

# PNWS - AWWA

## City of Corvallis Water Model Update



*Presented by*  
**Charles Duncan, PE**  
**West Yost Associates**  
**& Dick Gaskill**  
**City of Corvallis**

# Project Purpose & Objectives

- Outdated Model
- IDSE Compliance
- Optimal System Operations
  - Water Age Optimization
  - Tank Turnover
  - Outage Evaluations
  - Trouble Shooting

# Today's Presentation

**The City Of Corvallis**

**Operational Model Development**

**Operational Model Calibration**

**System Evaluation**

**Next Steps**

# Today's Presentation

## The City Of Corvallis

Operational Model Development

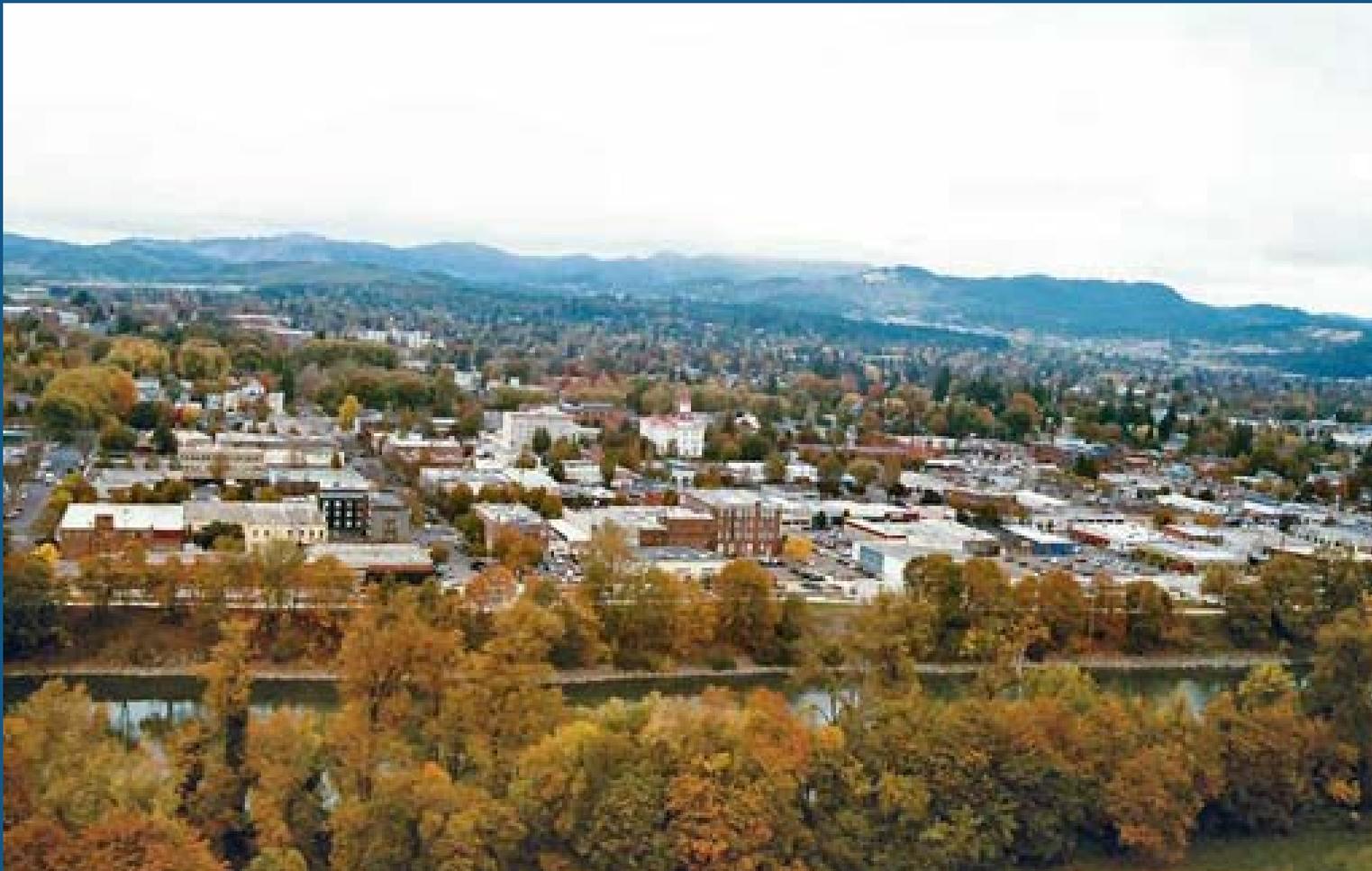
Operational Model Calibration

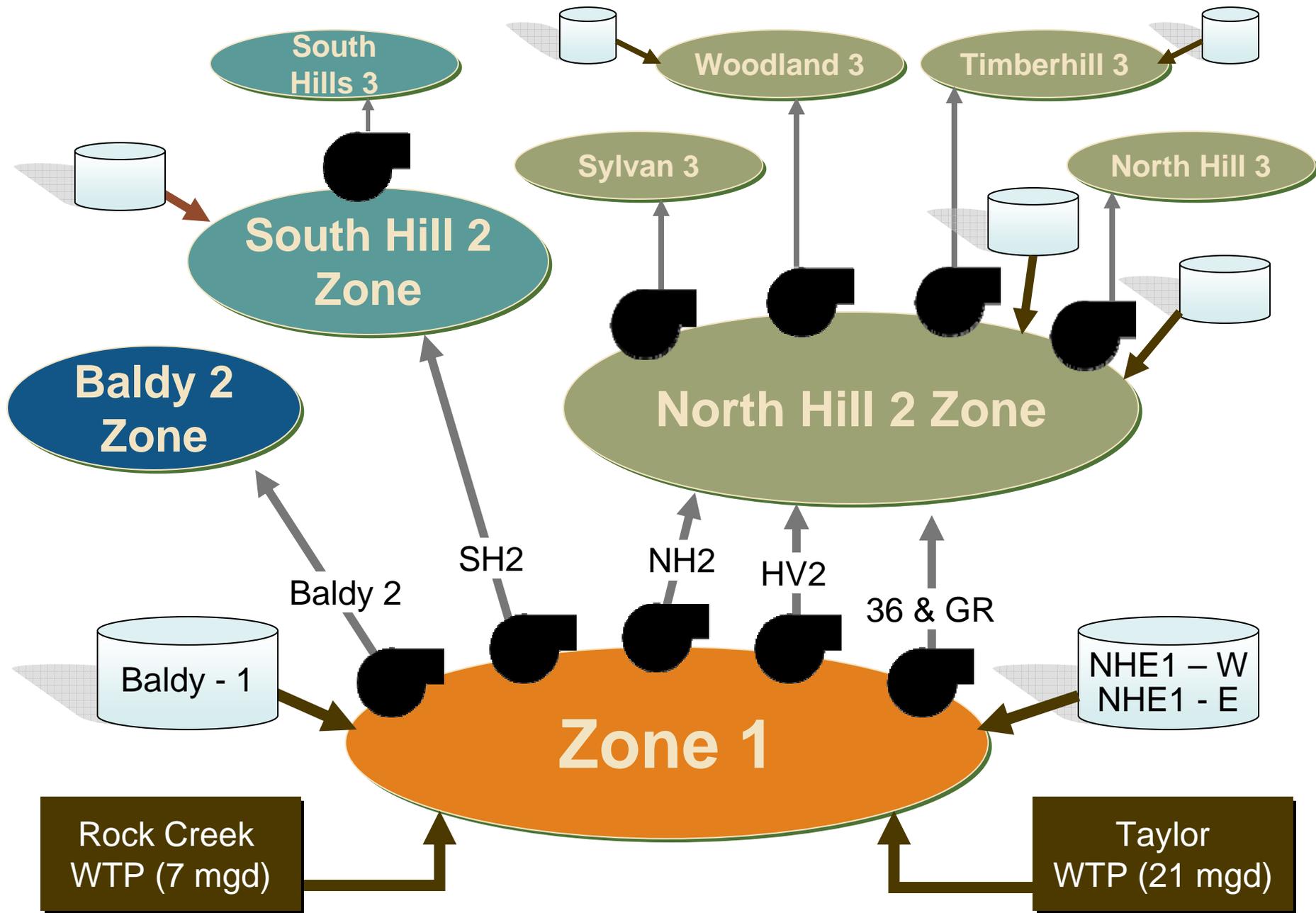
System Evaluation

Next Steps

# City of Corvallis

Population is 54,890 persons (14 square miles)





