7 September 2018

Evaluation of City Water System's Response in Fountaingrove to the October 2017 Fire

City of Santa Rosa

Agenda

- Introduction
- Process of Investigation
- Consultant Introduction
- Report Highlights
- Findings and Recommendations
- Wrap-up with Next Steps

Introduction

Joe Schiavone

Deputy Director – Water and Sewer Operations
Water DOC Incident Commander

Recap of the Tubbs Fire and the City's Response

- Named for its origin near Tubbs Lane on the outskirts of Calistoga, the fire started around 9:45 p.m. Sunday, October 8, 2017
- Fueled by ideal fire conditions, it rapidly grew and intensified, reaching the Fountaingrove area of Santa Rosa by 1 a.m. on October 9
- Evacuation was the Fire Department's first order of business

Goals of the Evaluation

- Assess the performance of the water system in Fountaingrove in response to the Tubbs Fire
- Determine lessons learned and provide recommendations for system resilience

Did the water system do what it was designed to do and what are the opportunities to improve?

Focus on Fountaingrove

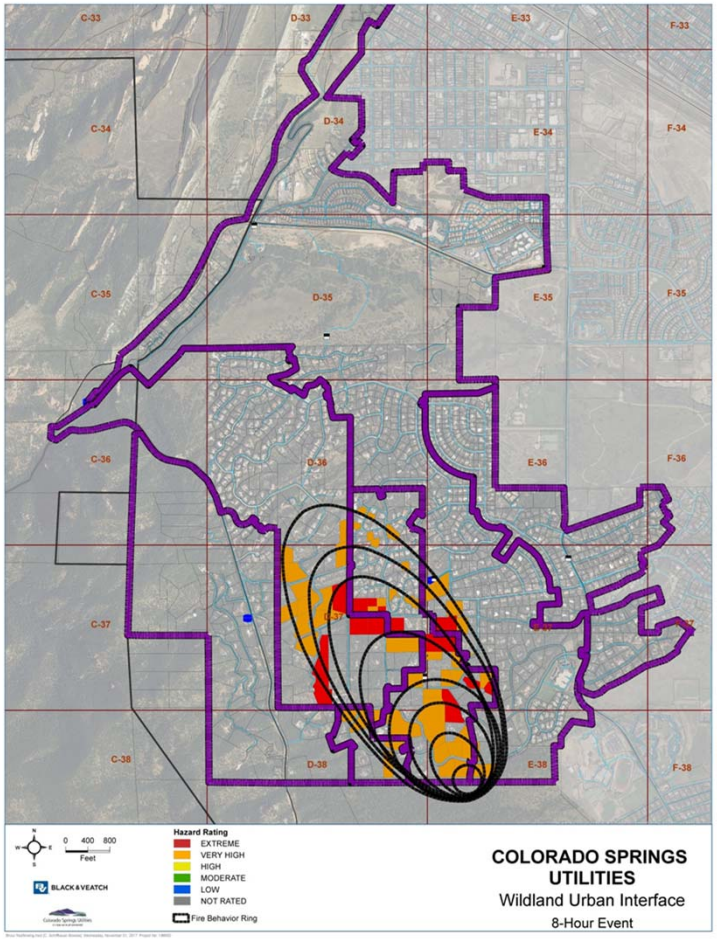
- Wildland-urban interface
  - Difficult terrain
  - Highly susceptible to fire
- Water supply requires a series of pump stations and tanks
- Damage was devastating
- How can lessons from Fountaingrove be applied city-wide?

Report Highlights

Karen Burgi
Regional Planning Leader
Black & Veatch Corporation

Consultant Selected to Provide Third-party Review

- Black & Veatch is a global engineering, consulting and construction company
- Specializes in infrastructure-related projects in the water, energy, telecommunications markets
- Relevant experience in California and Colorado



