City of Portland, Oregon
Bureau of Development Services
Land Use Services
FROM CONCEPT TO CONSTRUCTION

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MEMORANDUM

Date: **February 2, 2015**

To: **Portland Historic Landmarks Commission**

From: **Hillary Adam, Land Use Services, 503-823-3581**
Stacey Castleberry, Land Use Services, 503-823-7586

Re: **14-218444 HR EN – Mt. Tabor Reservoirs Disconnection**
Type III Historic Resource Review & Type II Environmental Review

Based on comments made by the Historic Landmarks Commission at the January 26, 2015 hearing, and the failed (3-3) motion to support the January 26, 2015 staff report recommending approval with conditions, staff has provided two options to the Commission.

1. Attached is a revised staff report recommending approval with conditions. One new condition has been added which states:
   The City of Portland shall formally adopt the May 2009 Mount Tabor Reservoirs Historic Structures Report and fully implement the restorative recommendations therein, including removal of non-historic elements, such as light fixtures and conduit, and restoration of the contributing resources of the Mt. Tabor Reservoirs Historic District by December 31, 2019.
   In addition, staff has revised the condition related to archaeological discovery, as dictated by Commissioner Solimano to state:
   The applicant will engage a qualified archaeologist to assess the project's potential to impact archaeological resources. This assessment should include review by a qualified geo-archaeologist and be completed prior to issuance of construction permits. In the event of any archaeological discovery, work potentially affecting the archaeological resources will be stopped, the State Archaeologist will be notified, and the procedures specified by state regulations will be followed.

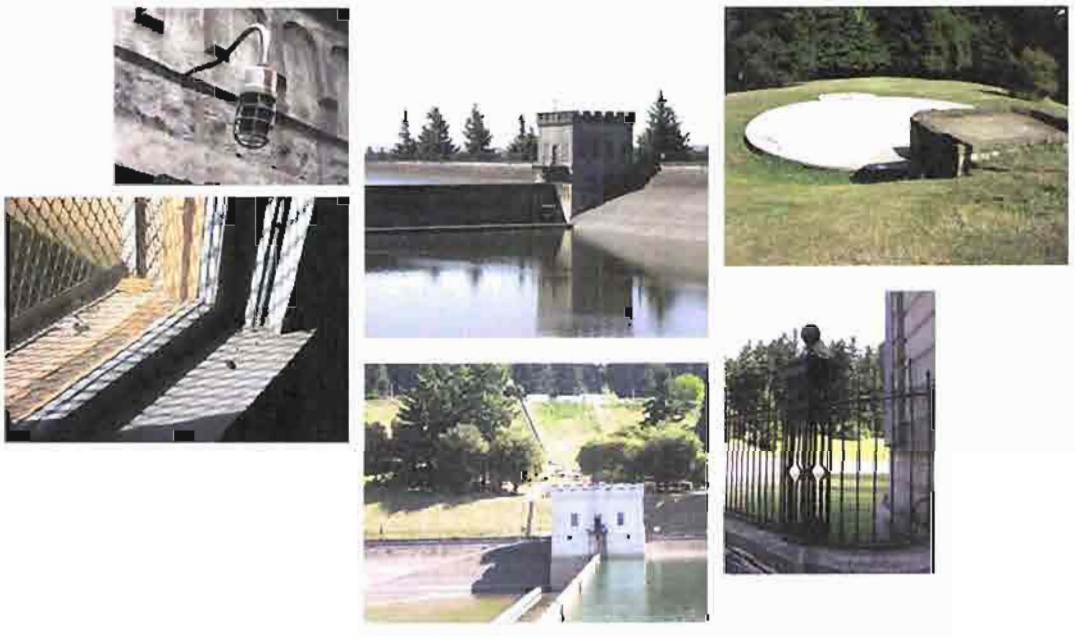
2. Also attached is a revised staff report recommending denial. Findings within this staff report have been revised to reflect comments made by Commissioners at the January 26th hearing. Because this staff report recommends denial, there are no associated conditions.

Because the Commission expressed interest in a preservation plan as well as information of the back flow preventer system, staff has provided this information (Exhibits H-17b, H-53, and H-54), already included in the record and previously presented to the Commission. Exhibit H-17b is the May 2009 Mount Tabor Reservoirs Historic Structures Report, submitted into the record by Kim Lakin. Exhibits H-53 and H-54 are information on the back flow preventer system, previously provided by the applicant. As the applicant has previously stated on the record, a back flow preventer has not been designed, developed, tested, nor approved by the necessary authorities, for the diameter necessary to close the Mt. Tabor Reservoirs' conduits, thus installation of such a system at Mt. Tabor would require these steps to be undertaken with no guarantee of approval by the agencies with authority to do so. If ultimately approved by the approval agencies, this system would then require a separate Historic Resource Review in order to be approved for installation at Mt. Tabor.

Please contact me with any questions or concerns.

MOUNT TABOR RESERVOIRS
HISTORIC STRUCTURES REPORT
Reservoir Nos. 1, 5, 6 and 7

City of Portland Water Bureau



May 2009

CASCADE DESIGN
PROFESSIONALS, INC.

MOUNT TABOR RESERVOIRS
HISTORIC STRUCTURES REPORT
Reservoir Nos. 1, 5, 6 and 7

City of Portland Water Bureau

May 2009

CASCADE DESIGN
PROFESSIONALS, INC.

THE OFFICE OF ROBERT DORTIGNACQ, AIA

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EXECUTIVE SUMMARY

The Mount Tabor Park Reservoirs' structures and buildings are considered nationally significant as part of an early design for a city's open water storage system. The system is historically significant for its initial construction and subsequent additions involving monumental civic undertakings, for the exemplification of early concrete engineering construction technology, and for its architectural design. As recognition of their historic significance, the buildings, structures, and site were nominated to the National Register of Historic Places and received designation as the Mount Tabor Park Reservoirs Historic District on January 15, 2004. Generally, those features within the district boundary that date from the initial construction in 1894 through construction and additions dating to 1951 are considered historic contributing.

As viewed from a historic resource perspective, the historic resources in the Mount Tabor Park Reservoirs Historic District are, for the most part, in good condition. The structures and buildings were carefully designed and were built for durability and low maintenance. Those considerations have allowed the structures to age gracefully. The facilities are currently used on a daily basis. Very few original construction components have been lost or removed. There have been minor modifications to the facilities to allow continued operation. In many cases, these alterations, such as new electronic measuring or pipe controls, supplement the historic resources instead of replacing them. The most significant deterioration is found at the oldest facility, Reservoir No. 1, where the decorative concrete finishes on the site wall and gate house are deteriorated. Some components have been recently renovated, such as painting of the wrought iron fencing assembly located around Reservoirs No. 1 and No. 5. Other components, such as roofing, are currently in serviceable condition but will need to be replaced shortly. Still other features may be advised to be replaced for restoration purposes.

The Portland Water Bureau contracted with Cascade Design Professionals and historic architect, Robert Dortignacq, in mid 2008 to develop a Reservoirs Historic Structures Report (RHSR), in order to provide expert advice on the condition, maintenance, rehabilitation and preservation of the historic features within the Mount Tabor Park Reservoirs Historic District,

The work on this RHSR included a review of existing historic research and documentation of the features, review of prior alterations, visual observations to physically determine the condition of the resources, assessment of the findings, and development of recommendations for preservation. A Tabular Summary (included at the end of this section) was developed and includes preservation recommendations that are noted sufficiently to define the overall scope of the project, uncover significant unknowns, and provide a basis for establishing a construction planning budget. They are not defined to a construction bid level in nature, but rather are intended to provide a comprehensive, overall condition assessment of the historic features, and to provide a strategy for their continued preservation. Specific repair methods and development of rehabilitation construction documents was not part of this scope.

The history and significance of the district and its context have been well-researched and documented, and therefore that information is not repeated in this report. Instead, a condensed statement of history and significance is provided for the user's reference. In addition, a

Construction and Materials Reference Guide discussing the type of deterioration and typical remedial treatment for the different materials used in the district has been specifically developed, and is included in the appendix. A brief bibliography is also included for further reference. As the sole owner and operator of the facilities, the Portland Water Bureau has an extensive library documenting the initial construction, prior projects, and maintenance as well as photographs.

The Reservoirs Historic Structures Report (RHSR) includes the analysis of historic resources as identified in the Mount Tabor Park Reservoirs Historic District National Register nomination. The buildings, structures, and objects included in this analysis are those noted as "contributing" according to the historic district National Register nomination. Fifteen (15) resources (7 buildings; 4 structures, including their basins, site walls, and improvements; and 1 object) were reviewed:

Reservoir 1 Gatehouse 1
Weir Building 1
Fountain Structure (16" round concrete basin at north end of Reservoir 1)
Site (Reservoir Structure, Site Wall (Parapet Wall) Assembly, Valve Platform, Walkways, Stairs)

Reservoir 5 Gatehouse 5
Weir House 5 (commonly know as Hypochlorite Building)
Site (Reservoir Structure, Site Wall (Parapet Wall) Assembly, Walkways, Tunnels, Roadway)

Reservoir 6 Inlet Gatehouse 6
Outlet Gatehouse 6
Site (Reservoir Structure, Site Wall (Parapet Wall) Assembly, Walkways)

Reservoir 7 Building
Underground Tank Structure

Several historic resources that were not included in the 2004 nomination are also discussed. These are: the access stairways between Reservoirs 5 and 6; the 44" Meter House at Reservoir 1; and the remains of an old house foundation at Reservoir 5.

This report discusses the components of these resources, e.g., doors, windows, and structure, by similar construction groupings for ease of identity and recommendations. The Historic District boundary, including structures and other features, is shown on the Site Plan in Figure 1 in the Introduction.

The Portland Water Bureau is currently in the process of constructing or implementing several changes to the Mount Tabor Reservoir facilities as part of the "Mount Tabor Interim Security & Deferred Maintenance Improvements Project" (Water Bureau Project No. 3366). Some of the planned improvements affect the condition assessments made in this report, and those items are identified as they relate to the observations.

Two Technical Memoranda were issued in the performance of this work. Technical Memorandum No. 1 (TM1) presented a review of background information, results of site visits and staff

interviews, and an assessment of the condition of each reservoir component. Technical Memorandum No. 2 (TM2) presented recommendations for the preservation treatment of the various reservoir components. TM1 and TM2 have been combined into this Final Report, along with the cost estimate and Tabular Summary.

In conjunction with preparation of the Technical Memoranda and Final Report, ongoing meetings were held with stakeholders and members of the Mount Tabor Neighborhood Association at key points in the project. A 'Conditions Workshop' was held with Portland Water Bureau staff and stakeholders to review report findings, recommendations, and alternatives as well as formatting for the Final Report. The Condition Analysis and Recommendations are organized by reservoir, then by subcomponent to facilitate use of the report. The report is provided in a loose leaf binder and in electronic format to further allow ease of use and periodic updating of preservation projects.

The Tabular Summary, below, is a condensed version of the main report following its organization. It contains an abbreviated version of the observations and recommendations, as well as a prioritization, cost estimate, and mechanic skill level judgment. The Summary uses abbreviations to facilitate sorting according to Structure and Component. The Structure (first column) is identified by its affiliated Reservoir, such as "GH1" for Gatehouse at Reservoir 1 and "OG6" for Outlet Gatehouse at Reservoir 6. The Component (second column) for each structure is further abbreviated by using letters from the component, such as "CONC" for concrete walls, floor and roof. The third and fourth columns briefly describe the work and recommended treatment. For some recommendations there may be alternative, but equally acceptable, solutions. When multiple options are listed, PWB shall evaluate which option to pursue prior to completion of any work. Those are labeled as sub-items, such as A.1 and A.2. A detailed explanation of the observations and recommendations is found in the main body of the RHSR. The fifth column notes the assigned priority – Short-term (less than 5 years), Long-term (5-10 years), or Maintenance level. The sixth column notes the estimated cost for the anticipated work including 10 percent contingency. The seventh and final column assigns a construction skill (practitioner) level for each recommendation that ranges from 'A', an historic preservation specialist, to 'C', a qualified contractor or PWB staff.

