PNWS AWWA, Eugene Oregon
May 8, 2014

Crandall Reservoir: A Case Study

Utility Perspectives on the Will Crandall Reservoir and Pump Station Project

Tyler Wubbena, PE, City of Hillsboro

Acknowledgements

- Kevin Hanway, City of Hillsboro
- Brad Phelps, CH2M HILL
- Ward-Henshaw Construction
- City of Hillsboro Staff

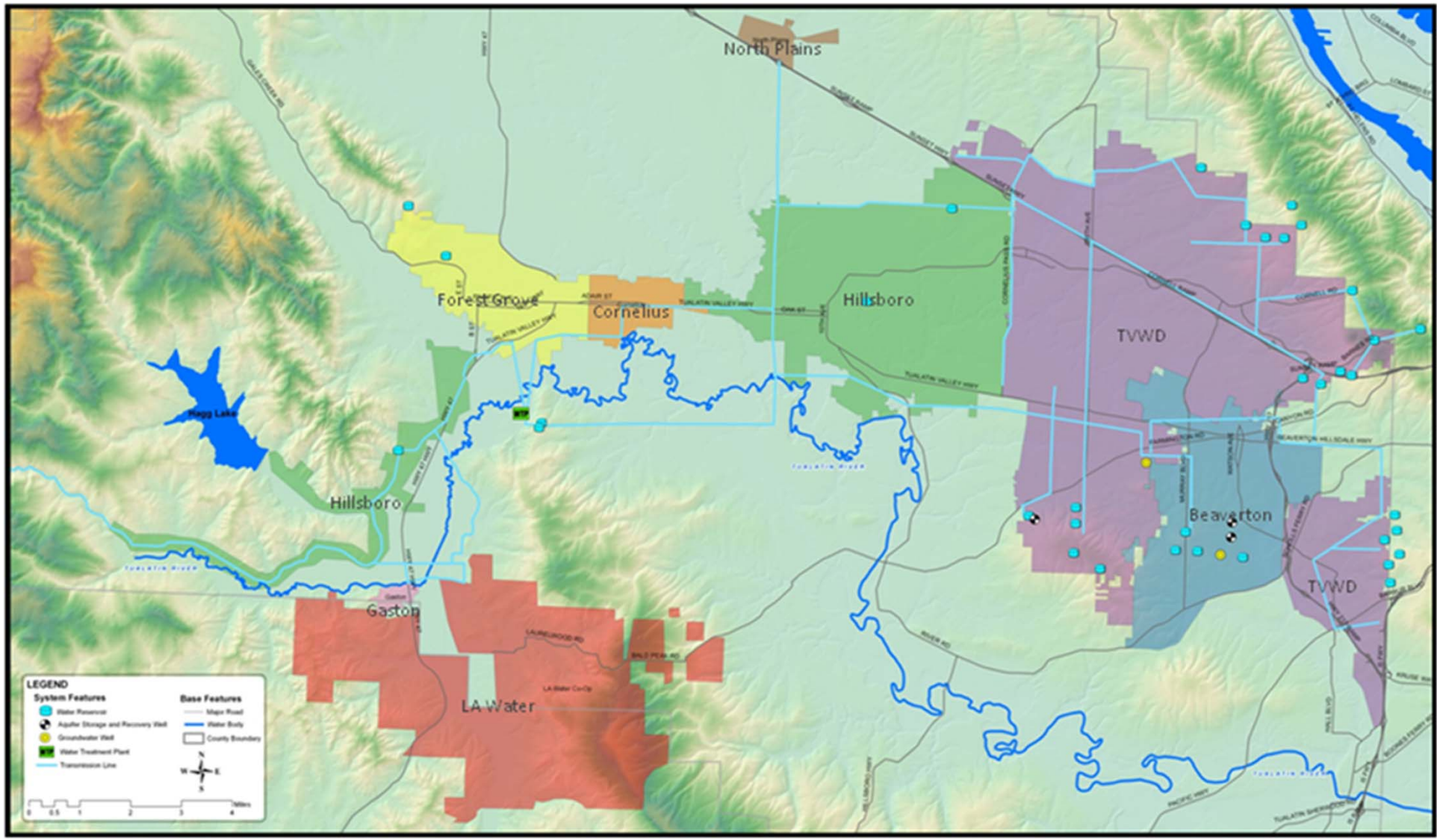
Hillsboro Water

Outline

- Project Background
- Design Objectives
- Water Quality
- Power Components
- Project Funding
- Public Involvement & Outreach