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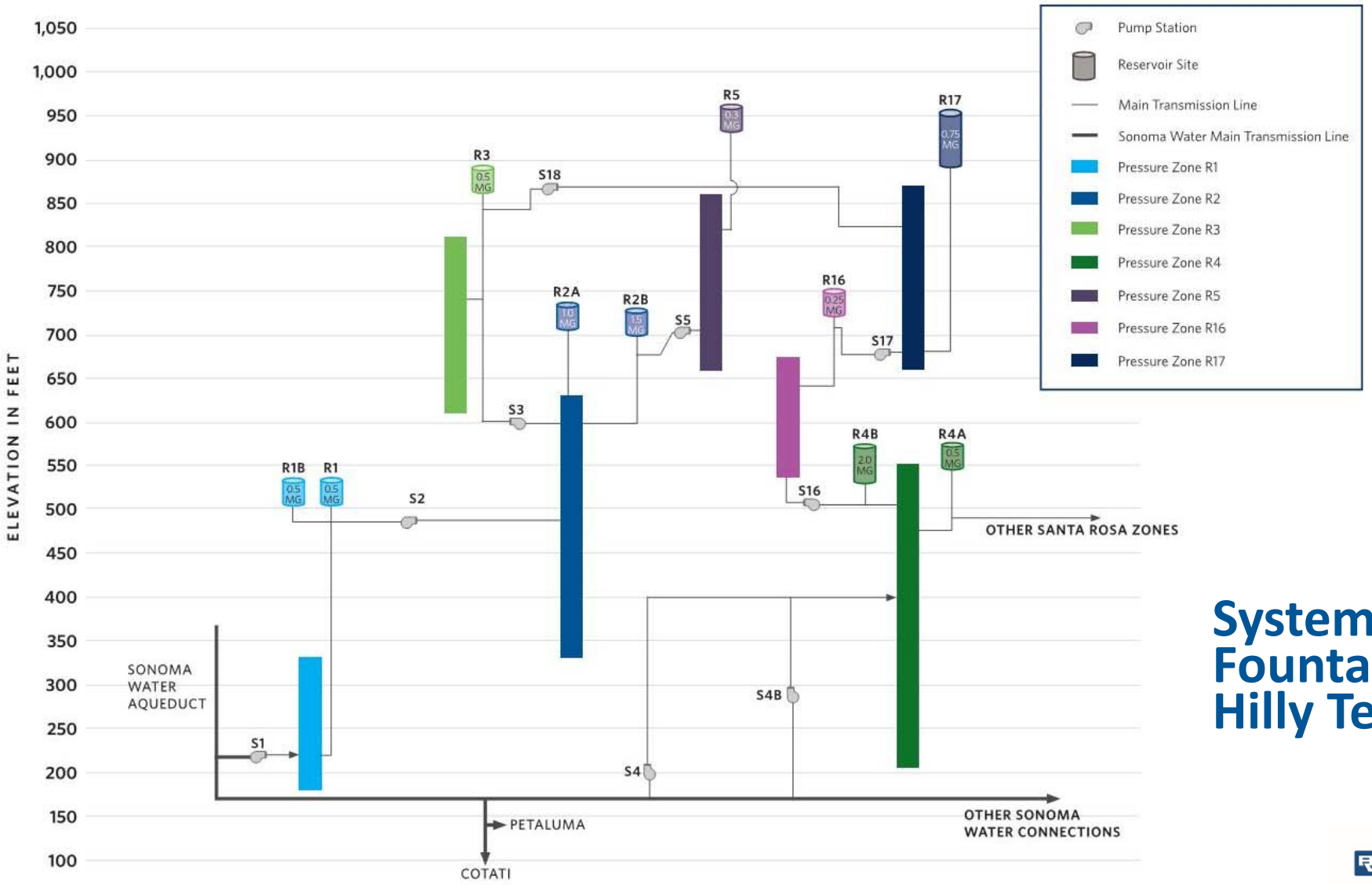

