



Lake Whatcom Water and Sewer District

Sudden Valley WTP Assessment Project

June 29, 2021

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Presentation Outline

- Project Description & Purpose
- Project History
- Alternatives Analysis Summary
- Risk Assessment Summary
- WTP Alternatives Analysis Report
- Next Steps



Project Description & Purpose

- South Shore Water System Assessment
 - Assess conditions at Sudden Valley WTP
 - Provide basis for decision making with regards to WTP modifications and / or continued use
 - Phase I
 - Assess existing condition of structures and equipment
 - Phase II
 - Provide alternatives analysis & recommendations

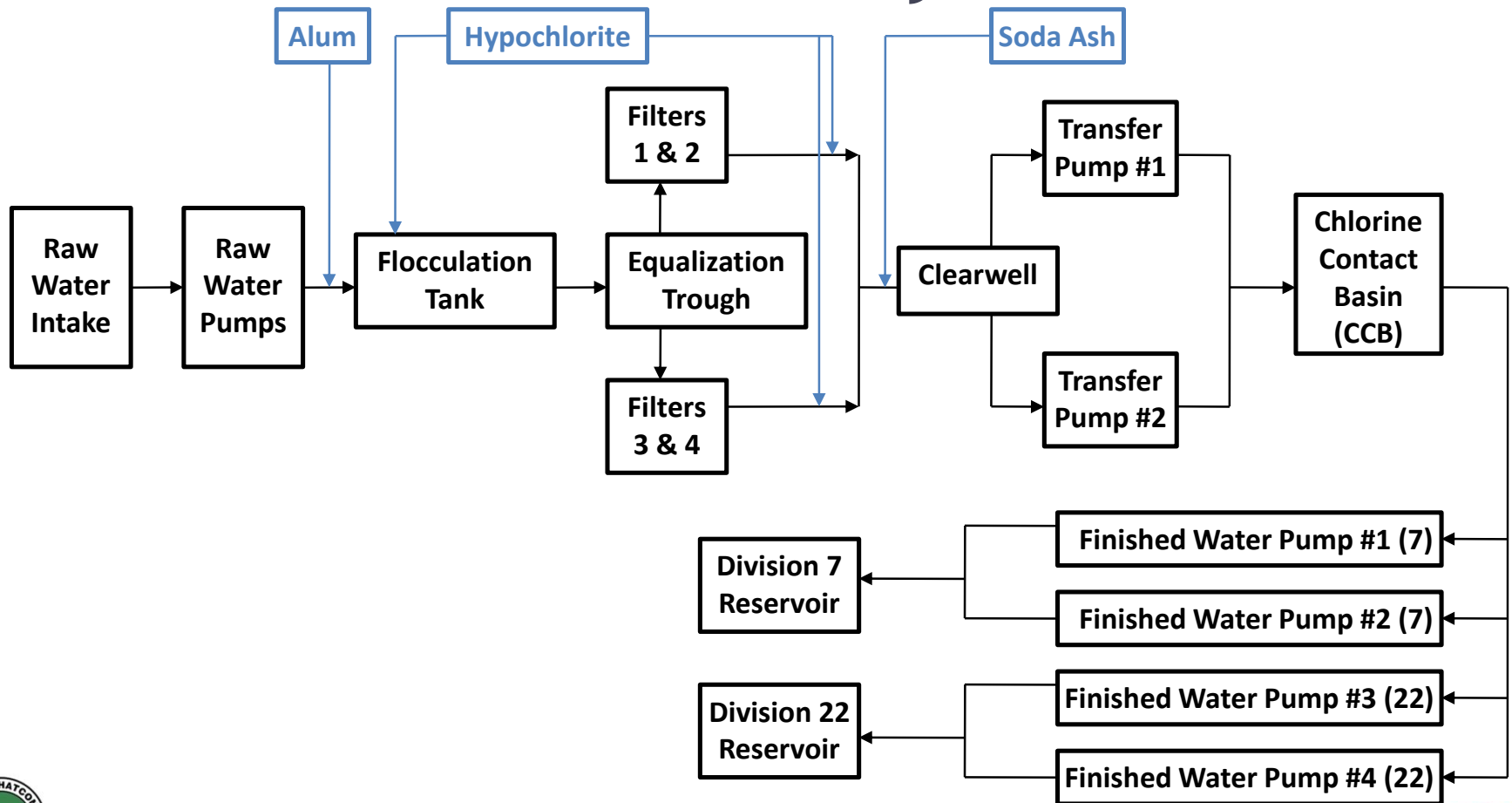


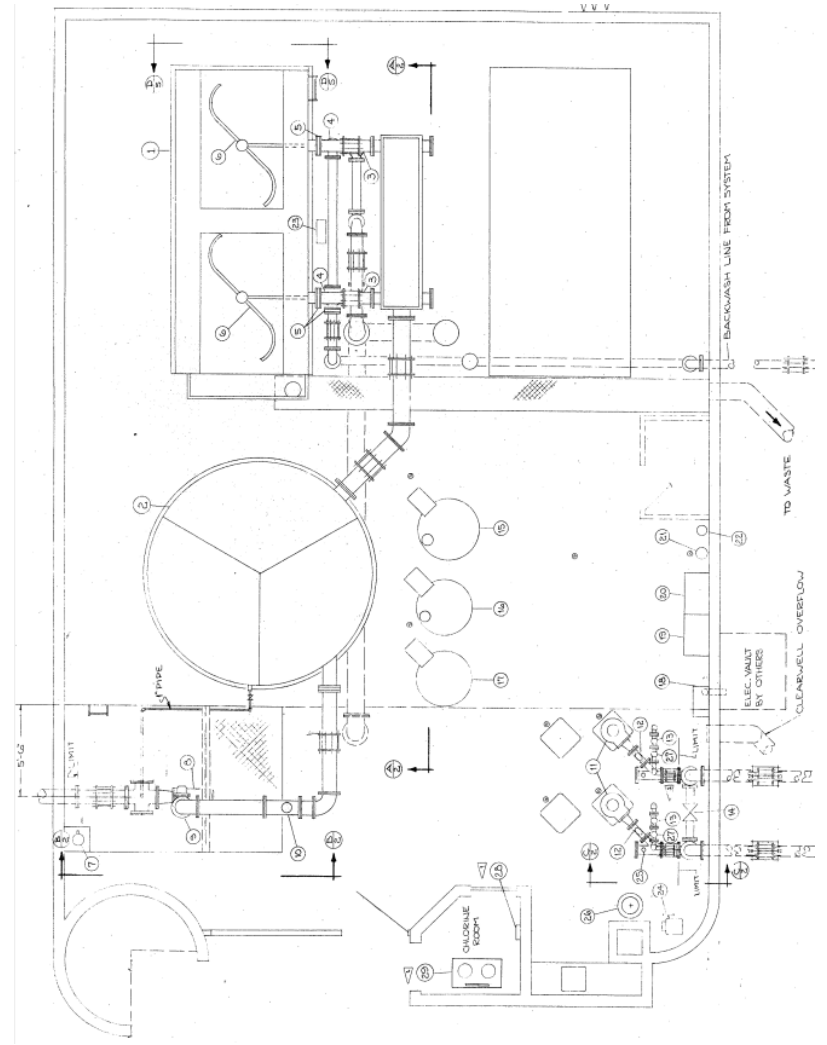
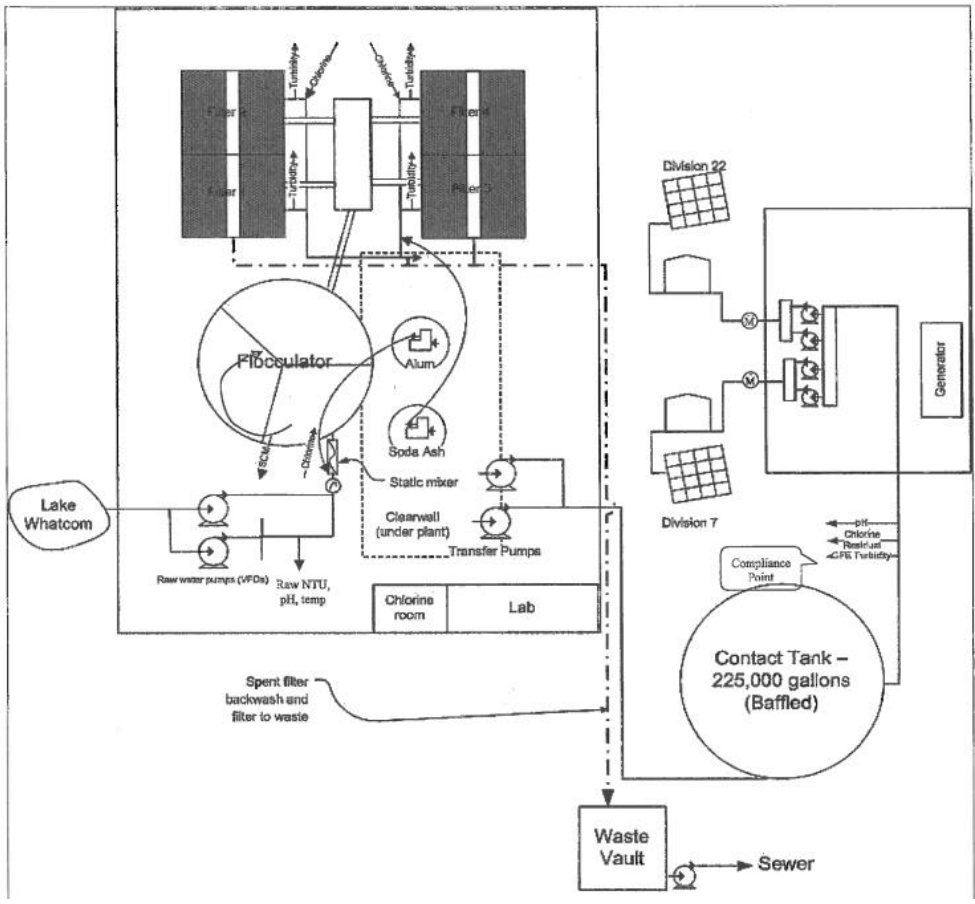
Project History

- Phase I - WTP Condition Assessment
 - Assessed existing buildings and process in February 2020
 - Process, Electrical, Structural, HVAC



WTP Process Summary





Project History

- Phase I - WTP Condition Assessment
 - Assessed existing buildings and process in February 2020
 - Process, Electrical, Structural, HVAC
 - Assessment Report completed in July 2020
 - Identified both high and low priority improvements
 - Structures were in good condition
 - Treatment is effective, but some components showing signs of age and use
 - Lack of available space
 - Anchoring and supports need seismic upgrades
 - Minor to moderate corrosion and/or deterioration
 - Some lack of redundancy puts WTP at risk



TABLE 3-1**Sudden Valley WTP High Priority Modifications Summary**

Modification	Location⁽¹⁾	Discipline⁽²⁾
Conduct chlorine disinfection system alternatives analysis	MB	P
Chlorine gas system modifications	MB	P
Alum storage and metering pump system modifications	MB	P
Soda Ash storage and metering pump system modifications	MB	P
Conduct backwash system alternatives analysis	MB	P
Replace existing clearwell and CCB level switches	MB	P
Replace corroded steel supports	MB	S
Prepare and coat steel tanks (Floc, Soda Ash, and Filters 1/2)	MB	S
Install seismic bracing for electrical conduit, electrical equipment, and treatment equipment	MB/FPB	S
Complete detailed structural evaluation	MB/FPB	S
Relocate existing laboratory electrical equipment	MB	A
Remove soil cover, vegetation growth, and organic debris from building exterior and roof	MB	A
Provide water upgrades to safety shower and eyewash	MB	A
Add fire and smoke alarm system	MB/FPB	A
Investigate current heating schedule	MB/FPB	M
Combine all existing plant records into a single as-built planset	MB/FPB	E