# Today's Presentation

The City Of Corvallis

**Operational Model Development**

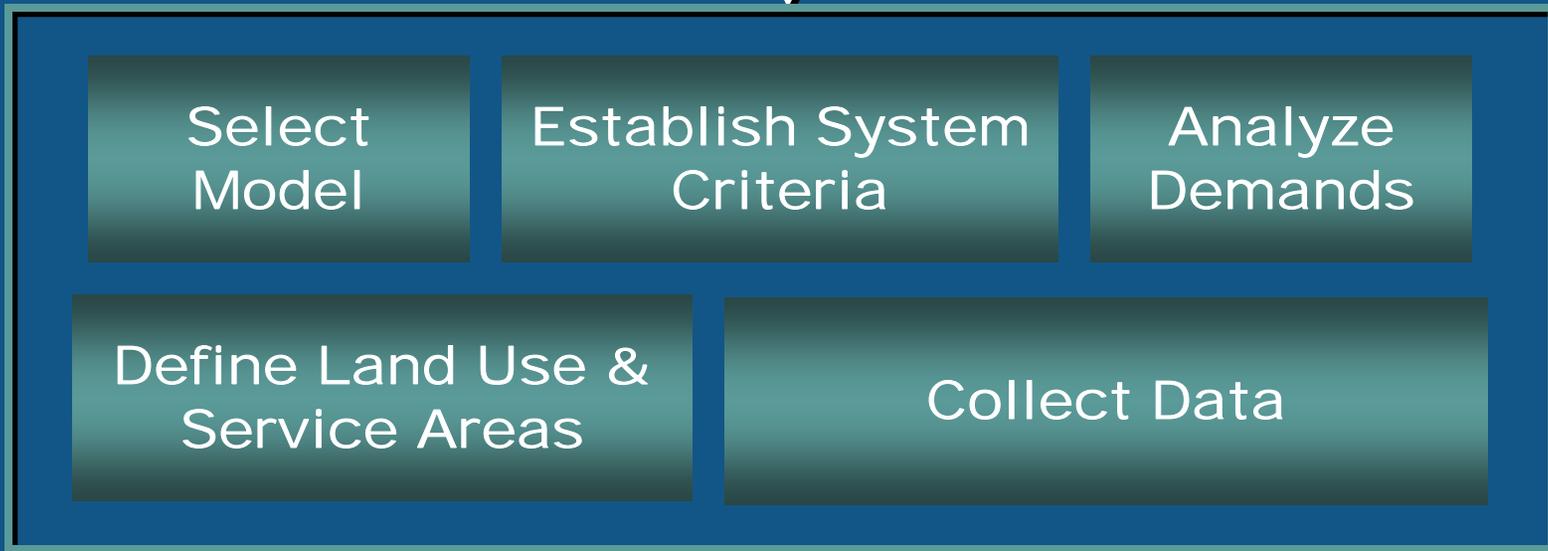
Operational Model Calibration

System Evaluation

Next Steps

# Operational Model Development

Define Objectives



Develop Model

Collect Calibration Data

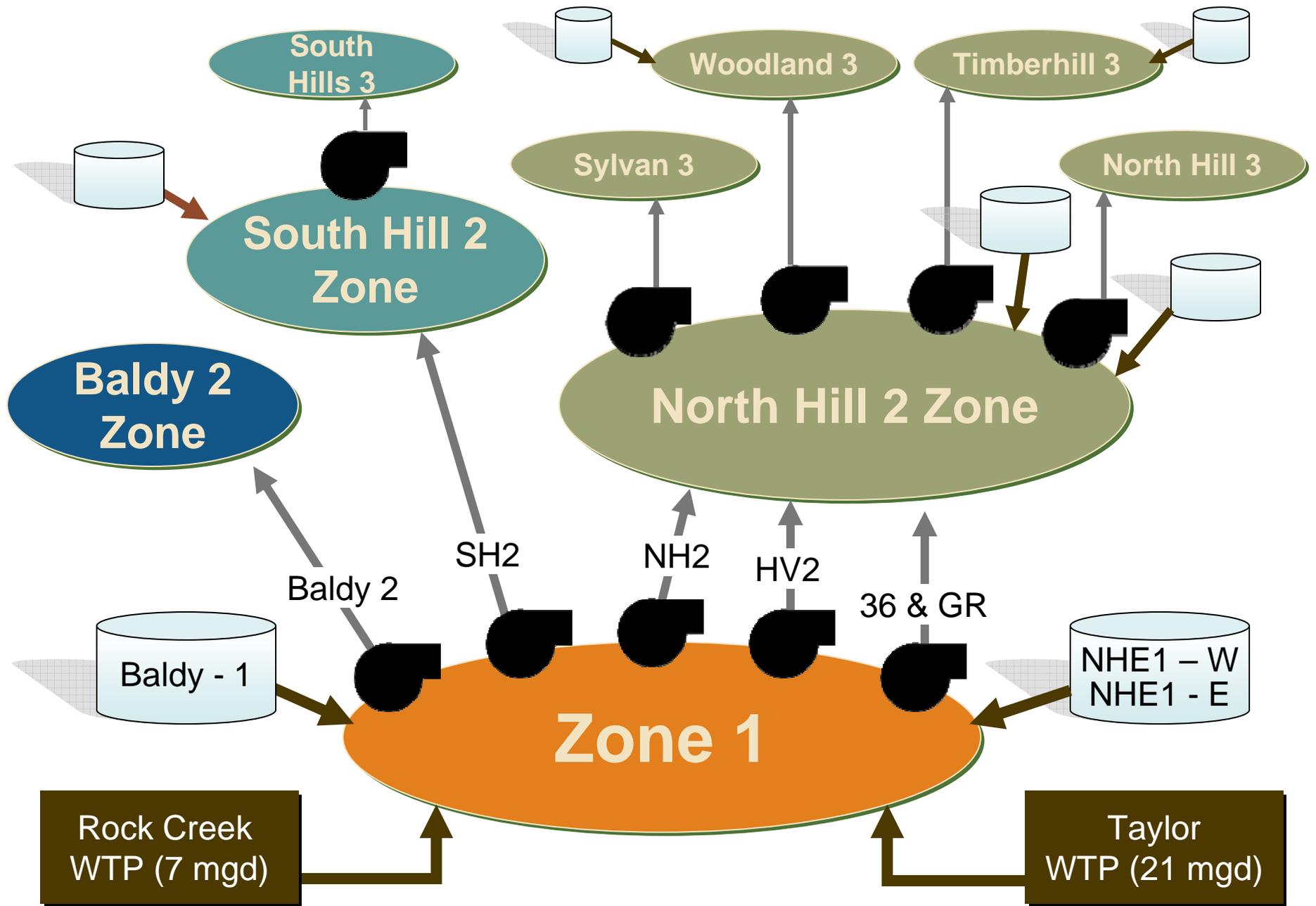
Calibrate Model & Verify

Use Model To Satisfy Objective

# Investigation of *Existing* Data

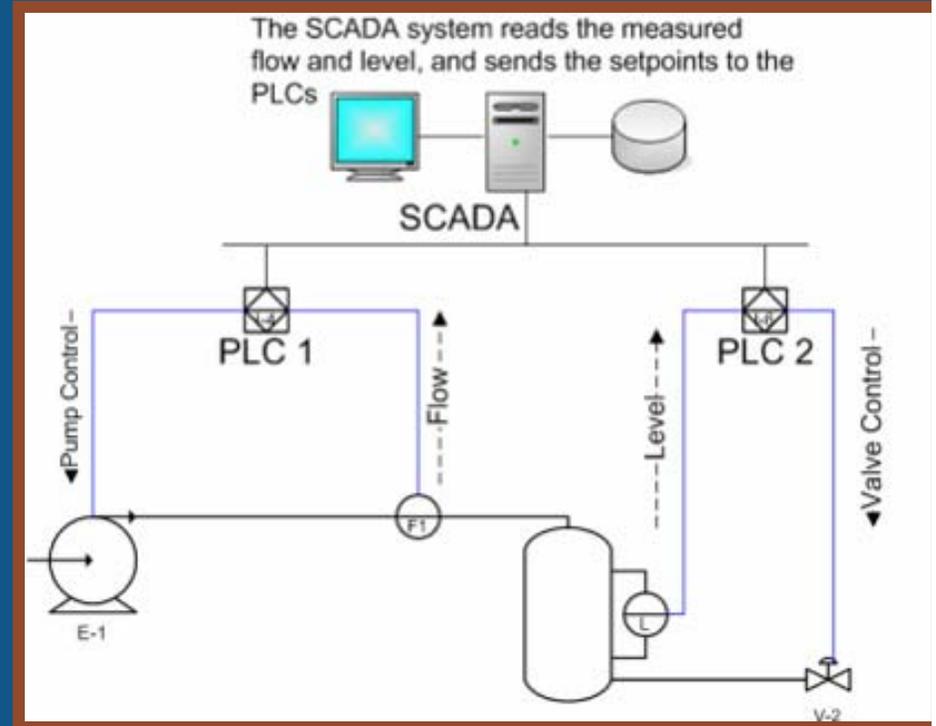


- Interviews with Staff
- Institutional knowledge



# Investigation of *Existing* Data

- Staff Interviews
- As-Built Maps
- Historical Records
- GIS Integration
- SCADA Operational Data



