AGENDA BILL Item 7.A	**Division 7 Reservoir Seismic Upgrade and ShakeAlert Implementation Project Briefing #1**			
DATE SUBMITTED:	May 18, 2022	MEETING DATE:	May 25, 2022	
TO: BOARD OF COMMISSIONERS		FROM: Bill Hunter, Assist. GM/District Engineer		
GENERAL MANAGER APPROVAL				
ATTACHED DOCUMENTS		1. None		
TYPE OF ACTION REQUESTED		RESOLUTION ☐	FORMAL ACTION/ MOTION ☐	INFORMATIONAL /OTHER ☒

BACKGROUND / EXPLANATION OF IMPACT

The intent of this project is to provide a seismic upgrade to the existing 1-million gallon welded-steel Division 7 Reservoir constructed in 1970. The project also implements an earthquake early warning system (ShakeAlert®) to automatically isolate a portion of the volume from rapid depletion due to water main breaks following an earthquake.

In 2016, BHC Consulants completed a Reservoir Seismic Vulnerability Assessment of all 5 of the District's welded steel reservoirs which included Division 7, SVWTP Chlorine Contact Basin, Division 22, Division 30, and Geneva reservoirs. The assessment identified the Division 7 Reservoir as having the highest probability of failure and one of the highest consequences of failure, making it the recommended highest priority for retrofit or replacement.

In 2017, as part of the update to the District's Water System Comprehensive Plan a system-wide reservoir capacity analysis found that the Division 7 Reservoir is oversized. The existing reservoir is 1-million gallons. The comprehensive water system analysis indicated that a reservoir size of roughly 0.5-million gallons was needed. Wilson Engineering LLC prepared a technical memoranda dated February 8, 2018 that analyzed options to perform seismic retrofits to the existing reservoir, or replace it with one or two new smaller reservoirs. The analysis concluded two new smaller reservoirs provided a significant advantage over retrofitting the existing reservoir. Advantages included capital cost, water quality, improved water system pressure, resiliency of having two parallel reservoirs, maintenance, and feasibility of continued operations during construction and future maintenance. The analysis utilized a pair of identical concrete reservoirs, each 185,000 gallons, that totaled together 370,000 gallons.

In 2018, the District submitted a Hazard Mitigation Grant application to the Federal Emergency Management Agency (FEMA) to replace the Division 7 Reservoir with two new smaller reservoirs constructed to meet seismic standards, and to implement ShakeAlert on

the new reservoirs. The grant application utilized the conceptual reservoir sizing identified in Wilson Engineering's February 8, 2018 technical memorandum.

In late 2020, the District's grant application was still in review. FEMA requested additional information to complete their review of the application. Wilson Engineering prepared a second technical memorandum dated December 28, 2020. The memo included: (1) an analysis of the expected duration of a reservoir outage in the case of a severe earthquake that would impact the existing seismically vulnerable Division 7 reservoir, (2) an analysis of the population that would be impacted by an unexpected outage of Division 7 reservoir, (3) provided capital cost estimate of two welded steel water reservoirs and updated cost estimates for the two concrete reservoirs as detailed in the previous memorandum, and (4) life cycle cost analysis of new concrete reservoirs and new welded steel reservoirs – comparing capital and maintenance costs to achieve 100 year life of reservoirs. The conclusion was two smaller concrete reservoirs is the best overall long-term option.

In 2021, the District was notified of the receipt of a Hazard Mitigation Grant for the project with cost sharing as follows: FEMA 75%, Washington State Emergency Management Division (WA-EMD) 12.5%, and Lake Whatcom Water and Sewer District 12.5%.

As of August 2021, the total project cost estimate was $2.28M (design, permitting, construction).

The FEMA grant funding is split into two phases: Phase 1 – Design/Permitting; and Phase 2 – Construction. Phase 1 is in progress with the goal to complete in 2022. Phase 2 targets construction during the summer of 2023.

Phase 1 Design/Permitting Grant Funding is summarized as follows:

Federal Funds (75%)	$337,456.50
State Funds (12.5%)	$56,244.25
District Local Match Funds (12.5%)	$56,244.25
Total Grant Amount	$449,954.00

A grant agreement amendment is planned for Phase 2 Construction once predesign, design, and permitting are near completion so that the construction scope of work and construction costs are well defined.

Wilson Engineering and District staff have been working on preliminary design and tank sizing. Much coordination, discussion, and analyses has occurred between engineering consultants, staff engineering, operations and maintenance, and the District's water treatment plant operator. The proposed smaller reservoir sizes will change normal District operations at the Sudden Valley Water Treatment Plant (SVWTP) and distribution system reservoir service areas. Staff and engineering consultants have been working together to test operational changes to confirm simulation results and better understand what future operations will require.

County permit applications are in development. A pre-application meeting with the County is tentatively scheduled for mid-June, with the goal of permit application submittal to follow shortly after. Prior to submitting for permits, the District, at all levels from

operations/maintenance staff to the Board of Commissioners, and its public stakeholders need to come together on the proposed reservoir sizing. The existing reservoir is 1-million gallons, and the total proposed reservoir volume is 0.42-million gallons (including both proposed new reservoirs). Physical reservoir service area testing and simulation analyses show that the proposed reservoir sizing will meet full-buildout capacity of the District. Operations at the SVWTP will need to adapt, and improvements identified in the SVWTP 20-year facility plan are important to enable the plant to operate at variable flow rates as demand from growth occurs.

Wilson Engineering and District staff will provide a project briefing on predesign and tank sizing efforts completed to date, update on project progress, upcoming milestones, and stakeholder engagement and education.

FISCAL IMPACT

Discussion only.

APPLICABLE EFFECTIVE UTILITY MANAGEMENT ATTRIBUTE(S)

Infrastructure Strategy and Performance
Community Sustainability

RECOMMENDED BOARD ACTION

No action is recommended.

PROPOSED MOTION

Not applicable.

