

EVALUATING ROLES FOR INTELLIGENT STORMWATER CONTROLS IN ADAPTIVE MANAGEMENT OF URBAN STREAMS

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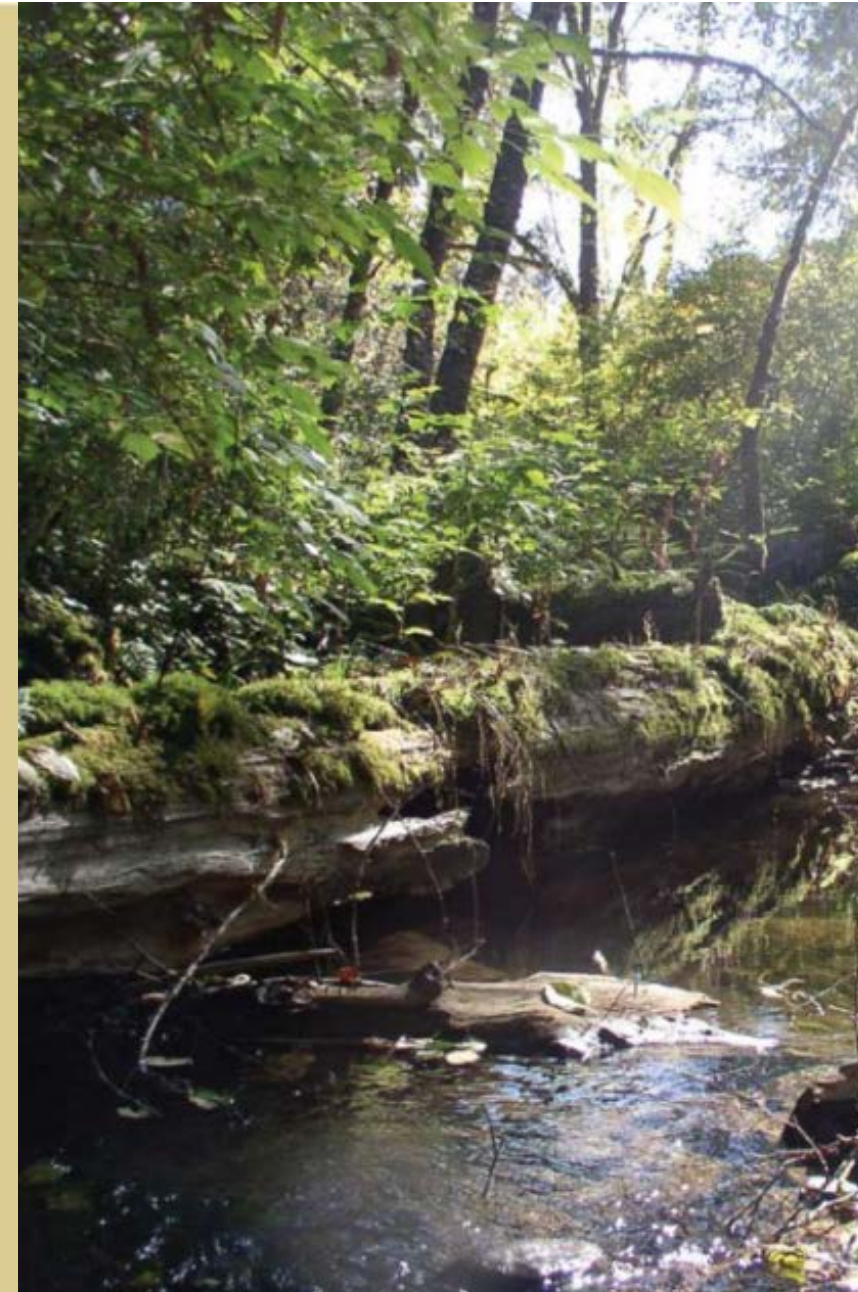
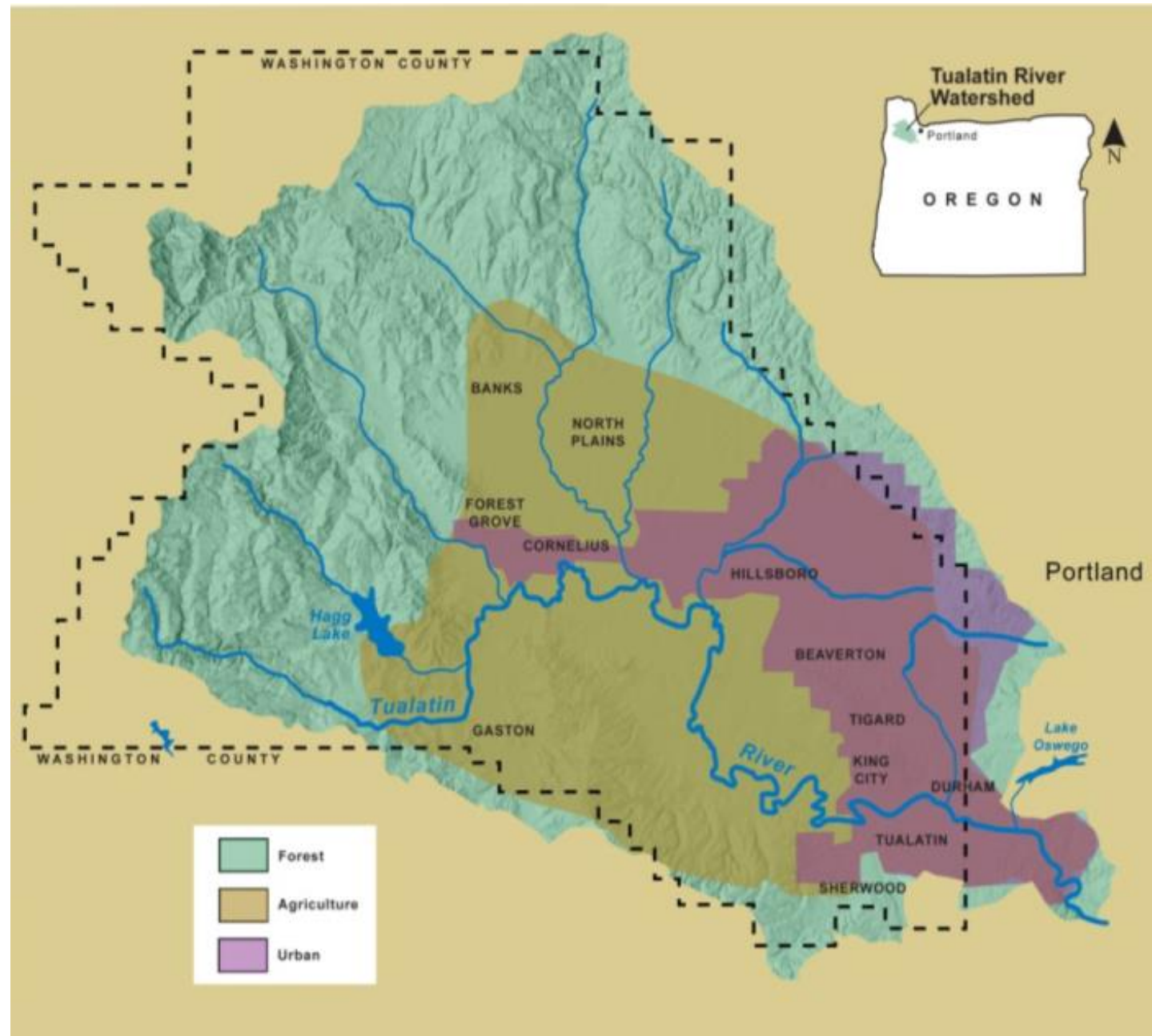
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CLEAN WATER SERVICES STREAM PROTECTION MISSION