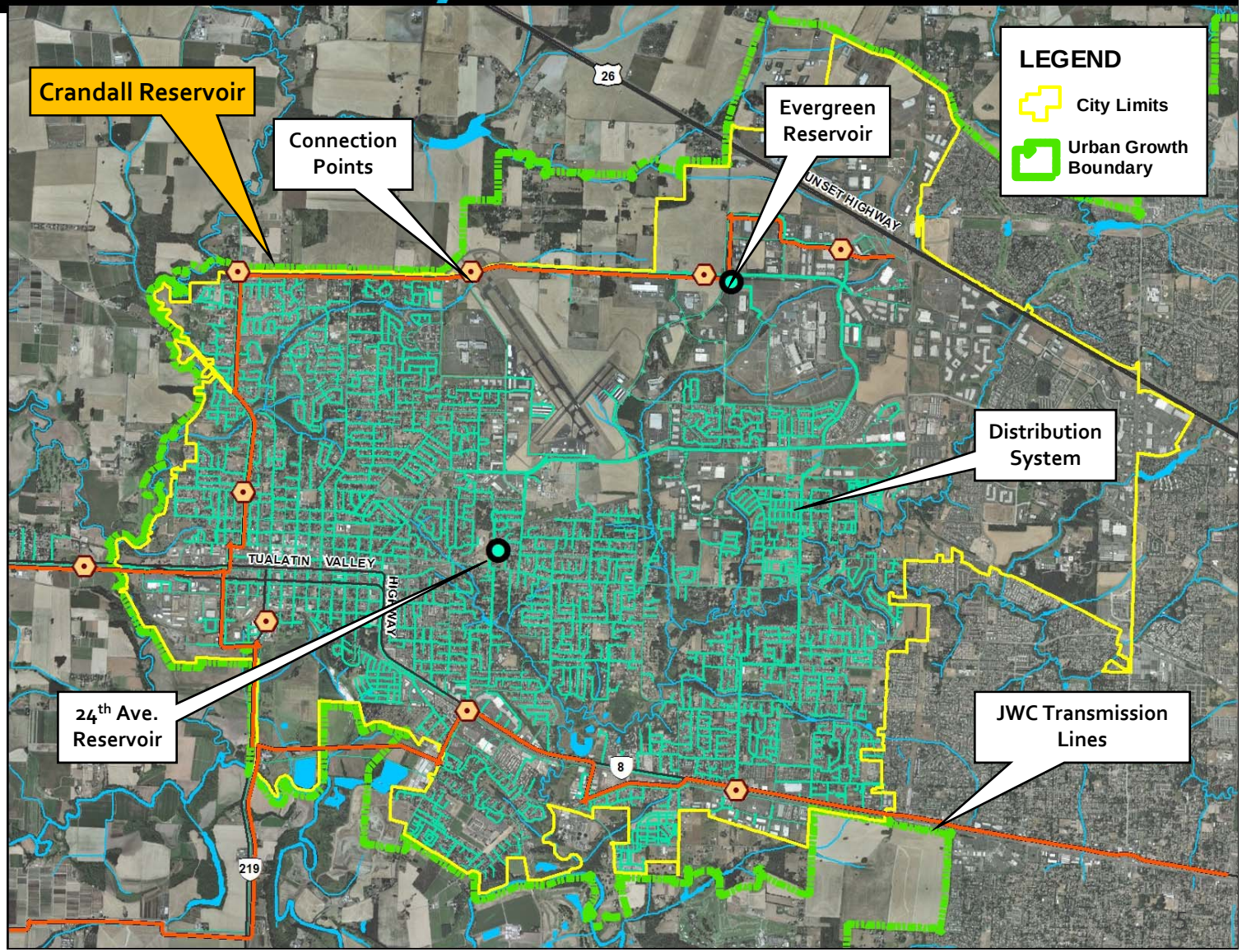
Hillsboro Water

Project Background



Project Background: Hillsboro Water System

- 2 Existing Reservoirs: 5.6 MG and 15 MG
- 9 PRV Connection Points

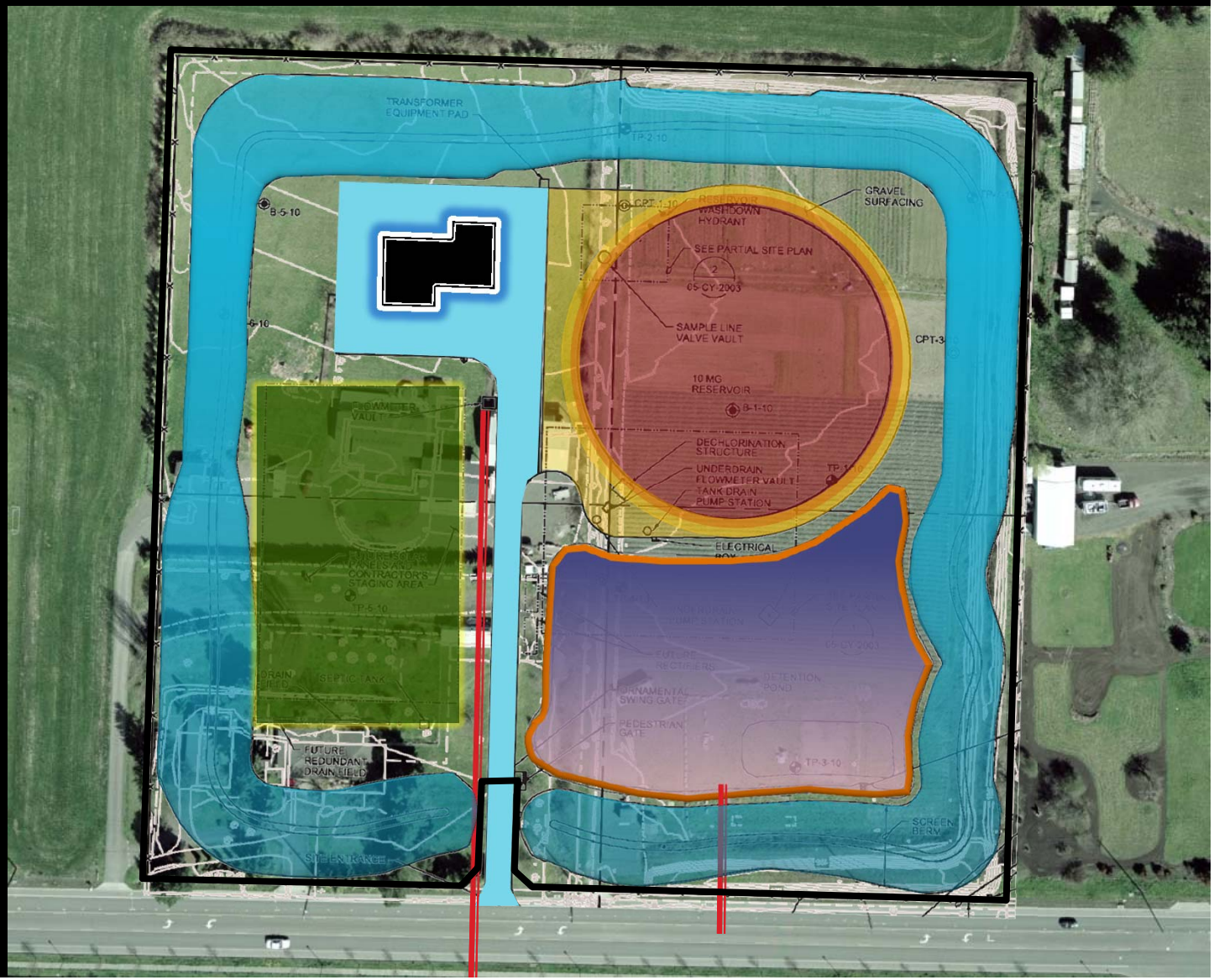


Project Background

- CMGC Project Delivery
- 10 MG Partially-Buried Water Tank
- 15 MGD Booster Pump Station
- 800 kW Generator
- 88 kW Hydro Turbine
- Rechlorination
- Mixing System

- 24th Street Reservoir – Rechlorination and Mixing System

Project Background - Site Features



Design Objectives

Design Objectives

- ☑ Meet distribution storage requirements
- ☑ Maintain water quality
- ☑ Provide backup power and water supply in an emergency
- ☑ Accommodate future ASR
- ☑ Accommodate future pump station expansion
- ☑ Maximize opportunities for flexibility in operation