LAKE WHATCOM WATER AND SEWER DISTRICT

Division 7 Reservoir Seismic Upgrade and Shake Alert Implementation Project

Project Overview and Update

May 25, 2022

WILSON ENGINEERING

Div 7 Reservoir - Presentation Overview

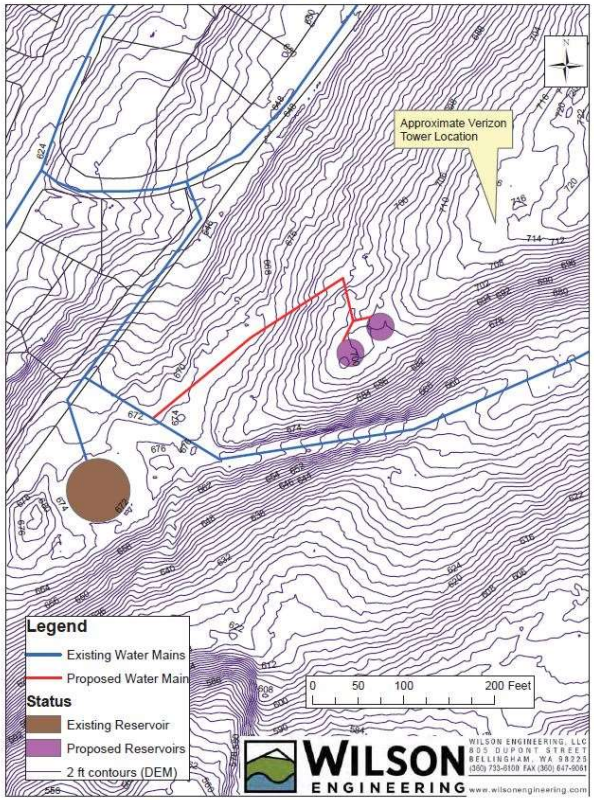
- Project Background
- Design Background and Criteria
- Distribution System Operation
- Distribution System Changes
- Proposed Tanks Simulation Analyses
- Field Testing and SVWTP Operational Changes
- Proposed Reservoir Sizing
- Project Timeline
- Construction Costs

Div 7 Reservoir - Project Background

Div 7 Reservoir - Project Background

- December 2016 structural analysis report (BHC Consultants) – Division 7 Water Reservoir identified as structurally and seismically deficient, HIGH PRIORITY for replacement.

Figure 1 - Division 7 Reservoir - Proposed Replacement with 2 Reservoirs

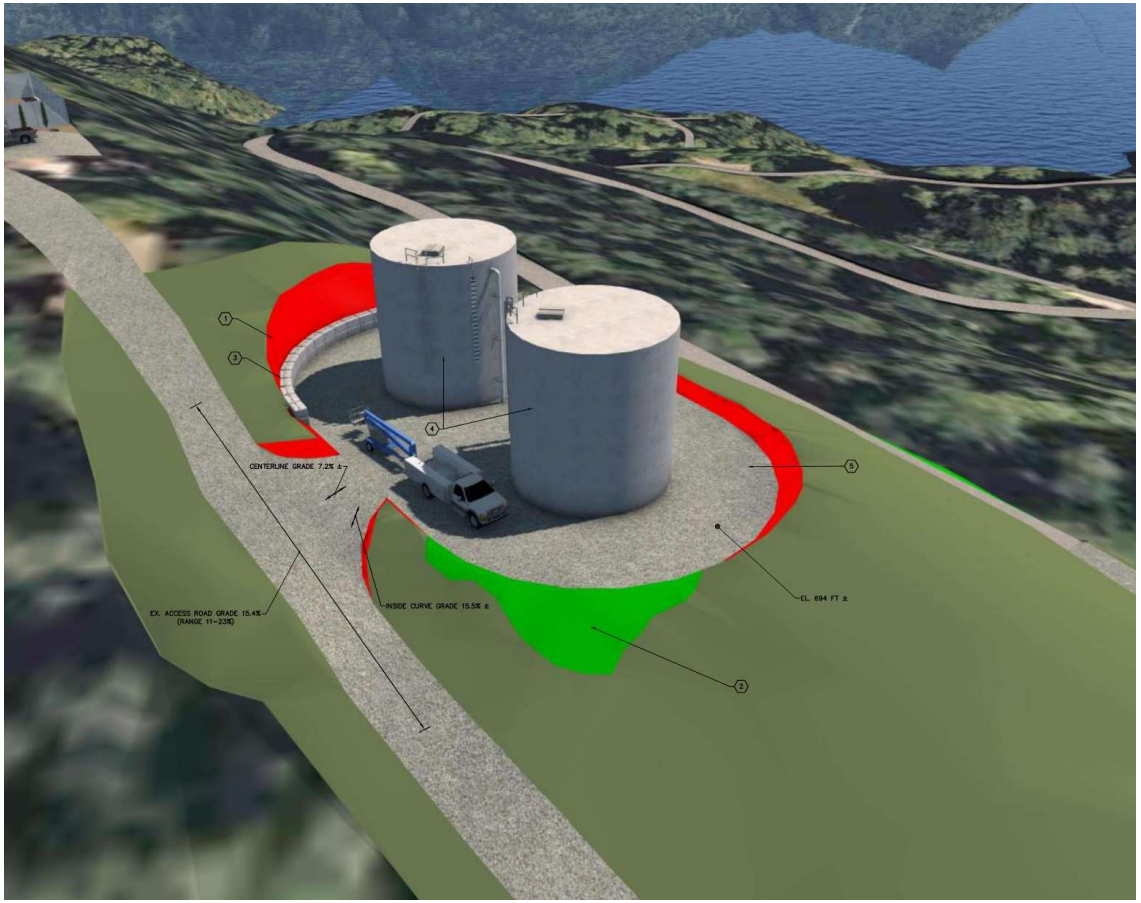


- 2016 Water System Plan Update (Wilson Eng.) – Capacity Analysis shows Division 7 Reservoir oversized. Recommended alternatives analysis for upgrades and repair of existing tank vs. replacing with more appropriate size.