- Protect
- Restore
- Enhance



REAL TIME CONTROL AND MONITORING AS A WATERSHED MANAGEMENT TOOL

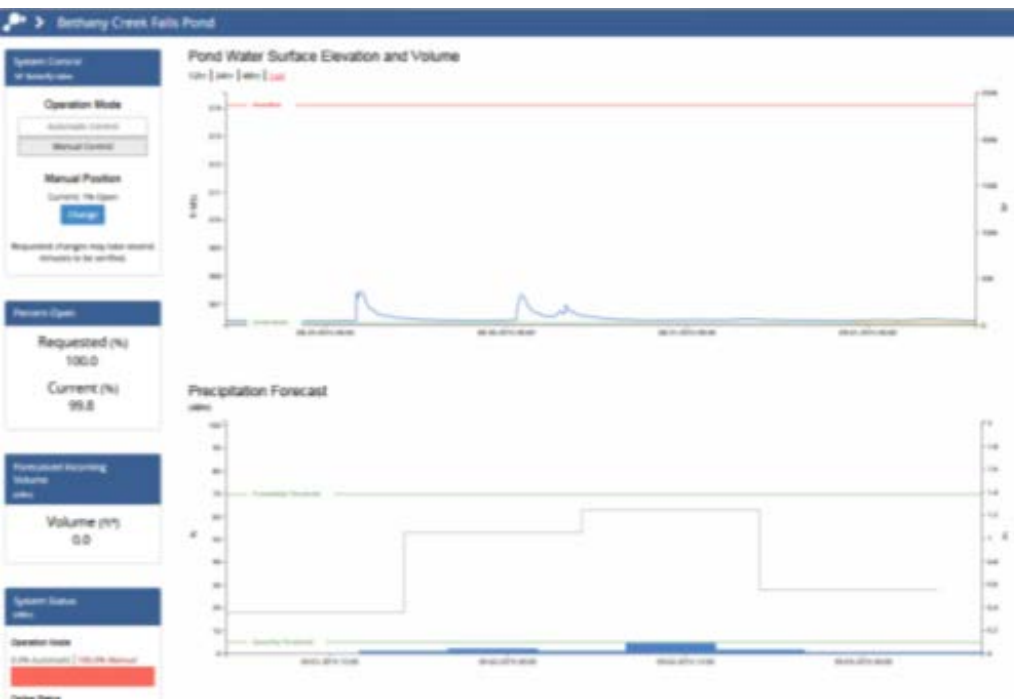
Use forecast information and sensor data to **actively prepare and control** storage facilities



Monitor facility and watershed conditions in real-time and assess performance



Adapt facility operations to meet performance objectives and watershed needs



DISTRICT EVALUATION OF RTC



PILOT PROJECTS

Butternut Creek – 2014



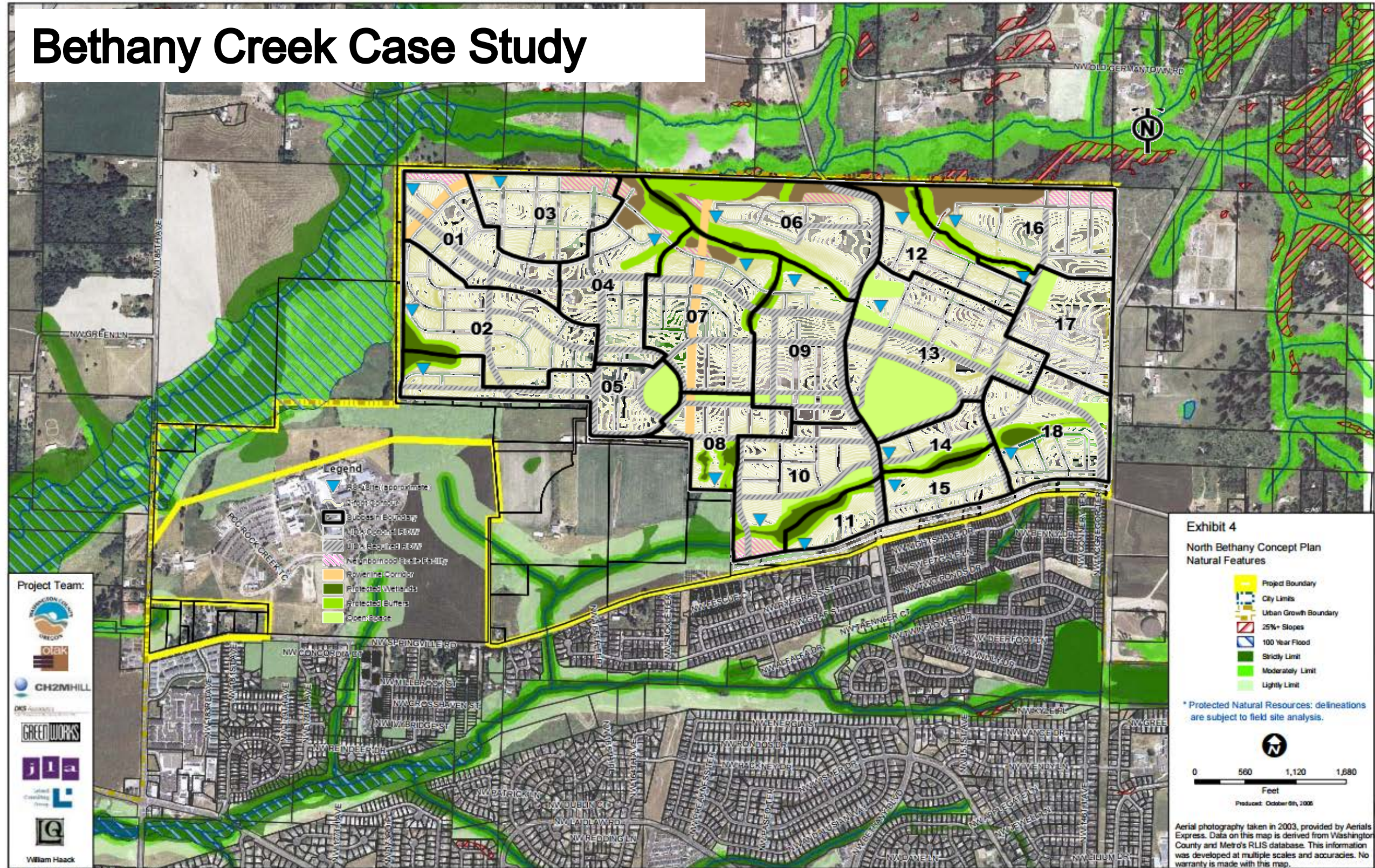
Retrofit of existing water quality facility