System Serves Fountaingrove's Hilly Terrain

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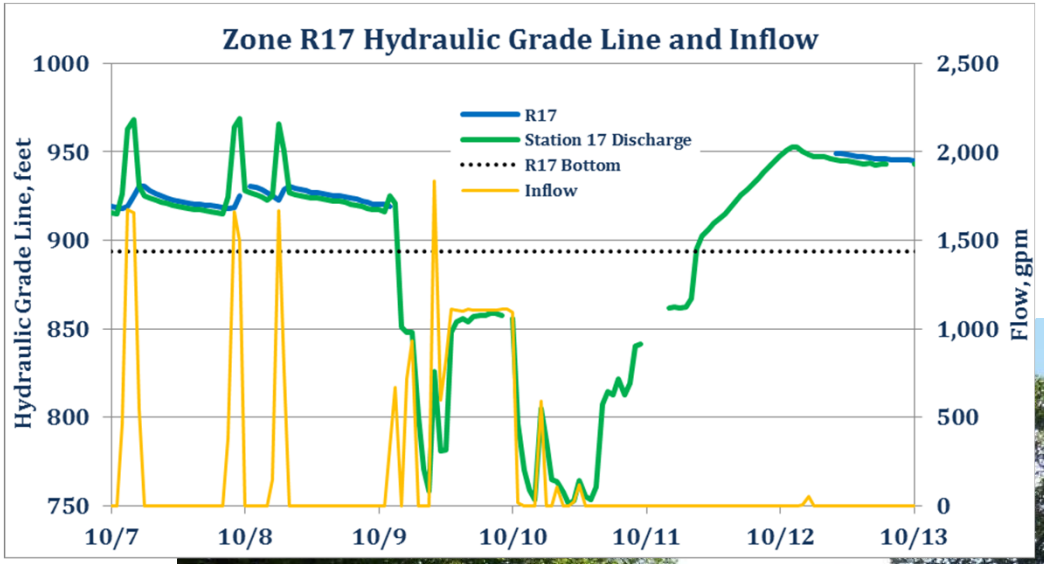
Data Mining

- Existing Hydraulic Model
- SCADA data
  - Pump Station Flows and Pressures
  - Tank Levels
- Reviewed pre-, during, and post-fire data



Codes, Guidelines and System Review

- City's Fire Code based on California and international codes
- City's Fire Code is directed to specific structures. To support this Fire Code, the water distribution system maintains a fireflow goal of 1,500 gpm at 20psi for 2 hours.
- Wildland-urban interface areas are not generally addressed in fire codes
- System's adequacy was evaluated as part of 2014 Water Master Plan
- All master plan recommendations for existing fireflow were implemented prior to Tubbs Fire
- Flow capacity was modeled based on operations prior to the fire

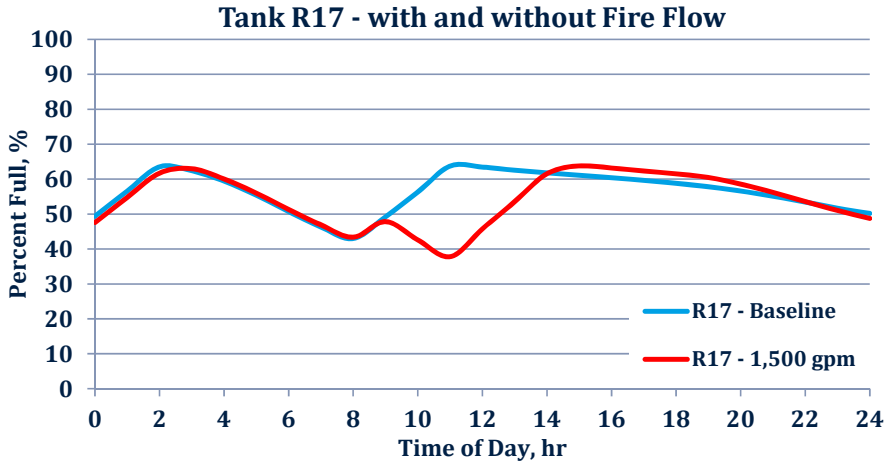
Evaluation determined the system met City goals, with the pressure and storage capacity to deliver requisite fireflow.