- Feb 2018 Alternatives Analysis Tech Memo (Wilson Eng) – Recommended alternative to replace with two appropriate sized concrete tanks.

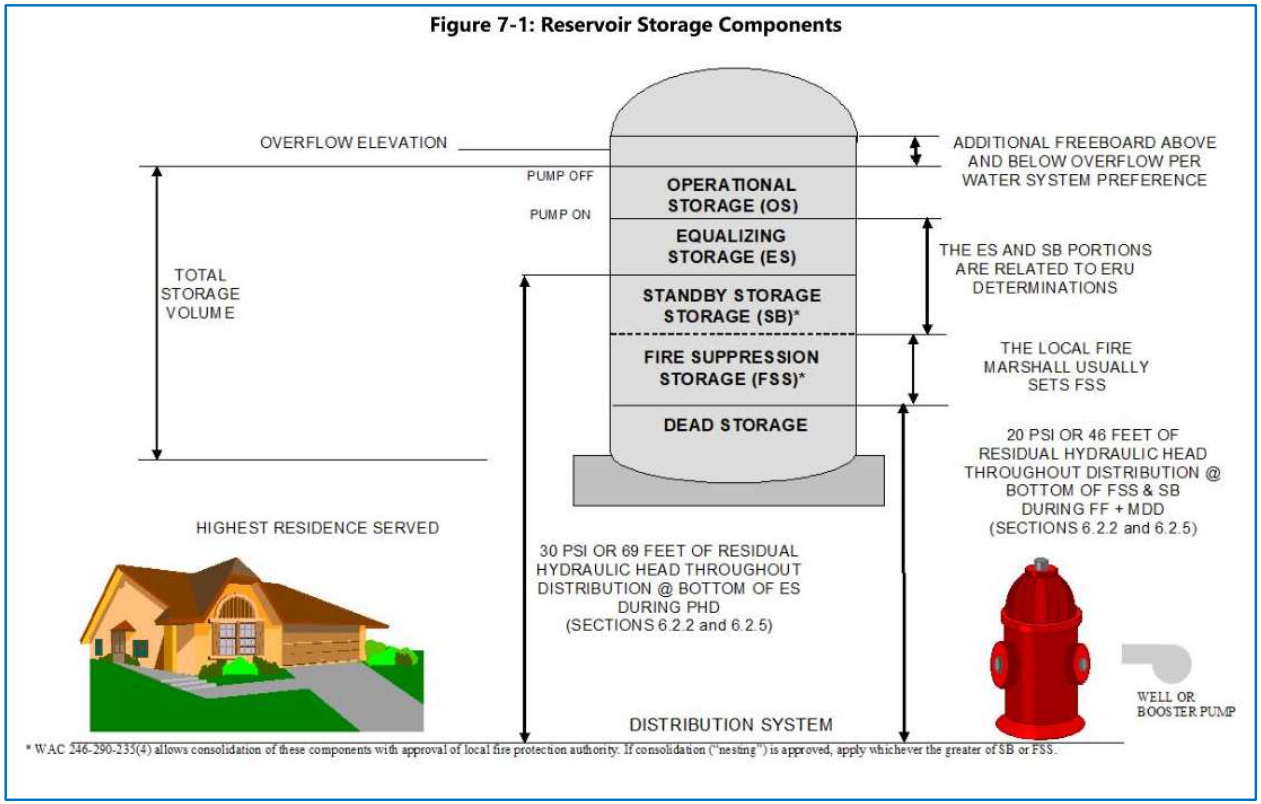
Div 7 Reservoir - Project Background

- 2018 District applied for FEMA Hazard Mitigation Grant to fund the reservoir replacement project, and implement ShakeAlert (earthquake early warning system) on these reservoirs and elsewhere.
- December 2020 Grant Application Supplement Tech Memo (Wilson Eng). – confirmed long-term preferred approach was two concrete reservoirs.
- Fall 2021 District selection of consultant team.
- Currently in progress – Funding Phase 1 Design and Permitting.



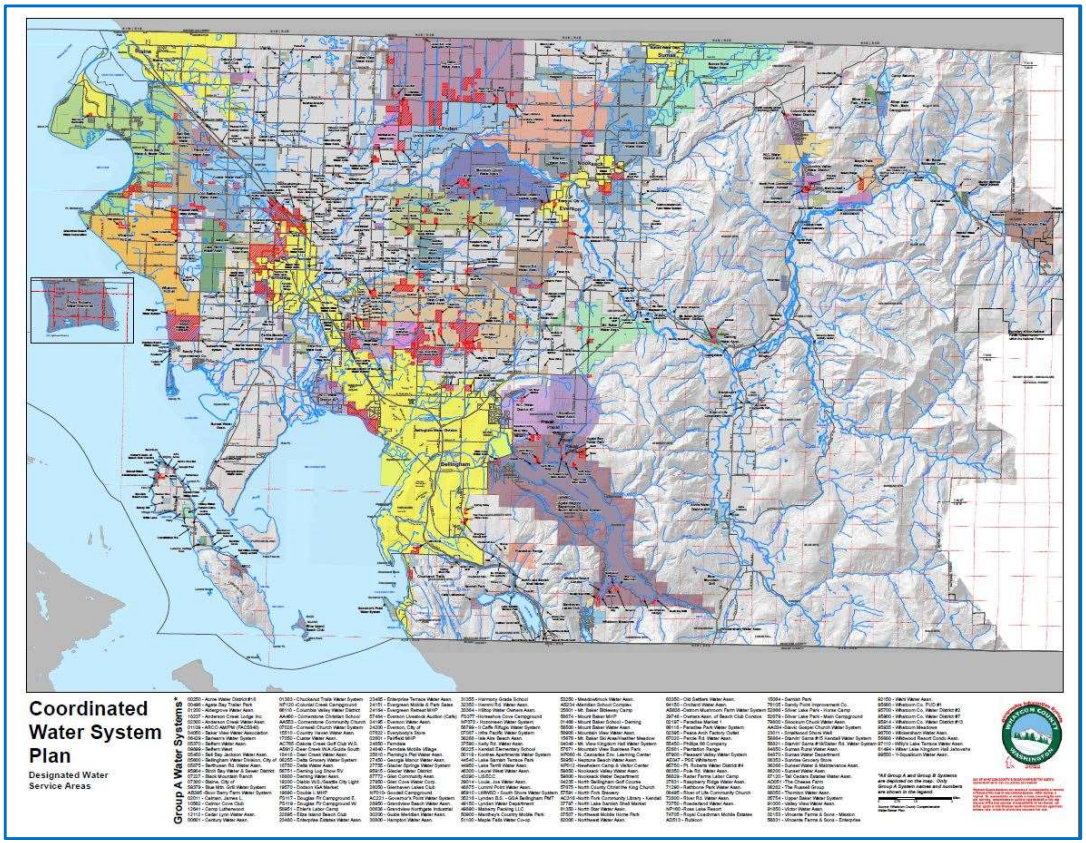
Div 7 Reservoir – Design Background/Criteria