Several work projects from the Tabular Summary that are recommended to be completed before others are noted in a memo titled "High Priority Project List" which is included in the Appendix. These more immediate work projects were identified either due to urgency, or because the task is both needed and is a readily achievable work item.

Mount Tabor Reservoirs Historic Structures Report
Condition Analysis and Recommendations
TABULAR SUMMARY

Structure	Component	Observation	Recommendation	Priority [1] S	L	M	Cost	Contractor Skill Level [2]
RESERVOIR 1								
GATEHOUSE 1								
GH1	CONC	Wall surface spalling, deterioration and exposed reinforcing	Clean exterior, test for absorption, apply sealer	X			$12,000	A
GH1	CONC	Wall openings and projections deteriorated	Clean exterior, test for absorption, rebuild severely deteriorated projections, apply sealer	X			$56,000	A
GH1	CONC	Roofing in fair condition, ponding at drain, inadequate roof drip	Replace roofing, provide overflow drain	X			$25,000	B
GH1	BALC	Iron work is rusted, ladder connections rusted	Further investigation needed, clean and repair rusted connections, repaint		X		$8,000	B
GH1	DOOR	Non-original main entry doors	Option A.1: Repaint doors, preserve cast-iron sills			X	--	C
			Option A.2: Repair and replace with units matching original design and materials				$6,000	B
GH1	WIND	South and west side wood members weathered, paint missing/oxidized; glass units need reputtying	Option A.1: Rehabilitate windows and deteriorated frame parts; select certain openings to be operable		X		$3,500	B
			Option A.2: Rehabilitate all windows and deteriorated frame parts; all openings to be operable		X		$11,500	B
GH1	INT	Damage to concrete floor deck; metal stair rusting	Option A.1: Maintain wood restroom structure, stairway, equipment			X	--	B
			Option A.2: Limited interpretive tours; signage, graphics		X		$4,000	-
			Option A.3: Additional documentation, inventory and photographs of existing historic equipment		X		$4,000	--
GH1	STEP	Substantial spalling; coating breaking up	Clean concrete surfaces, remove loose and deteriorated material; patch tests; patch spalled areas	X			$12,000	B

(1)
S: Short-term (less than 5 yrs)
L: Long-term (5-10 yrs)
M: Maintenance (Varies/Ongoing)

(2)
A: Requires Historic Preservation Consultant
B: Contractor w/ preservation background
C: Qualified contractor or PWB Maintenance Personnel

Mount Tabor Reservoirs Historic Structures Report
Condition Analysis and Recommendations
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Structure	Component	Observation	Recommendation	Priority (1)			Cost	Contractor Skill Level (2)
				S	L	M		
RESERVOIR 1								
WEIR BUILDING								
WB1	CONC	Moisture entering at parapet capstone	Option A.1: Concrete repair & seal	X			$28,000	A
			Option A.1: Roofing replacement	X			$19,000	C
			Option A.2: Metal cap parapet	X			$52,000	B
			Option A.3: Downspout repair		X		$5,500	B
WB1	DOOR	Need repainting; slightly rusty light fixture	Option A.1: Maintain existing doors; preserve historic light fixture			X	--	C
			Option A.2: Restore wood doors and frames		X		$5,500	B
WB1	WIND	Fair condition; new grating on interior planned	Maintain as is			X	--	C
WB1	INT	No issues	Maintain as is			X	--	C
RESERVOIR 1								
FOUNTAIN STRUCTURE								
FS1	FS	Front level top has hole and corners spalled and broken; side walls have spalling; cup and chain missing; securing bolt deteriorated	Option A.1: Clean and patch damaged areas; brush out adjacent planting		X		$3,500	A
			Option A.2: Clean and patch damaged areas; brushing; investigate-reconnect water source, replace cup and chain; provide signage		X		$7,000	A
RESERVOIR 1								
SITE								
S1	RES	Breaks and spalls in concrete; weeds; unsound valve platform	Option A.1: Routine maintenance; salvage historic materials from valve platform			X	--	C

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Structure	Component	Observation	Recommendation	Priority (1) S	L	M	Cost	Contractor Skill Level (2)
			Option A.2: Remove bituminous patching, replacement liner		X			
S1	WALL	Substantial wear and deterioration; exposed reinforcement	Option A.1: Repair deteriorated surfaces and detail; preserve intact portions; clean, patch and repair damaged areas; test	X			$50,000	A
			Option A.2: In addition to A.1, replace existing pole lighting, remove surface mounted conduit, provide entry lights at fence corner posts		X		$155,000	B
S1	WALK	Broken slabs, corners, spalls, rough surface, settlement	Patch-replace damaged portions; control vegetation; preserve/maintain stair and railing, cast iron grates and lids		X		$16,000	C
S1	METR	Vandalism, damaged entry door frame, damaged concrete edges of opening	Monitor and remove graffiti; replace door			X	--	C
RESERVOIR 5 GATEHOUSE 5								
GH5	CONC	Wall spalling, weathered concrete capstones, interior concrete topping slab spider cracking; worn roofing membrane	Option A.1: Roof and flashing	X			$19,000	B
			Option A.1: Clean concrete exterior; test for water absorption, renew sealer to parapet; preserve-repair historic light fixtures	X			$16,000	A
			Option A.2: Replace downspouts, remove surface conduit		X		$6,000	B
GH5	BALC	Balcony not needed for operations	Alter; install protective guardrail, remove/salvage exterior light fixture; cap conduit		X		$1,600	C

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Structure	Component	Observation	Recommendation	Priority [1]			Cost	Contractor Skill Level [2]
				S	L	M		
GH5	DOOR	Bottoms rusted out, moderate damage to side door	Option A.1: Maintain non-original doors, retain cast iron sills			X	--	C
			Option A.2: Restore wood doors and frames		X		$8,000	B
GH5	WIND	South and west sides: weathered, paint missing, sills deteriorated	Preserve			X	--	C
GH5	INT	Metal stair rusting, exposed gearing and valve stems	Option A.1: Maintain restroom structure, metal stairway, historic equipment			X	--	C
			Option A.2: Provide add'l documentation, inventory and photographs of historic equipment		X		$4,000	--
GH5	STEP	Spalling	Clean, test, patch	X			$4,000	B
RESERVOIR 5								
HYPOCHLORITE BUILDING (WEIR HOUSE)								
WH5	CONC	Soiling, some loose termination points, roof drains susceptible to clogging, visible roof equipment	Roof repair & flashing	X			$13,500	C
			Clean concrete; test for water absorption; breathable sealer to flat capstone; minor roof repairs	X			$5,000	B
WH5	DOOR	Need repainting	Remove hoist crane, replace doors similar to original, repaint		X		$4,500	B
WH5	WIND	Need repainting	Option A.1: Repaint and caulk			X	--	C
			Option A.2: Replace windows		X		$18,000	B
WH5	INT	No significant issues	No scheduled work					

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Mount Tabor Reservoirs Historic Structures Report
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Structure	Component	Observation	Recommendation	Priority (1) S	L	M	Cost	Contractor Skill Level (2)
RESERVOIR 5 SITE								
S5	RES	New liner has abated deterioration	Preserve and maintain			X	--	C
S5	WALL	Defects at cap end joints, no fence lighting in place	Option A.1: Clean, minor patching		X		$11,500	B
			Option A.2: Maintain			X	--	C
			Option A.3: Replace existing non-historic pole lighting around perimeter walkway		X		$250,000	B
			Option A.3: Fence lighting; restore iron fence post tops; install LED lighting		X		TBD	B
S5	WALK	Broken slabs, corners, spalls, rough surfaces, settlement	Minor patching or replacement, preserve cast iron grates and lids		X		$11,500	C
S5	STAIR	Portions of stairway replaced/patched, finish not match original pattern	Option A.1: Minor patching/replacement, preserve historic railing		X		$5,000	C
			Option A.2: In addition to A.1, repair/replace newer concrete with matching finish		X		$10,000	B
T1	Tunnel	(Not Accessed)	Preserve - ongoing maintenance			X	--	C
T6	Tunnel	Paint	Preserve - ongoing maintenance			X	--	C
RESERVOIR 5 OTHER FEATURES								
OT5	ROAD	Roadway repaved, curb on westside added	Option A.1: Preserve; ongoing maintenance			X		
			Option A.2: Possible historic paving restoration		X			
OT5	HOUS	Cobblestone remains of old house foundation	Option A.1: Protect existing historic walls			X	--	C

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Structure	Component	Observation	Recommendation	Priority (1) S	L	M	Cost	Contractor Skill Level (2)
			Option A.2: Provide historic interpretive information on the house		X		$2,000	
RESERVOIR 6								
INLET GATEHOUSE 6								
IGH6	CONC	Spalling, soiling, weathered capstones, spider cracking, door slab breakup, worn roofing membrane, roof ponding	Option A.1: Replace roofing, drains	X			$19,000	C
			Option A.1: Minor exterior cleaning, renew parapet as needed	X			$16,000	B
			Option A.2: Remove surface conduit		X		$5,000	C
			Option A.3: New breathable sealer		X		$26,000	B
IGH6	BALC	Iron work rusted, upper portion of ladder deformed	Inspect metal connections, clean and repair connection and damaged parts, repaint		X		$8,000	B
IGH6	DOOR	Rusting, need repainting, weathered exterior facing	Option A.1: Repaint doors, frames; maintain wood door, frame, sills,; patch side door landing			X	--	C
			Option A.2: Replace metal doors and frame; repair existing wood door, frame and hardware		X		$5,000	B
IGH6	WIND	Weathered wood members, paint missing/oxidized, need reputtying	Option A.1: Rehabilitate windows and deteriorated frame parts, repaint, repair select openings, evaluate interior security grill		X		$4,000	B
			Option A.2: Rehabilitate all windows and deteriorated frame parts, repair all openings		X		$16,000	B
IGH6	INT	No issues	Option A.1: Ongoing maintenance			X	--	C
			Option A.2: Additional documentation, inventory and photographs		X		$4,000	--

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Structure	Component	Observation	Recommendation	Priority (1) S	L	M	Cost	Contractor Skill Level (2)
IGH6	STEP	Spalling	Clean concrete surfaces, remove loose and deteriorated material; patch tests; patch spalled areas	X			$8,000	B
RESERVOIR 6								
OUTLET GATEHOUSE 6								
OG6	CONC	Areas of spalling; exposed, corroding reinforcing bars; soiling; weathered capstones; cracking; worn roof membrane	Option A.1: roofing, roof drains	X			$19,000	C
			Option A.1: Clean soiled exterior; test for water absorption	X			$22,000	B
			Option A.2: Repair; remove surface conduit as other project allow		X		$5,000	C
OG6	BALC	Iron work rusted, original wheel valves rusted and inoperable	Further inspection, clean and repair connections and damaged parts, repaint		X		$8,000	B
OG6	DOOR	Some rusting, weathered exterior facing, need repainting	Option A.1: Repaint doors and frames, maintain cost iron sills			X	--	C
			Option A.2: Replace metal doors and frame, repair existing wood door, frame and hardware		X		$5,000	B
OG6	WIND	Weathered, missing/oxidized paint, need reputtying	Option A.1: Rehabilitate windows and deteriorated frame parts, repaint, repair select openings, evaluate interior security grill		X		$4,000	B

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Mount Tabor Reservoirs Historic Structures Report
Condition Analysis and Recommendations
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Structure	Component	Observation	Recommendation	Priority [1]			Cost	Contractor Skill Level [2]
				S	L	M		
			Option A.2: Rehabilitate windows and deteriorated frame parts; repair all openings		X		$14,000	B
OG6	INT	Corroded wheeled gate operator on exterior balcony corroded, stem cover needs repair/replace	Option A.1: Preserve existing office, historic light fixture, wood doors and trims; preserve metal stairway and equipment; add new equipment as needed			X	--	C
			Option A.2: Addition documentation, inventory and photographs of equipment		X		$4,000	--
RESERVOIR 6 SITE								
S6	RES	Reservoir structure in good condition	Option A.1: Preserve the existing structure and liner			X	--	C
			Option A.2: Remove bituminous patching, new replacement liner		X			C
S6	WALL	Normal wear and tear, fencing in good condition, lighting discontinued	Option A.1: Clean and provide minor conc patching		X		$16,000	B
			Option A.1: Metal framing repairs		X		$110,000	B
			Option A.2: Replace existing non historic pole lighting with historically compatible design		X		$370,000	B
			Option A.3: Fence lighting; repair-restore fence post tops; install new LED lighting		X			B
S6	WALK	Many damaged areas, little base remaining for concrete slabs	Provide minor patching or replacement at damaged areas; preserve assorted cast iron grates and lids		X		$12,000	C