Bethany Creek Falls – 2015



Enhancement of a new detention pond, in combination with stream enhancement

Bethany Creek Case Study





BETHANY CREEK ENHANCEMENT PILOT PROJECT



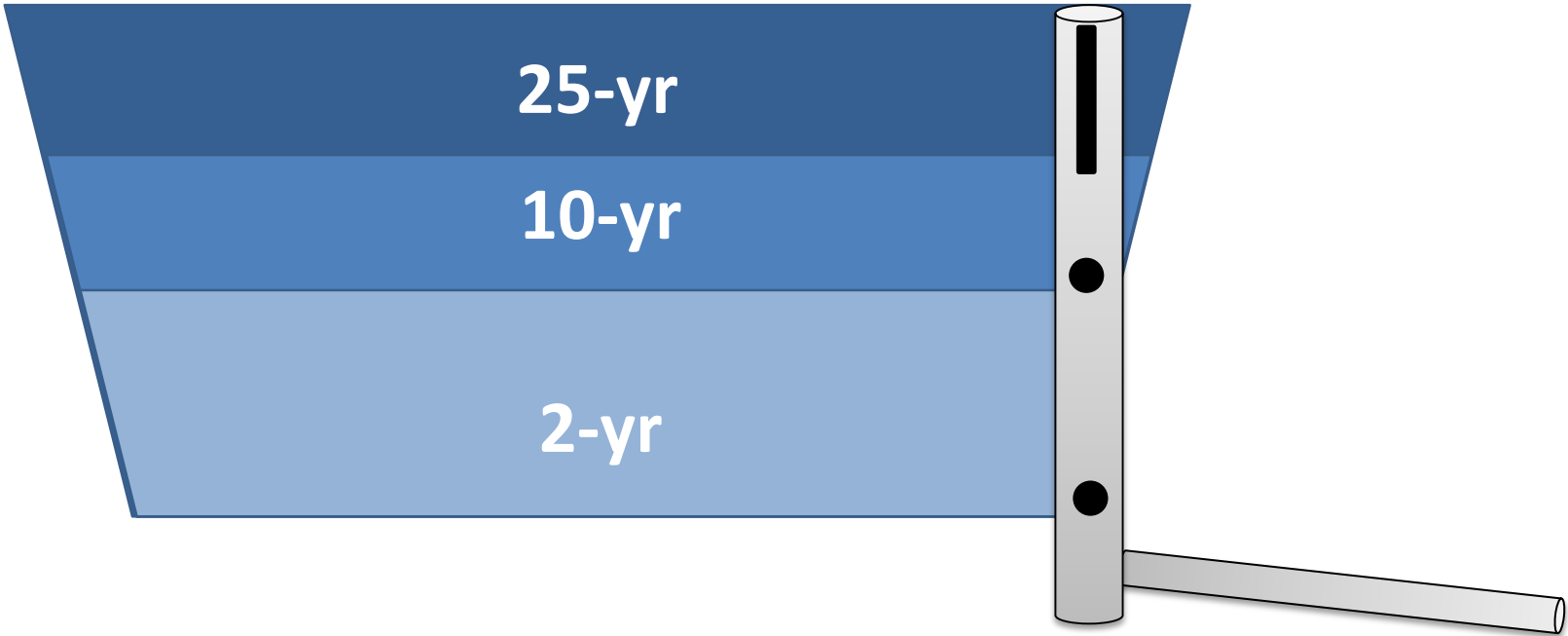
* View depicts approximately 10-15 years growth



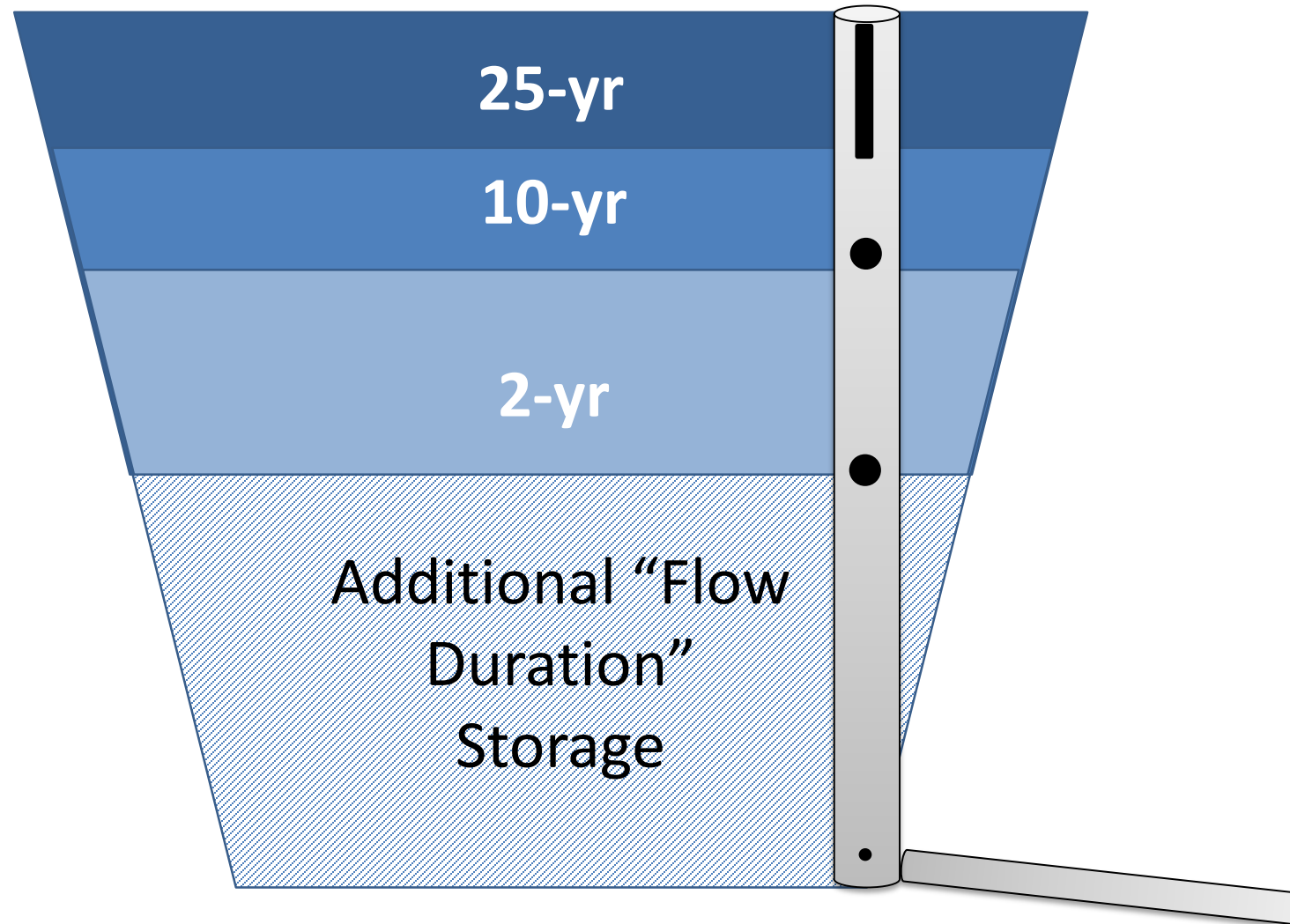
Bethany Creek Enhancement
Oblique View of Proposed Enhancements