- WA State Department of Health – Water System Design Manual
  - Framework for consistent water system designs for safe and reliable drinking water.
  - Regularly reviewed and updated, latest edition June, 2020.
  - Collaborated contributions from experienced experts in the industry; government regulators (engineers and planners), consulting engineers, municipalities, and operators.



Div 7 Reservoir – Design Background/Criteria

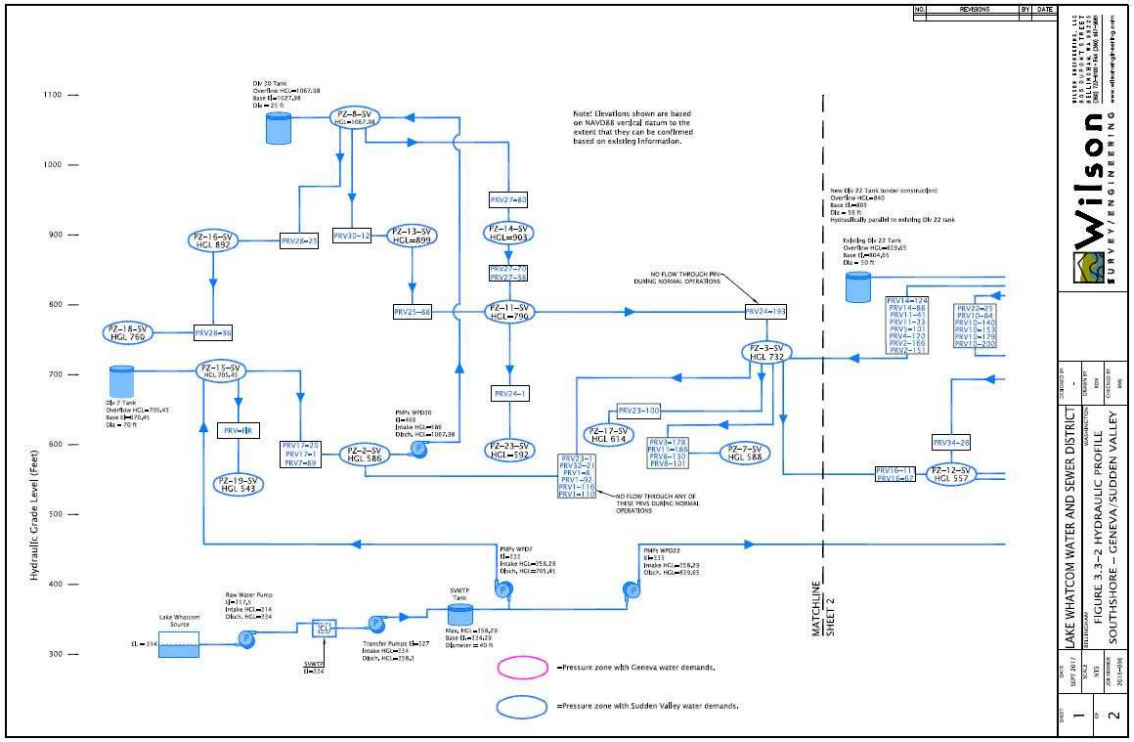
- Whatcom County Coordinated Water System Plan



- "Regional Supplement" to individual approved WSPs throughout Whatcom County.
- Prepared and submitted by the Whatcom County Water Utility Coordinated Committee (WUCC), representing dozens (>60) of water systems in Whatcom County; large and small, urban and rural, Associations and Districts and municipalities.
- Fire flow rate and duration requirements and recommendations were developed in coordination with the County Fire Marshal and the WUCC.
- Adopted by Whatcom County Council August 9, 2016.
- Approved by WA State DOH September 15, 2016.