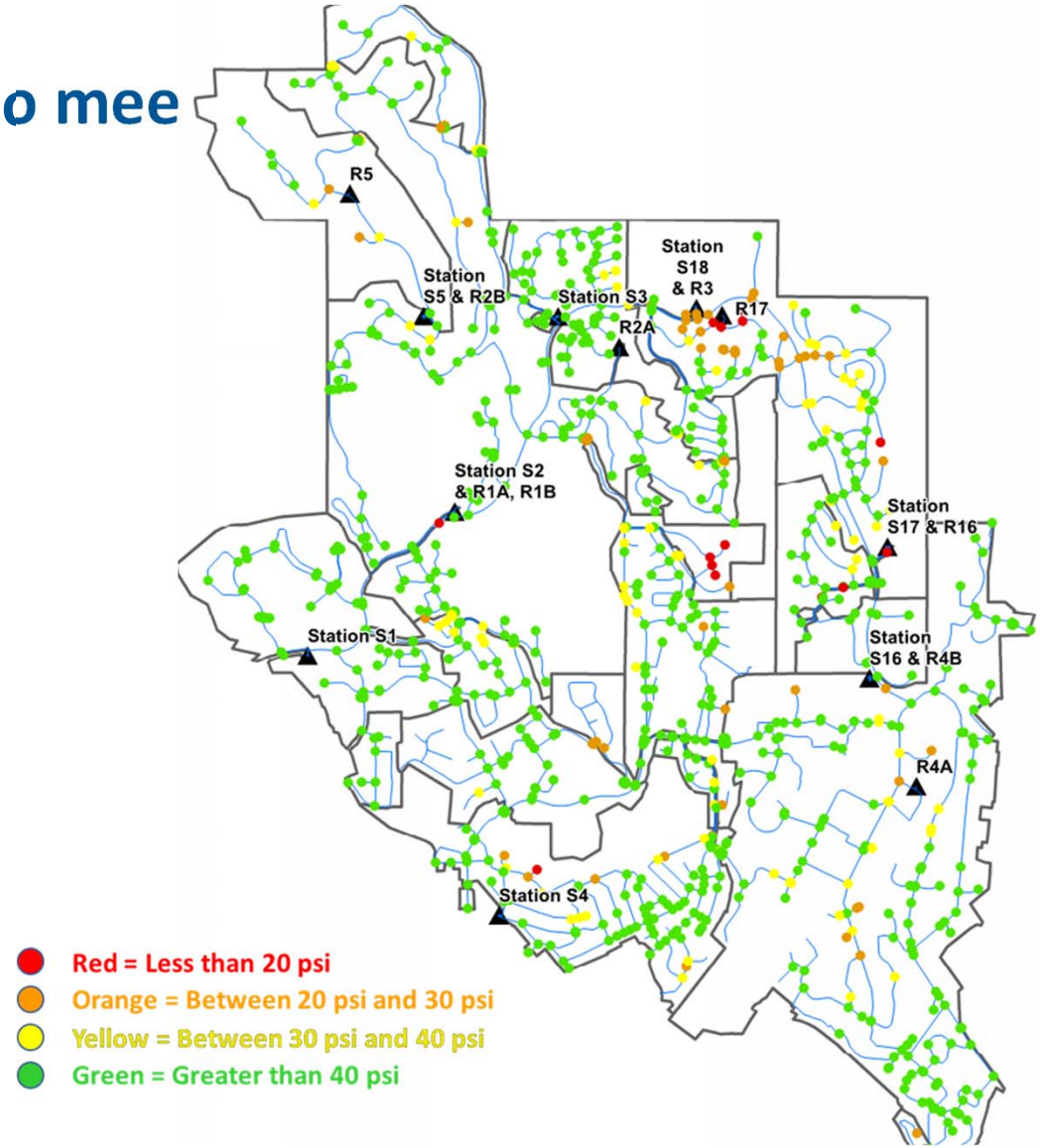
Resiliency of Pumping, Pipeline and Storage Network

- Emergency generator power was provided at all booster pump stations
- Pressure regulating valves are installed between pressure zones
- Storage provides extra capacity beyond what's required by City fire goals
- Water quality considerations limit the amount of storage that could be available
- City has operating procedures to support emergency operations

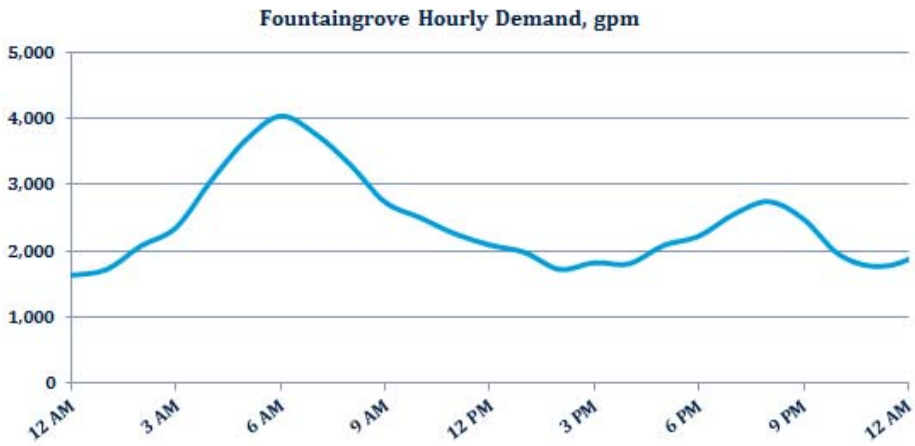
Water system is sufficiently robust to allow for multiple operational combinations, to provide flow into specific areas, while maintaining overall water quality.