*Goal: To Make Model Database as Complete as Possible*

# Development of City's Water Model

Integration of City's  
GIS

Diameters, length, age,  
material type

Populate Elevation  
Data

Smart Topography

Skeletonize Model

9,800 vs. 3,900 links

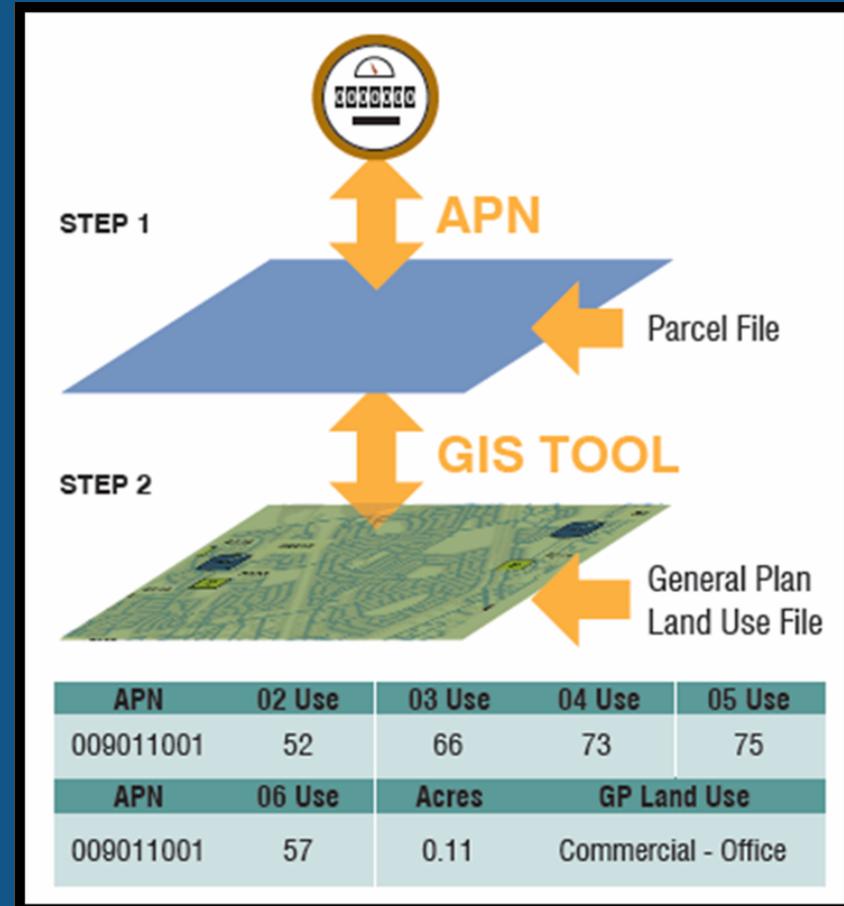
Model Demands

Allocation & Diurnal Curve  
Development

# Demand Allocation

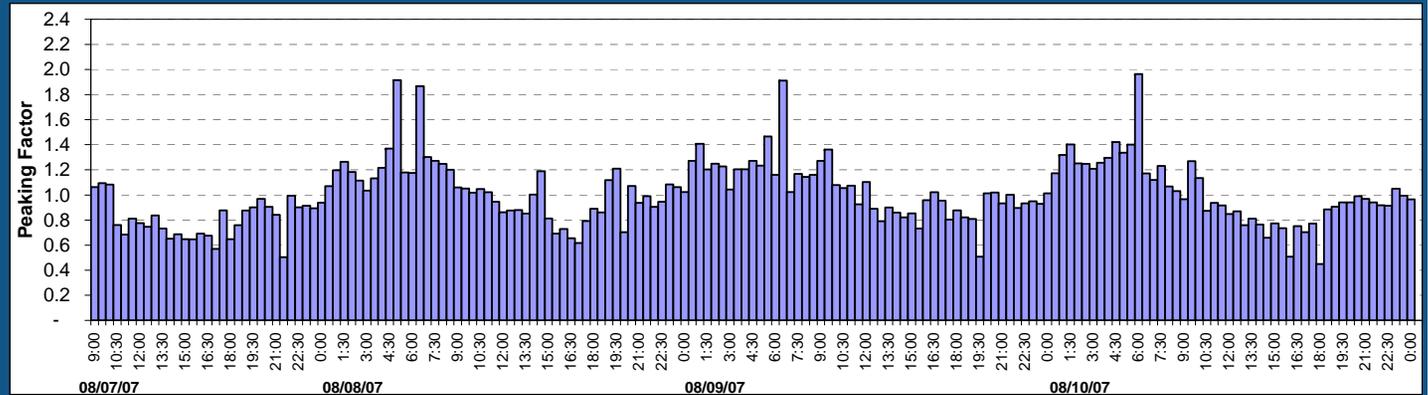
- 2006 monthly customer billings
- Used street address to link parcel map and billing record
- Spatially located >98% of metered demand