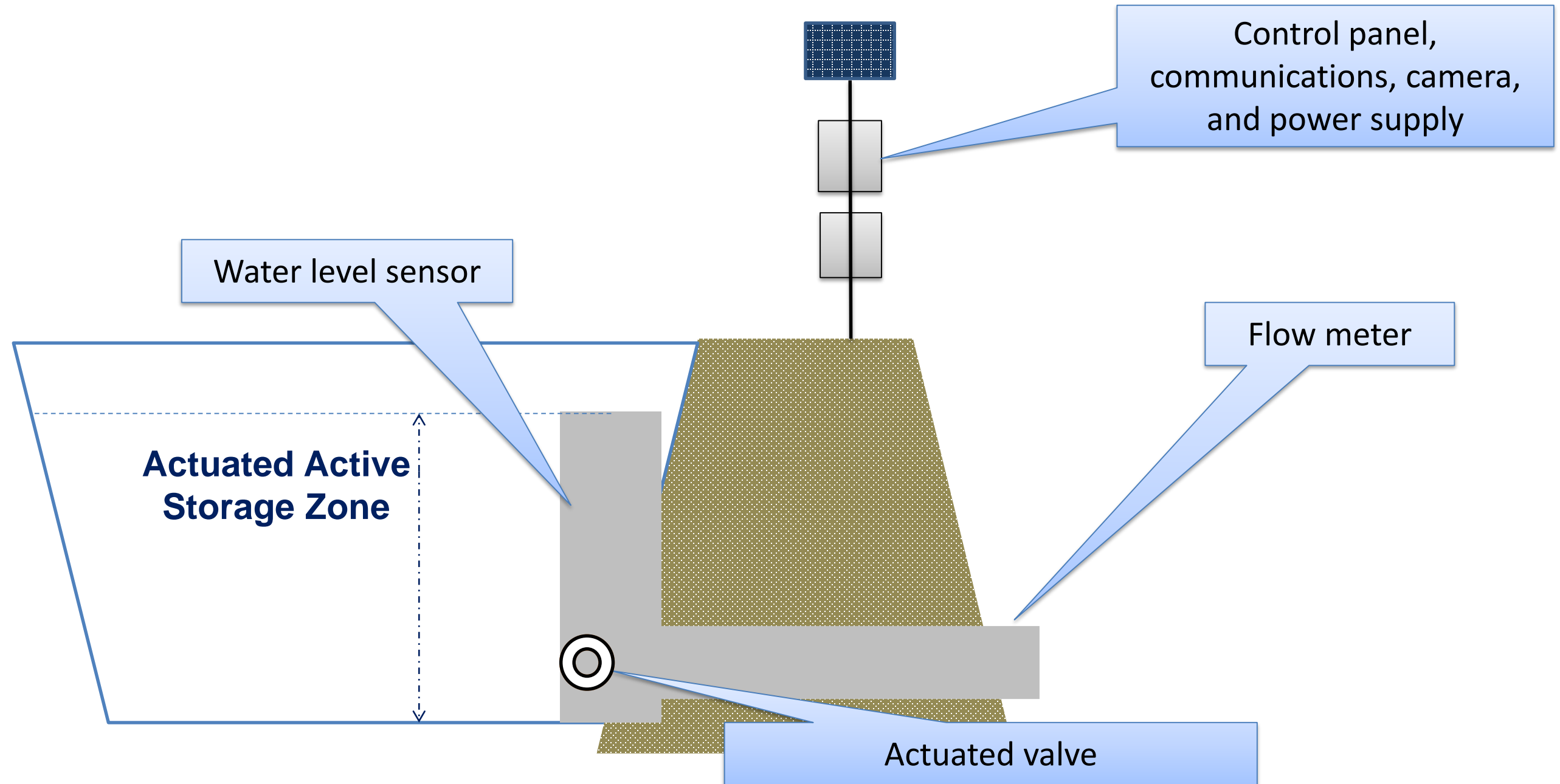
BASELINE CONTROL SCENARIO



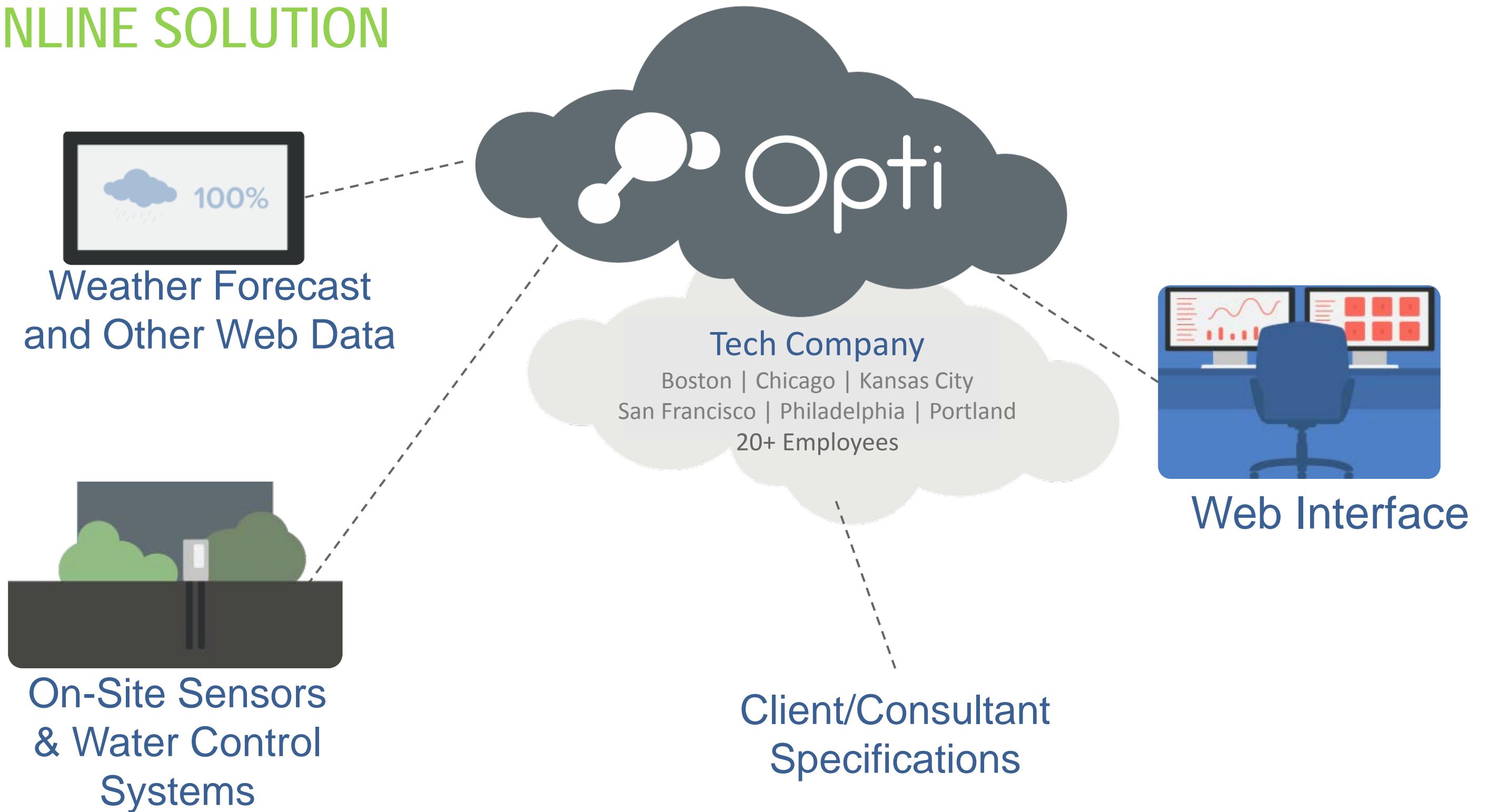
FLOW CONTROL ENHANCEMENT: PASSIVE



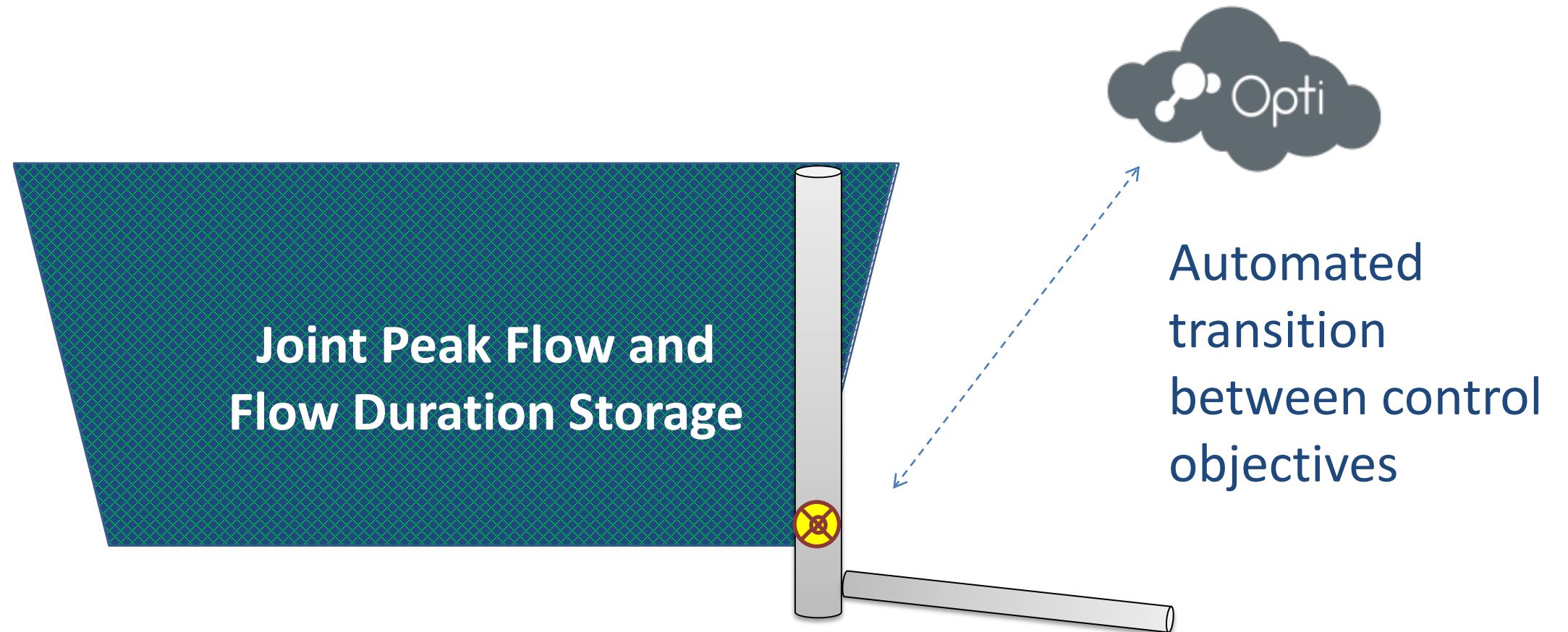