Complete a comprehensive electrical system audit	MB/FPB	E
Remove chemicals and metering equipment away from MCCs	MB	E
Review historical peak demand electrical consumption	MB/FPB	E
Replace MCC1 and MCC2 with new, current technology	MB/FPB	E
Replace MCC3 to address panel and interior component corrosion	MB	E

(1) MB = WTP Main Building. FPB = Finished Water Pump Building. CCB = Chlorine Contact Basin.

(2) P = Process, S = Structural, A = Architectural, M = Mechanical, and E = Electrical.



TABLE 3-2

Sudden Valley WTP Recommended Modifications Summary

Modification	Location ⁽¹⁾	Discipline ⁽²⁾
Modify/repair existing flocculation tank	MB	P
Provide new grout floor within raw water pump pit	MB	P
Drain and clean the clearwell	MB	P
Procure spare backwash flow meter	MB	P
Procure dedicated confined space equipment for the WTP	MB	P
Install additional access ladder to Filters 1 and 2 and Filters 3 and 4	MB	P
Revise CT calculations to include clearwell and BE of 0.1	MB	P
Revise piping and conduit above flocculation tank	MB	P
Provide additional Operator In Trouble alarming equipment	MB/FPB	P
Replacing existing tube-style level alarm at flocculation tank	MB	P
Procure a spare finished water pump motor	FPB	P
Replace existing pressure gauges	FPB	P
Improve the visibility of the existing clearwell hatch	MB	P
Complete a performance test of the raw water, transfer, and finished water pumps	MB/FPB	P
Prepare and coat exposed ceiling rebar	MB	S
Address deficiencies found in 2016 seismic report	CCB	S
Perform formal CCB coating inspection	CCB	S
Address deteriorating conditions in restroom	MB	A
Investigate additional site security measures	MB/FPB	A
Remove heavy organic debris from roof	FPB	A
Repair wall seepage above MCC3	MB	A
Repair seepage/leaks at storefront window assemblies	MB	A
Modify floor to promote drainage to existing trench drain	MB	A
Revise existing storefront window to provide larger door opening	MB	A
Relocate stored filter media and other supplies equipment	MB	A
Conduct energy and heat audit	MB/FPB	M
Repair crack in generator exhaust piping	FPB	M
Conduct annual load testing for existing generator	FPB	E
Replace existing fluorescent light fixtures with LED equipment	MB/FPB	E
Replace AC backed system with DC backed systems	MB/FPB	E
Consolidate existing electrical panelboards	MB/FPB	E
Reroute floor mounted electrical conduit	MB/FPB	E
Reroute field wiring within grey/blue wall mounted panels	MB	E
Modify transfer pump pad based on long-term operations strategy	MB	E
Fuel tank relocation investigation	FPB	E

(1) MB = WTP Main Building. FPB = Finished Water Pump Building. CCB = Chlorine Contact Basin.