Use of MWH Soft's  
"Allocator"  
Geocoded metered  
demand to model  
junctions

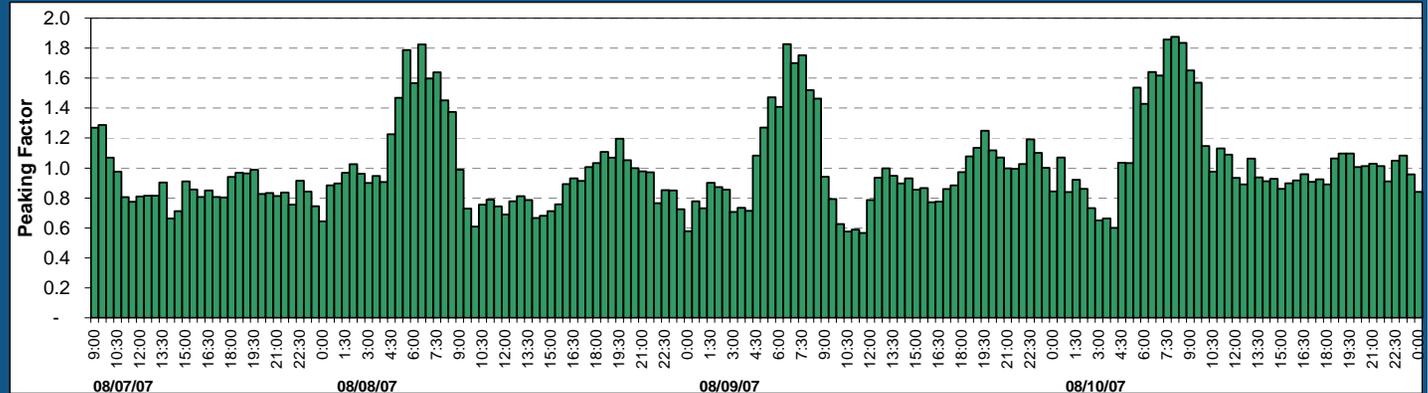


# Flow Diurnals

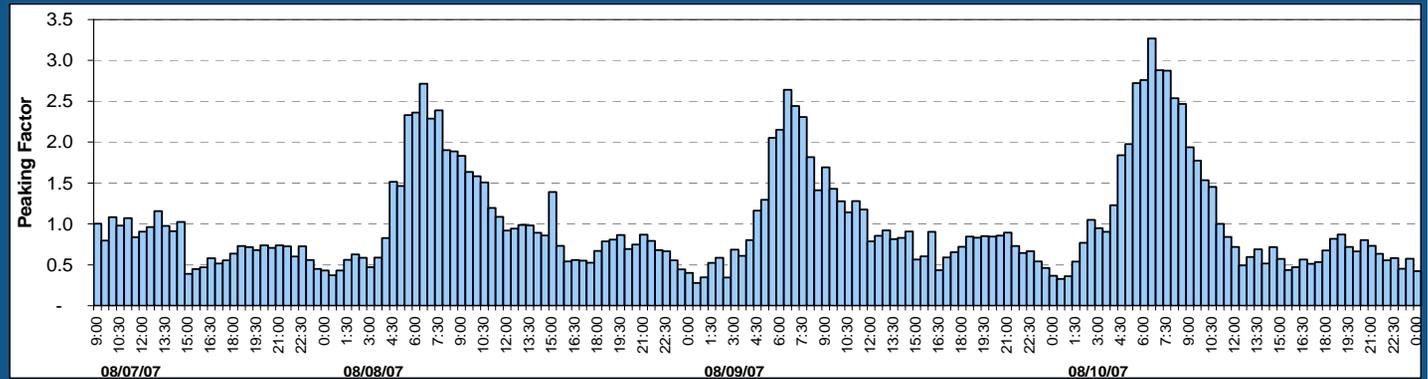
Zone 1



North Hill 2



Woodland 3 & Timber Hill 3



# Today's Presentation

The City Of Corvallis

Operational Model Development

**Operational Model Calibration**

System Evaluation

Next Steps

# Operational Model Calibration

How Closely a Model Simulates Field Operational Conditions

Three Calibration Steps

1

**C-factor  
tests**

# C-Factor Tests

## Fire Hydrant Tests

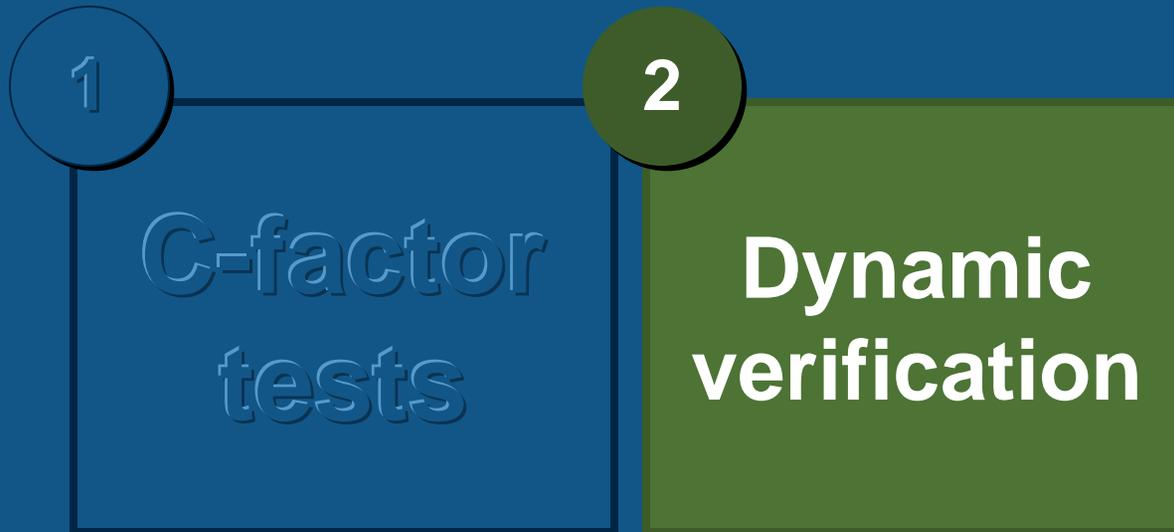
- Over two day period performed 22 C-factor tests



# Operational Model Calibration

How Closely a Model Simulates Field Operational Conditions

Three Calibration Steps

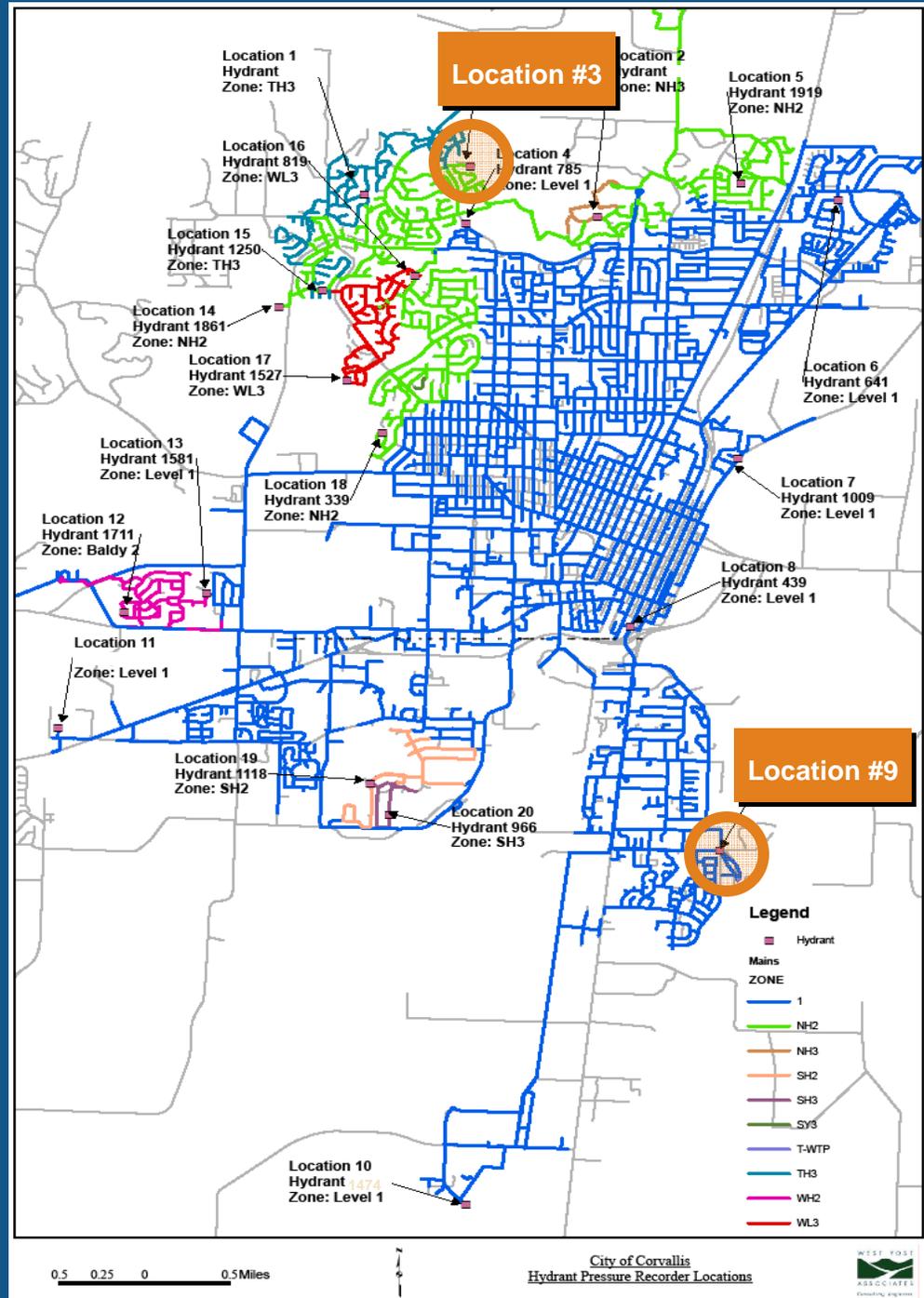


# Monitor Hydraulic Gradeline

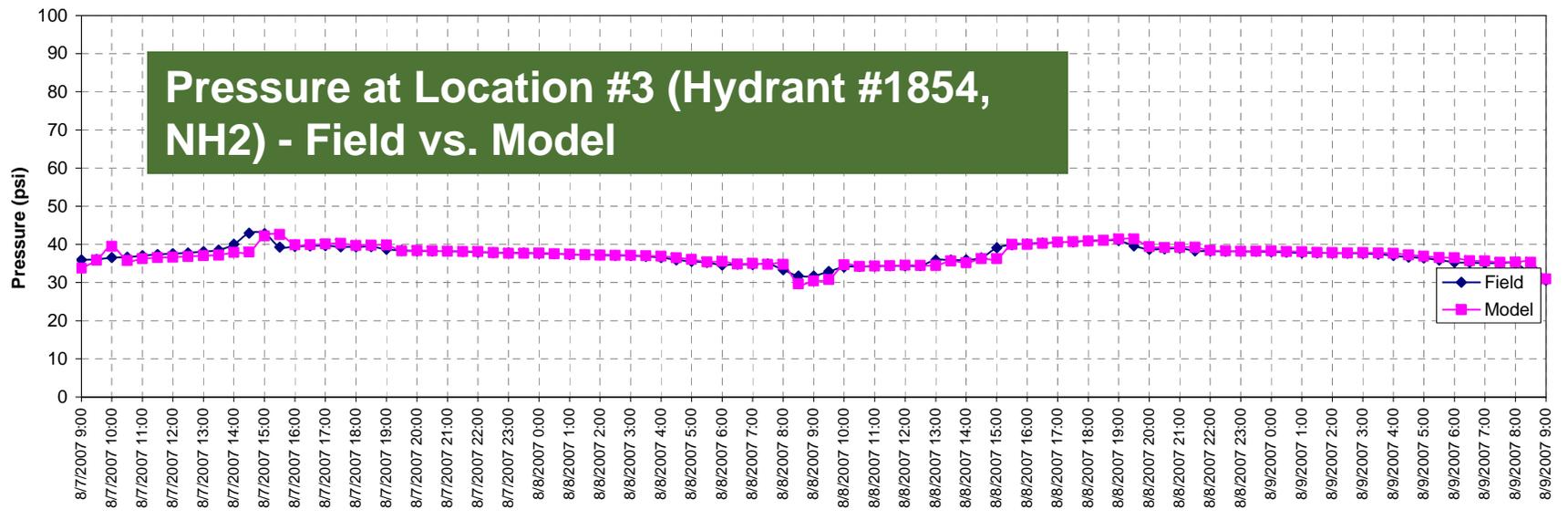
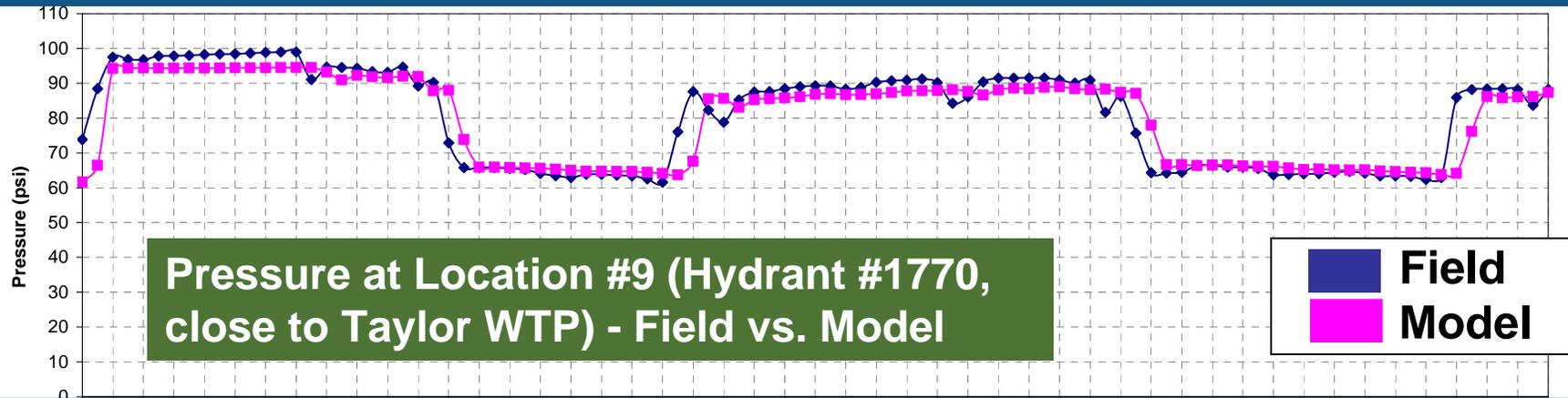
- Confirm operation of facilities
- Verify demand allocation