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Mount Tabor Reservoirs Historic Structures Report
Condition Analysis and Recommendations
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Structure	Component	Observation	Recommendation	Priority (1) S	L	M	Cost	Contractor Skill Level (2)
RESERVOIR 7 BUILDING								
B7	BUILD	Drainage problems, water damage, some deterioration, nonhistoric door hardware and security, frame molding partially missing, badly deteriorated wood louver vents	Option A.1: Roof and upper wall	X			$6,000	B
			Option A.1: Repair wood door and frame, repair louver vents where venting required	X			$6,000	B
			Option A.2: In addition to A.1, restore louver vents on sidewalls		X		$2,500	B
RESERVOIR 7 UNDERGROUND TANK STRUCTURE								
TS7	TANK	New top; good condition	Ongoing maintenance as required			X	--	C

(1) S: Short term (1 to 5 years)
L: Long term (5 to 10 years)
M: Maintenance (Varies and ongoing)

(2) A: Requires Historic Preservation Specialist/Specialty Contractor
B: Contractor with preservation background (i.e. 5 similar projects)
C: Qualified contractor or Water Bureau Maintenance Personnel

(1)
S: Short-term (less than 5 yrs)
L: Long-term (5-10 yrs)
M: Maintenance (Varies/Ongoing)

(2)
A: Requires Historic Preservation Consultant
B: Contractor w/ preservation background
C: Qualified contractor or PWB Maintenance Personnel

INTRODUCTION

MOUNT TABOR HISTORY AND SIGNIFICANCE

Portland first established its municipal water system in the 1890s. This was representative of other sizable municipalities across the country that sought to provide urban utility systems with an adequate supply of water for their growing cities. The supply was necessary not only to ensure safe water for domestic consumption, but also for fire fighting and manufacturing. The creation of the Portland water system involved significant effort and cost. The supply source, distribution network and reservoir system all needed to be assembled. Portland's leaders believed that the development of a dependable and safe water supply demonstrated the City's commitment to growth and the well-being of its citizens and future generations.

The effort to establish the municipal water system was the responsibility of Portland's Water Committee, a group created by the state legislature during special session in 1885. At that time there were issues relating to constant, adequate supply, and of water purity facing the growing city that then depended on the local, privately owned water companies. Portland was growing, becoming industrialized and, located downstream from other developing towns that used the river for waste and sewage disposal. Its residents were faced with degradation of the river water like many other comparably sized cities in the country.

Water was needed for a wide variety of purposes, including domestic, agriculture, manufacturing, construction, and notably, fire fighting. The city's growth resulted in areas of densely populated, wooden structures, with essentially no fire protection. Although building practice was beginning to change from all wooden structures to a more substantial type with masonry exteriors and wood interior framing, nearly all remaining buildings from that era reveal fire scars on their interior framing, attesting to the day-to-day fire risks.

During this time period health science was developing. New research discovered that certain epidemic diseases were water borne. As water purity increasingly became a concern for city leaders, municipalities across the country began to develop and control their own water supplies. Portland's Water Committee led the local effort to secure a clean, dependable source and supply of water at reasonable cost to its residents.

The new water system required a dependable source, the means to transmit the water, local storage facilities and the local distribution network. The Water Committee hired Colonel Isaac Smith as lead engineer for the project, and directed him to find a dependable water source replacement for the Willamette River. He recommended the Bull Run Watershed and River, which the Committee was able to secure, along with some surrounding watershed area. In addition, the Committee was able to secure federal protection for the greater watershed area (a current no trespass reserve).

Construction of Conduit No. 1 (pipeline) from the Bull Run Watershed to Portland was a considerable undertaking. The distance was great, the terrain difficult and largely wilderness. Construction required excavations, trestles and bridges to carry the water by gravity from an initial elevation of 710 feet at the intake Bull Run River to Mount Tabor, the chosen distribution site, at an elevation of 411 feet.

In Portland, Reservoir No. 1 was built at the Mount Tabor site. This reservoir fed and worked in conjunction with Reservoir No. 2 at the foot of Mount Tabor for east Portland service. The reservoirs at Mount Tabor supplied Reservoirs No. 3 and No. 4 at City Park (now Washington Park) through a conduit beneath the Willamette River for westside and downtown service. These four reservoirs provided a combined capacity of 66 million gallons of water, a 4-5 day reserve supply for Portland.

In years following the 1905 Lewis and Clark Exposition, Portland grew significantly to a size nearly triple that when the initial system was designed. The increase in population was accompanied by a similar increase in business and industry, making it necessary to enlarge the capacity of the water system to accommodate this new growth. A second supply line from Headworks, Conduit No. 2, was added along with additional storage Reservoirs No. 5, No. 6, and No. 7 at Mount Tabor in 1911. The reservoirs were interconnected by conduits in concrete tunnels between Reservoirs No. 1 and No. 5 (same elevation) and Reservoir No. 6 on the lower west slope of Mount Tabor. In 1923 a weir building (screen house) was added at Reservoir No. 1 with Conduit No. 3 construction. Since that period there have been periodic enlargements and improvements to the Bull Run source supply, system conduits, and operations to keep pace with technology and growth. Yet, the system still utilizes the core design and most of the structures from the original period, a testament to its thoughtful long-term vision.

The construction of the first structures at Mount Tabor consisted of Reservoirs No.1 and No. 2 and their gatehouses. The reservoir design took engineering advantage of the natural terrain and also reflected the ideals of the City Beautiful Movement that was then becoming popular. These concepts sought to reinforce natural beauty within the built environment by creating a sense of order in the setting and harmony between structures and landscape. This was exemplified by the perimeter walkway with decorative fencing surrounding the reservoirs, the paths and parkland, the water fountain and other public areas within a complex that provided municipal services. The gatehouses used a Romanesque Revival design that was then popular in the country for engineering works, but was also a design reference to fortress gatehouses in England and the Continent, where the structures also employed the use of water. The design conveyed a sense of strength and durability. It now also conveys a romantic setting.

Mount Tabor Reservoir No. 1 dam, lining, perimeter wall, and gatehouse are constructed of poured in place concrete, the first large scale projects using the Ransome method that utilized twisted iron reinforcing bars. This was cutting edge technology at the time, as were the early concrete mix designs using Portland cement. The ability of liquid concrete to be formed and cast into a variety of shapes and surface textures added to its attractiveness. Popular styles could be constructed faster, stronger and more economically than previously. Work at Reservoirs No. 5 and No. 6 and ancillary buildings continued the design style and type of construction using current engineering and construction technology, but still with craft and attention to details. The original piping, equipment, and mechanical construction still exist to a large extent.

The Mount Tabor Park Reservoirs structures and buildings are nationally significant as part of a vanishing design for a city's open water system. Only a small number of major water districts still utilize and operate their historic open reservoirs within an urban setting. The system is historically significant for its initial construction and additions involving monumental civic undertakings, for the exemplification of early concrete engineering construction technology, and for its architectural design.

PROJECT SCOPE & APPROACH

The purpose of this project is to develop a Reservoirs Historic Structures Report (RHSR) to provide an assessment of current conditions and recommendations for immediate and on-going maintenance, and for long-term preservation of the historic features within the Mount Tabor Park Reservoirs and Washington Park Reservoirs Historic Districts. The work items and procedures noted are generally not defined to a construction bid level in nature, although work items are noted sufficiently to define the project, uncover significant unknowns, and provide a basis for establishing a construction budget. This RHSR is based on the existing National Register Historic District nomination and includes review of existing historic research and documentation of the features, review of prior alterations, fieldwork for condition assessments, a tabular summary of results, and creation of an implementation plan. The tabular summary includes a prioritization list which identifies the immediate maintenance required to preserve the facilities against significant deterioration and the ongoing maintenance recommendations for items of lesser concern and significance.

The work is divided into two phases: Phase A – Mount Tabor Park, and Phase B – Washington Park. This RHSR pertains only to Phase A – Mount Tabor Park Reservoirs Historic Structures, and analyzes the condition of historic features as identified in the Mount Tabor Park Reservoirs Historic District (January 15, 2004). Buildings, structures, and objects included in this analysis are:

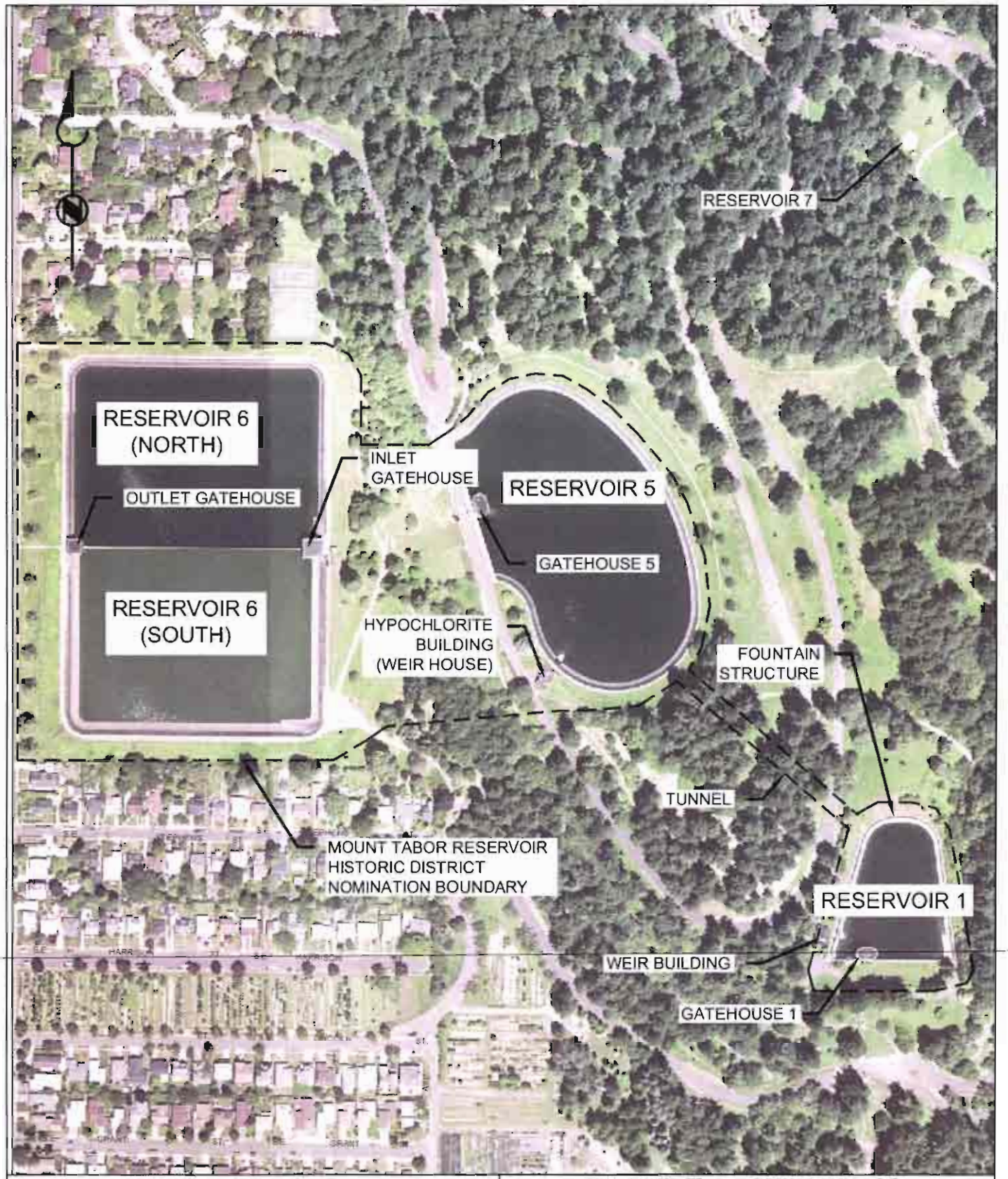
Reservoir 1
Gatehouse 1
Weir Building
Fountain Structure (16" round concrete basin at north end of Reservoir 1)
Site (Reservoir Structure, Site Wall (Parapet Wall) Assembly, Valve Platform, Walkways, Stairway, 44" Meter House)

Reservoir 5
Gatehouse 5
Hypochlorite Building (Weir House)
Site (Reservoir Structure, Site Wall (Parapet Wall) Assembly, Walkways, Stairway, Roadway, and Conduit Tunnels to Reservoirs No. 1 and No. 6)

Reservoir 6
Inlet Gatehouse 6
Outlet Gatehouse 6
Site (Reservoir Structure, Site Wall (Parapet Wall) Assembly, Walkways, Stairway)

Reservoir 7
Building
Underground Tank Structure

The Historic District boundary, including structures and other features, is shown in Figure 1, Site Plan.