TYPICAL ELEMENTS OF RTC APPROACH



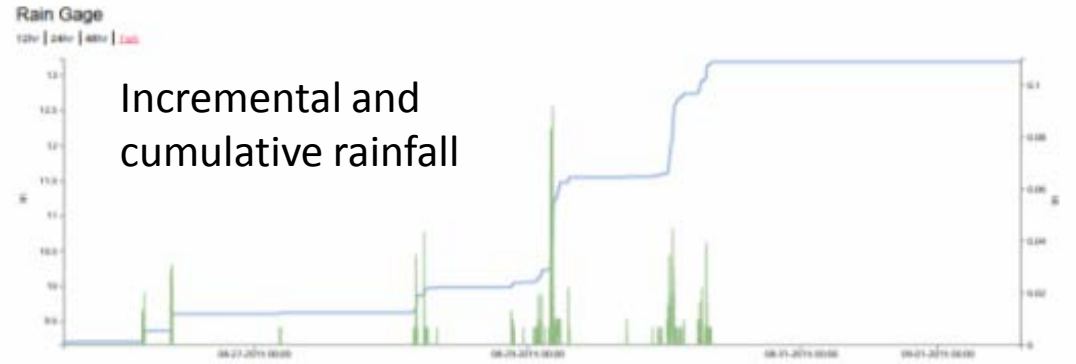
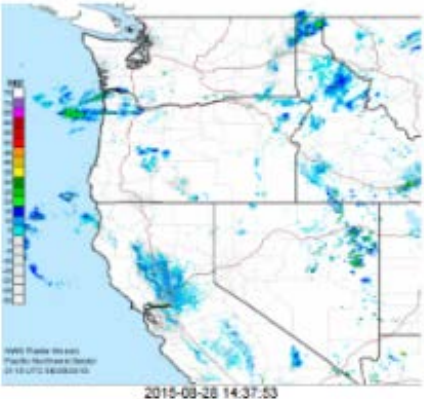
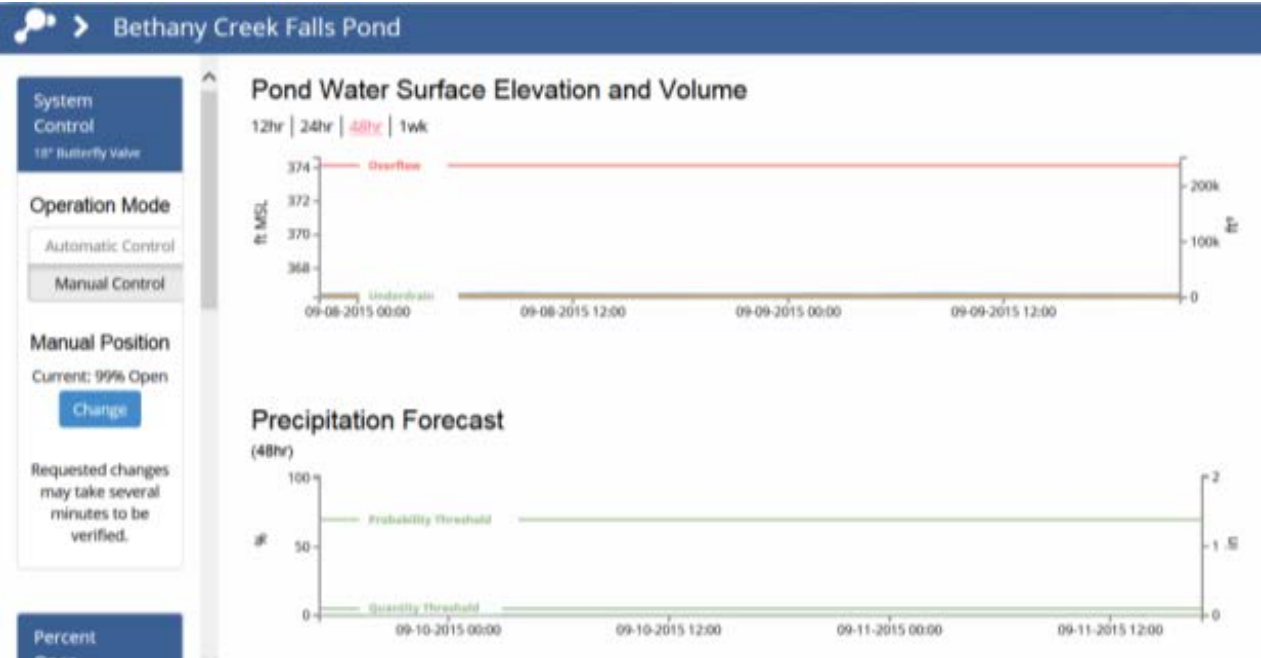
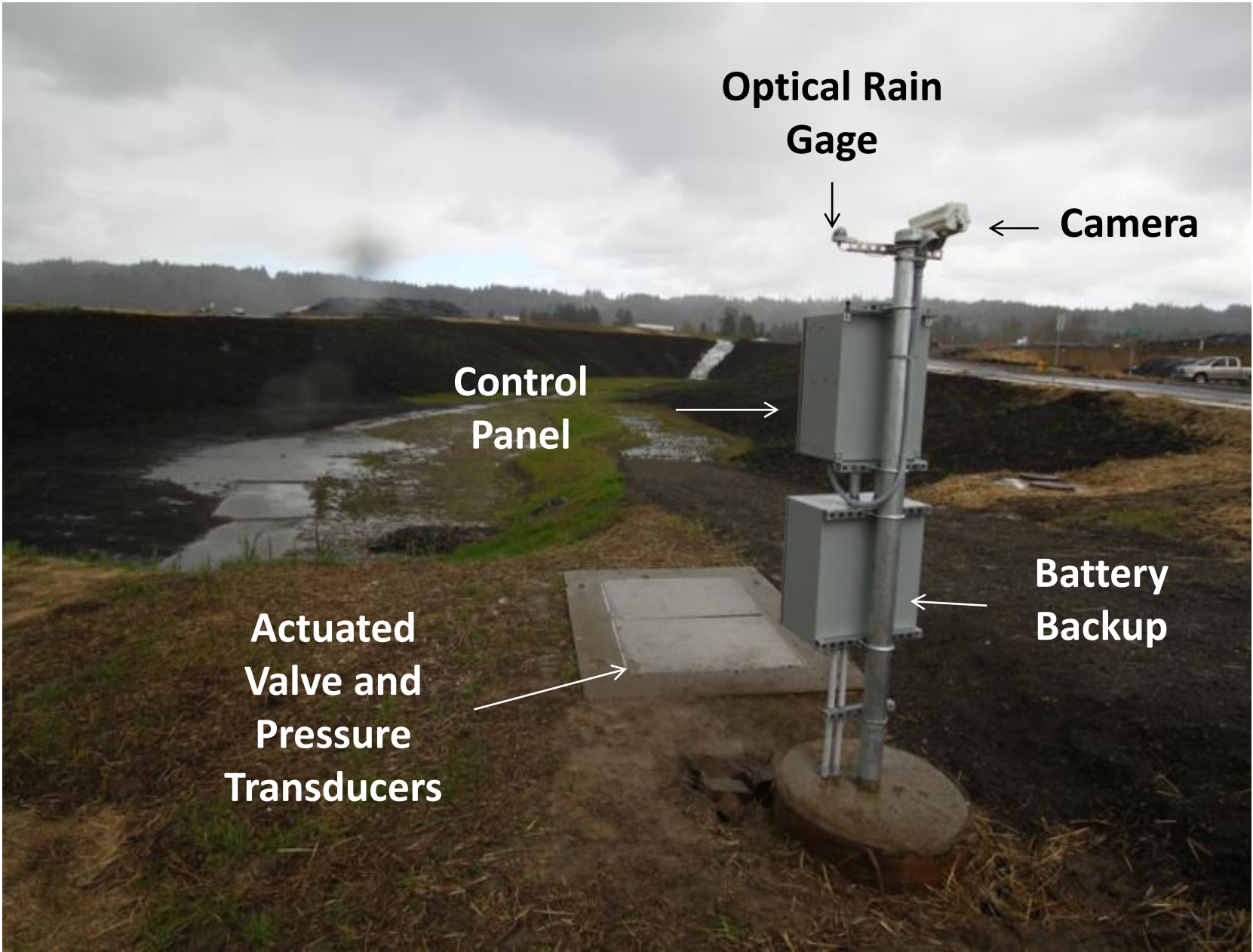
ONLINE SOLUTION