(2) P = Process, S = Structural, A = Architectural, M = Mechanical, and E = Electrical.



Project History

- **Phase II - WTP Alternatives Analysis**
 - Incorporate Assessment recommendations and analyze various treatment alternatives
 - A la carte approach
 - Pumping, seismic, structural, and coatings
 - Chemical, disinfection, filtration, and backwash
 - Board presentations for involvement/education
 - Final Alternatives Analysis Report
 - Assessment Report
 - Board & Staff input
 - Financial Analysis information
 - Recommendations for District implementation



Project Goals

- Phase II - Alternatives Analysis
 - G1 - Maintain exceptional WQ performance record
 - G2 - Accommodate immediate need for additional space and separation of chemicals/electrical equipment
 - G3 - Provide adequate equipment and process redundancy
 - G4 - Improve access and flexibility for equipment repair/rehabilitation and/or future expansion
 - G5 - Provide capacity for full buildout flow (1,400 gpm)
 - G6 - Provide treatment equipment for 30 or 50-year time period



Alternatives Analysis Summary

- Pump Performance – TM1
 - Pump flow and pressure testing
 - Finished water Pumps
 - Performing at or near design curve
 - Lack of optimized control (VFDs)
 - Associated electrical components outdated
 - Transfer Pumps
 - Testing not completed due to component restrictions
 - Lack of optimized control (VFDs)
 - Associated electrical components outdated
 - Raw Water Pumps
 - Testing not completed due to component restrictions
 - Associated electrical components outdated and corroded
 - Recommendations
 - Plan for replacement of FWP and TP. Replace RWPs



Alternatives Analysis Summary

- Pump Performance – TM1
 - Pump flow and pressure testing



Raw Water Pumps – Raw Water Pump 2 is original (1972) and near the end of its recommended useful life.



Transfer Pumps – Pumps are original (1992) and near the end of their recommended useful life.



Finished Water Pumps – Pumps are original (1992) and near the end of their recommended useful life.

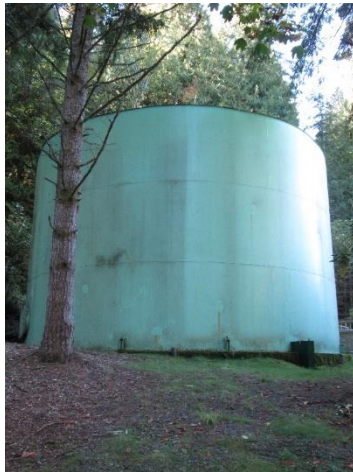
Alternatives Analysis Summary

- Chlorine Contact Basin Coatings – TM2
 - Interior and Exterior Coating Assessment
 - Exterior sidewall coating in fair condition
 - Recommend replacement within 5-10 years
 - Exterior roof coating in moderate/poor condition
 - Recommend replacement within 5 years
 - Interior coating in fair condition
 - Recommend replacement within 5-10 years
 - Recommendations
 - Seal welding, additional roof hatch, exterior ladder security, additional access security measures
 - New exterior and interior coating systems (<7 years)



Alternatives Analysis Summary

- Chlorine Contact Basin Coatings – TM2
 - Interior and Exterior Coating Assessment



CCB – Tank was erected in 1992.



Corrosion – Tank has several corrosion spots, some of which have been repaired.



Algae – Roof exhibits lichen and algae growth, both of which may have damaged the coatings.

Alternatives Analysis Summary

- Seismic Analysis– TM3
 - Complete Tier 2/Tier 3 Seismic analysis
 - Main Building
 - No structural deficiencies identified
 - Non-structural deficiencies include additional bracing
 - Finished Water Pump Building
 - Shear wall and diaphragm shear structural deficiencies
 - Non-structural deficiencies include additional bracing and securing existing gas piping
 - Chlorine Contact Basin (CCB)
 - Foundation ring wall deficiencies identified (BHC, 2016)
 - Nonstructural deficiencies include flexible piping connections



Alternatives Analysis Summary

- Seismic Analysis– TM3
 - Complete Tier 2/Tier 3 Seismic analysis



Seismic support –
Example of piping with
insufficient seismic support



Seismic support –
Example of equipment with
insufficient seismic support



Seismic Support – Conduit within the
FWP Building with insufficient seismic
bracing.

Alternatives Analysis Summary

- Chemical System– TM4
 - Alum (coagulant) & Soda Ash (pH control) system
 - Alum
 - Best coagulant for District use
 - Tank is beyond useful life, metering pump lacks redundancy and controls, tank filling is cumbersome, tank location restricts other WTP uses
 - Soda Ash
 - Best pH control for District use
 - Tank in fair condition, mixers in poor condition, access is restricted and requires significant manual labor for addition, chemical storage in building
 - Tank location restricts other WTP uses and likely contributes to corrosion of piping and other equipment
 - Recommendations
 - Replace alum tank, both metering pump systems, soda ash mixers
 - Relocate components to new chemical room/building to provide separation and reduced labor



Alternatives Analysis Summary

- Chemical System– TM4
 - Alum (coagulant) & Soda Ash (pH control) system



Alum Storage Tank – HPDE. Installed in 1992 and beyond its recommended useful life (15-17 years).



Soda Ash Storage Tank & Platform – Welded steel. Installed in 1992 and in good condition. Platform in fair condition while the mixer is in poor condition



Metering Pumps – Lack of features requires daily manual calibration.

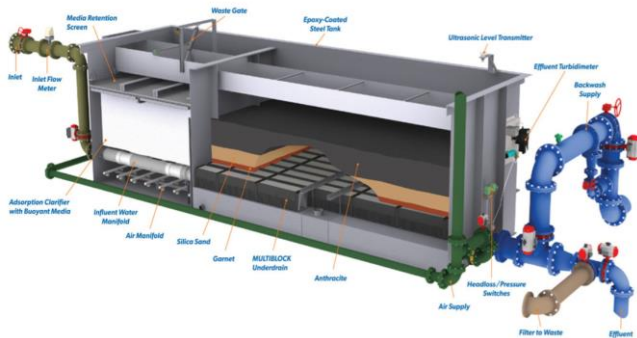
Alternatives Analysis Summary

- Filtration System– TM5
 - Filtration Alternatives
 - Status Quo
 - Rehabilitate all components for continued use in existing bldg.
 - Modified use of existing filters
 - New pretreatment, filter rehabilitation,
 - Requires new building
 - New rapid rate mixed media filter units
 - New filters with pretreatment
 - Requires new building
 - New membrane treatment filter units
 - New treatment and filtration
 - Requires new building



Alternatives Analysis Summary

- Filtration System– TM5
 - Filtration Alternatives



* Typical package filtration equipment with contact adsorption clarifier (CAC).



* Typical membrane filtration equipment



DAF – Dissolved Air Flotation treatment package.