CASCADE DESIGN
PROFESSIONALS, INC.
THE OFFICE OF ROBERT DORTIGNACQ, AIA

FIGURE 1 - SITE PLAN
MT. TABOR HISTORIC
STRUCTURES REPORT
PORTLAND WATER BUREAU
PORTLAND, OREGON

Phase A was divided into two parts. In Part 1 of Phase A, each of the historic contributing features of the above resources in the Mount Tabor Reservoirs Historic District were identified and reviewed, with a condition assessment developed for each. These were discussed with the Portland Water Bureau, the stakeholder group and members of the Mount Tabor Neighborhood Association. The results were documented in Technical Memorandum No. 1.

The consultant team visited each of the historic contributing resources over a three-week period during the field work portion. The visits were conducted by a team consisting of an architect to review the overall condition of the building or structure, a structural engineer to identify any pertinent structural deficiencies, and a civil engineer to review operational concerns. Each discipline then reviewed the findings in light of the building's or structure's historical significance. The reviews were visual and documented by digital photography. No testing or analysis was done in the course of the reviews.

Each of the contributing features was then reviewed. A condition assessment for each of the features was developed, including a description of the facilities, discussion of the operations, photos, and an itemized list of apparent deficiencies. The Portland Water Bureau is currently in the process of constructing or implementing several changes to the Mount Tabor Reservoir facilities as part of the "Mount Tabor Interim Security & Deferred Maintenance Improvements Project" (Water Bureau Project No. 3366). Since some of the planned improvements would affect the condition assessments made in this report, those items were identified as they related to the observations.

Subsequently, in Part 2 of Phase A, alternative treatment means and methods to address deficiencies identified in the condition assessment were analyzed. Recommendations for improvements and a plan to implement the preferred alternatives were developed and discussed with the Portland Water Bureau, the stakeholder group and members of the Mount Tabor Neighborhood Association. The recommendations and implementation plan included a prioritization of major repairs and an ongoing maintenance plan. The results were documented in Technical Memorandum No. 2. For some recommendations there may be alternative, but equally acceptable, solutions. Those are labeled as sub-items, such as A.1 and A.2.

Final Report Format

The information from the two technical memoranda have been integrated into this final RHSR. In the report, a separate, tabbed section is presented for each of the four Reservoirs (1, 5, 6, and 7). Within a particular section, each contributing resource is listed separately, such as Gatehouse 1, Weir Building, etc. The building or structure is further broken down by contributing feature or component (such as balcony, windows, doors, etc), each of which includes a brief description, observations/conditions, treatment recommendations, alternative treatment options, and a priority (urgency, not significance) ranking. This information is summarized in the Executive Summary, which includes a tabular summary as well. Report appendices include a selected bibliography and relevant Department of Interior Historic Preservation Briefs. (These Briefs are typically not directed specifically toward the types of features and materials found at Mount Tabor, but they have some useful information and relevant methodology.) In addition, a Construction and Materials Reference Guide discussing the type of deterioration and typical remedial treatment for the different materials used in the district has been specifically developed and included.

METHODOLOGY FOR REPAIRS

Treatment Guidelines

The recommendations and principles presented in this RHSR are in accordance with accepted good practice, and follow the Guidelines For Rehabilitating Historic Buildings as developed by the Secretary of the Interior in their "Standards for Rehabilitation". These recommendations for specific work on the buildings and structures follow those principles, guidelines, and methodology and are described below.

Fundamental Guideline for Treatment:
Work on historically significant buildings and structures seeks to

Identify, Retain and Preserve

those historic features and resources that distinguish their historic character.

Alternatives for Treatment

Once historic character defining features are identified and their conditions are assessed, recommendations can be made for their preservation. Those decisions need to consider both the nature of the feature and its anticipated use.

The following Secretary of the Interior guidelines define the possible alternatives for treatment, starting from the least invasive:

Protect and Maintain (Preserve): This method essentially seeks to slow deterioration. Often this is the recommended procedure, and always is the situation when there are adjacent projects that may damage the feature. This could be the recommendation when the feature can continue its intended use as is, or with minimal intervention, or when other repairs might threaten its integrity, or as an interim step until other treatment can occur. This work can also be considered as good maintenance.

Repair: When the physical condition of the historic character defining materials or features warrant, repairing is recommended. The general principle is to consider the least amount of repair necessary, then move to more extensive or invasive work where necessary. Repair may include limited replacement of heavily deteriorated materials. A project may, for example, include a basic level of repair work that satisfies most of the problem, and a smaller amount of more extensive repair. The existing condition should be well documented before any work commences.

Replace: The most invasive method of preservation is replacement. Generally this is only employed when the physical condition of the historic character defining materials or features is so deteriorated that suitable repairs are not feasible. The best replacement materials are those that are in 'kind' or close to the original material in composition, performance and resultant expression (See Restore below). Replacement can also occur for other reasons, such as structural conditions, or greatly altered operational use. In these situations, the replacement required within the new design should be incorporated into the historic fabric as much as possible. The existing conditions should be well documented before any work commences.

Restore, Design For Missing Historic Features: When an entire feature or component is missing, it no longer plays a part in physically defining the historic character of the structure or building unless it can be accurately recovered. Salvage of the missing item is most preferable and should be the first objective. But salvage may not be feasible (or may occur later at an unknown time in the future). An alternative is to reproduce the feature. Typically, use of similar materials and the same design is necessary. For example, a new door or window, or lantern may be made using an original as the pattern and study guide. A second acceptable option is the replacement of the item with an alternative, historically compatible design. This design should not detract from the remaining historic feature attributes in its design, materials and finish. This alternative might be a necessary, but temporary solution for the continued protection of the structure (such as roofing or downspouts) that is then later removed when the original can be restored. The alternative design (second option, not first) should be sufficiently differentiated from the original historic feature so that it is not generally perceived as the original historic component.

Alterations/Additions: It is important that the historic building or structure be able to continue its use. Alterations or additions might be necessary to achieve this goal. They may be part of the overall preservation strategy, and may affect historic features directly or indirectly. Such work needs to be considerate of the character defining materials and features and should weigh alternative solutions or strategies. Work should be designed in such a manner that there is the least impact. This may include work on lesser or non-character defining features rather than on the primary ones. The work should not radically change, obscure or destroy character defining features. Reversibility of the proposed work should be considered (Can this be easily removed in the future? Could the original be restored?). Alterations can include removal of non-historic materials or elements. The existing conditions should be well documented before any work commences.

Prioritization

The highest priority is for the continued preservation of the most significant historic features, and for those that are most in danger of being lost. This is followed by those features having lesser deterioration, or having less imminent damage. The recommendations are grouped into Short-term, ideally to be completed within 5 years, and Long-term, from 5-10 years. No sub-definition should be used, since it is beneficial to allow preservation to occur as funding for other operational projects is obtained. In this way, lower priority items may be completed earlier than expected, but in concert with adjacent work, which improves construction and funding efficiency and does not require revisions of otherwise completed work. Other work may be best considered as maintenance and thus performed on a regular cycle using annual funding.

Preservation recommendations are primarily concerned with the continued retention, structural integrity, and 'well being' of the historic building and its features. A secondary aspect is the aesthetic quality of the resource and its environment or context. These attributes are those that can be reconciled over time without great concern for loss of historic material. Although secondary, they are important since they provide additional citizen support and pride.

Procedures

Work procedures on historic materials are very important. Inadequate knowledge, preparation, skill, or inappropriate materials can do more harm than good for particular items. However, the historic materials used on buildings and structures in the Mount Tabor Park Reservoirs Historic District are generally durable and heavily constructed. These materials, though worn, have a very long life span and can last much longer with appropriate maintenance.

While each specific material needs to be handled with regard to its specific properties, the general procedure for all repairs is as follows:

1. Inspect deteriorated conditions thoroughly to determine scope and degree of work. Document and photograph existing conditions.
2. Develop appropriate preservation and repair options; this often is a combination of strategies, not "one size fits all".
3. Fragile and very important historic features need closer guidance and review throughout the design and repair process.
4. Use test samples to determine the best remedial solution for the particular work; at highly visible features or where the outcome is not certain, first utilize separate test samples, then try field samples on the structure when reasonably assured of favorable results.
5. Use the gentlest means first, then step to more aggressive means if necessary; keep in mind that more aggressive repairs can also mean more loss of historic integrity, and potentially more rapid future deterioration.
6. If materials and products do not work satisfactorily, consider benefits of scaling back to a 'Preserve' strategy; future technology may provide a better result if the feature can last.
7. Since many repairs over time result in accumulated loss of original material, repair only what is necessary.
8. Replacements usually involve removal of original materials. Apply the test of reversibility to determine the best design; evaluate the ability to retain original materials in the replacement; document historic conditions; salvage materials in sound condition.
9. Review prior alterations and rehabilitation work to determine whether there is an adverse impact to the historic materials. If so, evaluate alternatives to design and installation.

Skill Level of Practitioners

The background and skill level of those involved in the repairs of historic features is an important aspect in the success of the repair and in the long term preservation of the resource. The formulation, design, specification and at times, the monitoring of most projects should be performed by individuals having adequate professional knowledge and historic expertise. The Tabular Summary assigns a construction skill level for each recommendation that is based on the combination of the feature or material's historic or unique nature, the current general availability of repair and replacement materials and the provider's skills.

Skill Level: A: Use of a specialist historic preservation contractor is necessary; typically involves specialty products requiring prior experience on historic projects.

B: Use of a contractor with similar historic preservation experience; suggested: 5 similar firm projects, and primary workers to have experience on at least 3 similar projects.

C: Use of a qualified contractor or maintenance crew from PWB.

SUMMARY OF FINDINGS

Overall, the historic features in the district are in fair to good condition, are largely intact, and reflect their original construction. The buildings, structures and site are actively utilized and are maintained. Most of the rehabilitation work necessary is not of an immediate nature. That is, the historic features are not in a position of needing urgent repairs to prevent their loss. There are, however, various projects that need to be completed soon to prevent worsening conditions. The exterior concrete surface at Gatehouse 1 and its reservoir site wall are examples of deteriorated conditions that need addressing soon. They were part of the earliest construction effort, built when there was much less technological knowledge and quality control of concrete than with the later built structures in the district. Other noted short-term projects include building components that generally have shorter life cycles, such as roofing and flashings. These projects require attention since their failure can greatly increase damage to the building. There are a large percentage of projects that can be remedied under a long-term time frame. These also include restoration-type projects that would enhance the district. Finally, there are various projects that can be incorporated as maintenance.

IMPLEMENTATION PLAN

The Implementation Plan will be based on the Tabular Summary provided in this report. The Tabular Summary uses abbreviations to facilitate sorting according to Feature, Structure and Component and corresponds to the report narrative. The Feature or Structure (first column) is identified by its affiliated Reservoir, such as "GH1" for Gatehouse at Reservoir 1 and "OG6" for Outlet Gatehouse at Reservoir 6. The Component (second column) for each structure is further abbreviated by using letters from the component, such as "CONC" for concrete walls, floor and roof.

