COMPREHENSIVE MASTER PLAN UPDATE SUMMARY

TOWN OF BAR HARBOR, MAINE

PRESENTED BY: ANNALEIS HAFFORD P.E., VICE PRESIDENT
OLVER ASSOCIATES INC.

OUTLINE

1. Introduction to Olver Associates Inc.
2. Purpose and Objectives of Comprehensive Master Plan Update
3. Master Plan Process and Funding
4. Contents of Comprehensive Master Plan
5. Key Points Identified in the Plan
6. Overview of Water Modeling
7. Major Findings and Suggested Projects
8. Summary Tables/Estimated Cost of Findings

OLVER ASSOCIATES INC.

1. Olver Associates Inc. designs upgrades to Wastewater and Water systems and work in over 75 communities in Maine.
2. Currently, we employ about 60 people between our engineering and operations divisions and supervise the operation of 21 water and wastewater facilities.
3. Olver Associates Inc. was hired to assist the Town with preparing the recent Comprehensive Master Plan Update.

PURPOSE AND OBJECTIVES OF COMPREHENSIVE MASTER PLAN

- Provides a road map for prioritizing future improvements to the system. Not all improvements will follow the order of the plan, however, it helps the Town focus on where to complete improvements.
- Summarizes the history of the water system and its current operations.
- Evaluates operations/water quality/treatment systems/infrastructure and makes suggestions as to upgrades or improvements.
- Evaluates regulatory requirements and impacts to the water system.
- Evaluates suggested improvements and provides a cost estimate for each recommended improvement.
- Created a working water model to assist with making future design decisions.

COMPREHENSIVE MASTER PLAN PROCESS AND FUNDING

- Olver Associates Inc. competed with other firms to assist the Town in preparation of an Updated Comprehensive Master Plan.
- We met with the Water Department several times to discuss the Plan and its recommendations.
- The Prior Comprehensive Plan was completed back in 2005.
- The Town had already applied for funds to complete this plan and we were able to work within those funds.
- The State of Maine DWP contributed up to 50% of the Plan through their Capacity Development Grant Program.
- We assisted the Town with an extension of the grant and helped obtain the reimbursement once the plan was completed.
- Our work included completing a new water model for the Town's entire water system which was utilized to evaluate design options for the master plan.

CONTENTS OF COMPREHENSIVE MASTER PLAN

1.0 Introduction

- Provides purpose of plan, history, management and staffing description, overview of the water system, discusses coordination of the Town's Comprehensive Plan and discusses the Town's Terms and conditions.

2.0 Existing Water Service Area and Usage Evaluation

- Provides a description of the water system, population and future population predictions, water demands, water supply volumes, discussion of significant users and designated water system predicted design flows.

3.0 Existing Water Supply Facilities

- Discusses the water supply, the importance of maintaining the filtration avoidance waiver, the source water protection program and Eagle Lake inlet and outlet structures.

CONTENTS OF COMPREHENSIVE MASTER PLAN, CONTINUED

4.0 Existing Water Treatment Facilities
- This section focused on the description of the existing water treatment system at Duck Brook and each of its components and the condition of the existing treatment system.

5.0 Existing Pressure Zones
- This section reviewed the various pressure zones in the Town's water distribution system.

6.0 Water System Active Booster Pump Stations
- Reviewed each of the three booster stations that are currently utilized.

7.0 Water Storage Facilities
- Provided a discussion of the various storage tanks constructed over the years, and the ones in use.

CONTENTS OF COMPREHENSIVE MASTER PLAN, CONTINUED

8.0 Description of Water Distribution System

- Evaluated the water mains, transmission mains, prepared a material inventory including size and material and estimated age of installation, discussed seasonal versus year-round water mains.
- Evaluated fire hydrants and the Town's fire hydrant flushing plan.
- Discussed the Town's many valves for water system isolation.
- Reviewed water system bleeders and blow-off's.

9.0 Water Storage Volume Evaluation

- This section provided an evaluation of water storage within the Town's system and evaluated recommendations for operational storage, equalization storage, standby storage, fire suppression storage, dead storage volume and total suggested effective storage volume.