Alternatives Analysis Summary

- Disinfection System– TM6
 - Gas Chlorine injection and Chlorine Contact Time
 - Disinfection
 - Gas chlorine, bulk hypochlorite, and onsite hypchlorite generation alternatives
 - Most alternatives require new building
 - Chlorine Contact
 - CCB size and BE limit flow through the WTP
 - Alternatives include reuse of existing, new larger replacement CCB, and new supplemental CCB
 - High priority item and construction sequencing must be considered to ensure distribution system supply



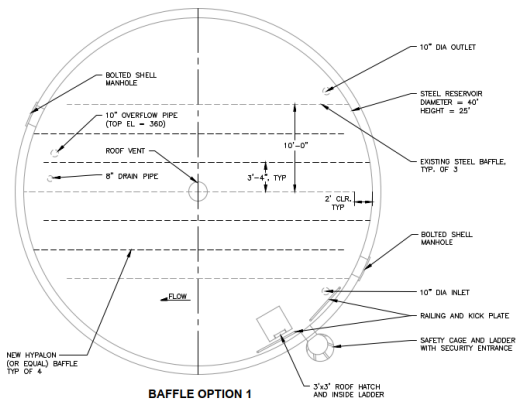
Alternatives Analysis Summary

- Disinfection System– TM6
 - Gas Chlorine injection and Chlorine Contact Time

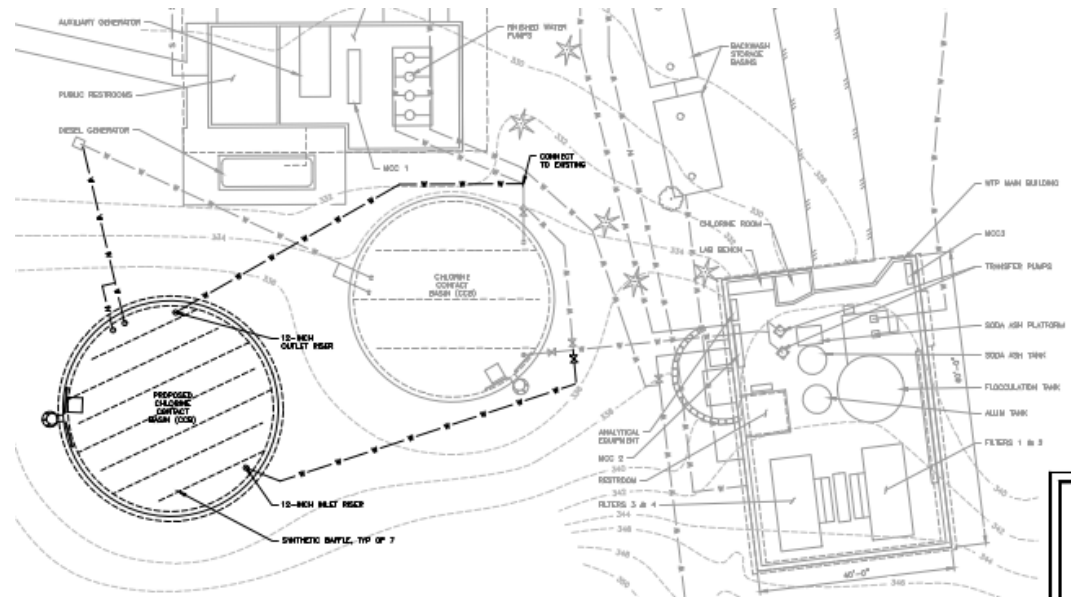


Alternatives Analysis Summary

- Disinfection System– TM6
 - Gas Chlorine injection and Chlorine Contact Time



* Proposed CCB modifications.



* Proposed new CCB.



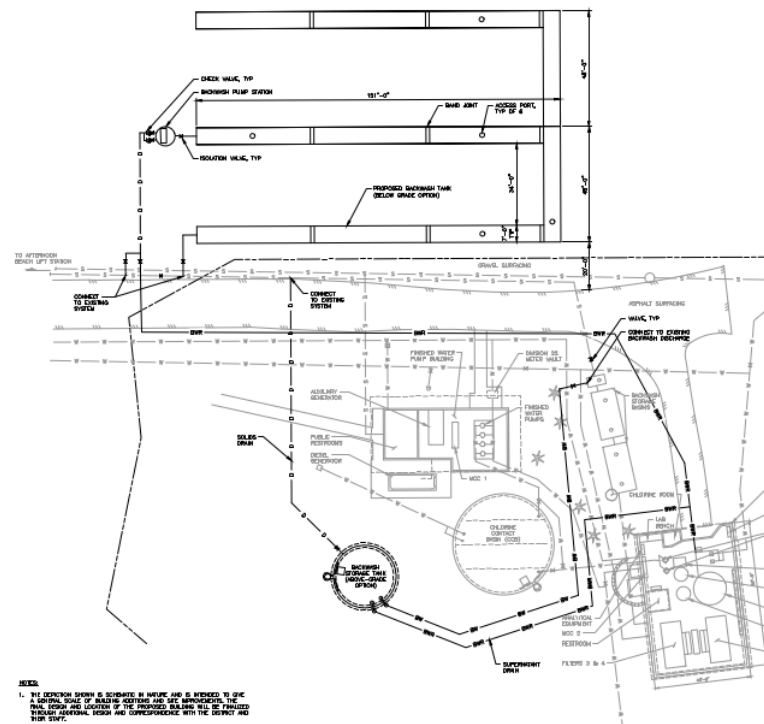
Alternatives Analysis Summary

- Backwash System– TM7
 - Filter Backwash System
 - Alternatives include continued municipal sewer discharge, Lake Whatcom discharge, and recycle
 - Below and above grade options
 - Status Quo
 - Expensive, cumbersome for high demand
 - Lake Whatcom
 - Significant monitoring and permitting requirements
 - Additional chemical addition systems likely
 - Recycle
 - Moderate monitoring and permitting requirements
 - Reuse of existing CCB possible in any scenario
 - Depends heavily on desired use of existing CCB



Alternatives Analysis Summary

- Backwash System– TM7
 - Filter Backwash System



Alternatives Analysis Summary

- Structural & Architectural Components – TM8
 - WTP Main Building and FWP Building
 - WTP Main Building
 - No major structural deficiencies, some corrosion of non-structural components (MCC's, supports, piping, etc.)
 - Lacks space and access to equipment, non-compliant safety shower and eye-wash, security should be improved
 - Alternatives included expansion “up” and “out”
 - Finished Water Pump Building
 - Two structural deficiencies identified. Additional seismic bracing recommended
 - Lacks space and access for some equipment
 - No alternatives analyzed



Alternatives Analysis Summary

- Structural & Architectural Components – TM8
 - WTP Main Building and FWP Building



Risk Assessment Summary

- Risk Assessment – TM9
 - Quantitative assessment of risk of failure
 - Scoring based on numerical scale of likelihood for failure and severity if failure occurs
 - $\text{Score} = \text{Likelihood (1-5)} * \text{Severity (1-5)}$
 - Treatment processes broken down into components
 - Raw water intake,
 - Raw water pumps,
 - Raw water instrumentation,
 - Etc.