Hillsboro Water

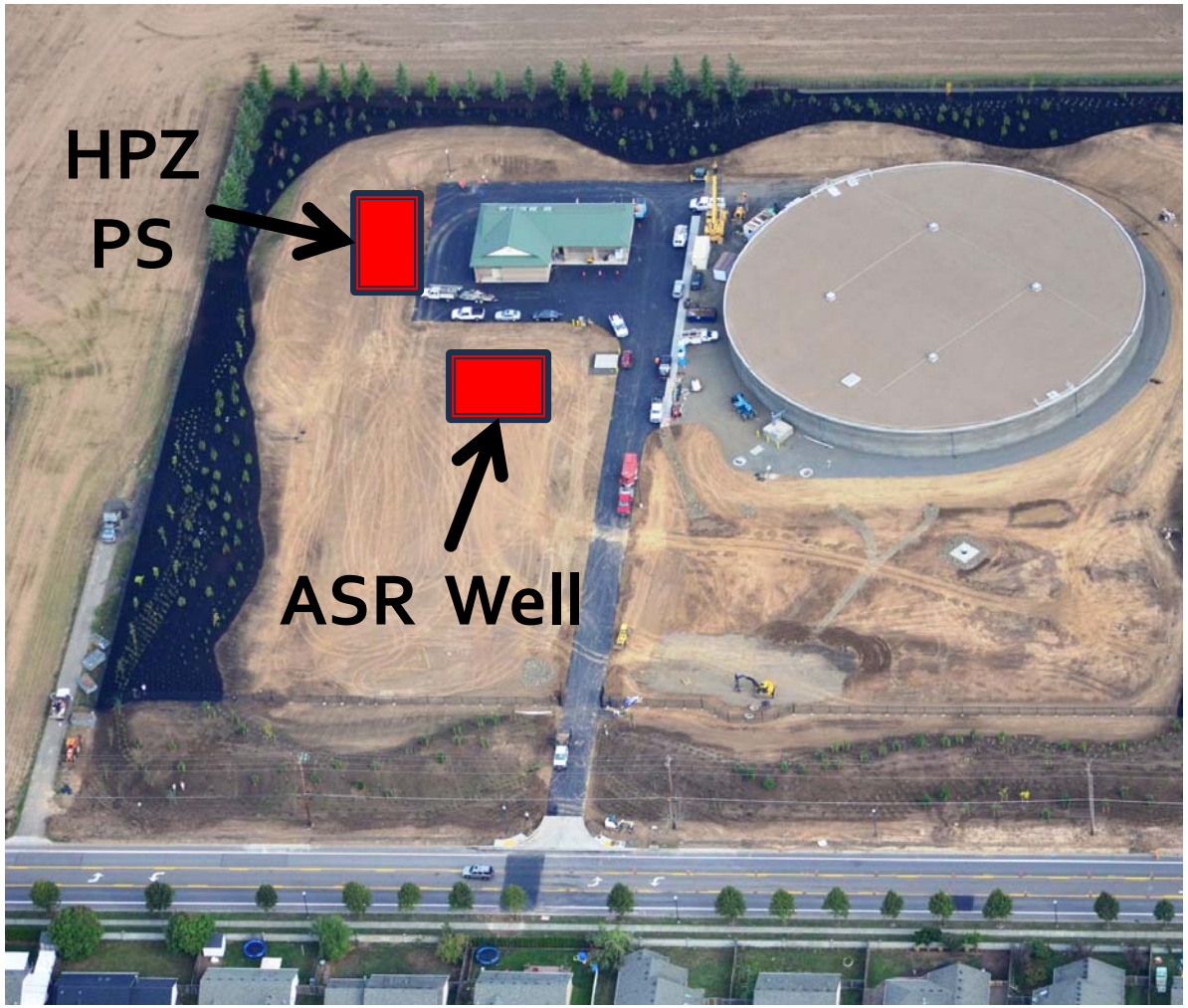
Design Objective: Emergency Supply

- Dedicated connection on PS header for Blivet fill station

Design Objective: Future ASR and High Pressure Zone Pump Station

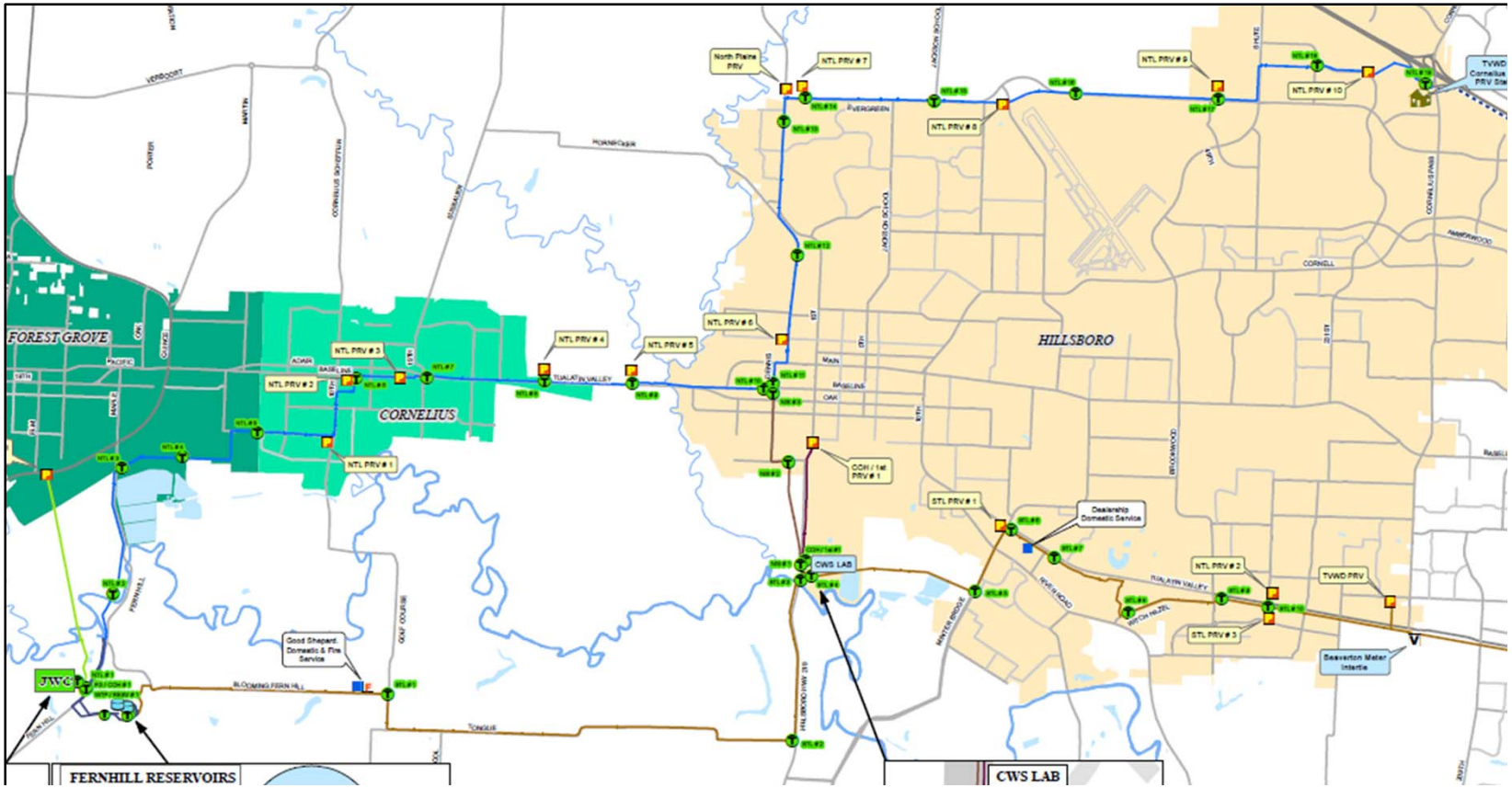
Existing

- Pump Station
- Backup Power
- Rechlorination
- Pump to waste basin
- SCADA
- Piping