# Data Collection – Field Measurements

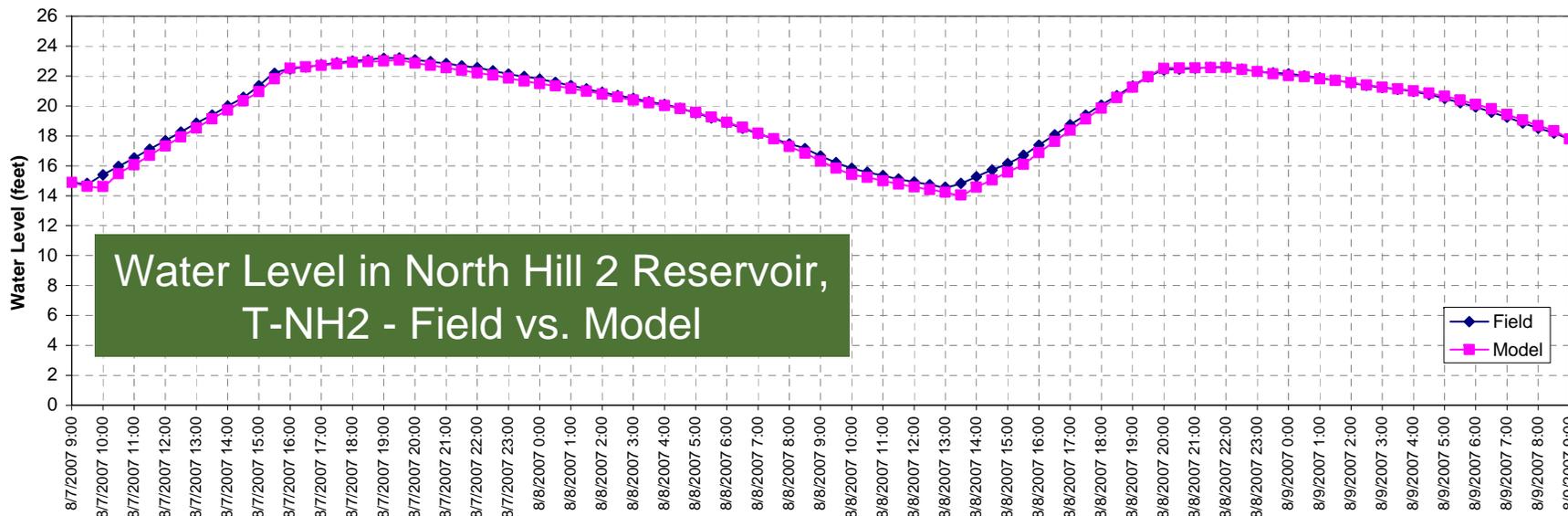
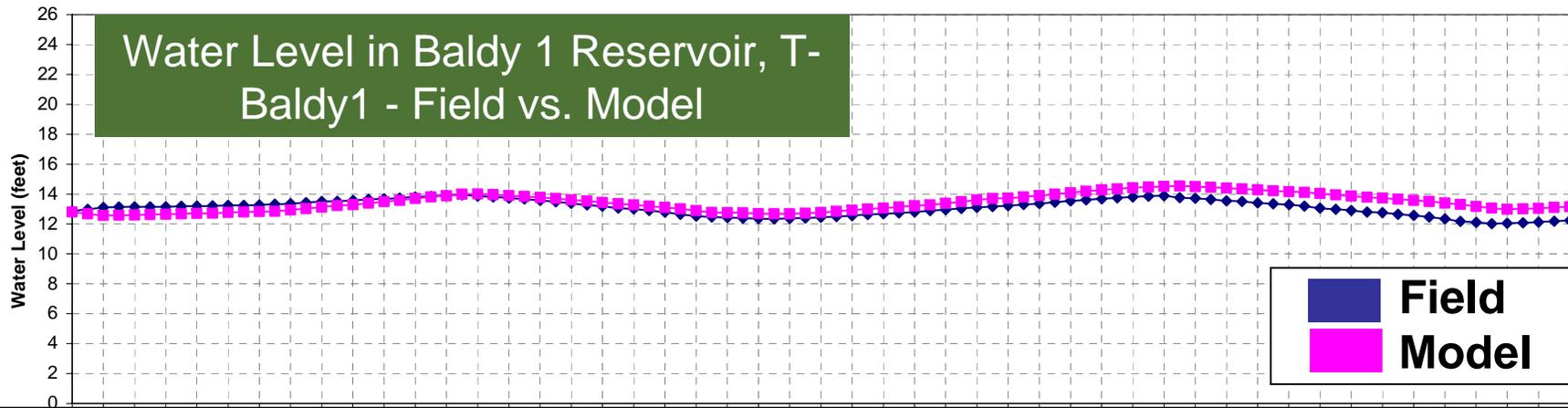
- Selected 20 HPR locations
- Proximity to T-Mains, high/low elevations, and spatially distributed
- Collected data over 72-hours