Portland Water Bureau (PWB) will use the Tabular Summary as a starting point to develop a detailed Implementation Plan. A PWB Stakeholder group will be established consisting of the appropriate representatives and will use the Tabular Summary to facilitate sorting work projects by priority, cost, or skill level and update as necessary to reflect personnel availability and financial conditions.

RESERVOIR 1

Contributing historic features at Reservoir 1 include the parabolic basin, its perimeter wall system, gutter and walkway, the gatehouse on the south side, the weir (screen) house on the west side and the small drinking fountain object on the north.

Reservoir 1 Gatehouse

Reservoir 1 - Gatehouse 1

Concrete Walls, Floor and Roof

The building is a poured in place reinforced concrete structure, oval in plan, measuring 42 feet east-west and 26 feet north-south, and is symmetrically composed and located on the south side of the reservoir toward the inlet chamber on the west. It was constructed using Ransome construction and finish patents that were the latest technological achievement at the time of its 1894 construction. The exterior was formed with a rusticated block pattern that was bush hammered to provide a heavy rock finish, while the interior is coated or painted. There is a low projecting parapet with a frieze using repetitive chamfered square recesses, horizontal molding lines with a crenel course below aligning with the frieze pattern. The continuous parapet capstone is covered with prefinished standing seam painted steel. Door and window openings are round arch headed and have projecting surrounds with a prominent sill projection. There is a molded water table base. The lower water facing exterior below the water table line (floor line projection) is unpatterned and coated with cement plaster. The concrete floor deck is finished with a smooth troweled concrete and is without other finishes. The floor has imbedded glass relights installed under the Ransome's patent method. The concrete roof deck is supported on concrete beams and is covered with a membrane roofing. Roof drainage is internal by means of cast iron pipe connected to outside site drainage facilities.

Condition/Observations: The exterior wall, though mostly sound, has many areas of surface spalling, deterioration and some with reinforcement exposed. The wear is primarily on the south side, but also extends around each end. The least upper wall deterioration is on the north, facing the reservoir. The wall openings and projections have deterioration. Previously (before metal parapet cap), the upper wall and roof edge deterioration was accelerated due to the broad concrete parapet cap and inadequate design for roof drip. The surface of the concrete is generally weathered and soiled. Some areas appear to have been patched in the past. It also appears that the building had a finish coating as part of its original construction. The soiling and deterioration is most notable on and around the parapet and on horizontal projections. The exterior water coating is spalled in the vicinity of the former high waterline and below. The upper portion of this coating is in better condition. There is one interior roof drain (southside) that daylights onto a small gutter crossing the walkway near the entry doors. The modified bitumen roofing is in fair condition, some of the sheet's scrim showing. There is ponding around the single drain.

Treatment Recommendations: The articulated above water concrete has surface deterioration that includes loss of material, especially that at horizontal projections, and friable material extending slightly into the outer surface. It is expected that the original concrete finish may be difficult to match.

Option A.1: Preserve and Repair – Gently clean the concrete exterior; test for water absorption, patch tests; install cementitious patching to rebuild severely deteriorated horizontal projections and apply a breathable sealer to the above waterline, articulated concrete finish; retain lower below waterline wall as is. Replace worn roofing; provide overflow drain. (Ref.: Pres. Brief 1, 15)

Priority: Short-term

Metal Balcony, Gatehouse 1

Metal Balcony

The partial width balcony (north side) is constructed of cast iron grating with a wrought iron framework that is diagonally braced back to the concrete wall of the gatehouse and has a pipe railing enclosure. All of the items are painted black. It was designed for reservoir valve (extant) operation; there is a fixed wrought iron ladder for Gatehouse roof access.

Condition/Observations: The iron work is rusted, particularly at joints and connections to the concrete structure. The ladder is intact, but also has rusted connections. The cast iron grating appears to be in useable condition. A gate operator is mounted on a metal balcony at the rear of the building. The balcony does not have adequate handrail for fall protection. A closer evaluation may be needed to better determine the condition of the connections to the building structure.

Treatment Recommendations: The platform and valves are used for normal operations, so replacement or retrofit to meet current codes and standards is not necessary.

Option A.1: Preserve and Repair – Further inspection of the metal connections is required; clean and repair connections and damaged parts where structurally unstable; provide fall restraint anchors; possibility to revise valve operation from interior; repaint. (Ref.: Pres. Brief 13 & 27)

Priority: Long-term

Doors

There is a single entry with inswinging paired doors at the top of 5 exterior concrete steps on the south side. There is a minimal top landing and two splayed side handrails (non public use). The doors are flush steel with a hollow steel frame that are replacements. The original wood jambs have been cut off at the transom line. The arched transom and fan light remain as does the cast iron sill. The reservoir side door is a replacement flush type wood door with wood frame.

Condition/Observations: The non-original paired hollow metal main entry doors and frame are in fair condition, and need repainting. This opening is not scheduled for revision under Water Bureau Project No. 3366. The reservoir-side door and its hardware are weathered and are non-historic replacements.

Treatment Recommendations:

Option A.1: Preserve – Repaint the doors and frames and retain as is; preserve cast iron sills
Priority: Maintenance

Option A.2: Repair, Replace – Replace doors and frame with units matching the original design and materials

Priority: Long-term

Windows

There are two windows on the south side flanking the door opening, one on the east end of the north side, and three on each of the curved east and west ends. Windows are typically arch topped, wood double hung, 4/4 with rope suspension, some ropes missing. Glass is intact but most of it appears to have been replaced over time and is not historic. Windows have been fitted with exterior security grilles.

Conditions/Observations: The windows are generally in good to fair condition depending upon their orientation to weather. On the south and west sides the wood members are weathered and paint is missing or oxidized. A number of glass units need reputtying. A few of the windows are opened on an occasional basis. There have been a variety of previous paint colors on the windows. There are plans to remove the existing exterior protection grilles and install new interior grilles as part of Water Bureau Project No. 3366. No other alterations are planned.

Treatment Recommendations:

Option A.1: Preserve and Repair – Rehabilitate windows and deteriorated frame parts; repaint; select certain openings to be operable, repair their suspension and hardware; evaluate interior security grill effectiveness (Ref.: Pres. Brief 9, 10)

Priority: Long-term

Option A.2: Preserve and Repair – Rehabilitate all windows and deteriorated frame parts; all openings to be operable, repair their suspension and hardware

Priority: Long-term

Interior Space

The interior retains much original wheeled valve and mechanical equipment in addition to new equipment. Chain driven flat valves are intact and operable. Overhead trolley, curved track, and lifting cranes are intact. There is an original wood framed restroom enclosure (water closet removed) with a raised floor and half light door to the southwest. A curved iron stairway descends counterclockwise to the lower level starting near the north door. The treads have been overlaid with expanded metal for better traction, but otherwise the assembly is in historic condition. The interior lighting is by surface-mounted modern floodlights.

Curved iron stairway, interior Gatehouse 1

Condition/Observations: There is some damage to the concrete floor deck. The metal stair has some rusting, but appears structurally well maintained. The metal stairway to the lower level is consistent with the design shown on drawings dated 1917. The anchorage was recently repaired or replaced.

Treatment Recommendations:

Option A.1: Preserve – Maintain wood restroom structure, (seal waste pipe) metal stairway and existing historic mechanical equipment intact; New equipment modifications added as needed with minimal removal or replacement of historic materials

Priority: Maintenance

Option A.2 – Provide for limited interpretive tours, develop portable signage and graphics

Priority: Long-term

Option A.3 – Provide additional documentation, inventory and photographs of existing historic mechanical equipment

Priority: Long-term

Entry Steps

There are five concrete steps plus the narrow upper landing with cast iron threshold that ascend from the walkway to the entry doors. The steps have a full bull nosed edge, and extend past the door to the reservoir wall returns. The two lowest steps that project past the wall are radiused back in the Romanesque style.

Condition/Observations: It is believed that the steps were originally constructed with a rough base and a top finish coating. There is substantial spalling of the outer coating at the steps; this coating is breaking up.

Entry Steps, Gatehouse 1

Treatment Recommendations:

Option A.1: Preserve and Repair – Clean concrete surfaces, remove loose and deteriorated material; patch tests; patch spalled areas (Ref.: Pres. Brief 1, 15)

Priority: Short-term

Reservoir 1 Weir Building

Reservoir 1 - Weir Building

The 1923 Weir or Inlet building is located a short distance to the west. It was originally the screen house and necessary when Conduit 3 was constructed. The screening function was replaced by facilities at Powell Butte. The building currently is utilized for storage.

Concrete Walls, Floor and Roof

The rectangular reinforced concrete building measures approximately 40 feet north to south and 25 feet east to west and is set close to the adjacent grade. The exterior wall surface and parapet ornamentation reflects the style and pattern of the gatehouse. The concrete roof deck is supported by steel I beams. Some roof deck openings have been made to allow for access. The roof has a membrane covering that terminates on the parapet wall. There are two through wall scupper drains emptying into surface mounted painted metal downspouts on the mid point of each of the long sides. These replaced the original roof drains with pipes cast into the concrete walls.

Condition/Observations: The exterior walls are generally in fair condition and do not have excessive soiling. The wall surface has a thin coat that appears to date to the original construction. There are, however, projecting areas that have spalled where the reinforcement is exposed. Some of the wall staining is associated with moisture entering the wall at the parapet capstone or eave drip. There are a number of horizontal cracks and some spalls on the backside of the parapet at the level of the upper frieze. This is an indication of water penetration damage. The modified bitumen roofing is worn; it has missing or loose termination bars at the wall joint.

Treatment Recommendations:

Option A.1: Preserve and Repair – Exterior Elevations: Clean concrete surfaces, remove loose and deteriorated material; patch tests; patching at missing portions. Parapet: Repair cracks and spalls; replace roofing; test parapet cap for water absorption; apply breathable water sealer (Ref.: Pres. Brief 1, 15)

Priority: Short-term

Option A.2: Repair – All work noted on A.1 and install metal parapet cap and wall liner on inside face of parapet

Priority: Short-term

Option A.3: Repair-Replace – Replace exterior downspouts with interior roof drain and pipe; use scuppers for overflows

Priority: Long-term

Doors

The primary entry is with an inswinging door on the south side. It is a hollow metal door with hollow metal frame and not original. Over the entry door there is a historic exterior light consisting of shaped conduit and an incandescent light in a caged fixture. There is an equipment entry with a similar door located at the midpoint of the west side.

Condition/Observations: The non-original paired hollow metal entry doors and frame are in fair condition, and need repainting. The openings are not scheduled for revisions under Water Bureau Project No. 3366. The light fixture is intact, but slightly rusty.

Historic exterior light over door

Treatment Recommendations:

Option A.1: Preserve – Maintain existing non original doors; preserve historic exterior light fixture

Priority: Maintenance

Option A.2: Repair-Replace – Restore wood doors and frames

Priority: Long-term

Windows

Windows are located on each side; one on the south, one at each end of the west, a pair on the north and a center pair flanked by two on the east. All windows are intact originals that are rectangular headed, wood double hung, 6/6; rope suspension missing; all have exterior security grating.

Condition/Observations: The windows are in fair condition. Water Bureau Project No. 3366 plans to remove the exterior security grating and install new grating on the interior.

Treatment Recommendations:

Option A.1: Preserve – Maintain windows as is (Ref.: Pres. Brief 9, 10)

Priority: Maintenance

Interior Space

Condition/Observations: No issues observed.

Treatment Recommendations:

Option A.1: Preserve – Maintain as is; retain water measure device

Priority: Maintenance

Reservoir 1 - Fountain Structure

Reservoir 1 Fountain Structure

At the north end of the reservoir, just above the perimeter walk and gutter, is a small fountain structure, approximately thirty inches wide. The structure is considered a historic contributing object. The fountain is believed to have been filled by a spring or artesian well.