Design Objective: Operational Flexibility

- "Davis" Dump Valve
- 2014 NTL Main Break



Project Funding

Project Funding

- System Development Charges (SDC's)
- Water Fund (rates)
- PGE Dispatchable Standby Generation (DSG) Grant
- Energy Trust of Oregon (ETO)
- Oregon Infrastructure Funding Authority (IFA) Grant

Hillsboro Water

Project Funding

- PGE Dispatchable Standby Generation (DSG) Grant
- Hillsboro received $132,000 for DSG grant
- Note: Hillsboro will receive future O&M saving through the DSG partnership

Hillsboro Water

Project Funding

- Energy Trust of Oregon (ETO)
- Applied for two separate grants
  1. 24th St Reservoir Rechlorination and Mixing
     - Initial grant award $45,842
     - Reduced to $43,843 after validation
  2. Crandall Reservoir Rechlorination and Mixing
     - Initial grant award $74,029
     - Still under validation testing of system

Hillsboro Water

Project Funding

- Business Oregon / Infrastructure Finance Authority Grant
- Previously City of Hillsboro waived a SDC fee for economic development
- Hillsboro received an IFA Grant project design
- Hillsboro required to provide matching funds
- Prominent signage requirements

Hillsboro Water

Water Quality

Water Quality/Energy Savings

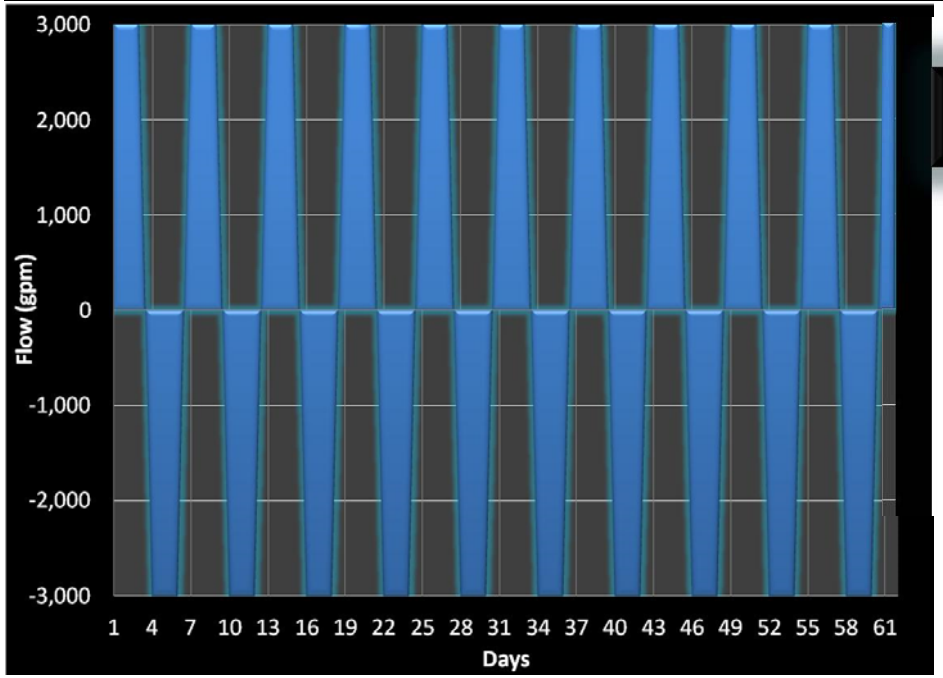
- Longer residence time ⇒ Less Pumping
- Maintaining chlorine residual with long residence times in reservoirs
  - Field tests to evaluate rechlorination
- CFD to evaluate mixing & sampling
- Incorporation of tablet chlorinator into the reservoir and pump station design

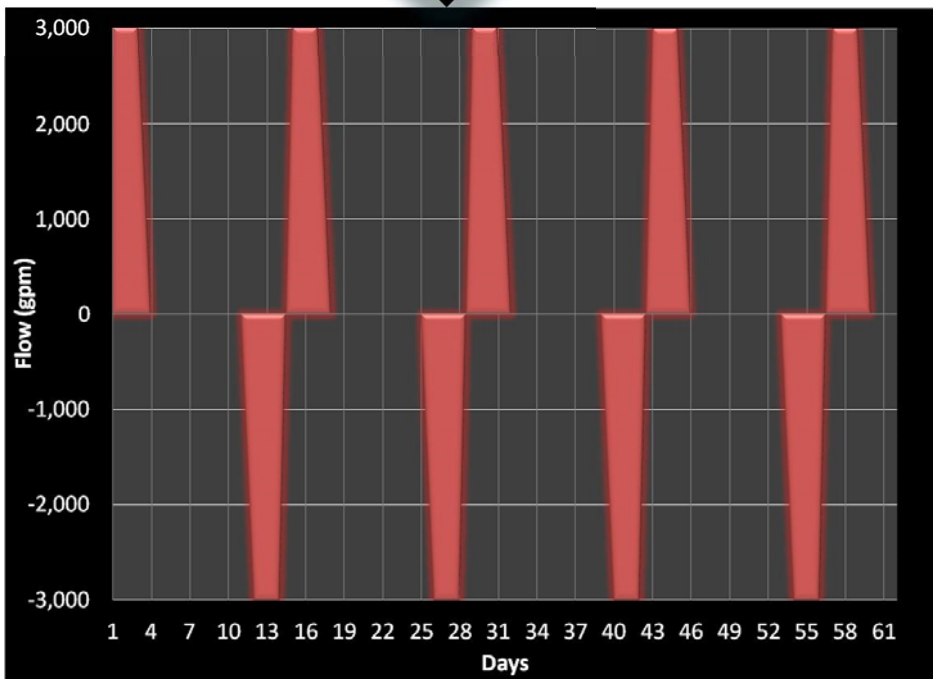
Hillsboro Water

Water Quality/Energy Savings

- ***Paradigm shift*** in reservoir storage time and water turnover BMP's
- Traditional BMP – 3 day average turnover
- City of Hillsboro – up to 30 days at Crandall and 24th Street Reservoirs