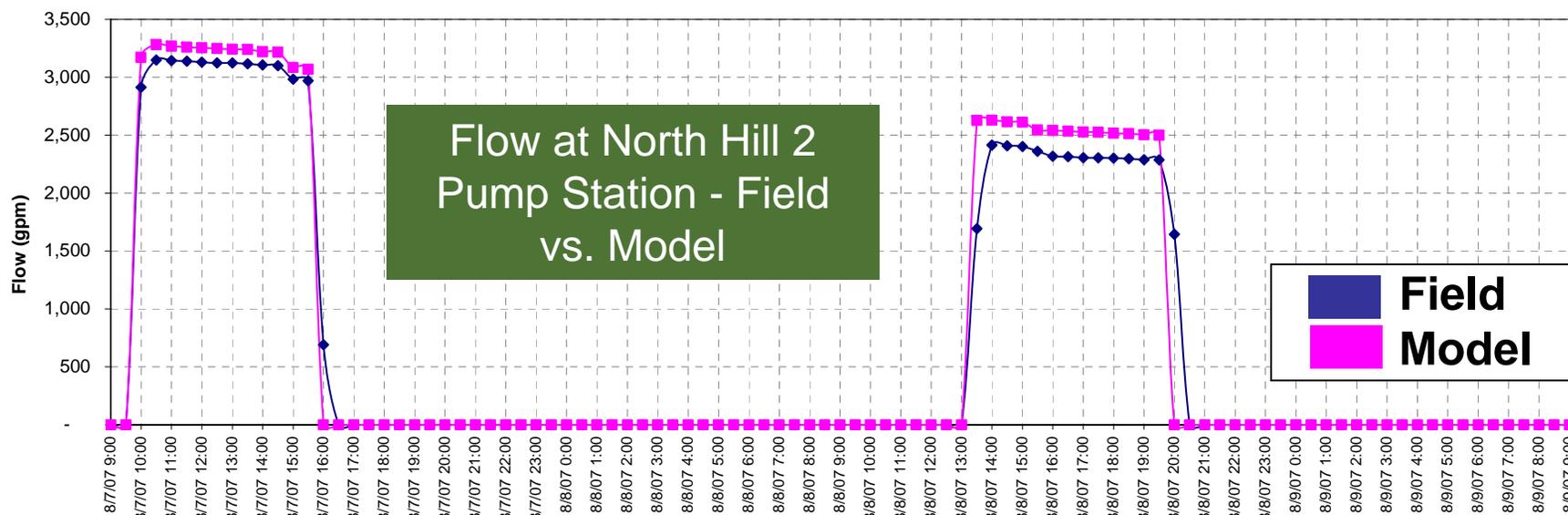
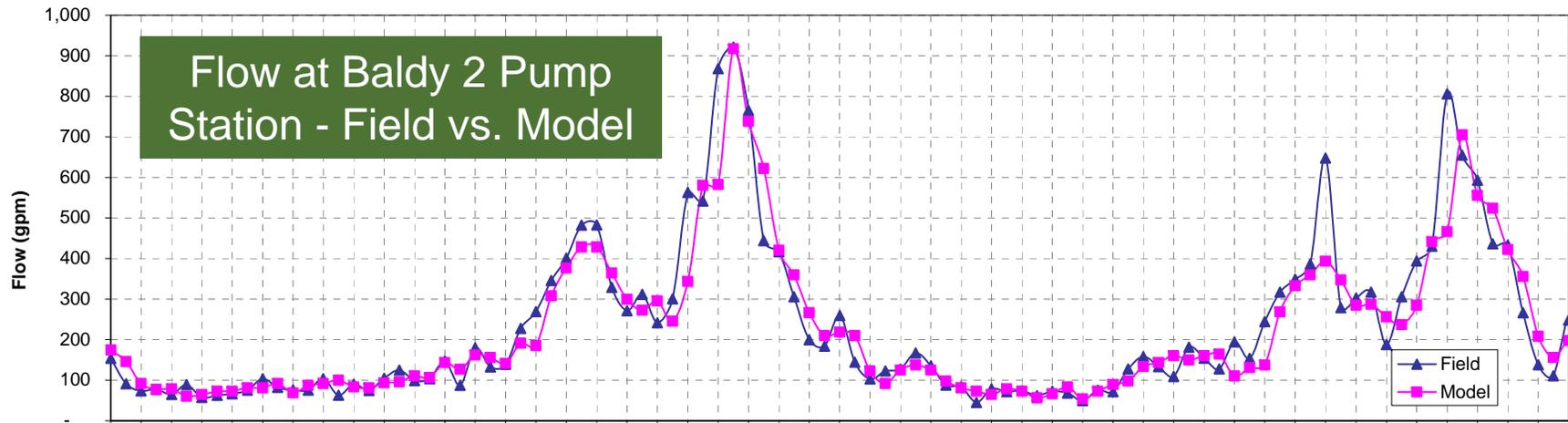
# Model Results Analysis Part I – Hydraulic Verification Examples



# Model Results Analysis Part I – Hydraulic Verification Examples (Cont.)



# Model Results Analysis Part I – Hydraulic Verification Examples (Cont.)



# Operational Model Calibration

How Closely a Model Simulates Field Operational Conditions

Three Calibration Steps



# Tracer Study

- Fluoride Sample Data Collection
- 3 Circuits with 28 Sample Stations over a 72-hour Period



# Data Collection – Field Measurements

- Collected data over three 8-hour shifts
- Sites 1-11 (close to Taylor WTP)
- Split into two circuits, north and south