CONTENTS OF COMPREHENSIVE MASTER PLAN, CONTINUED

10.0 Water System Regulatory Considerations

- Reviewed all current and known upcoming regulations to provide input within the plan as to any improvements that would need to be made to maintain compliance.

11.0 Water Distribution System Model

- Described the process of building the model, calibrating it and the results of the model as it was utilized in the Master Plan.
- The model was also used to determine what certain line size changes, looping, boosting and new water storage tanks impact would be on the distribution system.

12.0 Recommended Infrastructure and Water System Improvement Plan

- This section provided a description of infrastructure and policy needs as well as the estimated costs for all of the suggested long-term improvements. We also prepared a capital improvement program summary for all suggested improvements.

KEY POINTS IDENTIFIED IN THE PLAN ABOUT BAR HARBOR'S SYSTEM – VARIATIONS IN DEMAND AND TOPOGRAPHY

- The system pressure varies between 20 to just over 100 PSI due to variations in topography. This causes challenges in system operation due to extreme variations in pressure.
- During the summertime, the population is over 3 times the typical population with tourist population even higher.
- Water demands are the highest during the months of June through September with July and August being the highest.
- The water use is made up of residential, commercial, governmental, and lab users.

Category	Annual, Percent	Seasonal, Percent	Total Percent
Residential	19.2	4.4	23.6
Commercial	30.5	18.0	48.5
Governmental	3.0	1.9	4.9
Lab	22.7	0.3	23.0
Total	75.4	24.6	100

KEY POINTS IDENTIFIED IN THE PLAN ABOUT BAR HARBOR'S SYSTEM – WATER SYSTEM'S LARGEST USERS

- Non-revenue water is between 24 to 33 percent which includes known leaks, water quality bleeders, process water use, hydrant flushing, etc.
- Unknown water losses or unaccounted for water averages 11.6 % with 10% being the typical goal.
- Around 40% of the water is consumed by ten major water users with the highest demand from Jackson Laboratory which uses about 23.3 % of the water. The next largest user is Kebo Valley Club at 4.6 percent of the total water use. The remaining eight highest users are various Inns and Motels. Since the last Master Plan, there have been large changes in the use from the two largest users:

Date	Jackson Laboratory, Gal	Kebo Valley Club, Gal
2002 (2005 Plan)	44,148,538	12,463,026
2018 (2019 Plan)	60,749,149	11,005,653
Comparison	37.6% more	13.2% less

KEY POINTS IDENTIFIED IN THE PLAN ABOUT BAR HARBOR'S SYSTEM – WATER SYSTEM DESIGN FLOW

- Part of a Master Plan's purpose is also to provide the Town with predicted design flows for the next 20 years as defined below:

Current Average Flow	Predicted Average Flow	20 Year Design - Ave
1,001,164 GPD	1,174,288 GPD	2.0 MGD
Peak Daily Flow	Predicted Daily Peak Flow	20 Year Design Daily Peak
2,236,000 GPD	2,623,000 GPD	3.0 MGD
Peak Hourly Flow	Pred. Hourly Peak Flow	20 Year Design Hourly Peak
3,550,000 GPD	4,200,000 GPD	5.0 MGD
(2,500 GPM)	(3,000 GPM)	(3,500 GPM)

- Prior to COVID, the water system demands increased about 0.86 % per year over the last 13 years. This data was used to predict the 20-year design.

KEY POINTS IDENTIFIED IN THE PLAN ABOUT BAR HARBOR'S SYSTEM – EXISTING WATER SUPPLY FACILITIES

- The Town has utilized Eagle Lake as its water supply since around 1880. The Town currently draws around 2,500 GPM from Eagle Lake by gravity based on the water surface elevation when at 276.5 feet.
- During the summertime, when the usage is higher, the elevation drops below this level.
- The most important key factor of the existing water system, is that it has qualified for Filtration Avoidance. There are only 11 systems in Maine that currently qualify for a Filtration Avoidance Waiver. Three systems have lost their waivers since the Surface Water Treatment Rule was enacted. The Comprehensive Master Plan discusses the key components of the waiver, and the importance of maintaining it.
- Should the waiver ever be rescinded, the Town would face the need to locate, design, construct and operate a filtration system. This would be extremely expensive and should be avoided at all cost.