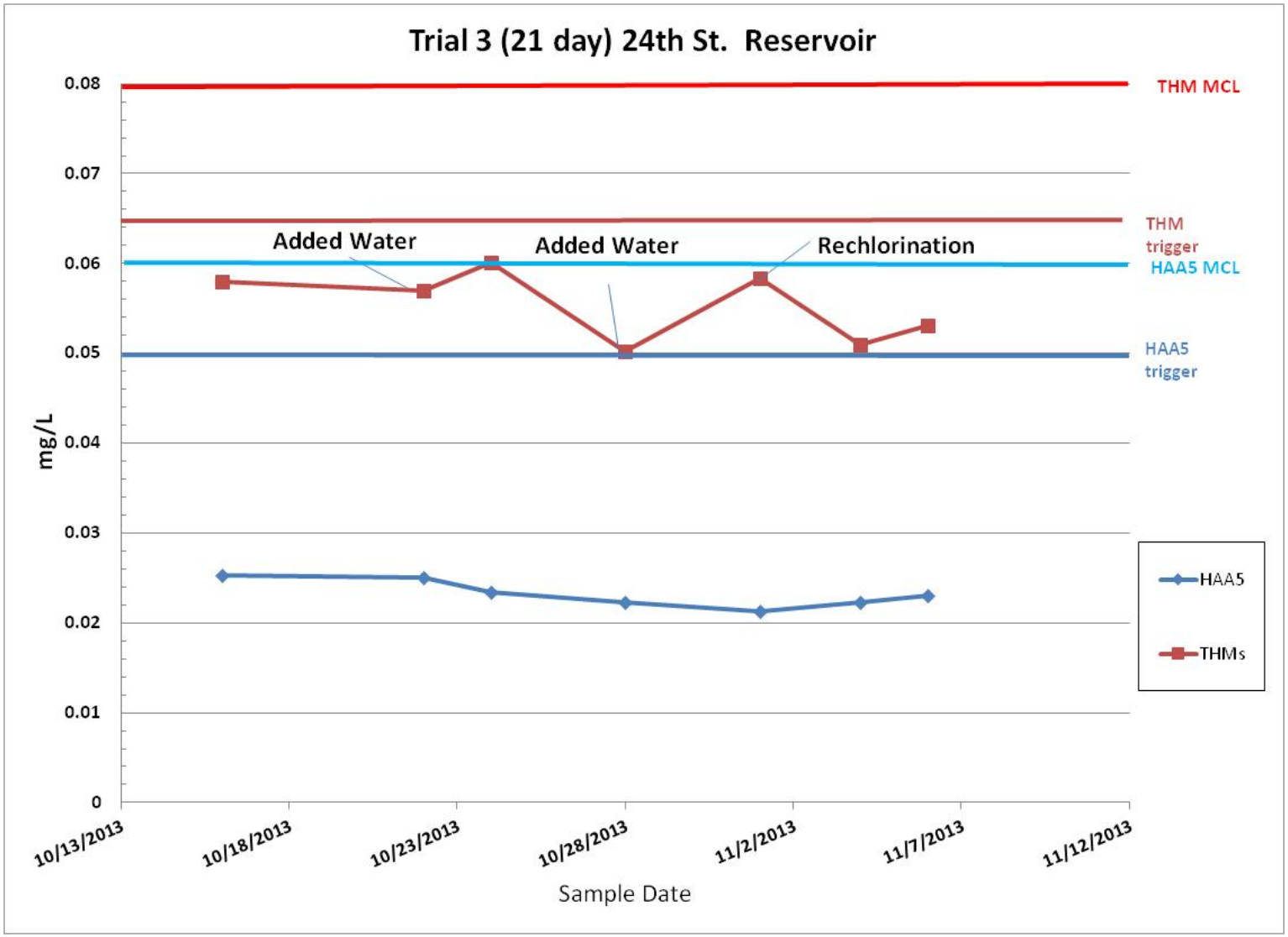
Storage Requirements: Fill and Draw Concepts





Desire to modify current operation and operate fill/draw cycles less frequently

Water Quality: Extended Storage Validation – 24th St Reservoir



Water Quality: Conclusion

- Extended Storage Validation
  - 24th Avenue Validation Testing Completed
  - 5 trials: 14, 21, 21, 30, and 29 days storage
  - Mixing, Cl2 rechlorination, and addition of water part of extended storage strategy
  - No THM or HAA5 violation
  - Extended storage successful up to 30 days
- Crandall Validation – postponed to Fall 2014

Hillsboro Water

Power Components

Power Components: Overview

- Utility Power Connection
- Backup Generator
  - Power for pump station
  - PGE DSG participation
- Micro Hydro
  - Converting head on inlet to reservoir
- Solar Panels (future)
- Energy Savings in Design
  - LED lighting, outside air ventilation, etc.

Hillsboro Water

Power Components: Backup Generator

- 800 kW generator
  - Oversized for needs at pump station – accomodate future expansion
- 3,000 gal fuel storage

Hillsboro Water

Power Components: Backup Generator & PGE DSG

- Supply power to pump station **AND** backfeed the power utility (PGE)
  - Parallel switching device
- PGE can operate generator remotely
  - PGE can meet peak power requirements for FERC
  - PGE can defer construction of another peak power supply

Hillsboro Water

Power Components: Backup Generator & PGE DSG

- City has first right of refusal for generator use during an emergency
- Generator is exercised under full load during monthly testing
- Win-Win for City
  - PGE pays all maintenance
  - PGE pays all fuel
  - Monitored 24 hours/day

Hillsboro Water

Power Component: In-Conduit Hydropower

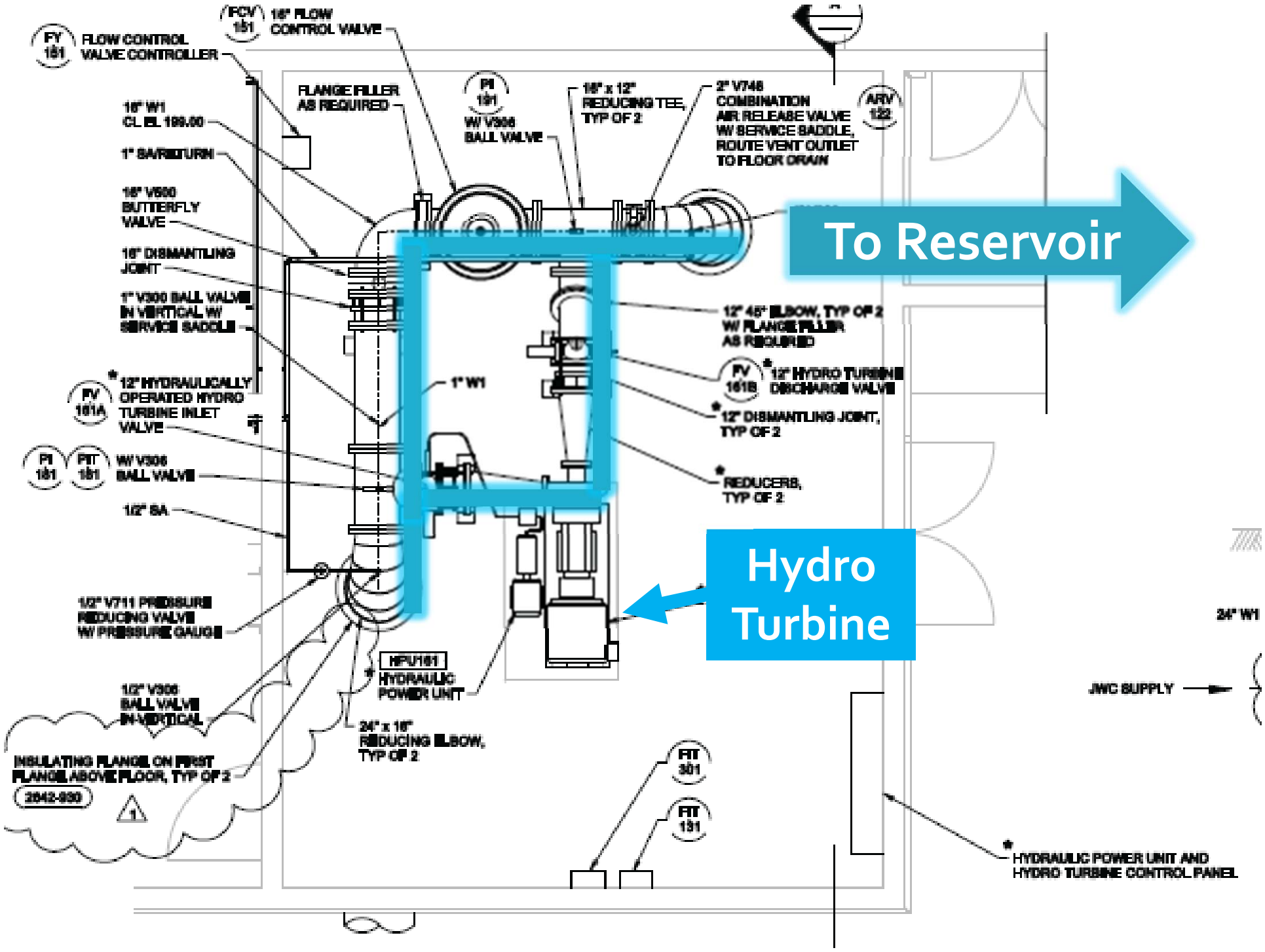
- Decrease on-site utility costs
- Convert potential energy into electricity
- Take advantage of constant flow and head to maximize turbine efficiency and output
- Access off-the-shelf pump technology
- Hillsboro is a leader in sustainability