Rock Creek  
WTP

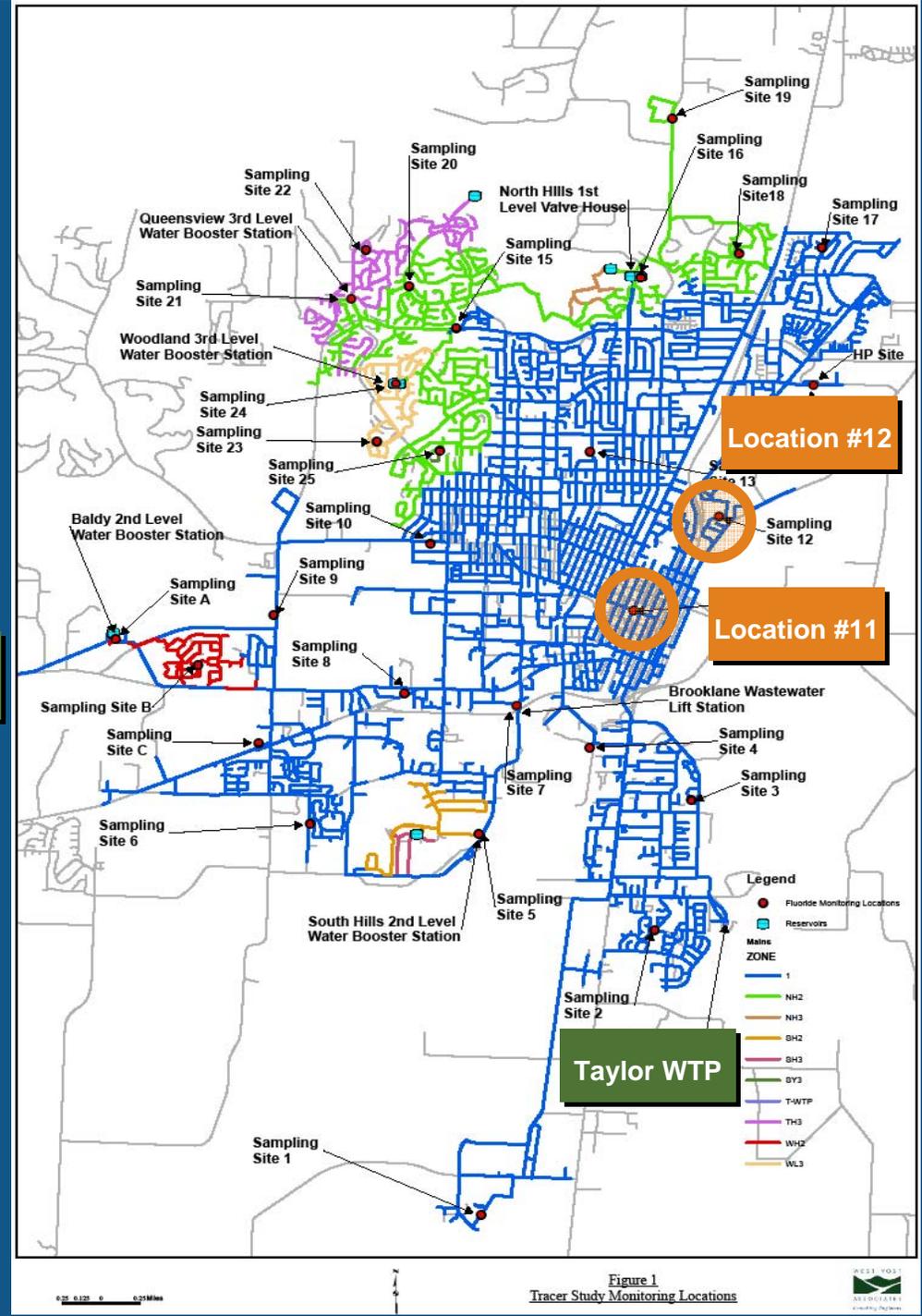
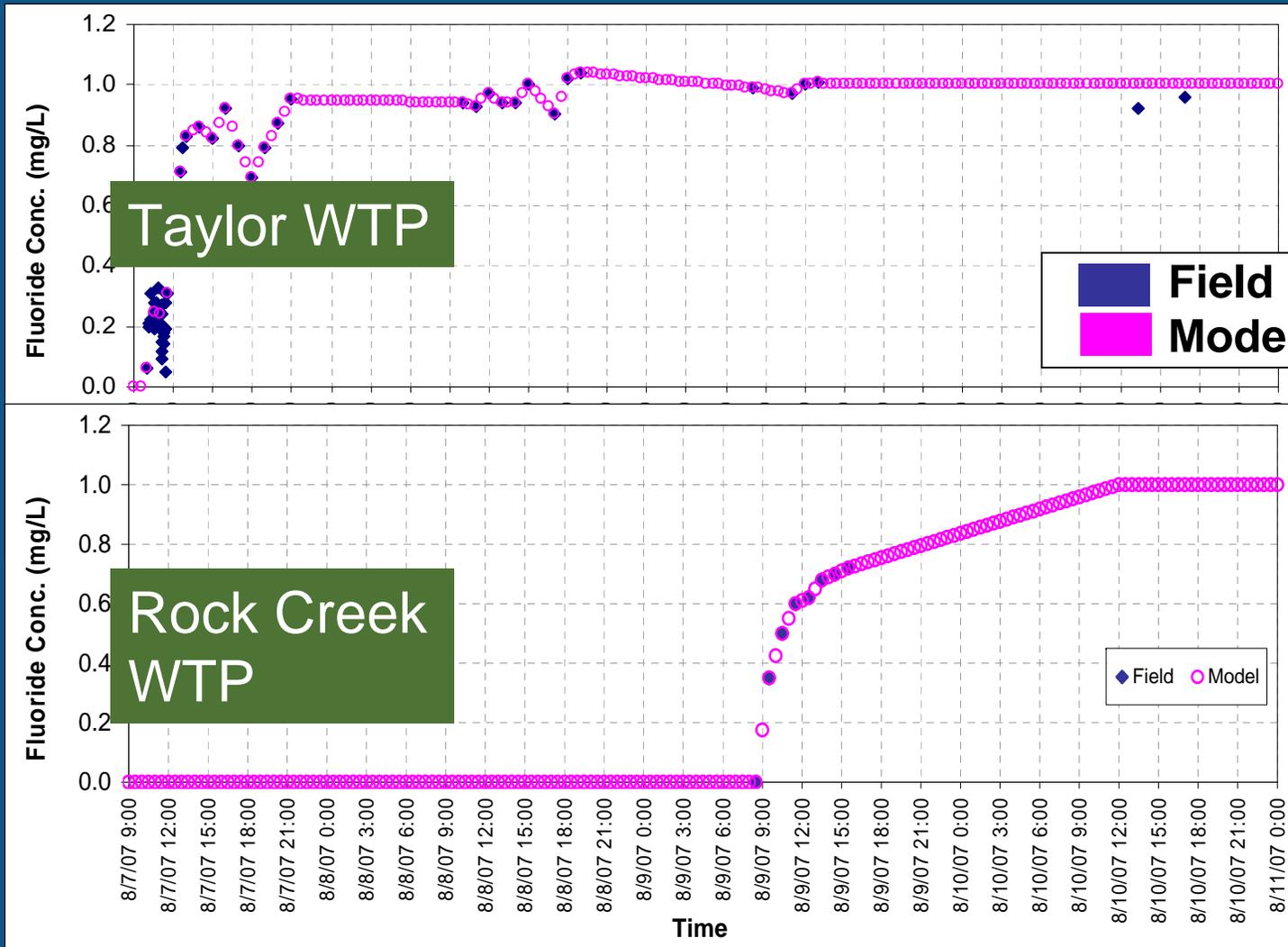
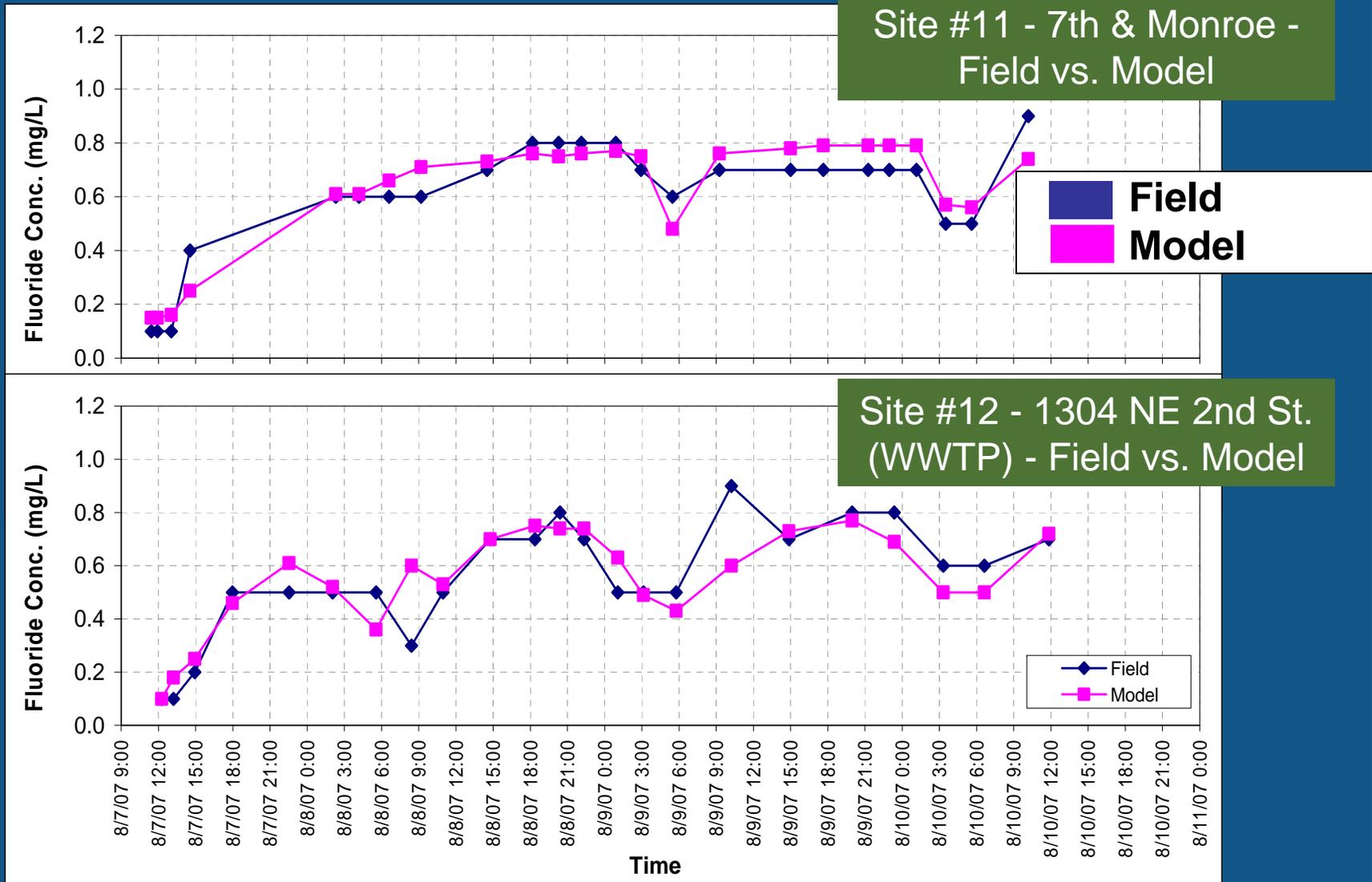