System has adequate capacity to mee requirements of City code



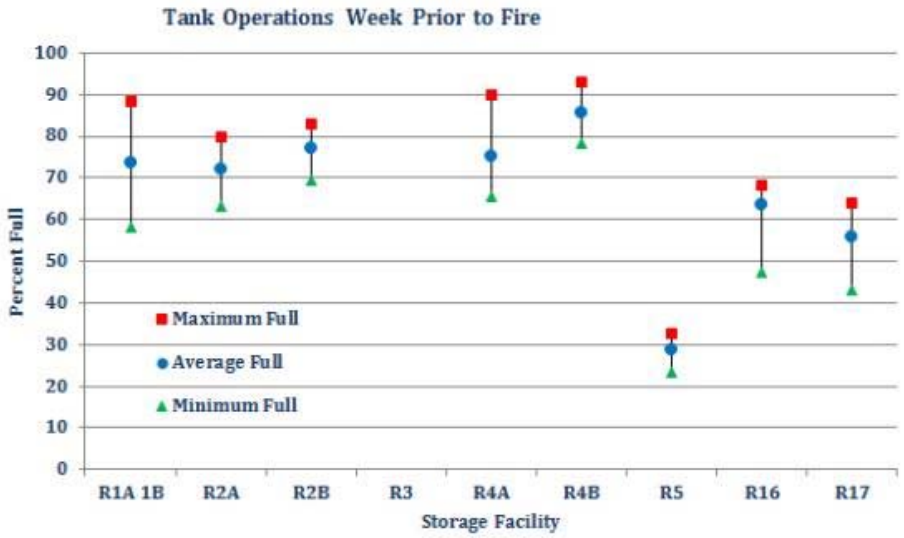


System Demands Prior to the Tubbs Fire



- Peak demand: 4-9 a.m. daily
- Lowest demand: late night to early a.m. daily
- Increased use: 7-9 p.m. daily

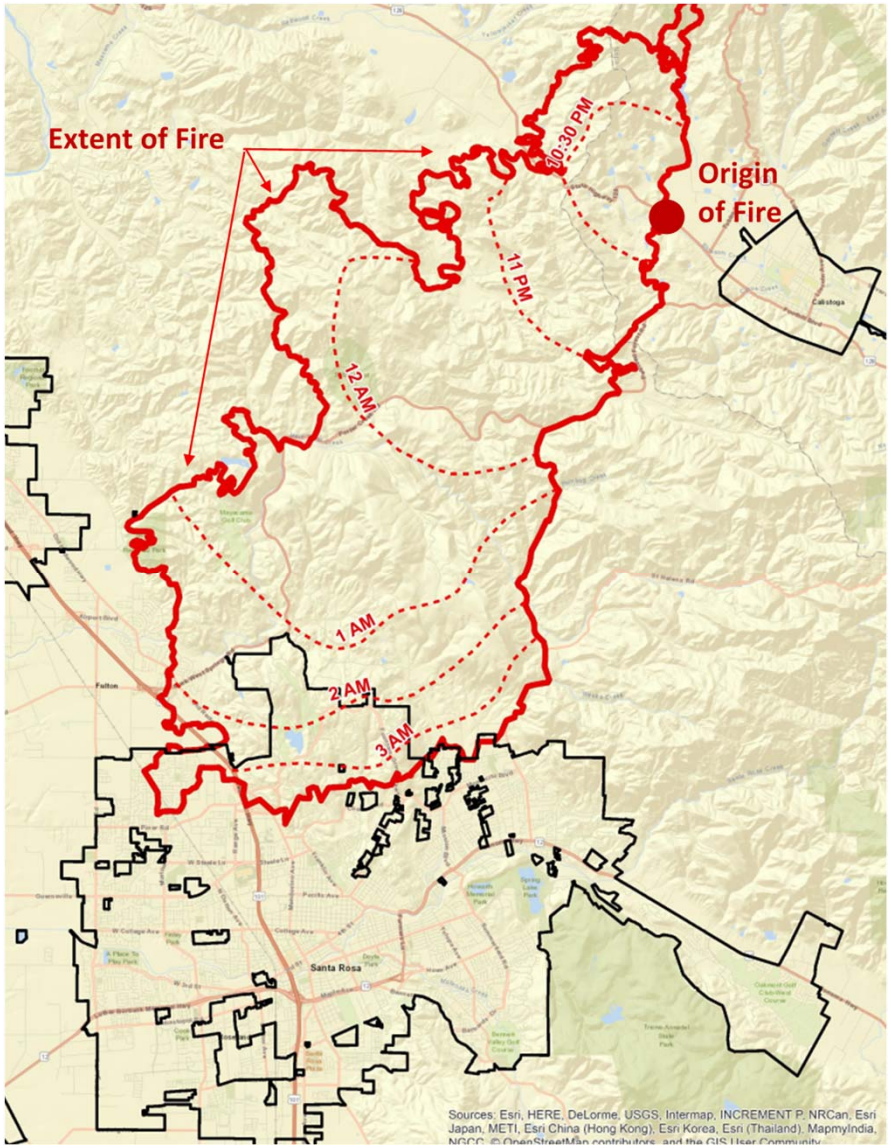
System Operations and Facilities Prior to the Fire