FLOW CONTROL ENHANCEMENT: ACTIVE



POLYGON AT BETHANY CREEK FALLS



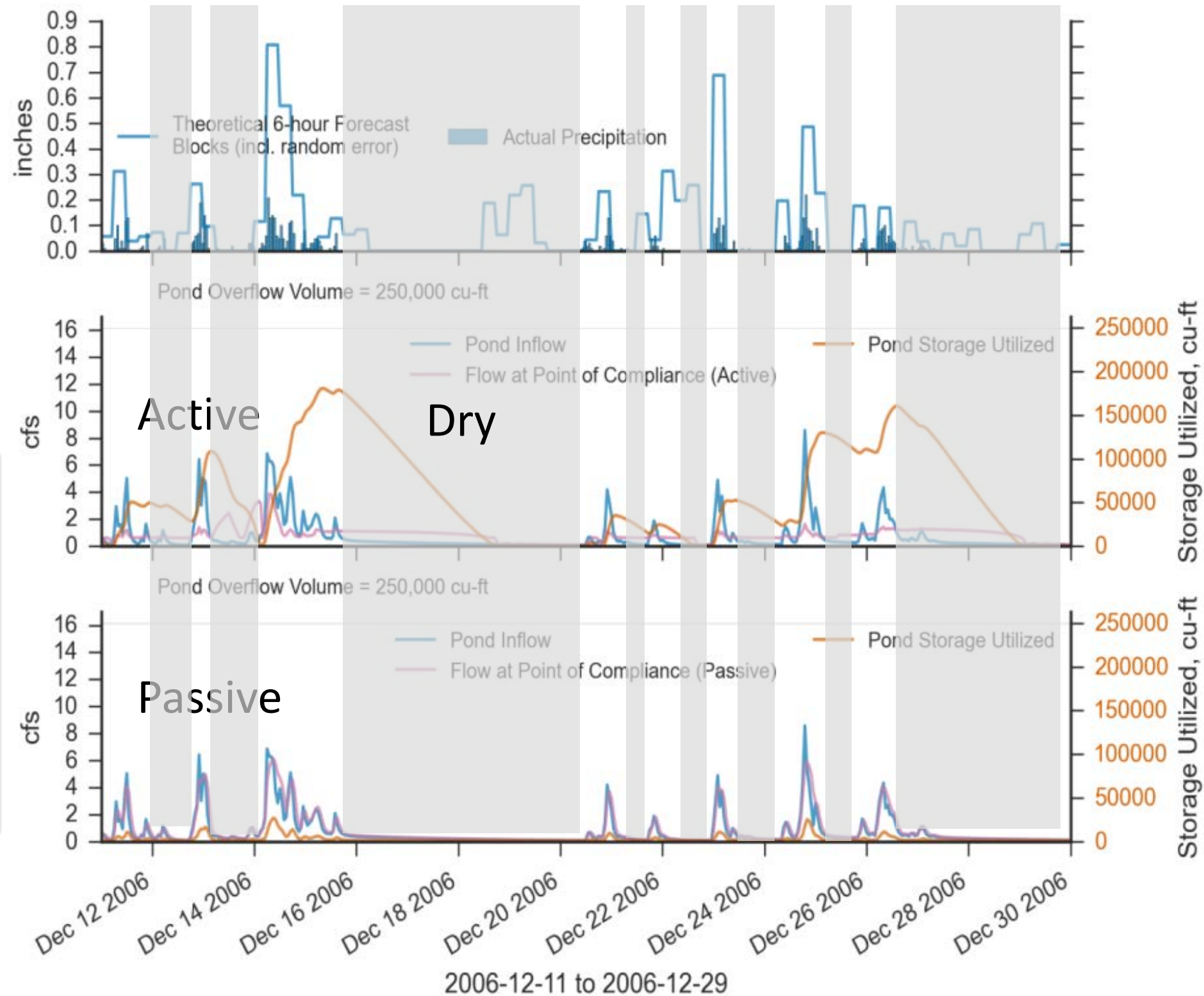
Example Event Response

Plot duration = 19 days
Total depth = 6.0 inches
Max 12-hour Depth = 1.2 inches

Range of event peak flow reductions:

Active = 40 to 90%

Passive = 0 to 25%



Example Event Response

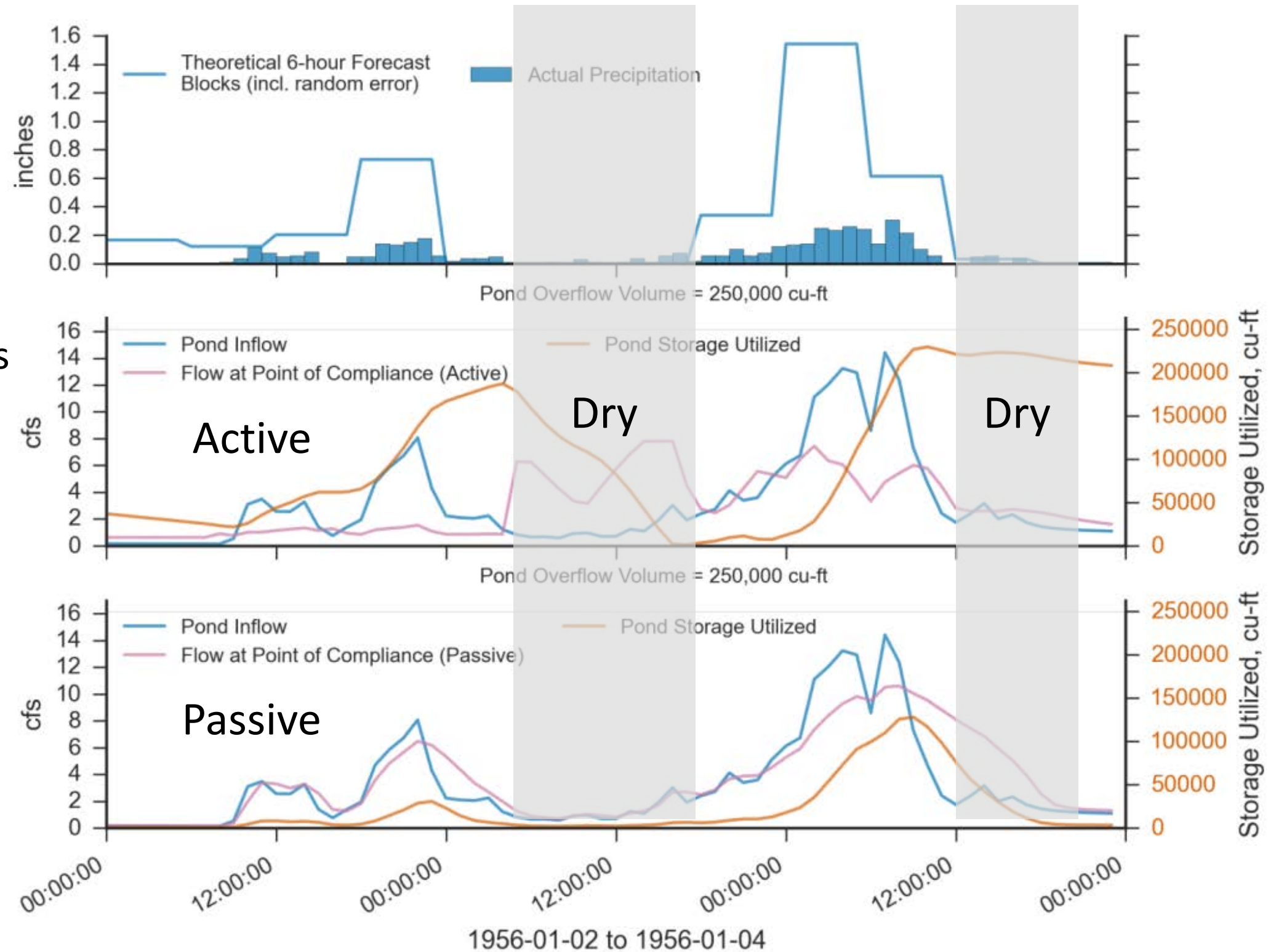
Plot duration = 3 days

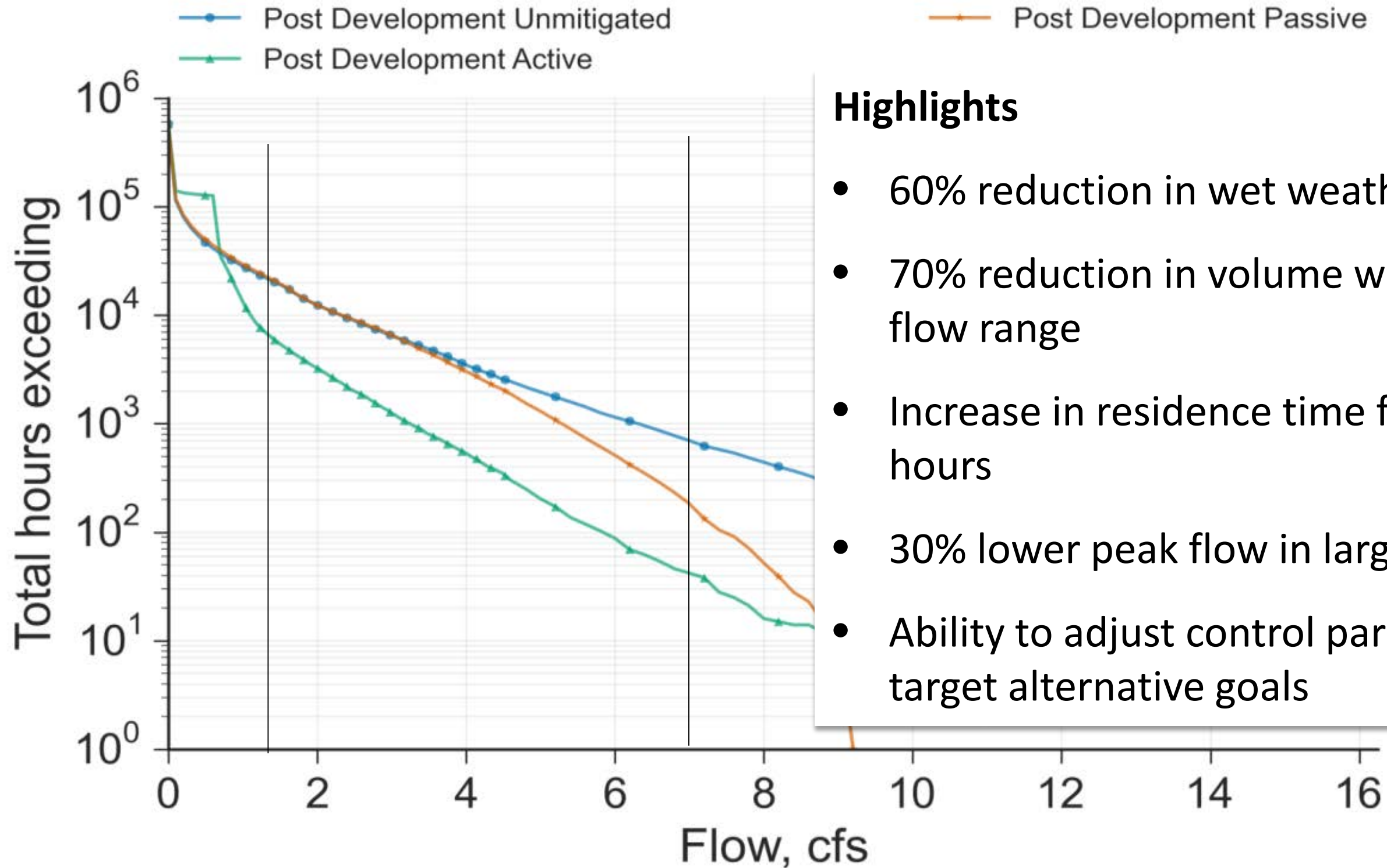
Total depth = 4.2 inches

Max 12-hour Depth = 2.2 inches

Active peak flow: 7.5 cfs
(50% reduction)

Passive peak flow: 10.5 cfs
(25% reduction)





Highlights

- 60% reduction in wet weather volume
- 70% reduction in volume within critical flow range
- Increase in residence time from 1 to 19 hours
- 30% lower peak flow in large events
- Ability to adjust control parameters to target alternative goals

LIFECYCLE COST COMPARISON – EQUIVALENT PERFORMANCE

Comparison of 4 ac-ft RTC pond to 7 ac-ft passive pond

Cost Summary	Passive	RTC	% Savings (Passive – RTC)/Passive
Total Capital Cost	\$575,000 [\$215,000 - \$950,000]	\$125,000 [\$100,000 - \$150,000]	
Annual O&M Costs	\$4,000 [\$3,000 - \$5,000]	\$6,300 [\$5,500 - \$7,000]	
Present Value of 25 year Lifecycle Cost	\$630,000 [\$260,000 - \$1,000,000]	\$210,000 [\$180,000 - \$240,000]	66% [25 to 75%]