KEY POINTS IDENTIFIED IN THE PLAN ABOUT BAR HARBOR'S SYSTEM – EXISTING WATER SYSTEM MAIN INVENTORY

The Town has about 189,529 LF of water distribution and transmission main piping with the following materials:

- Unlined Cast Iron – 41.07%
- Lined Cast Iron – 11.19%
- Galvanized Steel – 8.09%
- Ductile Iron – 11.02%
- High Density Polyethylene – 25.69%
- Asbestos Cement – 0.76%
- Plastic – 2.19%

KEY POINTS IDENTIFIED IN THE PLAN ABOUT BAR HARBOR'S SYSTEM – EXISTING WATER SYSTEM MAIN, VALVE AND HYDRANT INVENTORY

- Bar Harbor has a significant amount of undersized older cast iron piping with about 22.35% installed prior to the 1900's based on the data provided. The plan looked at sequencing water main replacement work on a priority basis.
- It is recognized that this work may be replaced based primarily on other Town driven roadway or wastewater improvement projects.
- The Town has 110 pubic fire hydrants that the town is responsible to maintain and flush. Many of the earlier hydrants appear to be in poor condition and have leaded joints.
- There is a large number (57 estimated) of hydrants installed prior to the 1970's which need replacement.
- The Town has mapped and identified approximately 273 valves with varying age, depending upon the year of the water line it is associated with. More valves are within the system but not fully located or mapped.

KEY POINTS IDENTIFIED IN THE PLAN ABOUT BAR HARBOR'S SYSTEM – WATER STORAGE TANK VOLUME EVALUATION

- The Town has a maximum possible volume of 1,000,000 gallons for water storage/disinfection split between two different locations:
  - Underground reservoir/Chlorine Contact Tank at Duck Brook Treatment Facility – Approximately 500,000 gallons
  - Jackson Laboratory Tank – Approximately 500,000 gallons
- During high demand periods, neither tank is operated full so the actual volume available is less than 1,000,000 gallons.
- Of this amount, some of the volume cannot be utilized and is called "Dead Volume". This leaves about a maximum of 690,000 gallons of usable storage.
- There are various methods used to determine a water system's recommended storage volume.

KEY POINTS IDENTIFIED IN THE PLAN ABOUT BAR HARBOR'S SYSTEM – WATER STORAGE TANK VOLUME EVALUATION

- We used the 2018 PUC report as a basis for water demand in Bar Harbor for these calculations.
- Using nationally recognized procedures for determining what the recommended volume would be, we have determined that an additional volume of 1,370,000 gallons would be beneficial for a water system of Bar Harbor's size.
- Adding more volume can also have negative implications related to water quality, especially for surface water systems so we do not recommend making a volume switch to this amount all at once.
- There are other methods to calculate recommended volume which result in lower recommended volume; however, Bar Harbor is still below those less conservative procedures.
- Through modeling, a recommended location has been evaluated. We would suggest possibly a 500,000-gallon installation for the first step in improving storage.

USE OF THE WATER MODEL IN THE COMPLETION OF THE COMPREHENSIVE WATER PLAN

- In order to evaluate decisions for updated storage and various other system responses and improvements, we completed a water model of the Town's system.
- The Water Model was calibrated and different system improvements were evaluated using the model as a basis to better understand the impacts of added water storage, pipe size changes, system connectivity, and location of improvements like a potential booster pump.
- The Town's water system layout is challenging with extreme variances in topography resulting in pressure variances, large developments and commercial systems with significant point source demands, along with older piping in busy downtown areas.
- Development has been permitted to occur in high elevation/low pressure areas.

USE OF THE WATER MODEL IN THE COMPLETION OF THE COMPREHENSIVE WATER PLAN, CONT.

- Computer models are initially formed using elements that represent the existing water system.
- These components include reservoirs, tanks, pipes, nodes between pipes, hydrants, pumps, booster system, valves, etc.
- Attributes for system characteristics were gathered from available maps, reports, and surveys and applied to system elements to create the model basis.
- Actual system demands were applied to all of the nodes where the water use was experienced.
- We used actual measured topography to develop the actual hydraulic grade of the system.
- The better the known information, the better the model predictions.