Hillsboro Water

Power Components: In-Conduit Hydropower

- Supply pressure from JWC at delivery point: 125 psi – 130 psi
- Only about 10psig is needed to fill the reservoir .
- We need to "break" the excess pressure of 120psig
  - Pressure Reducing Valve (PRV)
  - Hydroturbine
- Use MicroHydro when reservoir is filled
- Power generated is supplied to the grid
  - Net metering agreement with PGE

Hillsboro Water


FCV 151
16" FLOW CONTROL VALVE
FY 151
FLOW CONTROL VALVE CONTROLLER
FLANGE FILLER AS REQUIRED
PI 151
W/ V306 BALL VALVE
16" x 12" REDUCING TEE, TYP OF 2
2" V748 COMBINATION AIR RELEASE VALVE W/ SERVICE SADDLE, ROUTE VENT OUTLET TO FLOOR DRAIN
ARV 122
16" W1 CL. EL. 199.00
1" SA/RETURN
16" V500 BUTTERFLY VALVE
16" DISMANTLING JOINT
1" V300 BALL VALVE IN VERTICAL W/ SERVICE SADDLE
To Reservoir
12" 45° ELBOW, TYP OF 2 W/ FLANGE FILLER AS REQUIRED
1" W1
FV 151B
* 12" HYDRO TURBINE DISCHARGE VALVE
* 12" DISMANTLING JOINT, TYP OF 2
* 12" HYDRAULICALLY OPERATED HYDRO TURBINE INLET VALVE
FV 151A
PI 151
PIT 151
W/ V306 BALL VALVE
1/2" SA
* REDUCERS, TYP OF 2
Hydro Turbine
1/2" V711 PRESSURE REDUCING VALVE W/ PRESSURE GAUGE
24" W1
JWC SUPPLY
HPU151
* HYDRAULIC POWER UNIT
1/2" V306 BALL VALVE IN VERTICAL
24" x 16" REDUCING ELBOW, TYP OF 2
INSULATING FLANGE ON FIRST FLANGE ABOVE FLOOR, TYP OF 2
2842-930
1
FIT 301
FIT 151
* HYDRAULIC POWER UNIT AND HYDRO TURBINE CONTROL PANEL

Reservoir Pump Operations

- Crandall Reservoir filling cycle volume: 5MG
- Crandall Reservoir water surface elevation level (WSEL) range: 194 to 210
- Duration of Reservoir fill cycle: Depending on seasonal demands and water quality requirements, approximately 2.5 days every 3 weeks
- Nominal Discharge rate of hydropower equipment: 2MGD (3.1cfs)
- Average NTL pressure: 130psig
- Net available head: Depending on NTL pressure and Reservoir WSEL, expected to vary between 250 and 325 feet

Energy Output

- Rated turbine-generator output: 74kW
- Rated turbine-generator rated eff: 71%
- Energy production: 60,000kWh/year
- Energy output: 480 vac, 3-phase, 60Hz
- Net-metering arrangement with Portland General Electric (PGE)