RTC Summary : 25-year lifecycle cost of \$2,000 to \$3,000 per tributary acre

ADDITIONAL COST AND VALUE CONSIDERATIONS

In support of CWS strategic evaluation

Advantages

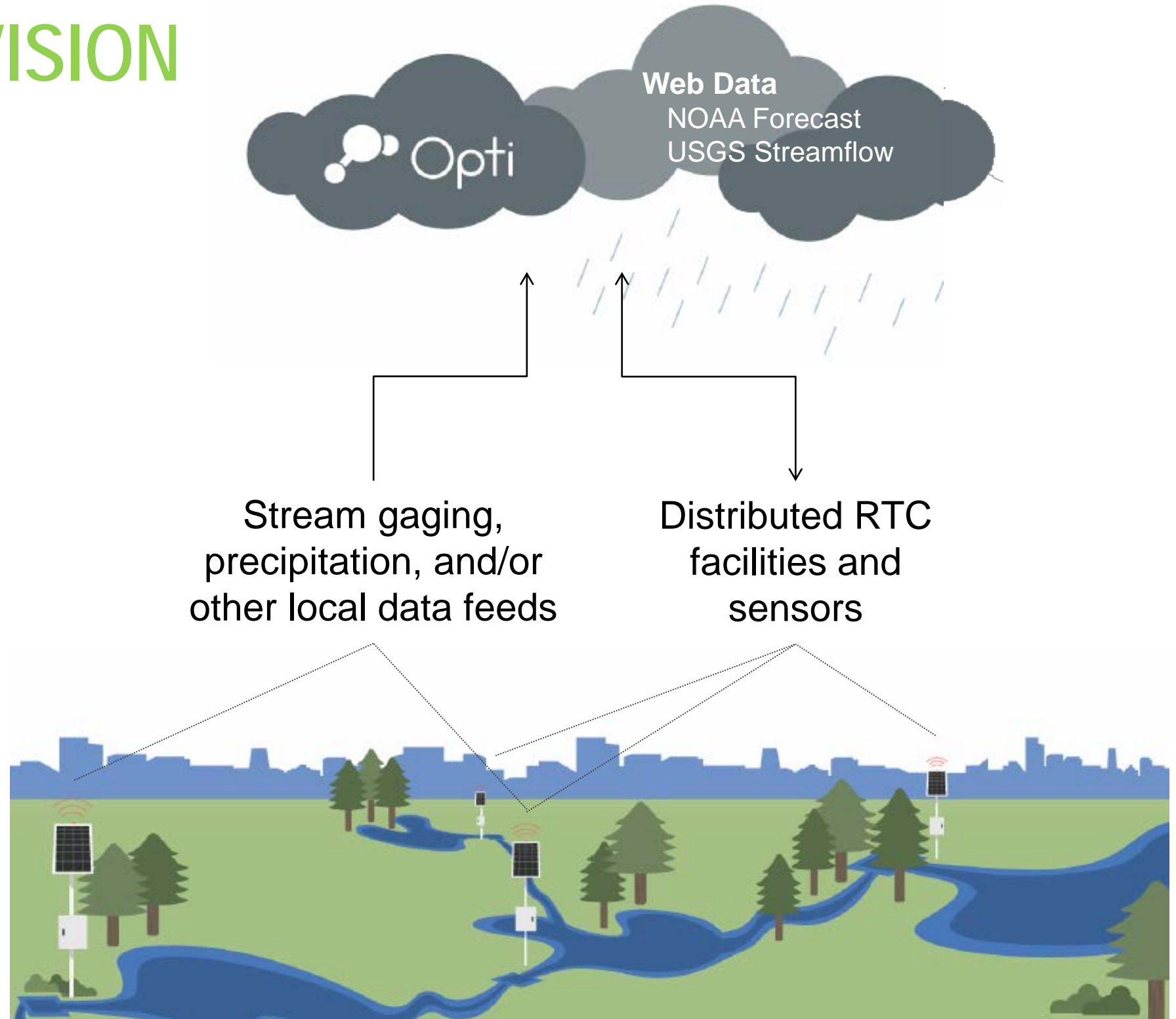
- Monitoring data and real-time performance metrics
- **Ability to adapt operations over time**
- Land savings/denser development for new and redevelopment
- Lower frequency of site visits and earlier identification of maintenance issues

Limitations

- Does not increase absolute storage capacity of SWM system
- Less familiar to designers, contractors, and regulators
- Less familiar to O&M crews

WATERSHED SCALE VISION

- Retrofit and development applications; in combination with in-stream projects
- Manage facilities based on watershed conditions and resource protection
- Track, adapt, and improve performance over time



QUESTIONS?

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