USE OF THE WATER MODEL IN THE COMPLETION OF THE COMPREHENSIVE WATER PLAN, CONT.

Once a representative model is created, it MUST be calibrated to verify that the data input is correct.

Ongoing updates to the model are important to keep the model up-to-date.

Once a model calibration is accepted, the model can be manipulated to simulate various system conditions, both existing and hypothetical. For the Master Plan these simulations included:

- New Storage Tanks at different locations
- A Booster System at the Town's Ferry Terminal
- Larger pipes
- Impact of looping lines
- Adding elevation to existing tanks
- Pressure predictions in planned developments

MODELED SCENARIOS EVALUATED DURING PLAN DEVELOPMENT:

- Evaluation of Hamilton Hill storage tank and Up-Island storage tank.
- New pump station at the Town's Ferry Terminal for filling of the Up-Island storage tank.
- Addition of height to the existing Jackson Laboratory Tank.
- Replacement of 4,277 LF of 8-inch diameter cast iron pipe on Kebo Road with 12-inch diameter ductile iron pipe.
- Addition of 740 LF of 16" ductile iron pipe on Eagle Lake Road between Prospect Avenue and Cross Street connecting the 6" and 12" Ø cast iron lines on Eagle Lake Road.
- Replacement of 6-inch diameter cast iron pipe on Main Street with 12" Ø ductile iron pipe.
- Replacement and looping of 6-inch cast iron line on Devon Street and Cleftstone Road with 8-inch ductile iron.
- Looping on Holland Avenue between Cottage Street and West Street.
- Replacement of various small lines within the system.

MASTER PLAN SUGGESTED PROJECTS – WATER STORAGE

- Construct new water storage tank on Town's property up-Island. This region spans from the section of Eden Street north of the Ferry Terminal to the seasonal lines past Salisbury Cove, including Hulls Cove.
- The Dreamwood Hill tank near this location was demolished in 2019 due to its poor condition.
- If there was a line break in this area, the downstream users would have not access to a standby supply of water. In addition, the lengthy distribution line to this area has significant head losses which limit flow capacity and result in low pressures especially when hydrants are used.
- To remove these system issues, we evaluated two locations, the Dreamwood Hill Tank area and the Town owned land at the top of Ireson Hill in Salisbury Cove situated between the High Seas Motel and Acadia Ocean View Motel.
- We decided that the Ireson Hill location was preferable since the Dreamwood Hill location was at a lower elevation and the lot was undersized.

MASTER PLAN SUGGESTED PROJECTS – WATER STORAGE

- The Ireson Hill lot is about 1.72 acres with an elevation of around 220 feet. The higher elevation is desirable as it works with the existing water supply elevation of Eagle Lake. It is also feasible to connect to the water system at this location.
- We suggested phasing the recommendations such that the Ireson Hill tank be installed and assessed for filling the summer pumps and overall performance before implementing additional recommendations to support up-island customers.
- We would suggest looping Highbrook Road to address the issue with filling the tank when the summer line is shut down for the season. The piping on Highbrook Road is in poor condition - undersized cast iron and galvanized steel.
- If the use of the Town's existing summer pumps causes too much pressure in the downtown area, it may be necessary to have a separate booster pump to efficiently fill the proposed up-island tank.

MASTER PLAN SUGGESTED PROJECTS – WATER STORAGE

- Jackson Laboratory Tank – The Jackson Laboratory tank operates at a lower hydraulic elevation than the Duck Brook tank and is also lower than Eagle Lake. This requires use of an altitude valve to prevent the tank from overflowing. Because of the increase in demand at Jackson Lab, they draw the tank down during the daytime to levels lower than what would be recommended. These levels can drop below 15 feet in the summertime, which is the recommended minimum operating level in the tank.
- This drops the hydraulic grade in the area by about 8 PSI.
- Future consideration to either increasing the height of the Jackson Lab tank by ten feet or installing another tank at this location would benefit the Town and would add about 167,000 gallons of storage if the tank was raised.
- We would recommend the up-island tank be done first since that will benefit the Jackson Lab tank in that demands from the Route 3 area would be satisfied by the volume in the new tank rather than drawing down the Jackson Laboratory Tank.