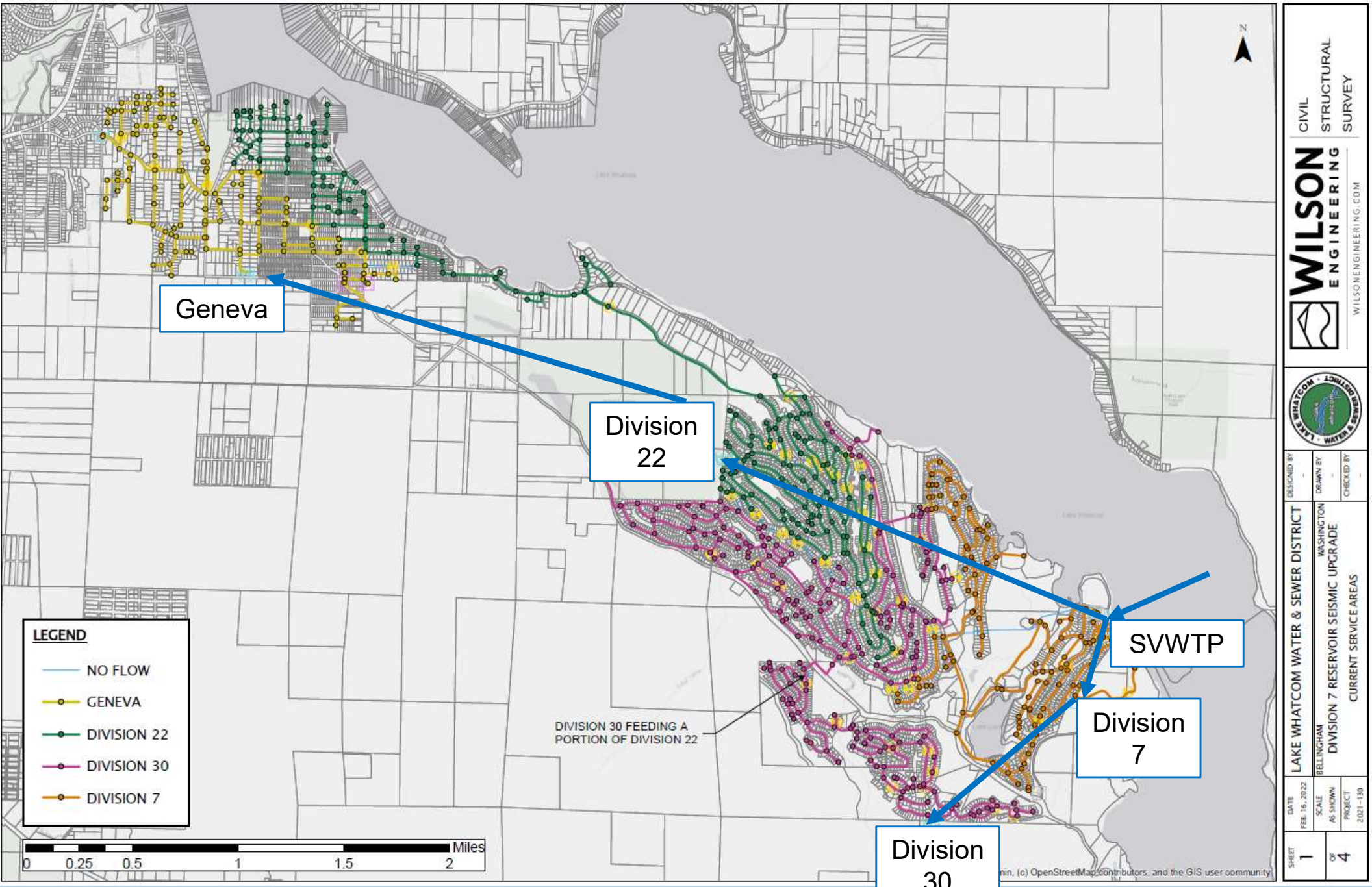
Div 7 Reservoir – Design Background/Criteria

- LWWSD Comprehensive Water System Plan
  - Adopted by LWWSD Board June 27, 2018
  - Approved by WA State DOH October 3, 2018
  - Establish Design Standards
    - Water Use - past, current, trends
    - Design parameter ADD, MDD, PHD
    - Fire Flow rate and duration