- Most tanks operate at 3/4 of volume, which is standard practice
- Maintaining tanks at less than full
  - Allows tanks to support normal operations
  - Maintains water quality
- City uses large-volume pumps to offset lower storage volumes
- Tank R3 was out of service for seismic retrofit

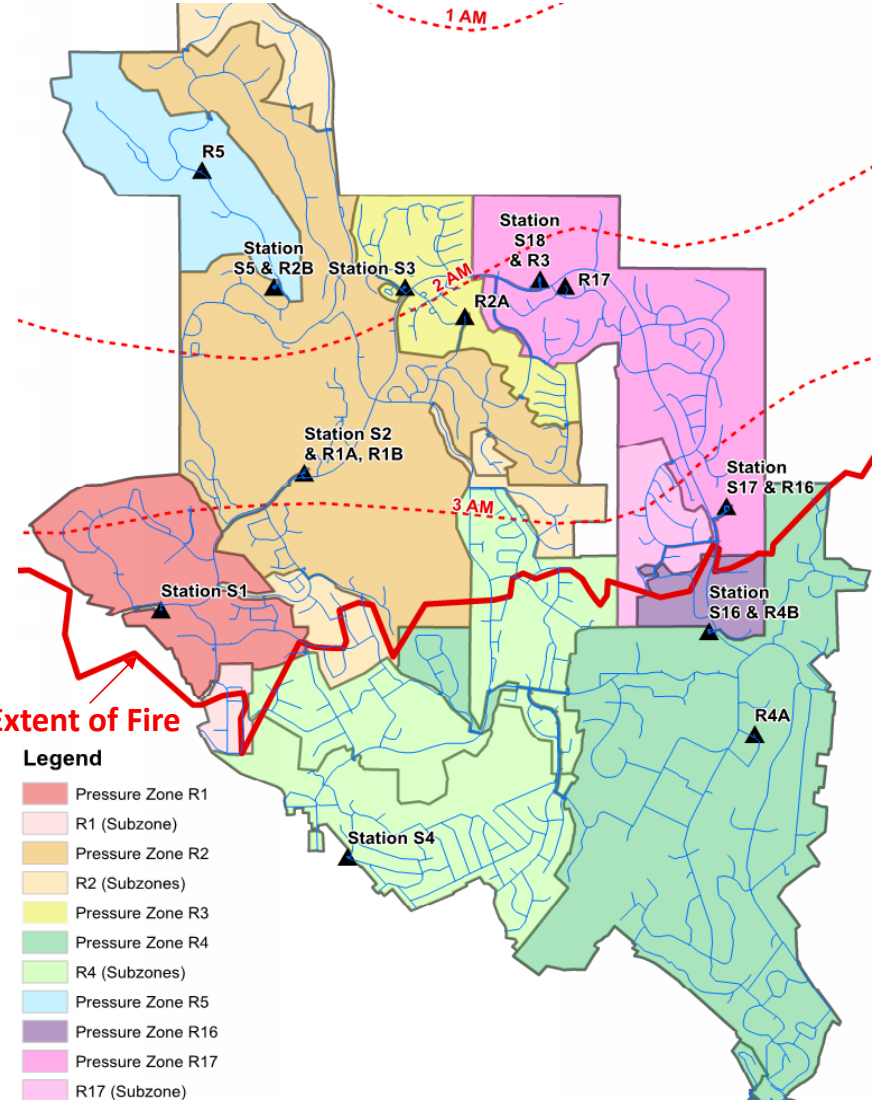
Tubbs Fire Progression

- Single-digit humidity, strong and sustained winds, and plentiful fuel stemming from years of drought then record rainfall were key factors behind the fire's incredible speed, magnitude and intensity
- Fire estimated to have spread 12 miles in the first three hours