BOOSTER PUMP STATION IMPROVEMENTS – ARATA DRIVE AND MOUNTAIN AVENUE

- Both booster pump stations are in poor condition. The Town would like to upgrade these two booster stations by looping Arata Drive and using one station to supply both Mountain Avenue and Arata Drive.
- Both stations are below grade confined spaces, each with only one pump.
- The new station would be above ground and the piping on Arata Drive would need to be upgraded since it is undersized and in poor condition.
- We would suggest upsizing the line from 3-inch Galvanized Steel to 6-inch ductile iron.

OVERALL WATER MAIN, VALVE AND HYDRANT IMPROVEMENTS

- Typically Towns complete watermain upgrades along with other infrastructure projects.
- The Plan provided general suggestions and preliminary sizing for the Town for various areas where we considered the watermains to be undersized or in need of replacement due to condition, age, etc.
- See the summary tables for each recommended improvement which contain preliminary order of magnitude cost estimates for each area.
- The plan has identified some lines that would need to be upgraded if certain tank or booster projects are completed.
- Where known low water pressure was discovered within the model, we evaluated alternative sizing for new lines to improve pressure. One example of this is Kebo Street. Upgrading the size to 12-inch diameter versus 8-inch cast iron had better results than the discussed new storage tank at Hamilton Hill.

RECOMMENDED INFRASTRUCTURE AND WATER SYSTEM IMPROVEMENT PLAN

SUMMARY OF RECOMMENDATIONS FOR LONG TERM WATER MAIN REPLACEMENT PROGRAM

STREET/LOCATION	RECOMMENDATION	LENGTH (LF)	BENEFITS	ESTIMATED COST
Devon Road	Increase line size from 6-inch CI to 8-inch DI. (Table 1a) Loop piping to West Street Extension (Table 1b)	1,350/2,000	Improved water quality, pressure, aging infrastructure, and fire flow.	$618,000 without Loop to West $803,000 with Loop to West (Cost Table A.1a and A.1b)
Old Farm Road	Increase the line size from 6-inch CI to 8-inch DI.	1,150	Improved water quality, fire flow, aging infrastructure, and eliminates a bleeder.	$359,000 (Cost Table A.2)
Harbor Lane	Increase line size from 6-inch CI to 8-inch DI.	624	Improved water quality, fire flow, aging infrastructure, and eliminates a bleeder.	$229,000 (Cost Table A.3)
Hamor Lane	Increase the line size from 2-inch GS to 4-inch DI.	500	Improved water quality and aging infrastructure.	$170,000 (Cost Table A.4)
Loren Street	Increase the line size from 2-inch GS to 4-inch DI.	730	Improved water quality and aging infrastructure.	$218,000 (Cost Table A.5)

RECOMMENDED INFRASTRUCTURE AND WATER SYSTEM IMPROVEMENT PLAN (CONTINUED)

SUMMARY OF RECOMMENDATIONS FOR LONG TERM WATER MAIN REPLACEMENT PROGRAM (CONTINUED)

STREET/LOCATION	RECOMMENDATION	LENGTH (LF)	BENEFITS	ESTIMATED COST
Kebo Street[2]	Increase the line size from 8-inch CI to 12-inch DI.	4,310	Remove significant bottleneck and improve pressure reliability.	$1,440,000 (Cost Table A.6)
Arata Drive[2]	Increase the line size from 3-inch GS to 6-inch DI.	1,053	Improved water quality, increased reliability and reduced pressure losses for combined booster station.	$356,000 (Cost Table A.7)
Hancock Street	Increase the line size from 6-inch CI and 2-inch GS to 8-inch DI and 4-inch DI.	2,120	Improved water quality, aging infrastructure, and fire flow.	$749,000 (Cost Table A.8)
Atlantic Avenue	Increase the line size from 6-inch CI and 2-inch GS to 8-inch DI and 4-inch DI.	1,100	Improved water quality, aging infrastructure, and fire flow.	$489,000 (Cost Table A.9)
Albert Meadows and Derby Lane	Increase the line size from 6-inch CI and 3-inch GS to 8-inch DI.	952	Improved water quality, aging infrastructure, and fire flow.	$531,000 (Cost Table A.10)
Stephen's Lane and Cottage Way	Increase the line size from 2-inch GS to 4-inch DI.	750	Improved water quality, aging infrastructure.	$323,000 (Cost Table A.11)