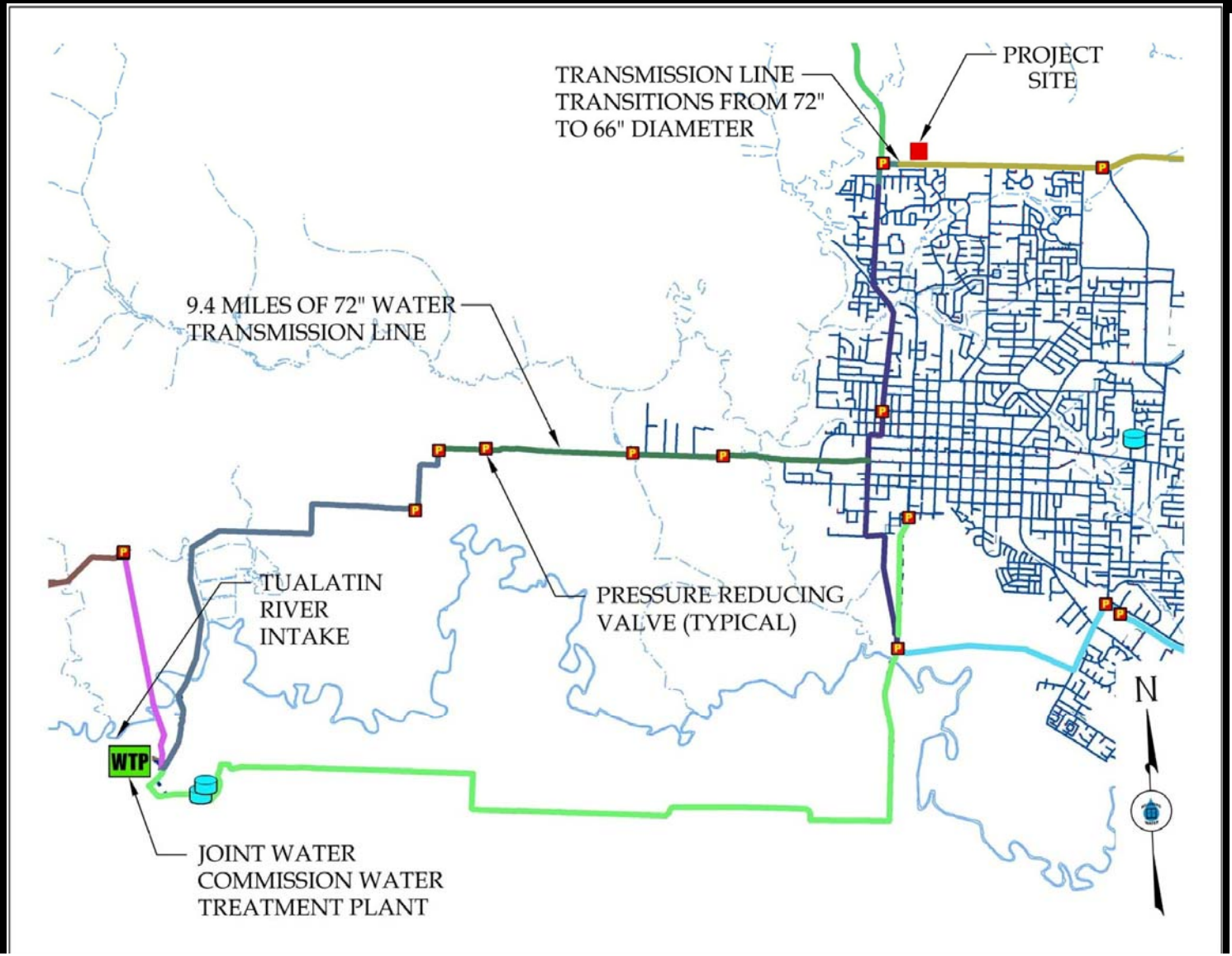
Hillsboro Water

FERC Small Conduit Facility Exemption Requirements

- Utilizes hydroelectric potential for power generation
- Located on non-Federal lands
- Installed generating capacity of less than 40MW
- Not an integral part of a dam
- Does not rely upon construction of a dam
- Discharges the water it uses for power generation into a conduit and directly to a point of municipal consumption

Hillsboro Water

FERC Permitting: City of Hillsboro Water Distribution Network



FERC Exemption Permit Timeline (approximately 19 months)

- Dec. 12, 2011 – Initial Consultation Document sent to over 50 stakeholders
- Jan. 17, 2012 – Initial Consultation Meeting open to all stakeholders and the public / beginning of 30-day comment period
- Mar. 13, 2012 – New docket submitted to FERC with all documentation of Initial Consultation
- Apr. 13, 2012 – Comments received from FERC
- Jul. 6, 2012 – Resubmitted docket to FERC
- Sep. 5, 2012 – FERC initiates 60-day public review of docket
- Nov. 14, 2012 – Order Granting Exemption From Licensing (Conduit) issued by FERC
- Jan. – Mar. 2013 – ordered aperture cards and delivered to FERC in Washington D.C.
- Jul. 3, 2014 – Authorization to start construction

Hillsboro Water

FERC Permitting Issues

- Working with Federal staff in Washington DC – long distance, different time zone
- Stakeholder notification process
  - Over 50 stakeholders notified
  - Two responded: ODFW and WRD
- Legacy documentation requirements – Aperture card (think microfiche)
- Selecting the appropriate Water Right for the project

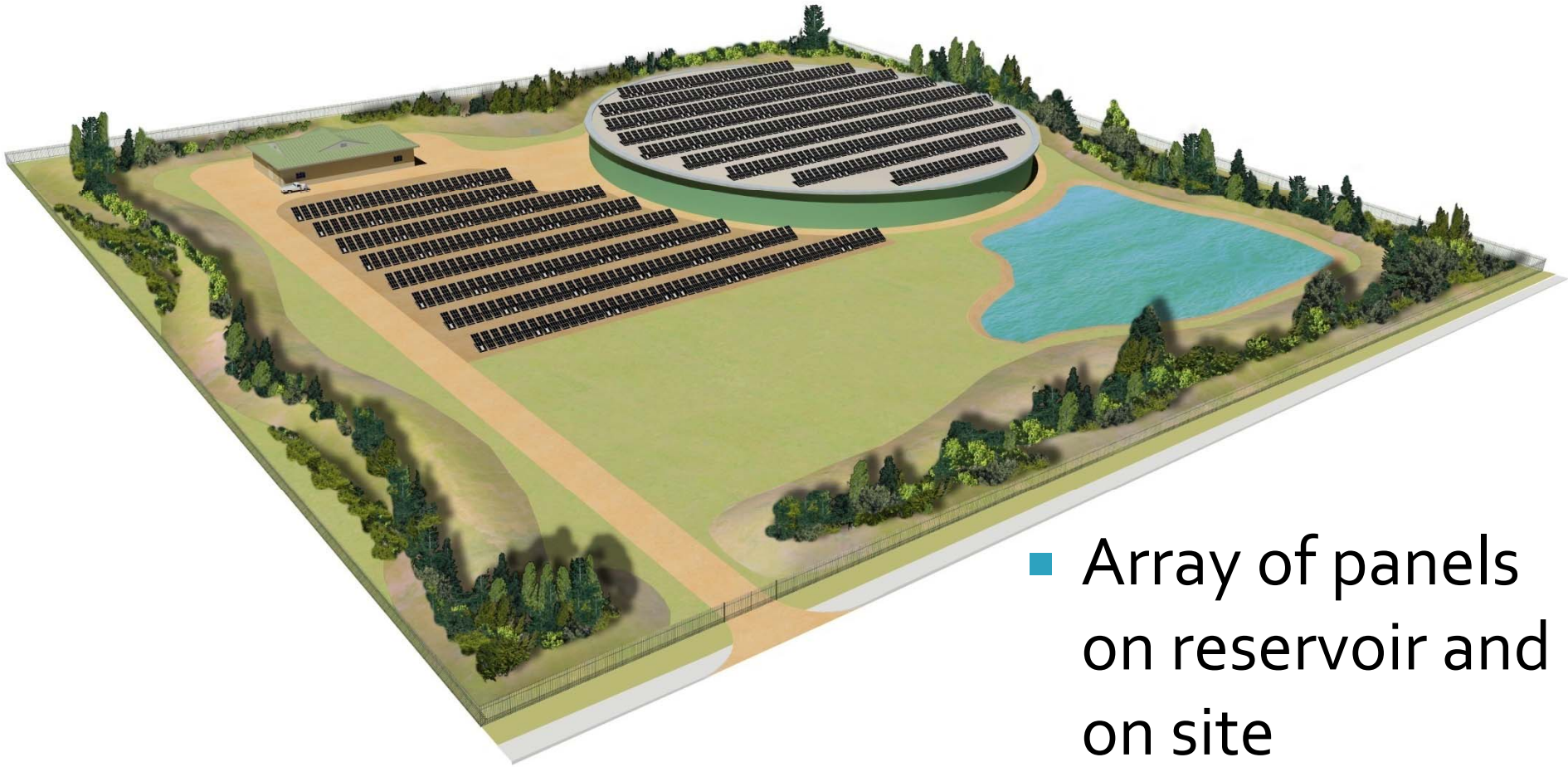
Hillsboro Water

Power Components: Solar Panels

- Planned as part of future activities at the site
- City has experience with solar panels at Evergreen Reservoir site (100 kW) and multiple other locations
- Note: Solarworld is 3 miles from the project site and a water customer of the City