Risk Assessment Summary

- Risk Assessment

Component	Impact(s)	Confined Space or Health & Safety Hazard?	Likelihood	Severity	Combined Score	Rank
Raw water intake	Loss of production, no service.	Y	2	2	4	13
Raw water pumps	Loss of production, no service.	Y	3	3	9	6
Raw water instrumentation	DOH non-compliance, regulatory action	N	2	1	2	16
Alum delivery system	Decrease in water quality, increase in maintenance	Y	4	4	16	1
Flocculation tank	DOH non-compliance, decrease in water quality, increase in maintenance	N	2	3	6	9



Risk Assessment Summary

- Risk Assessment

High Risk	Moderate Risk	Low Risk	Minimal Risk
Alum delivery system	Raw water pumps	Raw water intake	Raw water instrumentation
Chlorine contact basin	Clearwell transfer pumps	Filters 1 & 2	Clearwell
	Cl Disinfection system	Filters 3 & 4	Finished water instrumentation
	Soda Ash delivery system		WTP Main Bldg. piping
	Finished water pumps		WTP FWP Bldg. piping
	Flocculation tank		WTP Main Bldg. electrical
	WTP SCADA		WTP FWP Bldg. electrical
	WTP Security		



WTP Alternatives Analysis

- Introduction
- Description of Existing Facilities
- Background and Project History
 - Technical memorandum summary
 - Risk assessment summary
- WTP Modification Alternatives
 - Minimum
 - Baseline
 - Maximum
- Summary and Recommendations



WTP Alternatives Analysis - Baseline

Short Term Improvements (<10 years)

- Replace finished water pumps
- Replace transfer pumps
- Replace raw water pumps
- WTP Main Building seismic retrofits
- Finished Water Pump Building seismic retrofits
- Chlorine gas modifications
- WTP Security improvements

Long Term Improvements (>10 years)

- Chemical addition system improvements
- New 0.3 MG CCB
- Rehabilitate existing filters
- Rehabilitate existing CCB
- Backwash recycle implementation



WTP Alternatives Analysis - Baseline

Short Term Improvements (<10 years)

- Replace finished water pumps
- Replace transfer pumps
- Replace raw water pumps
- WTP Main Building seismic retrofits
- Finished Water Pump Building seismic retrofits
- Chlorine gas modifications
- WTP Security improvements

Long Term Improvements (>10 years)

- Chemical addition system improvements
- New 0.3 MG CCB
- Rehabilitate existing filters
- Rehabilitate existing CCB
- Backwash recycle implementation



WTP Alternatives Analysis

- **Baseline Alternative**
 - **Short Term Improvements**
 - Finished Water Pump Replacement
 - Pumping capacity & growth analysis
 - Replace all 4 finished water pumps
 - Replace all associated MCC equipment
 - Upgrade to VFD controls
 - Budget Cost
 - \$455,000
 - Other Considerations
 - DS supply during construction



WTP Alternatives Analysis

- **Baseline Alternative**
 - **Short Term Improvements**
 - Clearwell Transfer Pump Replacement
 - Replace both clearwell transfer pumps
 - Replace all associated MCC equipment
 - Upgrade to VFD controls
 - Budget Cost
 - \$210,000
 - Other Considerations
 - Separate electrical room?



WTP Alternatives Analysis

- **Baseline Alternative**
 - **Short Term Improvements**
 - Raw Water Pump Replacement
 - Replace both raw water pumps
 - Replace all associated MCC equipment
 - Budget Cost
 - \$150,000
 - Other Considerations
 - Separate electrical room?



WTP Alternatives Analysis

- **Baseline Alternative**
 - **Short Term Improvements**
 - WTP Main Building seismic retrofits
 - Non-structural bracing recommendations
 - Budget Cost
 - \$75,000
 - Other Considerations
 - Reorganization of existing space
 - Installation of new/upgraded components



WTP Alternatives Analysis

- **Baseline Alternative**
 - **Short Term Improvements**
 - WTP Finished Water Pump Building seismic retrofits
 - Structural diaphragm and roofing modifications
 - Non-structural bracing recommendations
 - Budget Cost
 - \$180,000
 - Other Considerations
 - Installation of new/upgraded components



WTP Alternatives Analysis

- **Baseline Alternative**
 - **Short Term Improvements**
 - WTP security improvements
 - CCB security
 - Fencing and access control
 - Video monitoring
 - Budget Cost
 - \$75,000
 - Other Considerations
 - SVCA, park and delivery vehicle access
 - New CCB or buildings?



WTP Alternatives Analysis - Baseline

Short Term Improvements

- Replace finished water pumps
- Replace transfer pumps
- Replace raw water pumps
- WTP Main Building seismic retrofits
- Finished Water Pump Building seismic retrofits
- Chlorine gas modifications
- WTP Security improvements
 - Contingency, Tax, Project Administration

Cost

- \$455,000
- \$210,000
- \$150,000
- \$75,000
- \$180,000
- \$153,000
- \$75,000
- \$1,277,000

TOTAL

\$2,575,000



WTP Alternatives Analysis - Baseline

Short Term Improvements (<10 years)

- Replace finished water pumps
- Replace transfer pumps
- Replace raw water pumps
- WTP Main Building seismic retrofits
- Finished Water Pump Building seismic retrofits
- Chlorine gas modifications
- WTP Security improvements

Long Term Improvements (>10 years)

- Chemical addition system improvements
- New 0.3 MG CCB
- Rehabilitate existing filters
- Rehabilitate existing CCB
- Backwash recycle implementation



WTP Alternatives Analysis - Baseline

Short Term Improvements (<10 years)

- Replace finished water pumps
- Replace transfer pumps
- Replace raw water pumps
- WTP Main Building seismic retrofits
- Finished Water Pump Building seismic retrofits
- Chlorine gas modifications
- WTP Security improvements

Long Term Improvements (>10 years)

- Chemical addition system improvements
- New 0.3 MG CCB
- Rehabilitate existing filters
- Rehabilitate existing CCB
- Backwash recycle implementation



WTP Alternatives Analysis

- **Baseline Alternative**
 - **Long Term Improvements**
 - Chemical Addition System Improvements
 - Replace alum tank and metering pumps
 - Replace soda ash tank and metering pumps
 - Relocate chemicals to new, standalone building
 - Budget Cost
 - \$2,110,000
 - Other Considerations
 - DS supply during construction



WTP Alternatives Analysis

- **Baseline Alternative**
 - **Long Term Improvements**
 - New 0.3 MG chlorine contact basin
 - Replaces existing CCB
 - Provide maximum access and treatment flexibility
 - Budget Cost
 - \$990,000
 - Other Considerations
 - DS supply during construction



WTP Alternatives Analysis

- **Baseline Alternative**
 - **Long Term Improvements**
 - Rehabilitate existing filters
 - Empty and inspect filters
 - Rehabilitate underdrain, piping, coatings, wash system
 - Refill with new, fresh media
 - Budget Cost
 - \$100,000
 - Other Considerations
 - DS supply during construction
 - Perform during low-demand, winter months



WTP Alternatives Analysis

- **Baseline Alternative**
 - **Long Term Improvements**
 - Rehabilitate existing CCB
 - Provide seal welding, new coatings, new appurtenances
 - Install seismic retrofits and new controls
 - Budget Cost
 - \$620,000
 - Other Considerations
 - Containment and environmental considerations



WTP Alternatives Analysis

- **Baseline Alternative**
 - **Long Term Improvements**
 - Backwash recycle implementation
 - Repurpose CCB for backwash recycle
 - Install new controls, appurtenances and piping
 - Modify existing piping connections and WQ monitoring
 - Budget Cost
 - \$630,000
 - Other Considerations
 - Permitting and DOH approval
 - Potential decrease in finished water quality