The concrete fountain features a 16 inch diameter circular basin set into a level top that is half covered with a niched roof. There is a small overflow hole at the back of the basin. It has partial 8 inch thick side walls with a raised detail on the inner half of the top surface. The walls and roof extend back into the hillside. The face of the roof is embossed with the date of 1894. There are remains of an iron rod and chain, presumably for a dipping cup. There is an iron step installed on the back side of the gutter that allows a user easy access to the basin.

Condition/Observations: The basin, top and inner niche surface are in good condition except toward the front exposed portion, where the level top has a 5 inch hole and the front corners are spalled and broken. The side walls have spalling at the lower end of their raised detail. The basin retains a small amount of water. The cup and chain are missing; the securing bolt is badly deteriorated.

Treatment Recommendations:

Option A.1: Repair – Clean and patch damaged areas; brush out adjacent planting (Ref.: Pres. Brief 1,15)

Priority: Long-term

Option A.2: Repair – Clean and patch damaged areas; brush out adjacent planting; investigate-reconnect water source, replace cup and chain; provide interpretive signage (Ref.: Pres. Brief 1, 15)

Priority: Long-term

Reservoir 1 – Site

Reservoir Structure

Reservoir Structure, Reservoir 1

The basin retains the original concrete lining as installed under the Ransome method. It was constructed in a south facing drainage by enclosing the end with a concrete dam further supported by earthen fill; the basin was not designed with an underlying drain system. A vehicle ramp descends from the southeast corner reaching the bottom near the north end. There is a metal valve platform between the gatehouse and the southwest corner.

Condition/Observations: There are numerous breaks and spalls showing in the patched concrete, giving a mottled appearance. Weeds are growing out of cracks. The reservoir has had leakage issues over time. The bituminous water proofing coating remains in portions. The valve platform is not sound and is being replaced under Water Bureau Project No. 3366. A new wash down pipe system is desired.

Treatment Recommendations:

Option A.1: Preserve – Routine maintenance on reservoir liner; there is adequate structure and underlying support at repair areas; salvage historic materials from valve platform

Priority: Maintenance

Option A.2: Repair-Replace – Remove bituminous patching; there is adequate structure and underlying support at repair areas; install reservoir basin liner

Priority: Long-term

Site Wall (Parapet Wall) Assembly

Bordering the basin is a low concrete wall with wrought iron fence. The wall is designed with a projecting crowned cap, an apron beneath and a tall base. The wall is approximately 42 inches high along the south, most visible side. Due to variations in the walkway grade, the exposed face along the hillsides is closer to 24 inches. It is smooth finished concrete with elongated, raised diamond pattern on the taller south side. The fence consists of decorated upper and lower rails, and vertical bars alternating in height all with a spear design; the taller spears each have a pair of leaves. Fence posts at the ends of segments are set into the concrete cap. These posts have a sphere ornament just below their spear tips. At the gatehouse the wall returns to connect to the building. Non-historic pole lighting (50-foot spacing) is located adjacent to the low wall around the basin. The poles are outside of the walkway at the dam portion.

Condition/Observations: The low wall has substantial wear with many areas that are deteriorated, including the cap, projecting diamond patterns, and joint edges. It is not difficult to locate exposed reinforcement. In some instances, the reinforcement is located too close to the exterior surface. There have been some prior patching repairs, but many other defects now are evident. The fencing has recently been renovated under Water Bureau Project No. 3366; it is now being reinstalled with posts set in cored drilled holes with non shrink cementitious grout. Electrical conduit feeds for the light poles are surface mounted on the walkway side of the low wall and junction down to the base of each metal lamp post (50-foot spacing).

Treatment Recommendations:

Option A.1: Repair – The south wall requires substantial repairs to the deteriorated surfaces and detail; preserve the most intact portion(s), the other perimeter wall portions have less deterioration, but not minimal; clean, patch and repair damaged areas; test for water absorption, apply breathable sealers if beneficial (Ref.: Pres. Brief 1, 15)

Priority: Short-term

Option A.2: Repair-Replace – Replace existing non historic pole lighting at south (first) and around perimeter walkway; utilize historically compatible design and products, underground wiring; remove surface mounted conduit; provide entry lights at the adjacent fence corner posts (Ref.: Pres. Brief 1,15)

Priority: Long-term

Walkways

The basin wall is surrounded by a continuous five-foot wide concrete walkway. The walk is scored in 30-inch squares and has a light finish. The length along the hillside has an integral concrete gutter to receive and direct surface runoff. There are historic cast iron bar grates on the south gutter corners. In addition, there are several cast iron lids around the perimeter of the reservoir.

Condition/Observations: The walkway has many damaged areas, including broken slabs, corners, spalls, roughened surfaces and settlement. There does not appear to be much of a base remaining for the concrete slabs. The gutter is in better condition, although there are areas without uniform transition to the walkway.

Treatment Recommendations:

Option A.1: Preserve and Repair – Patch-replace damaged portions of the south walk and the perimeter walk, gutter, and transitions between; cut back and control vegetation at bank above gutter; preserve, repair and maintain stair and railing to meter house; coordinate repairs with site lighting changes and surface mounted conduit removal; preserve cast iron grates and lids.

Priority: Long-term

44" Meter House

44" Meter House Reservoir 1

This structure is not included in the National Register Nomination, but it is historically significant. The reinforced concrete structure is located at the foot of the stairway descending south from the bench area adjacent to the gatehouse and it is located along the vehicle drive. It measures 9 feet by 16 feet and is 13 feet high at the road side; other sides are dug into the hillside. There is a single entry door on the east, now hollow metal with hollow metal frame, three 1/1 double hung wood windows with exterior security screens, one on each daylit side. Walls are board formed concrete and end at the 8-inch roof overhang. Inside, there is steel ladder access to lower level equipment. The accessway is protected with steel pipe railing. There are new concrete steps.

Condition/Observations: The structure is outside of the vehicle controlled area, and appears to receive vandalism as a result. The entry door frame is damaged at the head member, and there are damaged concrete edges around that opening.

Treatment Recommendations:

Option A.1: Preserve and Repair – Monitor graffiti and remove promptly; replace damaged metal (non-historic door)

Priority: Maintenance

RESERVOIR 5

Contributing historic features at Reservoir 5 include the large kidney shaped basin, its perimeter wall system and walkway, the gatehouse on middle of the straight dam portion of the west side and the hypochlorite building (former weir house) on the southeast corner. The dam has a controlled access roadway that runs past the gatehouse and hypochlorite building and thence to Reservoir 1 and the upper portion of Mount Tabor. There are also assorted cast and wrought iron grates and lids and light poles of historic interest.

Reservoir 5 Gatehouse

Reservoir 5 - Gatehouse 5

Concrete Wall, Floor and Roof

The building is a poured in place concrete structure, oval in plan, measuring 40 feet north-south and 24½ feet east-west, and is symmetrically composed. It is very similar in many ways to the gatehouse of Reservoir 1. The exterior was formed with a rusticated block pattern, while the interior shows a 6-inch board form work pattern. There is a low crenellated (indented) projecting parapet with corbel courses below and cast concrete capstones at both the merlons (solid higher portion) and the crenel (lower indent portion). The exterior lower walls have a substantial amount of surface mounted conduit and numerous cored access holes. Door and window openings are round arched and have projecting quoined surrounds. The lower water facing exterior below the water table line (floor line projection) is unpatterned and coated with cement plaster. The concrete floor deck is finished with a smooth troweled topping slab and is without other finishes. The concrete roof deck is covered with a membrane roofing. The roof is drained by through wall scuppers on either side of the entry with replacement painted plastic downspouts that are daylighted. There are partial remains (curved overhead conduit) of an exterior historic light over the reservoir valve balcony door.

Condition/Observations: The exterior wall is mostly sound, although there are areas of spalling, primarily on the south side. Some areas have been patched in the past. There is some soiling and staining from metals and bio matter. Horizontal cold joints from the original construction are visible (inside and out) at roughly two-foot spacing; the joint lines do not line up with the exterior block pattern. The concrete capstones are weathered. The parapet has an elastomeric coating on all surfaces except the exterior elevation. The exterior water coating is spalled in the vicinity of the former high waterline. The interior concrete topping slab has some spider cracking. The roofing membrane is worn.

Treatment Recommendations:

Option A.1: Preserve and Repair – Clean the concrete exterior; minor patching of spalled areas; test for water absorption; renew the sealer to the parapet; verify if breathable sealer is needed at walls above waterline; replace roof membrane; retain lower below waterline wall as is; preserve-repair historic light fixtures

Priority: Short-term

Option A.2: Repair and Replace – Replace surface mounted downspouts with interior roof drains; remove surface conduit as other projects allow (Ref.: Pres. Briefs 1, 15)

Priority: Long-term

Metal Balcony

The partial width original balcony (east side) and ladder have been removed years ago due to deteriorated conditions and lack of need for valve operation. It was constructed of cast iron grating with an iron framework with diagonal braces and was similar to the other platforms.

Condition/Observations: There is evidence of the former balcony attachment points. Due to changes in the valve operations, the balcony is not needed for operations. Roof access is obtained by portable ladder from the street side.

Treatment Recommendations:

Option A-1: Alter; install protective guardrail at reservoir side doorway; remove and salvage the remains of the exterior light fixture; cap off the conduit

Priority: Long-term

Doors

There is a single entry with inswinging paired doors at the top of five exterior concrete steps on the west side. There is a minimal top landing and two side handrails (non public use). The doors are flush steel with a hollow steel frame that are replacements. The original wood jambs have been cut off at the transom line. The arched transom and fan light remain as does the cast iron sill. The reservoir side door is the original single wood cross buck door with wood frame and fan light transom.

Condition/Observations: The non-original paired hollow metal entry doors and frame are in fair condition, though the bottoms have rusted out. This opening is scheduled for revision under Water Bureau Project No. 3366 that shall remove the wood transom and install a new hollow metal arched frame with metal paneled doors and metal fan light. The reservoir side door has moderate damage and is scheduled for repairs and new hardware. There are partial remains of an exterior historic light fixture (a curved overhead conduit) at the reservoir valve operator balcony door.

Treatment Recommendations:

Option A.1: Preserve – Maintain non-original doors; retain cast iron sills

Priority: Maintenance

Option A.2: Replace – Restore wood doors and frames

Priority: Long-term

Windows

Typical Window, Gatehouse 5

There are two windows on the west side flanking the door opening, one on each side of the reservoir facing door, and three on the each of the curved north and south ends. Windows are typically arch topped, wood double hung, 4/4 with chain suspension, some chains missing. Glass is intact but most of it appears to have been replaced over time and is not historic. At the former toilet room the glass is obscure. Windows have been fitted with exterior security grilles.

Condition/Observations: The windows are generally in fair condition depending upon their orientation to weather. On the south and west sides the wood members are weathered and paint is missing or oxidized. A number of glass units need reputtying and many of the sills are deteriorated. The windows are only occasionally opened, and primarily just a few windows. There have been a variety of previous paint colors on the windows. The current security project shall replace the sills, and make sash operable (no suspension repairs). The exterior security grilles shall be removed and new ones installed on the interior.

Treatment Recommendations:

Option A.1: Preserve

Priority: Maintenance

Interior Space

Interior Gatehouse 5

The interior retains much original wheeled valve, water level measurement and mechanical equipment that is intact and operable, in addition to new equipment. Overhead trolley and lifting cranes are intact. There is extensive interior framing in progress that is associated with the new security provisions. The work is modifying and replacing, mostly, other non historic interior framing. A former restroom enclosure to the north has been removed and no longer exists. An iron stairway descends counterclockwise along the northeast curved wall, to the lower level. The treads have been overlaid with expanded metal or straight bars for better traction, but otherwise the assembly is in original condition. At the base there is access to the tunnel that descends to Reservoir 6.

Condition/Observations: The concrete floor and roof decks appear to be in good condition. The metal stair has rusting, but appears structurally well maintained. Existing valve operators appear to be in good condition and are well-maintained; however, exposed gearing and valve stems may present a safety concern.