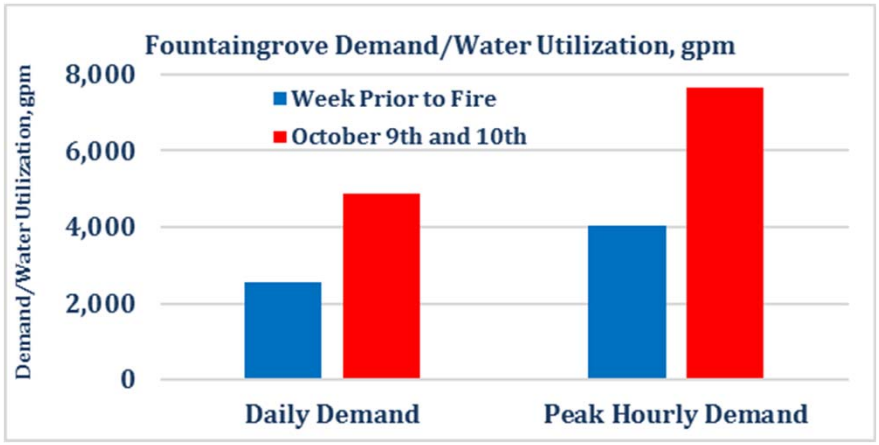


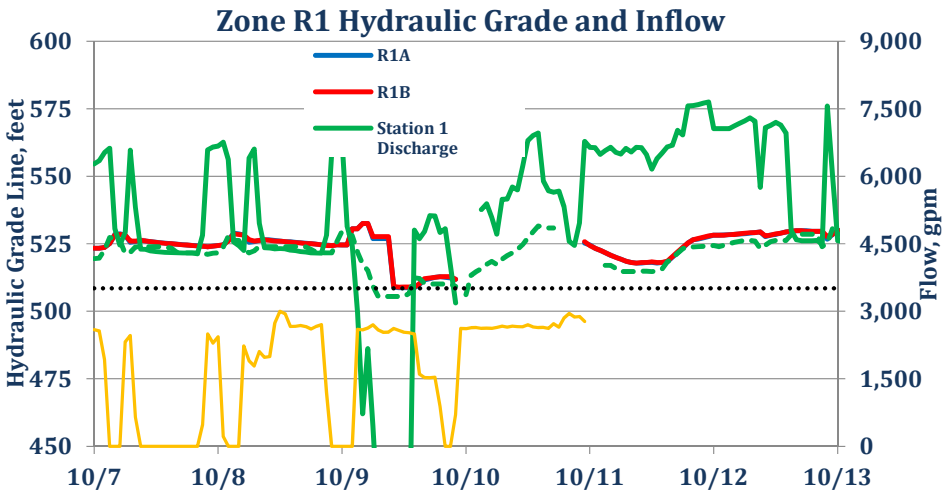
System Impacts in Fountaingrove

- Even before the fire entered the City, widespread electrical power outages created the need for several facilities to rely on backup generator power. This included Station S2, where staff delivered a portable generator.
- Booster Pump Station S3 became inoperable around 3 a.m. because the water pressure in Pressure Zone R2 became too low to provide suction pressure
- Power outages and burned infrastructure caused SCADA system to freeze at some facilities, or report incorrect or no data at others