WTP Alternatives Analysis - Baseline

Long Term Improvements

- Chemical addition system improvements
- New 3.0 MG welded steel CCB
- Rehabilitate existing filters
- Rehabilitate/repurpose existing CCB
- Implement backwash recycle improvements
 - Contingency, Tax, Project Administration

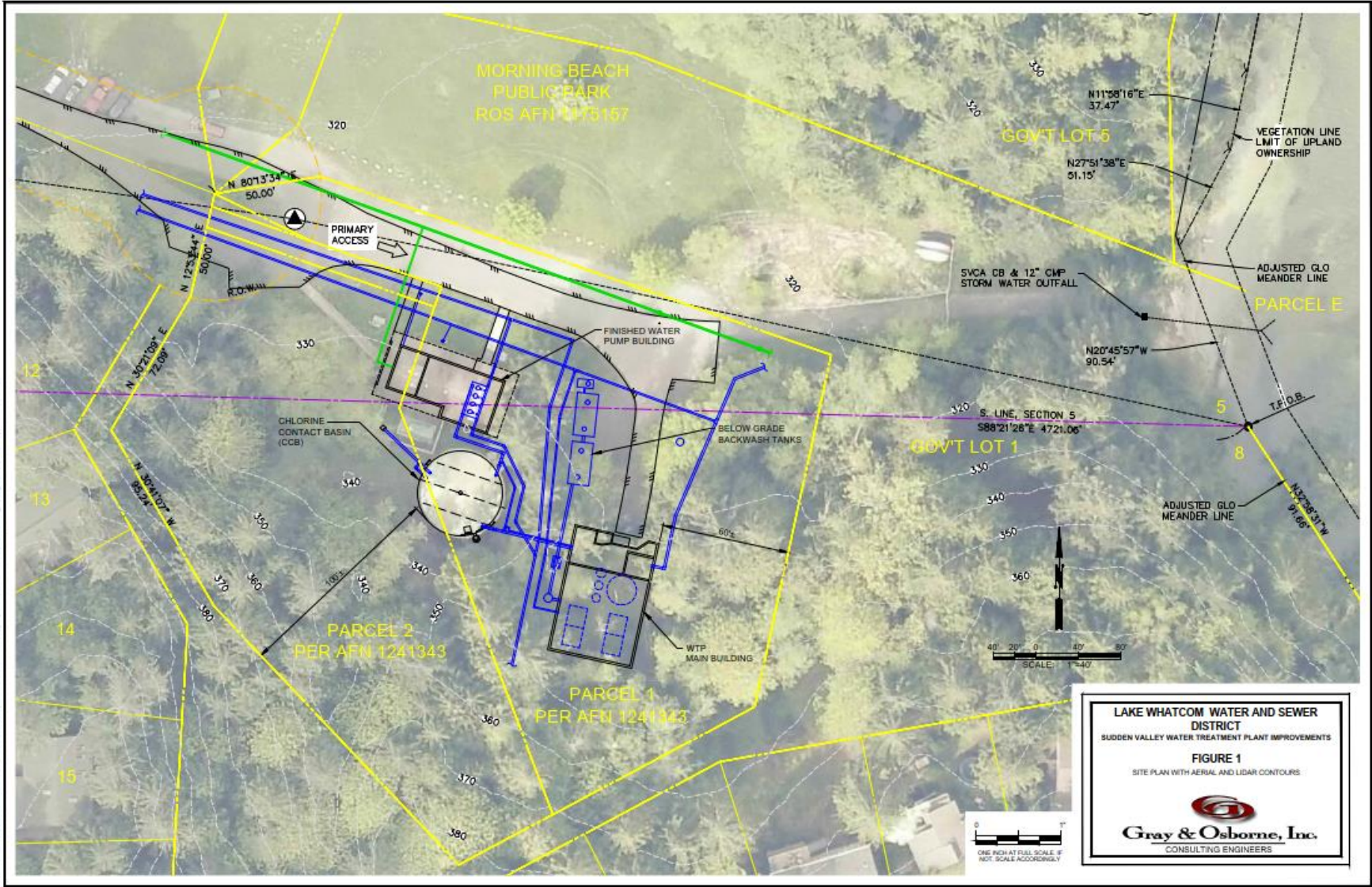
Cost

- \$2,110,000
- \$990,000
- \$100,000
- \$620,000
- \$630,000
- \$4,378,000


TOTAL

