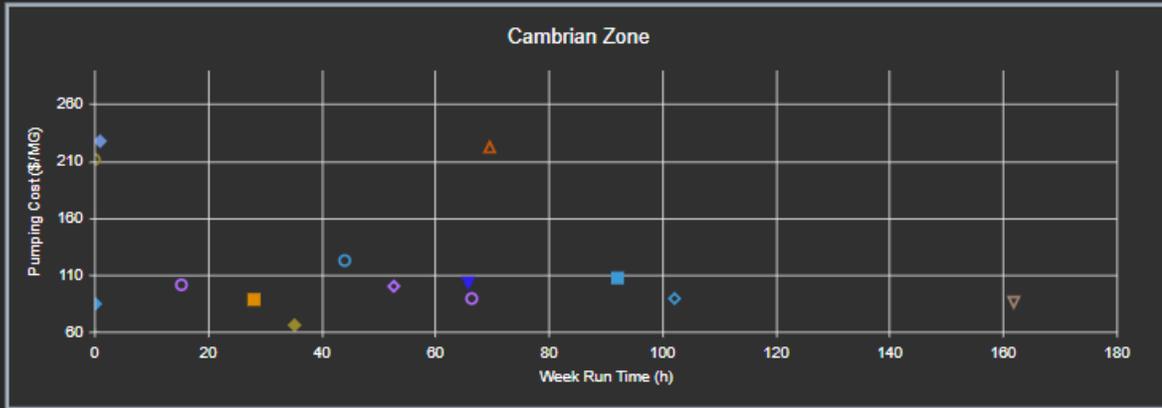
PG&E Info	
Rate Schedule	B20S
Current Rate Charge	0.1324 \$/kWh
Current Rate Category	Off Peak

Navigation Pane	
<a href="#">Pump Level (Wells)</a> Pump KPI Comparison Displays <a href="#">Boosters</a>   <a href="#">Wells</a> Station Level: Buena Vista Station <a href="#">System Overview</a>   <a href="#">System Schematic</a>	



# Groundwater Zones

## Run Time vs Pumping Cost



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