RECOMMENDED INFRASTRUCTURE AND WATER SYSTEM IMPROVEMENT PLAN (CONTINUED)

SUMMARY OF RECOMMENDATIONS FOR LONG TERM WATER MAIN REPLACEMENT PROGRAM (CONTINUED)

STREET/LOCATION	RECOMMENDATION	LENGTH (LF)	BENEFITS	ESTIMATED COST
Newton Way and Des Isle Avenue	Increase the line size from 2-inch and 3-inch GS to 8-inch DI.	1,100	Improved water quality and aging infrastructure.	$463,000 (Cost Table A.12)
Eagle Lake Road	Increase the line size from 2-inch to 8-inch DI. Loop to Cross Street.	740	Improved water quality, aging infrastructure, extend fire protection service area, extend service through to Cross Street.	$319,000 (Cost Table A.13)
Spring Street (Includes southern end)	Remove 10-inch CI pipe and replace with 10-inch DI, upsize 2-inch GS and 4-inch CI to 8-inch DI.	1,250	Improved water quality, aging infrastructure, and fire protection. Upper Spring in location of future sewer project.	$502,000 (Cost Table A.14)
Shannon Road	Remove last remaining 10-inch AC and replace with 10-inch DI.	1,500	Improved water quality, aging infrastructure In Location of future sewer project.	$718,000 (Cost Table A.15)
Glen Mary Road	Upgrade 3-inch GS and replace with 8-inch DI	1,200	Improved water quality, aging infrastructure, improve fire protection.	$531,000 (Cost Table. A.16)

RECOMMENDED INFRASTRUCTURE AND WATER SYSTEM IMPROVEMENT PLAN (CONTINUED)

SUMMARY OF RECOMMENDATIONS FOR LONG TERM WATER MAIN REPLACEMENT PROGRAM (CONTINUED)

STREET/LOCATION	RECOMMENDATION	LENGTH (LF)	BENEFITS	ESTIMATED COST
Holland Avenue .	Increase 6-inch CI and 2-inch GS to 8-inch DI.	1,450	Improve water quality, aging infrastructure. Improve fire protection. Future location of sewer project.	$577,000 (Cost Table A.17)
Main Street	Increase 6-inch CI to 12-inch DI.	2,400	Improve water quality and bottleneck through downtown.	$1,274,000 (Cost Table A.18)
Scott's Lane	Increase 2-inch GS to 8-inch DI.	850	Improve water quality, aging infrastructure, and fire protection.	$289,000 (Cost Table A.19)
Stanwood Place	Increase 3-inch GS to 4-inch DI.	200	Improve water quality and aging infrastructure.	$146,000 (Cost Table A.20)
Kavanaugh Place	Increase 2-inch GS to 4-inch DI.	350	Improve water quality and aging infrastructure.	$167,000 (Cost Table A.21)
Oak Street	Increase 2-inch GS to 8-inch DI.	440	Improve water quality, aging infrastructure, and fire protection.	$206,000 (Cost Table A.22)

RECOMMENDED INFRASTRUCTURE AND WATER SYSTEM IMPROVEMENT PLAN (CONTINUED)

SUMMARY OF RECOMMENDATIONS FOR LONG TERM WATER MAIN REPLACEMENT PROGRAM (CONTINUED)

STREET/LOCATION	RECOMMENDATION	LENGTH (LF)	BENEFITS	ESTIMATED COST
Highbrook Road[2]	Replace 6-inch CI with 8-inch DI and loop to West Street Extension.	850	Improve water quality, aging infrastructure, and fire flow. This needs to be done with new storage tank, and Ferry Terminal Booster Pump.	$375,000 (Cost Table A.23)
Eden Street[3]	Replace 8-inch CI with 8-inch DI. (This was not upsized to 12 inches since the downstream piping was recently replaced to 8-inch DI.)	960	Needs to be done if Ferry Terminal Booster Pump is installed. This also is older CI piping and may need updating at some point due to its age.	$469,000 (Cost Table A.24)
Total Estimated Water Line Costs (In 2020 Dollars)				**$11,518,000 to $11,703,000**