\$8,828,000



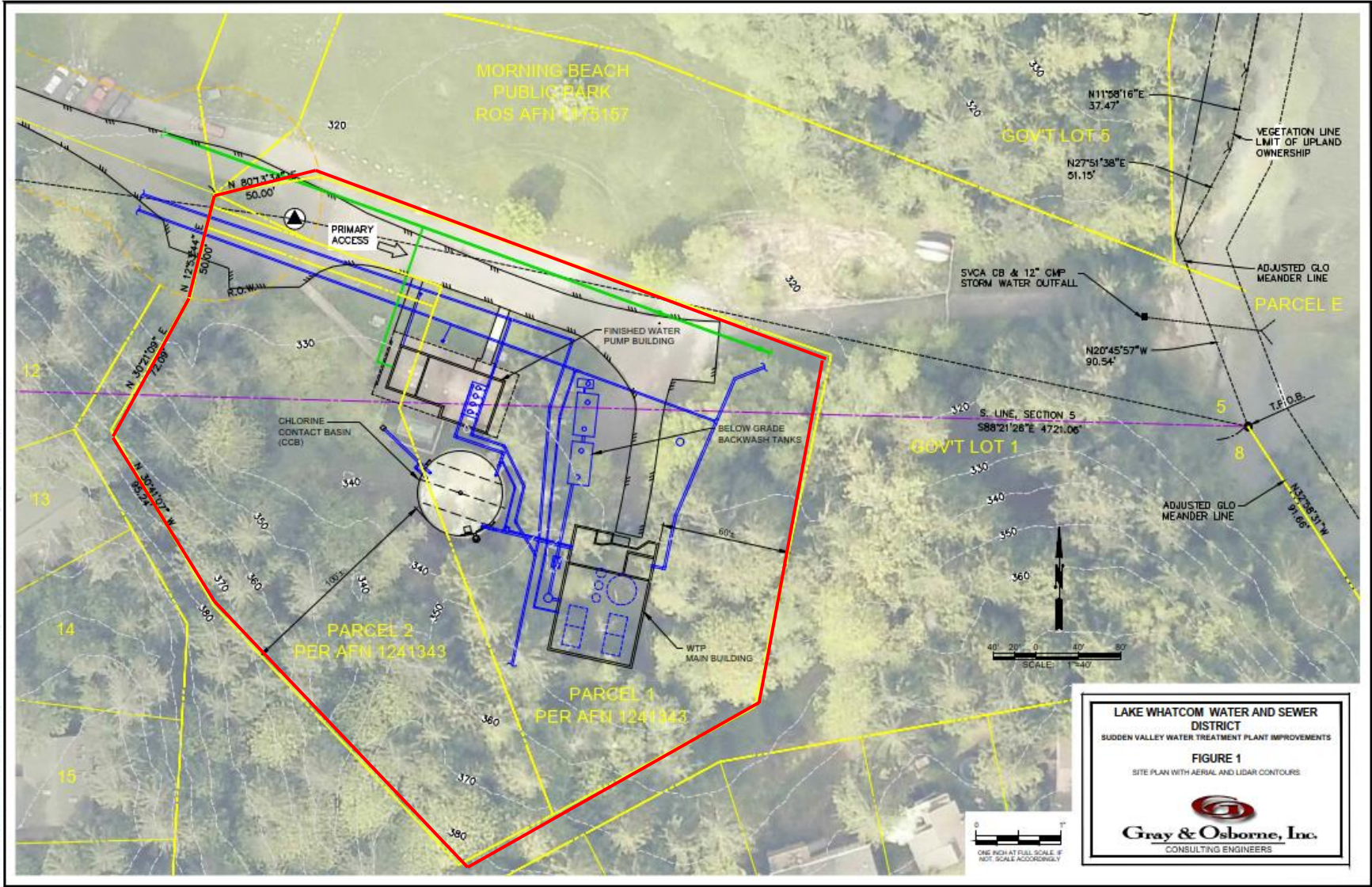


LAKE WHATCOM WATER AND SEWER DISTRICT
SUDDEN VALLEY WATER TREATMENT PLANT IMPROVEMENTS
FIGURE 1
SITE PLAN WITH AERIAL AND LIDAR CONTOURS




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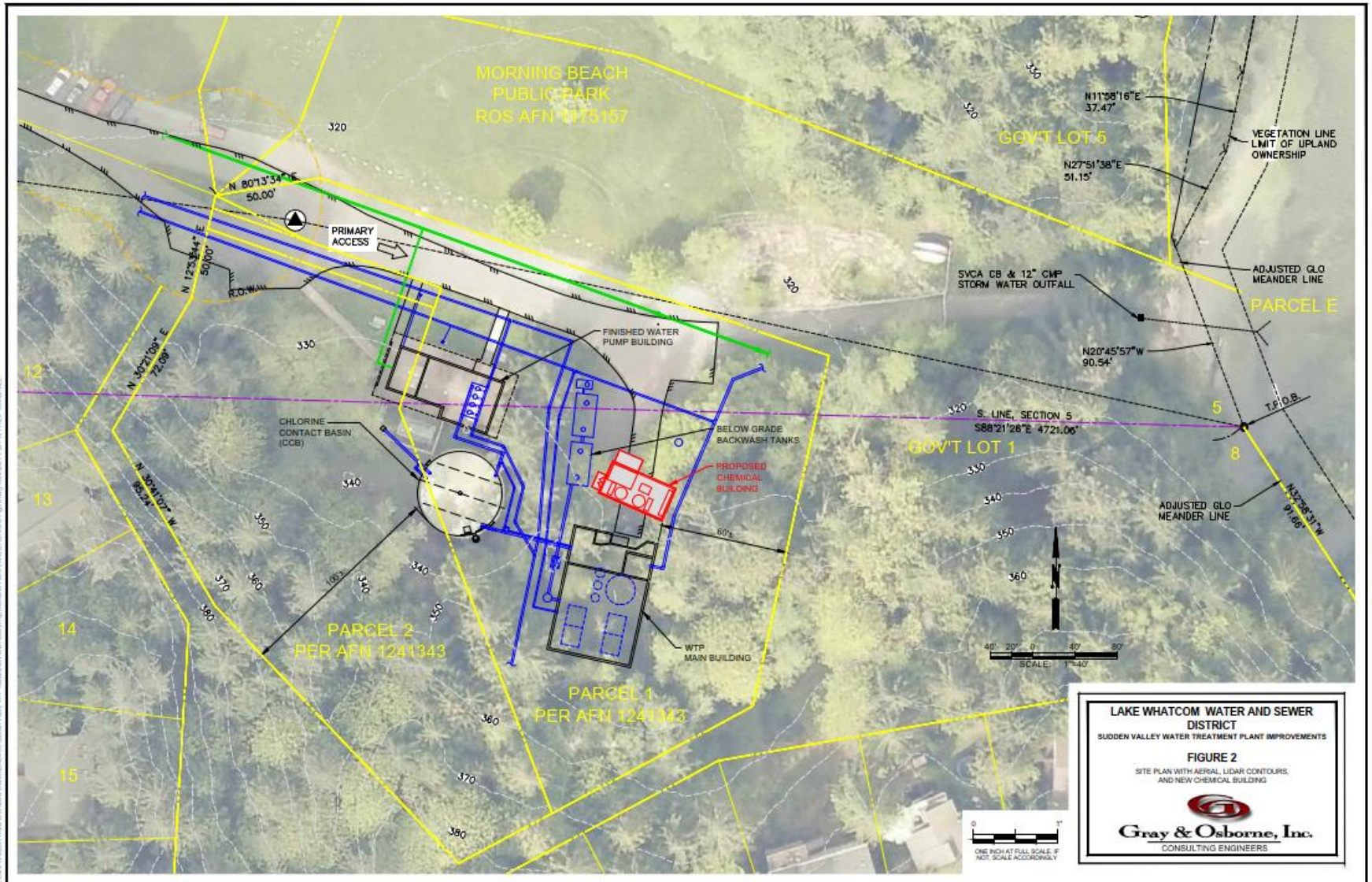


LAKE WHATCOM WATER AND SEWER DISTRICT
SUDDEN VALLEY WATER TREATMENT PLANT IMPROVEMENTS
FIGURE 1
SITE PLAN WITH AERIAL AND LIDAR CONTOURS