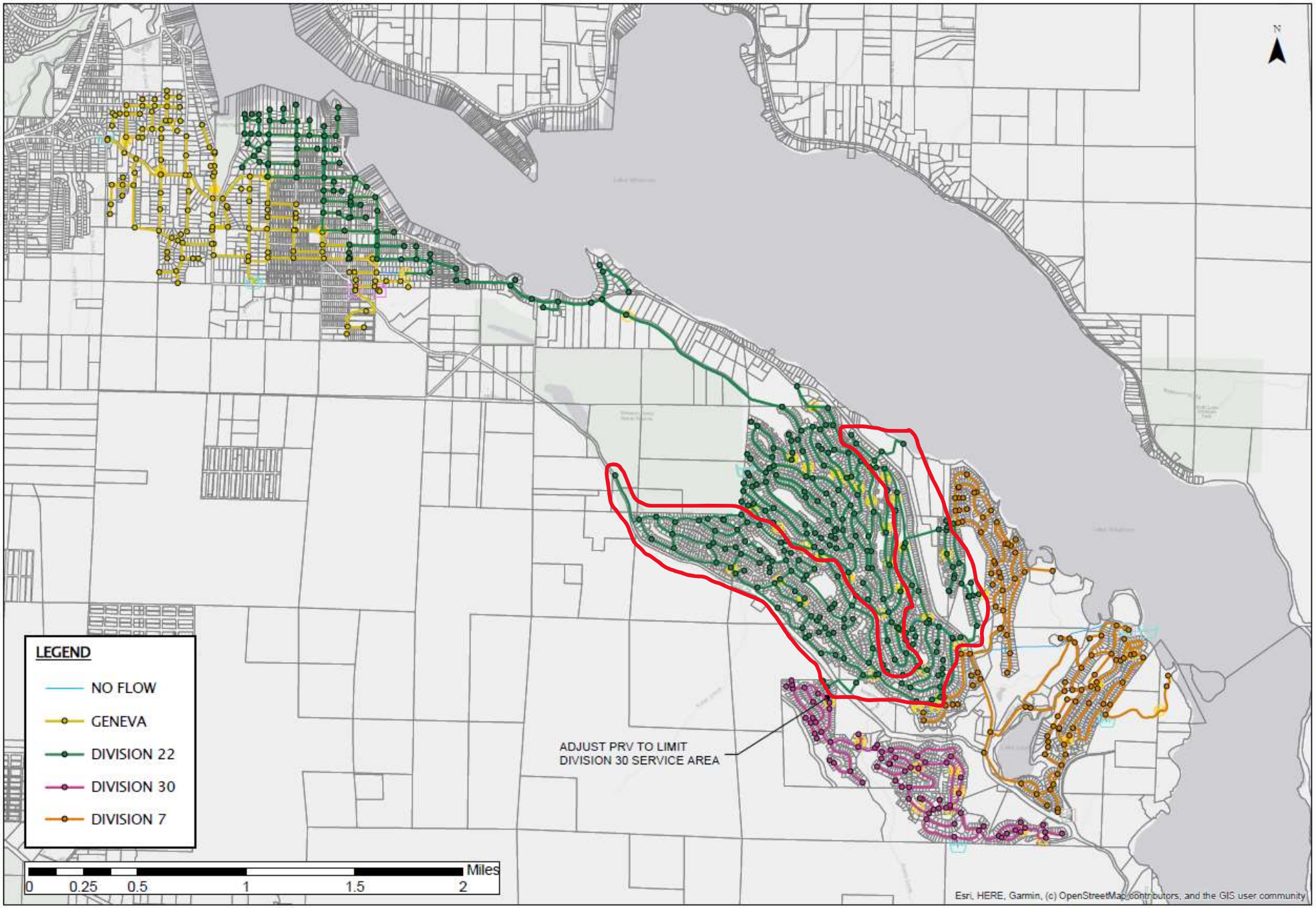


- Other Design Considerations:
  - Build-Out Conditions
  - Water age, negative water quality effects
  - Operational inefficiencies
  - Two tanks vs. One tank
  - New Site

Div 7 Reservoir – Distribution System Operation



Div 7 Reservoir – Distribution System Changes



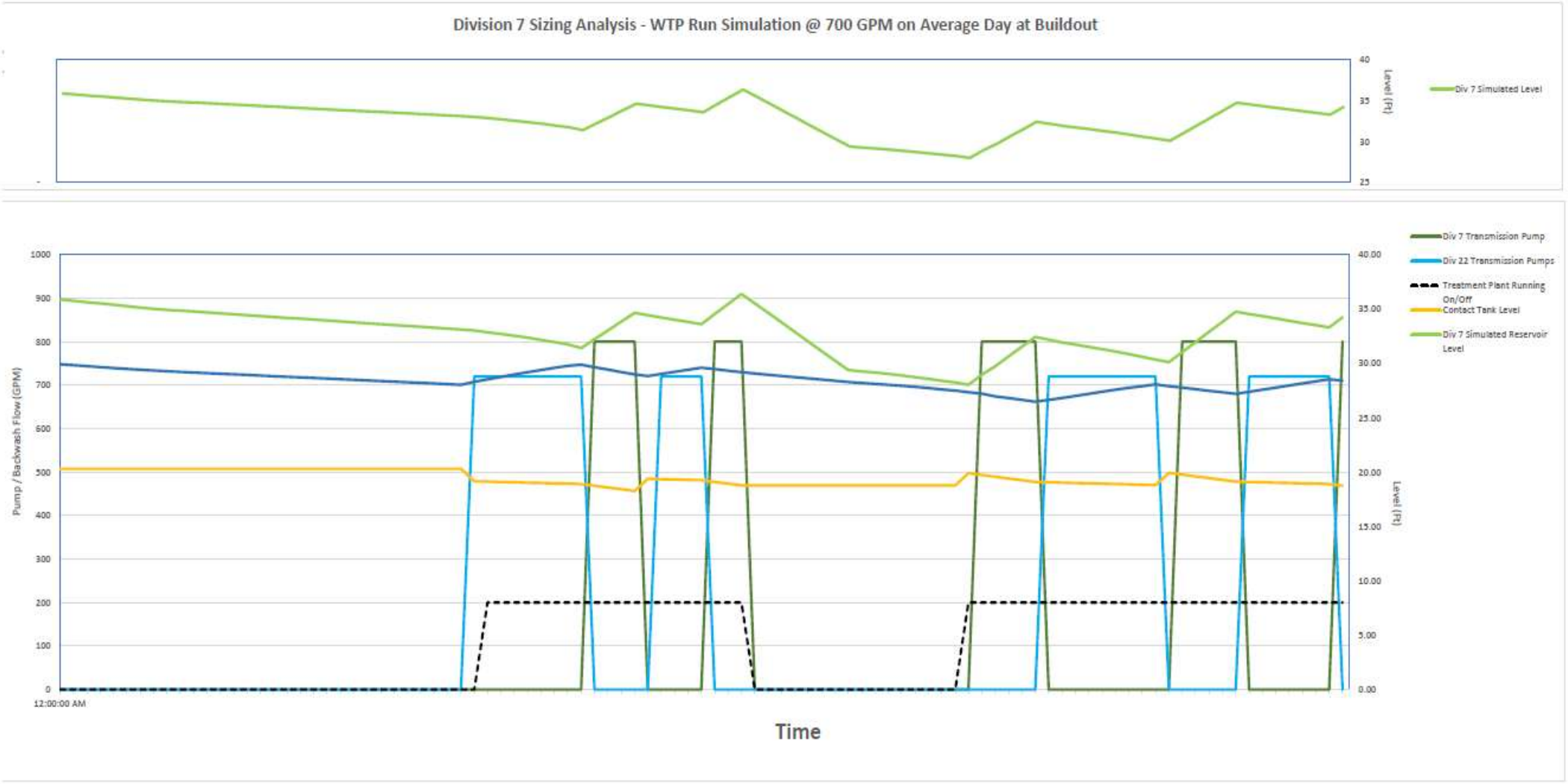
Div 7 Reservoir – Simulation Analyses, Proposed

Option C Summary:

Reservoir	Capacity (gallons)	Build-out ERUs: Geneva	Build-out ERUs: Sudden Valley	Sum of required storage (gallons)	Surplus of storage (gallons)	Surplus of storage (%)
Proposed Division 7A	422,800		1078	419,384	3,416	0.8%
Proposed Division 7B						
Division 22	1,158,859	178	2333	976,340	182,519	15.7%
Division 22 New						
Division 30	146,869		369	112,445	34,425	23.4%
Geneva	508,333	692		266,606	241,726	47.6%

Note: Fire Suppression Storage is nested within Standby Storage for all reservoirs

Div 7 Reservoir – Simulation Analyses, Proposed



Div 7 Reservoir – SVWTP Operational Changes

- Proposed distribution system changes result in:
  - More demand on Div 22 reservoirs
  - Less demand on Div 7