Hillsboro Water

Power Components: Solar Panels



- Array of panels on reservoir and on site

Power Components

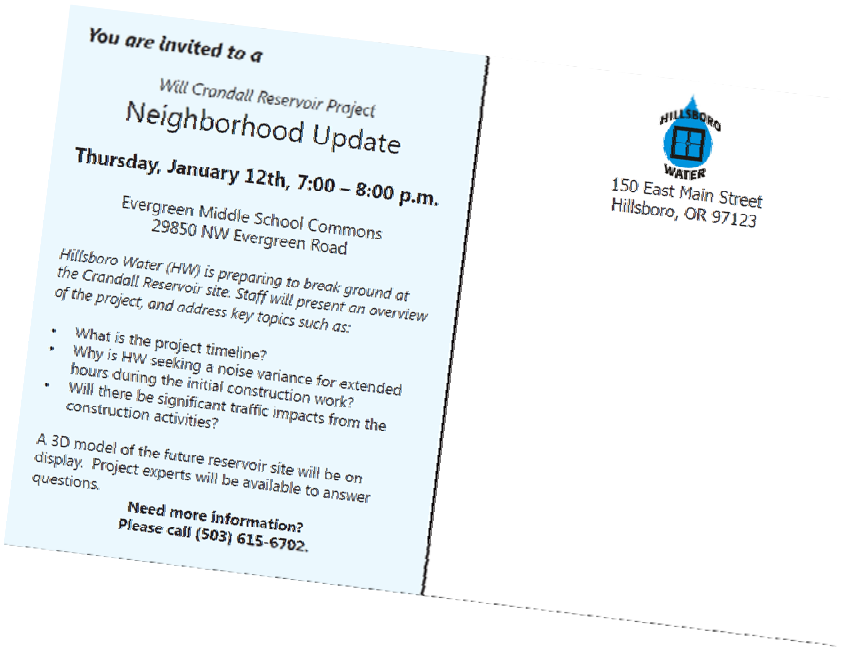
- City has the opportunity to generate power 3 different ways at their Crandall reservoir site
  - Diesel backup power generation partnership with PGE DSG program
  - Microhydro offsets pumping costs at Crandall
  - Future solar panels provide a passive power generation opportunity

Hillsboro Water

Public Involvement & Outreach

Design Phase
Neighborhood Meeting

- Early planned outreach to neighbors
- Combined with requirements for noise variance requirements with Washing County
- Provided project fact sheets



Design Phase

- Keep Simple
- Open and transparent
- Direction to additional info
- Point of contact

Will Crandall Reservoir

Hillsboro's Newest In-Town Storage

Project Status

Construction will begin soon on the Crandall Reservoir Project. Beginning construction activities include mobilization, site prep, and berm construction. Contractors will then begin laying an earthquake resistant foundation using a concrete and deep soil mixing technique.

Construction Variance

Hillsboro Water is seeking a variance from Washington County to extend working hours from the standard 7am – 7pm to a 6 am - 10 pm double-shift schedule for 90 days, which will allow the Contractor to finish the deep soil mixing portion of the project in early summer rather than early fall, resulting in less noise impacting the neighborhood's outdoor summer activities.

Contractors have planned for sound mitigation. Sound barriers such as a perimeter berm and other blockers will be on-site. The generators to be used are insulated and considered "Hollywood Movie Quality." Loud equipment will be angled away from the south and east and placed to maximize distance between the loudest activities and the nearest residences.

Traffic Impacts

There will be some increase of traffic, due to supply deliveries and workers accessing the site. However, there will be a lot less traffic generated than a typical construction site, such as Intel's D1X, because the majority of excavated soils will be kept on site and used in building a berm.

For more Information

Visit our website at www.hillsborowater.org for updates once the Crandall Reservoir Project is underway.

Receive notification e-mails of construction activities by signing up for the Crandall Neighbors Distribution List. Send requests to be added to the Distribution list to: tacys@ci.hillsboro.or.us.

Phone Contacts:

Contractor: For questions about site activity, the Contractor will post a number at the construction site once the project is underway.

Hillsboro Water: For questions about the Crandall Reservoir Project call Tyler Wubbena, Project Manager, or Tacy Steele, Public Information Coordinator, at (503) 615-6702.

Hillsboro Water

Pre Construction Tailgate

Hillsboro Water

Pre Construction Tailgate

- Used tailgate to proactively reach out to local public
- Intercept before construction inconveniences arise
- Show 3D model of finished facility
- Allow public to ask questions in a comfortable environment

Hillsboro Water

Pre Construction Tailgate

- Keep it a fun, family event

Hillsboro Water

Pre Construction Tailgate

Hillsboro
Water

Project Blog

- Project blog posted on Water Department website
- Updated every 2 weeks or as required
- Updates included current activities and project facts
- Included current photos of the project

Hillsboro Water

Project Blog (Screen Shot)

STEM Outreach

- Worked closely with Evergreen Middle School STEM Club
- Provided approximately 5 field visits throughout construction
- Hillsboro staff assisted with in class room learning

Hillsboro Water

STEM Outreach

- Coordinated other tours including JWC WTP
- Program very well received by both students and staff
- Excellent example to demonstrate real world engineering

Hillsboro Water

Dedication & Open House

- Decision made to combine the Dedication and Open House on the same day
- Date selected approximately 5 months before the Dedication
- Schedules to coordinate: Mayor, City Manager, Will Crandall, Commissioners, and so on…..
- Commitment from the Contractor to have the site ready on the date of dedication

Hillsboro Water

Dedication


Will Crandall Reservoir
Dedication
October 1, 2013
WILL CRANDALL RESERVOIR

Dedication

- Surprise turn out!
- Pump station is now an auditorium!
- Will Crandall's extended family traveled from multiple states to attend the dedication

Hillsboro Water

Dedication

Will Crandall was honored with the naming of the Reservoir and Pump Station. Will served on the Hillsboro Utilities Commission for 29 years.

Open House

- Similar to the Tailgate, the Open House allowed to public to see the finished reservoir
- Public response was very positive

Hillsboro Water

Questions?

PNWS • AWWA
Eugene 2014
Tap the Wave of Change

Thank you,

Tyler Wubbena
City of Hillsboro

Hillsboro Water

CH2MHILL

Weather:
2012 Record Wet Spring

CH2M Asst PM, Jeff Stallard:
Project Weather Expert

Construction: Site