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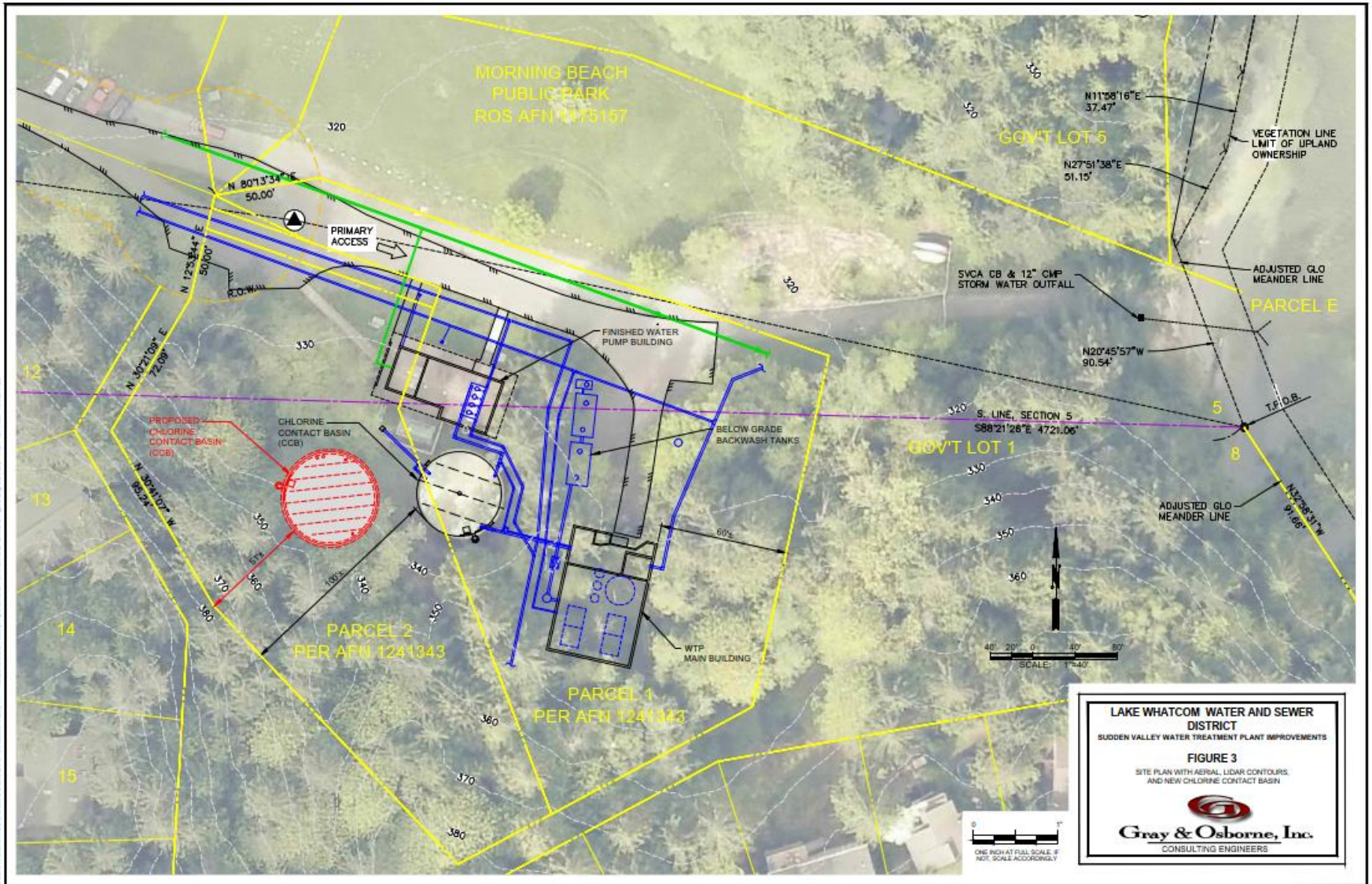




LAKE WHATCOM WATER AND SEWER DISTRICT
SUDDEN VALLEY WATER TREATMENT PLANT IMPROVEMENTS
FIGURE 2
 SITE PLAN WITH AERIAL, LIDAR CONTOURS,
 AND NEW CHEMICAL BUILDING

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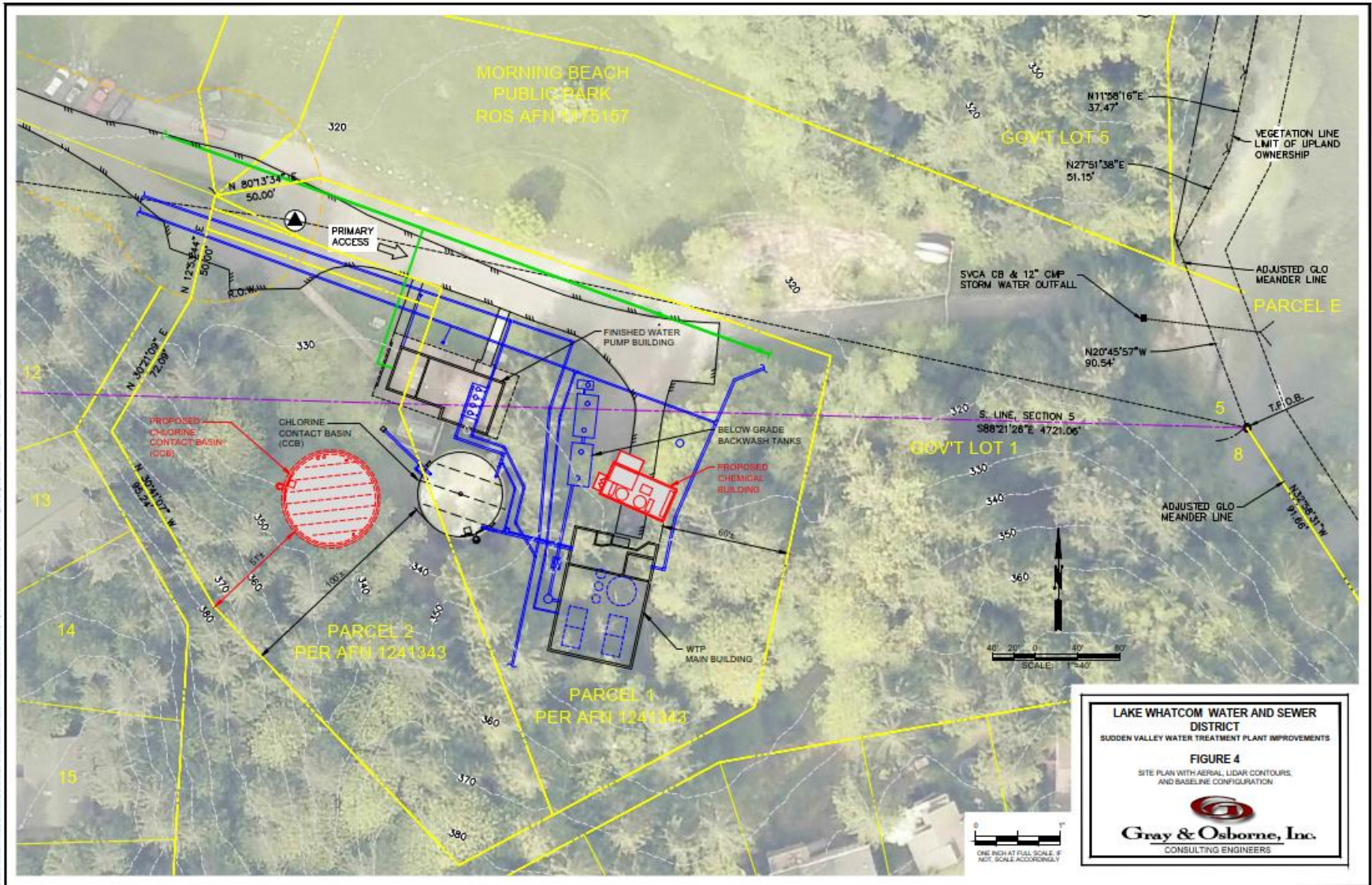




LAKE WHATCOM WATER AND SEWER DISTRICT
SUDDEN VALLEY WATER TREATMENT PLANT IMPROVEMENTS
FIGURE 3
SITE PLAN WITH AERIAL, LIDAR CONTOURS,
AND NEW CHLORINE CONTACT BASIN


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LAKE WHATCOM WATER AND SEWER DISTRICT
SUDDEN VALLEY WATER TREATMENT PLANT IMPROVEMENTS

FIGURE 4
SITE PLAN WITH AERIAL, LIDAR CONTOURS,
AND BASELINE CONFIGURATION



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Next Steps

- Prepare Draft Alternatives Analysis Report
- District & Staff Input Meeting
 - July 21, 2021 @ 300PM
- Board Informational Presentation
 - August 11, 2021 @ 630PM
- Board Input Meeting and Discussion
 - August 25, 2021 @ 800AM
- Modify and Finalize Alternatives Analysis Report



Questions?