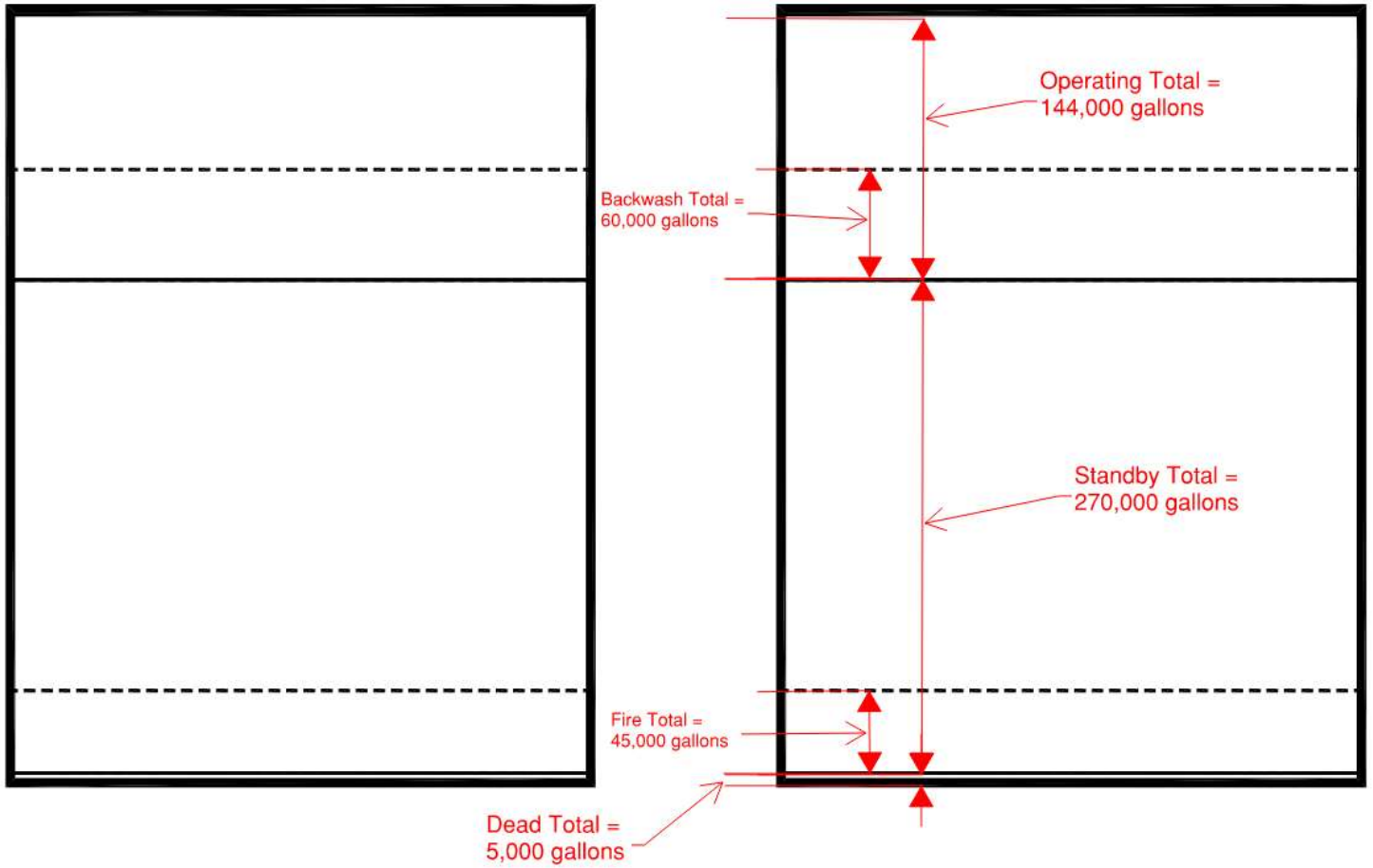
- Implementing lead/lag control scheme for Div 7 / Div 22 transmission pumps

Div 7 Reservoir – Progression of Field Testing and SVWTP Operational Changes

- New control scheme to work under all conditions:
  - Existing distribution system operation or proposed distribution system operation
- Step 1: Implementing new transmission pump control strategy
  - Currently underway
- Step 2: Implement distribution system operation modification
  - Had tested previously, but now with new pump control strategy
- Step 3: Planning to test SVWTP production at 1,000 gpm with the above two changes
  - 1,000 gpm production not required for proposed Div 7 tanks, but dovetails nicely with project and is almost necessary
    - To meet peak summer demands
    - To keep tanks from draining during a significant leak