Figure 1  
Tracer Study Monitoring Locations

# Fluoride Conc. Diurnal Curves at Water Treatment Plants



# Model Results Analysis Part II – Fluoride Conc. Verification Examples



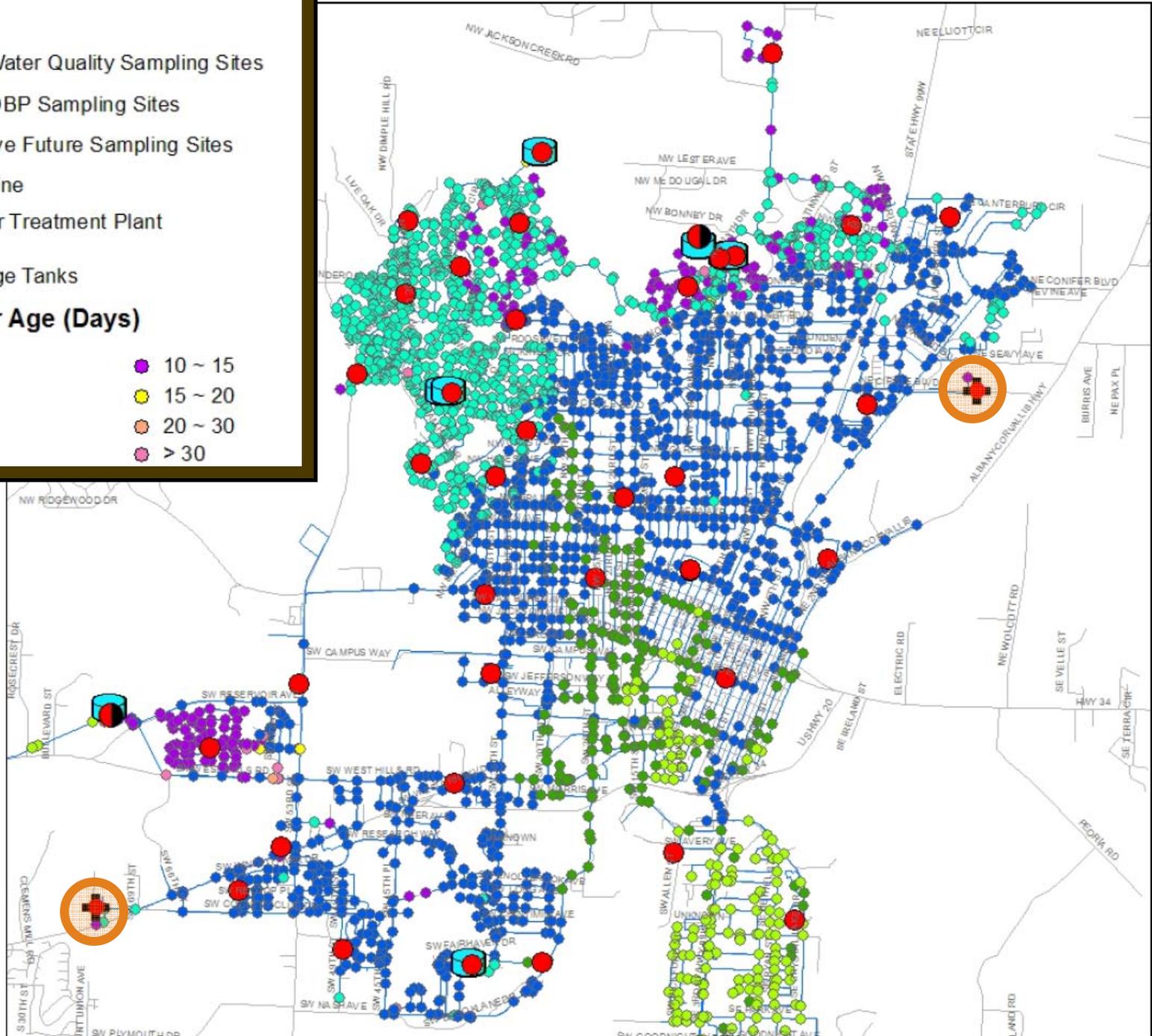
# Legend

- Existing Water Quality Sampling Sites
- Existing DBP Sampling Sites
- + Prospective Future Sampling Sites

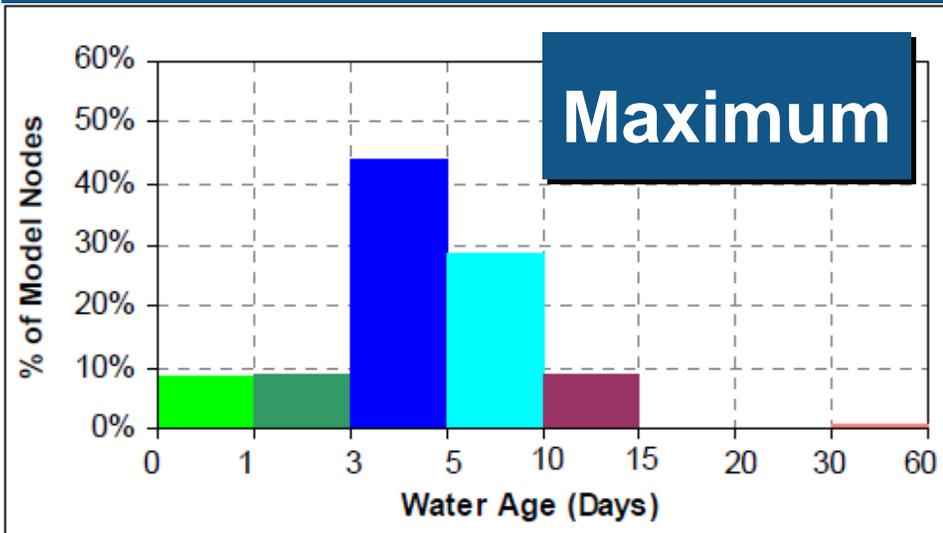
- Pipeline
- WTP Water Treatment Plant
- Storage Tanks

## Max Water Age (Days)

- |   |   |
|---|---|
| <span style="color: lightgreen;">●</span> < 1 | <span style="color: purple;">●</span> 10 ~ 15 |
| <span style="color: green;">●</span> 1 ~ 3    | <span style="color: yellow;">●</span> 15 ~ 20 |
| <span style="color: blue;">●</span> 3 ~ 5     | <span style="color: orange;">●</span> 20 ~ 30 |
| <span style="color: cyan;">●</span> 5 ~ 10    | <span style="color: pink;">●</span> > 30      |

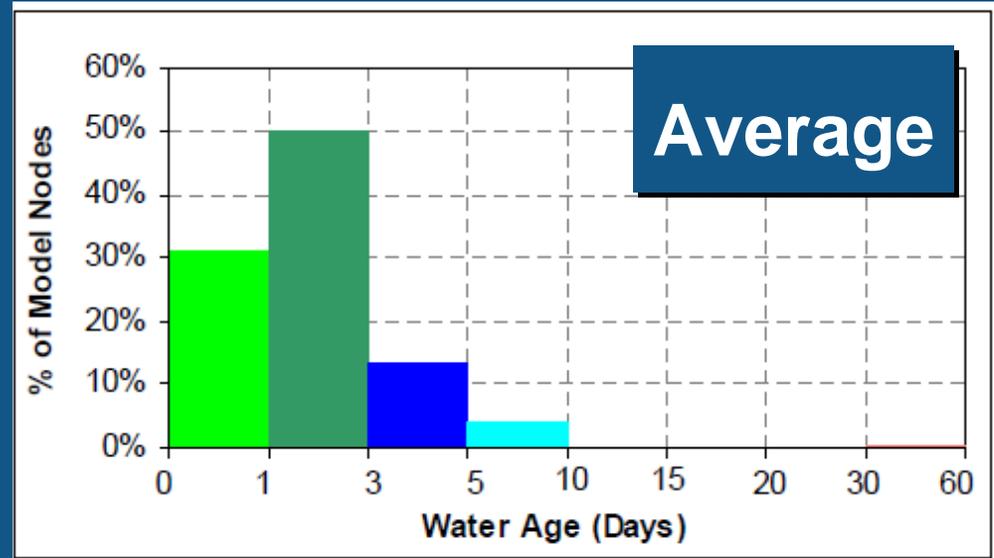


# Water Age Histogram



- 45% 3 - 9 days
- 29% 5 – 10 days
- 99% < 15 days

- 31% < 1 day
- 50% 1 - 3 days
- 99% < 10 days



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The City Of Corvallis

Operational Model Development

Operational Model Calibration

**System Evaluation**

Next Steps

# System Evaluation

## Shutdown of Baldy Reservoir

Effects to Baldy Second Level Pressure Zone (Zone)



# System Evaluation

Shutdown of Baldy  
Reservoir  
Effects to Baldy Second  
Level Pressure Zone (Zone)

## Comparing

- High and low elevation
- High and low pressures
- Key intersections
- Suction/discharge of pump station

<b>Node #</b>	<b>Location</b>	<b>Node Significance</b>
N-1-11	Baldy Pump Station Suction	On the suction side of the Baldy Pump Station.
J-1-5487	SW Reservoir Ave at SW West Hills Rd	Upstream of the pump station in Zone 1 on the 16-inch pipe to the reservoir and pump station.
J-1-3621	SW 53rd St at SW Reservoir Ave	In Zone 1 at the intersection of the 24-inch pipe at Walnut Blvd and the 12-inch line at Reservoir.
J-1-1813	SW 53rd St at SW West Hills Rd	In Zone 1 at the intersection of the 24-inch pipe at Walnut and the 20-inch pipe at West Hills.
J-1-5667	SW Willow Ave at SW 54th St	In Zone 1 in an area with lower pressures.
J-BALDY2-27	In Grand Oaks	Elevation of 411.86, the highest elevation in the pressure zone.
N-BLADY2-1	Baldy Pump Station Discharge	On the discharge side of the Baldy Pump Station.
J-BALDY2-11	SW Grand Oaks Dr at SW Chestnut Dr	At one of the entrances to the Grand Oaks Apartment complex.
J-BALDY2-173	SW Grand Oaks Dr at SW Trellis Dr	At one of the entrances to the Grand Oaks Apartment complex.
J-BALDY2-155	SW Donovan Pl near SW 56th St	At a dead end to the east of the pump station.
J-BALDY2-347	SW 55th St	At the end of an 8-inch pipe. This node is located in an area with relatively high pressures.
J-BALDY2-345	SW West Hills Rd	In an area with relatively high pressures.

# System Evaluation

Shutdown of Baldy  
Reservoir  
Effects to Baldy Second  
Level Pressure Zone (Zone)

Evaluation Under 7  
different system  
configurations

## Comparing

- High and low elevation
- High and low pressures
- Key intersections
- Suction/discharge of pump station



# System Evaluation

Shutdown of Baldy Reservoir  
Effects to Baldy Second Level Pressure Zone (Zone)

Evaluation Under 7 different system configurations

Comparing

- High and low elevation
- High and low pressures
- Key intersections
- Suction/discharge of pump station

**The system can meet MDD + FF, however, the levels in the North Hills Reservoir must be at least 70% full.**

# Today's Presentation

City of Corvallis

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**Next Steps**

# Next Steps

- Continue to Utilize the Hydraulic Model for Operational Evaluations
- Model Distribution System with Future Storage and Demands
- Use Operational Model to Refine and Prioritize CIP

# PNWS - AWWA

## Thank you



WEST YOST  
ASSOCIATES



*Presented by*  
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**& Dick Gaskill**  
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