Treatment Recommendations:

Option A.1: Preserve – Maintain metal stairway and existing historic mechanical equipment intact; new equipment modifications added as needed with minimal removal or replacement of historic materials

Priority: Maintenance

Option A.2: Provide additional documentation, inventory and photographs of existing historic mechanical equipment

Priority: Long-term

Entry Steps

Entry Steps Gatehouse 5

There are five concrete steps including the narrow upper landing that ascend from the walkway to the entry doors. All steps curve back to the front wall. The fourth step is imprinted with "Reservoir 5" with "1911" on the next lower third step.

Condition/Observations: There is some spalling at the steps. New angled handrails are planned to replace the existing side rails.

Alternatives/Recommendations:

Option A.1: Preserve and Repair – Clean, test and patch steps

Priority: Short-term

Hypochlorite Building (Weir House) Gatehouse 5

Reservoir 5 - Hypochlorite Building (Weir House)

Concrete Wall, Floor and Roof

The 1951 building is a poured in place concrete structure, rectangular in plan, measuring 25 feet north-south and 40 feet east-west, and is symmetrically composed. The building is situated close to the grade level at the reservoir inlet on the southwest corner. The exterior was formed with a rusticated block pattern similar to the older buildings, while the interior is smooth. There is a low crenellated (indented) but otherwise unadorned parapet (without projection or horizontal moldings) and cast concrete capstones. The four building corners are defined with a projected parapet and quoins formed in the concrete. Door and window openings are rectangular and have projecting surrounds in a modified Gibbs surround with a lintel head. The concrete floor deck is finished with a smooth troweled topping slab and has a paint finish. The concrete roof deck is supported on concrete cross beams and is covered with a membrane roofing. A bay of the roof has been altered to allow taller tanks. A lift beam and steel framed brace extends from the center of the paired equipment doors (added in the 1980's and no longer used). The former hatches have been replaced with wood decking.

Condition/Observations: The exterior walls are in good condition. There is some soiling, most notably at the upper wall and around the parapet. The capstones are weathered. The modified bitumen roofing is in fair condition; there are some termination points that are loose and susceptible to water entry. The four roof drains are susceptible to debris clogging. Roof top alterations have been made and equipment is visible from a short distance away.

Treatment Recommendations:

Option A.1: Preserve-Repair – Clean concrete; test for water absorption; apply breathable sealer to flat capstones; replace roofing membrane and flashings

Priority: Short-term

Doors

The original primary entry was on the west side is with an inswinging door. This entry is not frequently used and overgrown plantings hide the door. There is an equipment entry with similar paired doors at the midpoint of the north side. There is also another single half light door on this side near the east end. These northside entries are the day-to-day use doors. All doors are 1983 replacements, flush with hollow metal frames. The design and construction of original doors is not known.

Condition/Observations: The hollow metal doors and frames are in fair to good condition, and need repainting. The openings are not scheduled for revisions under Water Bureau Project No. 3366.

Treatment Recommendations:

Option A.1: Preserve, Replace – Remove hoist crane and its assembly, replace doors with units similar to originals; repaint

Priority: Long-term

Windows

Windows are located on each side; four on the south, one at the west, one on the north, and a triple unit on the east. The windows were all replaced in 1983; the design of the originals is not known. All windows are intact rectangular full light units in hollow metal frames; all have exterior security grating.

Condition/Observations: The windows are in fair condition and need repainting. Water Bureau Project No. 3366 plans to remove the exterior security grating and install new grating on the interior.

Treatment Recommendations:

Option A.1: Preserve - Repaint and caulk as needed

Priority – Maintenance

Option A.2: Replace – Replace existing windows at the end of their useful life with a design that matches the original design

Priority – Long-term

Interior Space

The interior has been divided into a main treatment room with tanks and piping and retainment curb, and a raised control-work area at the east end. The interior dividing wall is constructed of concrete block units and is painted.

Condition/Observations: No significant issues observed, although the chemicals may require more ventilation to minimize adverse effects. The interior does not contain historic material.

Treatment Recommendations:

Option A.1: No scheduled work

Reservoir 5 – Site

Reservoir Structure

The basin retains the original concrete lining as installed under a recently installed, heavy hypolon liner. The reservoir was constructed in a west facing drainage by enclosing the end with a Reinforced Concrete Counterfort Wall with downstream earthen embankment dam, and working the hill side slopes to form the present somewhat kidney shaped basin. A concrete stairway with stainless steel railing descends from the northwest corner reaching the bottom near the gatehouse. Overflow and aqueduct structures are located along the west side and the gatehouse is at the midpoint of the straight dam portion. To avoid flow into the City storm system, the reservoir was designed with an under drain system; the system is now metered. Reservoir 5 is linked by tunnel and pipes to Reservoir 1 (same elevation) with a connection on the southeast and to Reservoir 6 also by tunnel and pipes. Those corridors as well as the slope down to Reservoir 6 are part of the historic district.

Condition/Observations: The new liner has rectified water loss issues and abated the deterioration of the basin structure. Its dark color has soiled and oxidized some so that it visually blends better into the setting.

Treatment Recommendations:

Option A.1: Preserve and Maintain

Priority: Maintenance

Site Wall (Parapet Wall) Assembly

Bordering the basin is a low 30" high concrete wall with wrought iron fence. The wall is designed with a projecting crowned and chamfered cap, an apron beneath and a projecting base. It is smooth finished concrete without pattern. The fence consists of decorated upper and lower rails, and vertical bars alternating in height all with a spear design. Fence segments are set into the concrete cap and have a curved brace on the reservoir side. At approximately every seventh segment (approximately an 80-foot spacing) there is a four-sided ornamental fence column.

Fence, Reservoir 5 Site Wall Assembly

At these locations the concrete wall widens to receive the metal post. These posts once held a tapered wrought iron top fitted with twin lamps to provide walkway lighting, alternating with posts that held cast ball tops. Currently, the posts all have a cast ball shaped cap. According to Bureau staff, the mold for these items is stored in the gatehouse and some tapered top sections are reported to be in storage at the Hazelwood facility. Provisions are made in the wall and fence for basin access. At the gatehouses the wall returns to join the gatehouse wall. The wall has a substantial amount of surface mounted conduit, particularly along the straight dam portion.

Non-historic light posts, Reservoir 5

Concrete posts and lantern light fixtures are located along the roadway. These are the historic fixtures used throughout the park, but these lie within the reservoir historic district. Non-historic light posts with "shoebox" fixtures are installed around the basin at a 50-foot interval.

Condition/Observations: The low wall has normal wear and tear associated with its age. There have been some prior patching repairs, but defects remain, often at the cap end joints that are approximately every 25 feet. The fencing has recently been removed, stripped of lead based paint, repaired, recoated and reinstalled. Lighting on the fence was discontinued long ago, and none of the fixture arms or tapered tops are in place. Electrical conduit feeds for the newer separate pole lighting are surface mounted to the walkway side of the low wall and provide a junction point to feed each of the new metal lamp posts (ca 1978, 250w High Pressure Sodium lamps, spaced at 50-foot intervals and are similar to those on Reservoir 6.)

Treatment Recommendations:

Option A.1: Preserve and Repair – Clean and provide minor degree of patching at damaged areas

Priority: Long-term

Option A.2: Preserve – Preserve existing historic lamps; maintain non historic lights until end of natural life or substantial technology change warrants

Priority: Maintenance

Option A.3: Replace – In addition to above replace existing non historic pole lighting at west (first) and around perimeter walkway; utilize historically compatible design and products, underground wiring, remove surface mounted conduit

Priority: Long-term

Option A.4: Replace-Restore – Fence lighting; restore alternate wrought iron fence post tops (some still exist); install new LED lighting using small cabling

Priority: Long-term

Walkways

The basin wall is surrounded by a 46-inch wide concrete walkway that surrounds the reservoir. Outside of the walkway there is a level grassy area that extends to the toe of the hill slope. No drains were located around the perimeter, except along the gutter on the west side. Those grates are straight bar type made of cast iron. The walk is scored in squares and has a light finish. Along the west, the walkway doubles in width and extends to the roadway curb and gutter.

Condition/Observations: The walkway has some damaged areas, including broken slabs, corners, spalls, roughened surfaces and settlement. There does not appear to be much of a base remaining for the concrete slabs. The walkway is in better condition than at the other reservoirs.

Treatment Recommendations:

Option A.1: Preserve and Repair – Provide minor degree of patching or replacement at damaged areas, particularly at widened entry to Gatehouse; preserve assorted cast iron grates and lids

Priority: Long-term

Stairway

Stairway, Reservoir 5 to Reservoir 6

A concrete stairway descends from the road to Reservoir 6. The stairway has a pipe handrail on the north side and fencing on both sides. The original paving finish was ribbed crosswise to the direction of travel. There are semi-recessed concrete bollards with steel loops on the hill either side of the stair – their original function is not determined.

Condition/Observations: Portions of the stairway have been replaced or patched; the finish does not match original pattern. A low chainlink fence encloses the hillside and creates a corridor for the stairway. It was installed for structural reasons to limit pedestrian access and prevent erosion that regularly occurred on the west dam hillside face.

Treatment Recommendations:

Option A.1: Preserve and Repair – Provide minor degree of patching or replacement at damaged areas; preserve historic railing

Priority: Long-term

Option A.2: Replace – In addition to Option A.1 repairs, replace newer concrete not matching original finish with that which does

Priority: Long-term

Reservoir 5 - Other Features

Roadway

The vehicle roadway has been repaved and now includes a concrete curb on the west edge. The current security project will install new wrought iron fence styled vehicle control gates in place of the existing ones.

Treatment Recommendations:

Option A.1: Preserve – Provide ongoing maintenance to road and curbs

Priority: Maintenance

Option A.2: Replace – Research and review original paving installed at west side road; possible area for historic paving restoration

Priority: Long-term

Old House Foundation (historic)

The cobblestone remains of a small house's foundation and root cellar (as seen in original construction photos) are located approximately 80 feet east of the northwest reservoir corner, north of the walkway.

Treatment Recommendations:

Option A.1: Preserve – Protect existing historic walls

Priority: Maintenance

Option A.2: Preserve – Provide historic interpretive information on the house that predated the reservoir

Priority: Long-term

Tunnel

A tunnel with two riveted steel pipes connects Reservoir 5 to Reservoir 6 and other elements of the Mt. Tabor system. The tunnel is accessed from Reservoir 5 Gatehouse, and proceeds west under the loop road and embankment, and terminates at a vented manhole at the base of the embankment. From there the pipes are directly buried and diverge.

The tunnel is constructed of reinforced concrete and is circular, with an approximate diameter of 5 feet high by 6 feet wide. Board formwork is evident on the ceiling, which is painted, and the floor is concrete.

Condition/Observations: The concrete roof/ceiling appears to be in good condition. No evidence of leakage or serious concrete deterioration was observed. The floor was dry. The painted ceiling has peeled in some areas, and there is evidence of concrete patching. New conduit has been installed on the south wall in conjunction with Water Bureau Project No. 3366.

Treatment Recommendations:

Option A.1: Preserve – Maintain concrete structure, repaint ceiling, clean moss buildup at west terminus manhole.

Priority: Maintenance

Option A.2: Provide additional documentation, inventory and photographs of existing historical mechanical equipment (piping, fixtures, etc.)

Priority: Long-term

RESERVOIR 6

Contributing historic features at Reservoir 6 include the large rectangular basin, its perimeter wall system and walkway, the inlet gatehouse located at the midpoint of the east side and the outlet gatehouse directly across the reservoir on the west side. There are also assorted cast and forged grates and lids of historic interest.

Reservoir 6 - Inlet Gatehouse 6

Inlet Gatehouse 6

Concrete Wall, Floor and Roof

The building is a poured in place concrete structure, nearly square in plan, measuring 43 feet north-south and 48 feet east-west, and is symmetrically composed. The exterior was formed with a rusticated block pattern, while the interior shows a six-inch board form work pattern. There is a low crenellated (indented) projecting parapet with horizontal molding below and cast concrete capstones at both the merlons (solid higher portion) and the crenel (lower indent portion). The four building corners are defined with quoins formed in the concrete. Door and window openings are rectangular and have projecting surrounds in a post and lintel design. The lower water facing exterior below the water table line (floor line projection) is unpatterned and coated with cement plaster. The concrete floor deck is finished with a smooth troweled topping slab and is without other finishes. The concrete roof deck is covered with a membrane roofing; there is a bird net over the roof and a shock track mounted on the parapet to prevent birds from landing or roosting.