Impact on Distribution System





- Demand skyrocketed beyond the normal and continued for hours, causing storage to drain quickly
- Demand came from firefighting efforts, including by residents, plus supply flowing freely from damaged lines, taps, connections
- In most cases the pumps continued to pump but could not maintain normal system pressures
- Supply could not recover until freely flowing services could be identified and closed

Conclusions

- Water distribution system operated as designed and meets fire flow goals
- System was pumping, where there was suction head, but could not regain tank levels until flowing pipes were shut-off

Recommendations – Distribution System Improvements

- Investigate ways to increase pumping reliability in the higher-pressure zones
- Examine adding additional interconnections and pressure regulating valves
- Study technical solutions to prevent openly flowing appurtenances
- Study feasibility of providing off-line storage
- Study feasibility of using large-diameter pipes or looping in dead-end areas
- Evaluate improvements to increase SCADA system reliability
- Perform a similar evaluation for Coffey Park area
- Update Master Plan to include lessons learned and follow recommendations identified

Recommendations – Fire Flow Availability Modifications

- Evaluate system with fire flow goals based on land-use designations, zoning or structure type
- Weigh cost and water quality impacts of any modifications

The goal is to provide a cost-effective system to meet both normal and emergency operating conditions

Recommendations – Emergency Response Considerations

- Formalize and document communications structure between the Water Department and Fire Department during red flag conditions
- Investigate and develop procedures that identify:
  - Available flows and pressures in various areas
  - Emergency operating plans for critical facilities
  - Communication protocols
  - Mobilization plan during fire events to turn off openly flowing appurtenances

Moving Forward

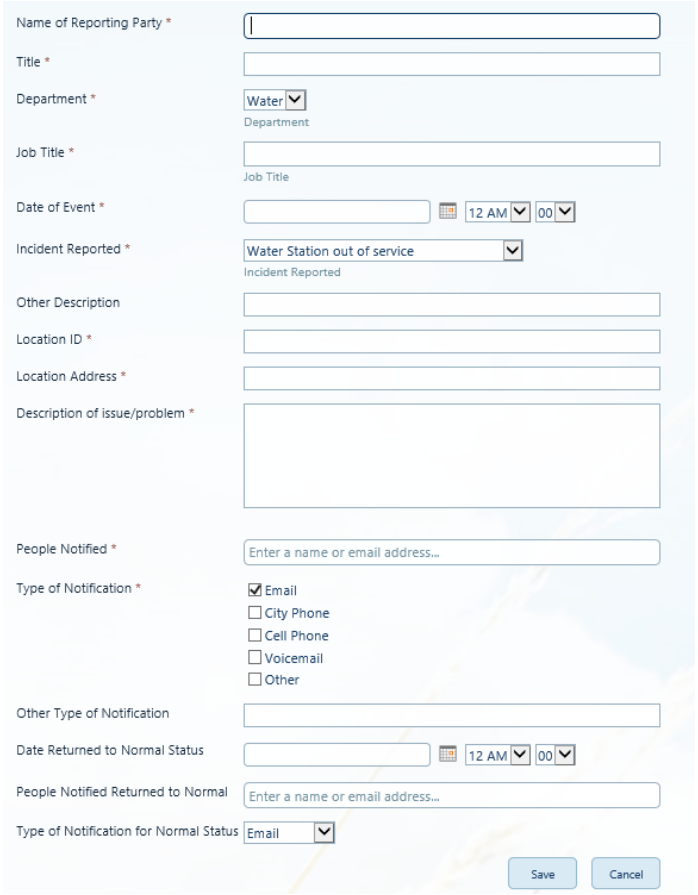
Joe Schiavone
Deputy Director – Water and Sewer Operations
Water DOC Incident Commander

Moving Forward -

- Value of Report Findings
- Recognize areas that could be improved
- Valuable tool for the department

Progress Toward Recommendations– Planned Items for future analysis -

- Formalize and document communications structure between the Water Department and Fire Department during red flag conditions



Progress Toward Recommendations–
Planned Items for future analysis -

- Hardening of our infrastructure
- Advanced Communications (SCADA/Telemetry)
- Additional System Modeling/Further Review Of our Water Distribution System