RECOMMENDED INFRASTRUCTURE AND WATER SYSTEM IMPROVEMENT PLAN (CONTINUED)

ESTIMATED COST OF FIRE HYDRANT REPLACEMENTS

REPLACEMENT METHOD	ESTIMATED COST - EACH HYDRANT	TOTAL COST PER METHOD ASSUMING 5 HYDRANTS/YEAR
By a Contractor, replacing hydrants only	$10,000 -$15,000 (with a new valve)	$50,000 to $75,000
With a pipeline project	$6,000	N/A

RECOMMENDED INFRASTRUCTURE AND WATER SYSTEM IMPROVEMENT PLAN (CONTINUED)

ESTIMATED COST OF VALVE REPLACEMENTS

REPLACEMENT METHOD	EST. COST, PER VALVE	EST. COST/YEAR (5/YEAR)
By a Contractor, replacing valves only, including excavation.	$10,000 -$15,000	$50,000 to $75,000
Insertion Valves including excavation by contractor.	$10,000 to 20,000	$50,000 to $100,000
With a pipeline project – 8-inch valve.	$2,500	N/A

RECOMMENDED INFRASTRUCTURE AND WATER SYSTEM IMPROVEMENT PLAN (CONTINUED)

SUMMARY OF WATER STORAGE TANK IMPROVEMENT COSTS

LOCATION	ESTIMATED COSTS
New Tank at Ireson Hill (Cost Table B.2)	$1,929,000
Increase Elevation of Jackson Laboratory Tank (Cost Table B.5)	$581,000
Total Suggested Water Tank Improvements	**$2,510,000**

RECOMMENDED INFRASTRUCTURE AND WATER SYSTEM IMPROVEMENT PLAN (CONTINUED)

SUMMARY OF BOOSTER PUMP IMPROVEMENT COSTS FOR LOW PRESSURE AREAS

LOCATION	ESTIMATED COSTS
Arata Drive/Mountain Avenue Booster Station (Cost Table B.1)	$528,000
Ferry Terminal Pump Station (Cost Table B.3) (This would only be needed if filling the proposed new tank was difficult in the summer. See Master Plan for more details.)	$743,000 Not recommended until after new tank is installed and only if there are issues with controlling the tank filling.
Building Improvements at Rockwood Avenue (Cost Table B.4)	$20,000
Total Suggested Booster Pump Station Improvements	**$548,000/$1,291,000**

RECOMMENDED INFRASTRUCTURE AND WATER SYSTEM IMPROVEMENT PLAN (CONTINUED)

UPDATED WATER SYSTEM POLICIES OR PROGRAMS

SUGGESTED IMPROVEMENT	ESTIMATE	STATUS
Terms and Conditions	$5,000	
Construction Specifications for the Water System	$1,500	In Process
Water Shed Protection Plan	$10,000 - $15,000	
Development Review	$5,000/year	
Implement Limited Service Contracts where suggested: o Hamilton Hill and future development subdivision lots o Kebo Ridge Development o East Strawberry Hill o Cleftstone Road	Completed by Water System Staff	

RECOMMENDED INFRASTRUCTURE AND WATER SYSTEM IMPROVEMENT PLAN (CONTINUED)

EAGLE LAKE OUTLET DAM EVALUATION AND IMPROVEMENTS

LOCATION	ESTIMATED COSTS
Structural Inspection and Report	$10,000
Tree Growth Removal	$5,000
Sluiceway Board Replacement with controlled release valve	$50,000
Total Suggested Outlet Dam Improvements	**$65,000**

RECOMMENDED INFRASTRUCTURE AND WATER SYSTEM IMPROVEMENT PLAN (CONTINUED)

SUGGESTED ADDITIONAL STAFFING FOR DISTRIBUTION SYSTEM MAINTENANCE

Additional staffing within the Water Department would depend upon the position advertised. We would expect that this would as a minimum add between $45,000 in salary and depending upon the specific benefits an additional $20,000 for insurances with a minimum impact to the budget of around $65,000.