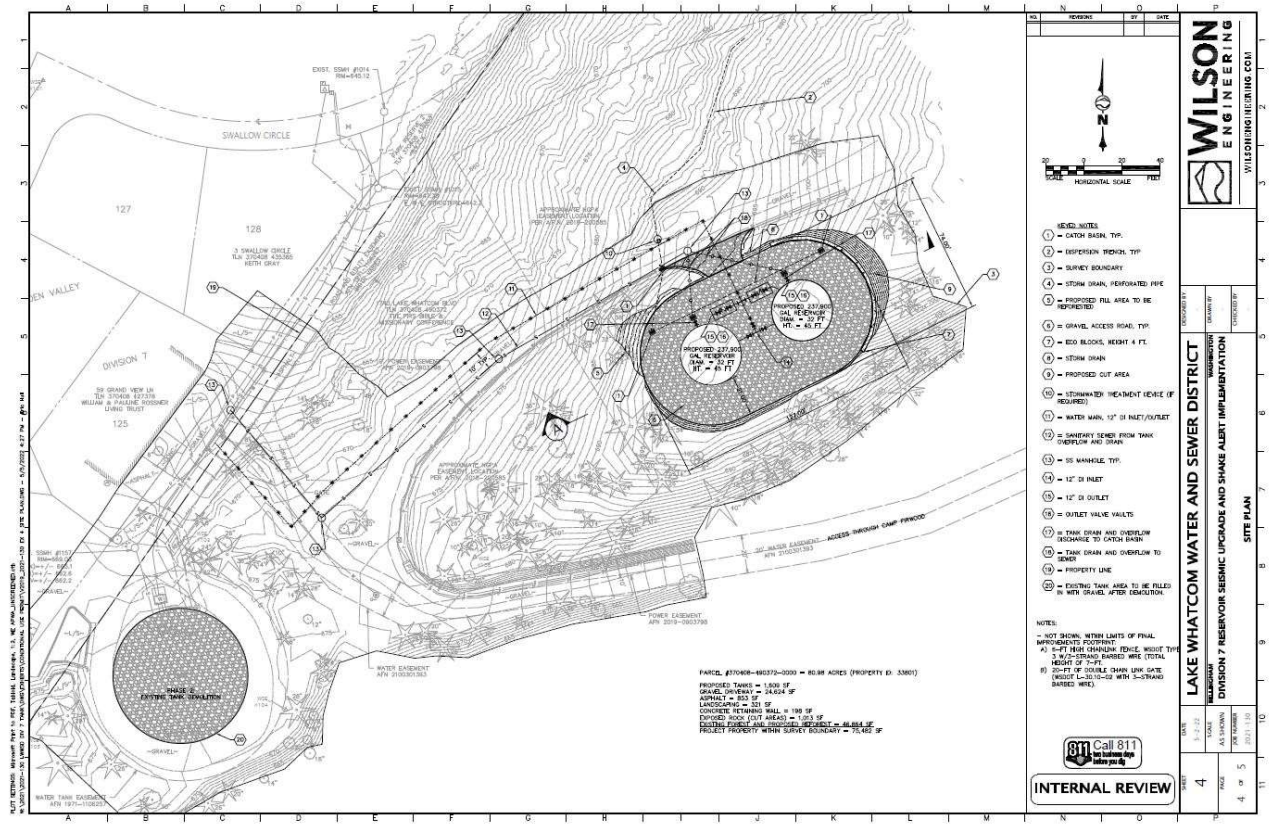
Div 7 Reservoir – Proposed Reservoir Sizing

- Div 7 reservoir volumes:
  - Operating is nearly identical to current
  - Equalizing is not needed
  - Standby is less than current standby
    - Driven by number of connections being served, which is going down significantly
  - Existing Div 7 had excessive storage capacity
    - Removing the excessive volume will improve system efficiency and improve water age



Div 7 Reservoir – Project Timeline

- Completed:
  - Survey
  - Geotechnical investigation
  - Telemetry testing
- In-Progress:
  - Operational optimization
  - Final Sizing
  - Preparing Permitting Applications/Documents
  - Preliminary Design
  - Easement negotiations

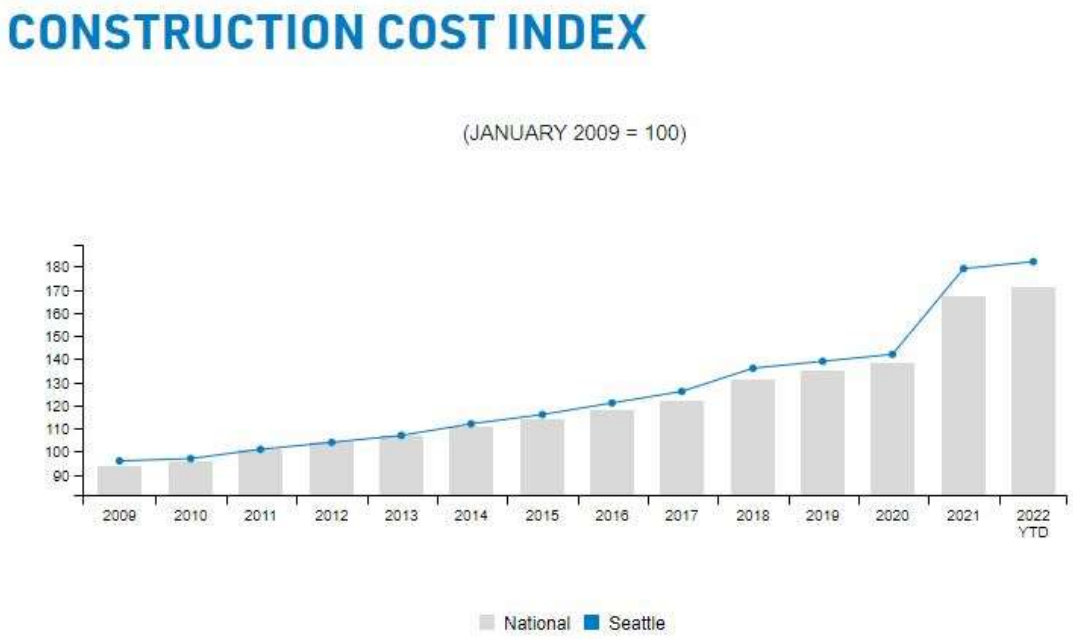


Div 7 Reservoir – Project Timeline

- Future Target Dates:
  - County Pre-Application Meeting; mid-June
  - DOH Project Report; July 2022
  - Conditional Use Permit and Variance; submit early August 2022
  - Design and Public Outreach; Aug-Dec 2022
  - Bidding; January 2023
  - Construction; June 2023

Div 7 Reservoir – Project Construction Cost Estimate

- Construction Cost Estimate (ROM, Pre-Design):
  - New Facilities = $2.1 M (incl. 20% contingency, sales tax)
  - Demo Existing = $225,000
  - TOTAL = $2.4 M
- Industry Wide Cost Escalation



The *Mortenson Cost Index* is showing a single quarter increase of 2.3% nationally and 1.6% in Seattle. Over the last twelve months, costs increased 18.3% nationally and 21.8% in Seattle.

Source: Mortenson, Cost Index, Seattle: https://www.mortenson.com/cost-index/seattle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