Conditions/Observations: The exterior wall is mostly sound, although there are areas of spalling, primarily on the south side. Some areas have been patched in the past. There is some soiling, most notably around the parapet. Horizontal cold joints from the original construction are visible (inside and out) at roughly two-foot spacing. The capstones are weathered. The lower vent openings have spalling, especially the center one. The exterior water coating is spalled in the vicinity of the former waterline. The interior concrete topping slab has spider cracking. At the reservoir door there is substantial break up of the topping slab or a former leveling patch adjacent to the balcony. The exterior walls and parapet have an elastomeric coating on all surfaces. The roofing membrane is worn. There is ponding over half of the roof.

Treatment Recommendations:

Option A.1: Preserve and Repair – Minor cleaning of the coated concrete exterior; minor patching of spalled areas; renew coating as necessary at parapet; replace roofing to eliminate ponding; retain the wall as is below the waterline wall; provide overflow roof drains (Ref.: Pres. Brief 1, 15)

Priority: Short-term

Option A.2: Replace – Remove surface conduit as other projects allow

Priority: Long-term

Option A.3: Preserve-Repair – Remove elastomeric coating; utilize breathable water sealer (Ref: Pres. Brief 1)

Priority: Long-term

Metal Balcony

Metal Balcony, Inlet Gatehouse 6

The partial width balcony (west side) is constructed of cast iron grating with an iron framework that is diagonally braced back to the concrete wall and a pipe railing enclosure; all painted black. It was designed for reservoir valve operation. There is a fixed steel ladder for Gatehouse roof access. Other equipment includes a cable and drum measuring device (appears to be no longer used).

Condition/Observations: The iron work is rusted, particularly at joints and connections to the concrete structure. The ladder is intact, but the upper portion is deformed and not anchored well.

Treatment Recommendations:

Option A.1: Preserve and Repair – Further inspection of the metal connections is required; clean and repair connections and damaged parts where structurally unstable; repaint (Ref: Pres. Brief 13, 27)

Priority: Long-term

Doors

There is a single entry with inswinging paired doors at the top of seven exterior concrete steps on the east side. There is a minimal top landing and no handrails (non public use). The doors are flush steel with a hollow steel frame that are replacements of the original doors. The original wood jambs have been cut off at the transom line. The rectangular transom frame remains, but it is covered. The reservoir side door is the original single wood cross buck door with wood frame and four light transom. The door is 2¼" thick, constructed of 2x cross buck frame at the interior and 1x6 vertical board exterior cladding. It has 1½ pair ball tip, ball bearing butts, surface bolt lock and handle, remains of the former mortise latchset.

Condition/Observations: The non-original paired hollow metal entry doors and frame have some rusting at the base, and need repainting. This opening is not scheduled for revision under Water Bureau Project No. 3366. The balcony door's exterior facing is weathered.

Treatment Recommendations:

Option A.1: Preserve and Maintain – Repaint the doors and frames and retain as is; maintain wood door and frame, cast iron sills; patch reservoir side door landing

Priority: Maintenance

Option A.2: Repair, Replace – Replace metal doors and frame with wood units matching the original design; Repair existing wood door, frame and hardware

Priority: Long-term

Windows

There are two windows each on the east and west sides, and five each on the south and north sides. Windows are typically wood double hung, 4/4 with chain suspension, some chains missing. Glass is intact but most of it appears to have been replaced over time and is not historic. Windows have been fitted with exterior security grilles. Six windows have been boarded over at the interior to allow for interior operations and equipment security. On the west side below floor level there are three small wall openings with vertical security bars.

Condition/Observations: The windows are generally in good to fair condition depending upon their orientation to weather. On the south and west sides the wood members are weathered and paint is missing or oxidized. A number of glass units need reputtying. The windows are only occasionally opened, and primarily just a few windows. The covered windows were not able to be reviewed. There have been a variety of previous paint colors on the windows. Water Bureau Project No. 3366 shall remove the exterior security grilles; repair the windows (no new suspensions, but to be made operable); change the glazing from glass to polycarbonate in the six windows closest to walkways, i.e. the two on the east and the eastern two on the north and south sides; and install new interior security grilles, and repaint.

Treatment Recommendations:

Option A.1: Preserve and Repair – Rehabilitate windows and deteriorated frame parts; repaint; select certain openings to be operable repair their suspension and hardware; evaluate interior security grill effectiveness

Priority: Long-term

Option A.2: Preserve and Repair – Rehabilitate all windows and deteriorated frame parts; all openings to be operable and repair their suspension and hardware

Priority: Long-term

Interior Space

The interior is devoted to control, security, piping, and hydroelectric generating equipment; some original wheeled valve and mechanical equipment is present and appears to be in use. There is no access to space below the floor level except by manhole.

Condition/Observations: Hydroelectric equipment and electrical equipment are operational and in good condition. No issues needing attention were observed.

Treatment Recommendations:

Option A.1: Preserve and Maintain – Ongoing maintenance

Priority: Maintenance

Option A.2: Provide additional documentation, inventory and photographs of existing historic mechanical equipment

Priority: Long-term

Entry Steps

There are six concrete steps plus the narrow upper landing that ascend from the walkway to the entry doors. The upper step is imprinted with "Reservoir 6" with "1911" on the next lower step.

Condition/Observations: There is spalling at the steps. It appears that the steps have been recoated in the past, or were originally poured rough and finished with a topping coat, and that this topping is breaking up.

Treatment Recommendations:

Option A.1: Preserve and Repair – Clean concrete surfaces, remove loose and deteriorated material; patch tests; patch spalled areas

Priority: Short-term

Reservoir 6 - Outlet Gatehouse 6

Concrete Wall, Floor and Roof

The smaller outlet building is similar in design and construction to the inlet house. It measures 35 feet north-south and 32 feet east-west, and is symmetrically composed. It is located close to grade with only one step up to the entry door sill.

Condition/Observations: The exterior wall is mostly sound, although there are areas of spalling, primarily on the south side. In some cases the reinforcing bars are exposed and have corroded. Some areas have been patched in the past. There is much more soiling than at the inlet gatehouse. Horizontal cold joints from the original construction are visible (inside and out) at roughly two-foot spacing. The capstones are weathered. The exterior water coating is spalled in the vicinity of the former waterline. There are diagonal cracks at each corner of the interior underside of the roof deck. These appear to be old cracks and may likely have occurred as a result of poor roofing conditions. The interior concrete topping slab also has spider cracking. The entry step has minor wear. The parapet has an elastomeric coating on all surfaces except the exterior elevation. The roofing membrane is worn.

Treatment Recommendations:

Option A.1: Preserve and Repair – Clean the heavily soiled concrete exterior; test for water absorption, apply a breathable sealer to the capstones, verify if needed at walls above waterline; minor patching at spalled areas; retain lower below waterline wall as is; replace roofing; provide overflow roof drains

Priority: Short-term

Option A.2: Repair; remove surface conduit as other projects allow

Priority: Long-term

Metal Balcony

The partial width balcony (east side) is similar to that of the Inlet house but is full width. The wheeled gate valves remain but are rusted and inoperable. The fixed steel ladder for roof access remains.

Condition/Observations: The iron work is rusted, particularly at joints and connections to the concrete structure. The original wheel valves are rusted and inoperable.

Treatment Recommendations:

Option A.1: Preserve and Repair – Further inspection of the metal connections is required; clean and repair connections and damaged parts where structurally unstable; repaint

Priority: Long-term

Doors

Like the inlet house, there is a single entry with inswinging paired doors on the west elevation. The floor level is set closer to the walkway grade requiring only one step. The doors are flush steel with a hollow steel frame that are replacements of the original doors. The original wood jambs have been cut off at the transom line. The rectangular transom frame remains, but it is covered. The reservoir side door is the original single wood cross buck door with wood frame and four light transom similar to that on the inlet house but retains its mortise latch and knobs; black finish (termed Barr Barf or "BB").

Condition/Observations: The non-original paired hollow metal entry doors and frame have some rusting at the base, and need repainting. This opening is not scheduled for revision under the current work. The balcony door's exterior facing is weathered.

Treatment Recommendations:

Option A.1: Preserve and Maintain – Repaint the doors and frames and retain as is; maintain cast iron sills

Priority: Maintenance

Option A.2: Repair, Replace – Replace metal doors and frame with units matching the original design; repair existing wood door, frame and hardware

Priority: Long-term

Windows

Similar to the inlet house, there are two windows each on the east and west sides, and four each on the south and north sides. Windows are typically wood double hung, 4/4 with chain suspension with some chains missing. Glass is intact but most of it appears to have been replaced over time and is not historic. Some windows have been boarded over at the interior to allow for interior operations, equipment or security.

Condition/Observations: The windows are generally in good to fair condition depending upon their orientation to weather. On the south and west sides the wood members are weathered and paint is missing or oxidized. A number of glass units need reputtying. The windows are only occasionally opened, and primarily just a few windows. There have been a variety of previous paint colors on the windows.

Water Bureau Project No. 3366 shall remove the exterior security grilles, repair the windows (no new suspensions, but to be made operable); change the glazing from glass to polycarbonate in the four windows closest to the walkways, i.e. the 2 on the west and the easternmost one on both north and south sides; and install new interior security grilles, and repaint.

Treatment Recommendations:

Option A.1: Preserve and Repair – Rehabilitate windows and deteriorated frame parts; repaint; select certain openings to be operable repair their suspension and hardware; Evaluate interior security grill effectiveness

Priority: Long-term

Option A.2: Preserve and Repair – Rehabilitate all windows and deteriorated frame parts; all openings to be operable, repair their suspension and hardware

Priority: Long-term

Interior Space

The interior has two wood framed rooms and a metal stair descending to the lower level equipment. The south room is the original office with separated toilet room. The floor is raised on 2x4 framing and covered with a 1x4 decking. This construction is also used for the ceiling enclosure. Walls are 2x4 framed and covered with 1x4 tongue and groove paneling. Doors are original panel type (five panels, 4 vertical and 1 horizontal) with one pair of plain bearing ball tip hinges and mortise latchset; all BB finish. The office has a porcelained cast iron wall hung lavatory on the east wall. The water closet has been removed. The north room is a newer construction, not historic, wood framed with plywood sheathing, but reusing a salvaged panel door. This room is used for security equipment and controls. The open space of the gate house is devoted to storage, control, security and piping equipment; some original wheeled valve and mechanical equipment is extant.

Condition/Observations: The north storage room is a newer addition. The south room is intact from original construction and in good condition. Interior piping and valves have been recently replaced. A wheeled gate operator located on the exterior balcony exhibits significant corrosion and the wall of the stem cover has deteriorated. The stem cover should be replaced or repaired.

Wheeled gate operator stem cover, Outlet Gatehouse 6

Treatment Recommendations:

Option A.1: Preserve and Maintain – Preserve existing wood framed office, historic light fixture, wood interior doors and trims; preserve existing metal stairway and mechanical equipment; new equipment modifications added as needed with minimal removal or replacement of historic materials

Priority: Maintenance

Option A.2: Provide additional documentation, inventory and photographs of existing historic mechanical equipment

Priority: Long-term

Reservoir 6 – Site

Reservoir Structure

Reservoir 6 structure

The primary site feature is the dual basin reservoir oriented north-south on the relatively level site area at the base portion of Mount Tabor. The large basin measures 875 feet north to south and 600 feet east to west and is 22 feet deep. Each reinforced concrete basin is rectangular with rounded corners and is partially dug into the terrain and bermed at areas above natural grade. The two basins are separated by a reinforced concrete division wall, located at the north-south basin midpoint, which joins the two gatehouses. Additional piping connects the two gatehouses. This divider allows separate and alternating operation of the two basins. At the center of each basin is an aeration fountain. Related features include the overflow channel south of the outlet gatehouse and vehicle access ramps to each basin; for the north one the ramp descends north from the inlet gatehouse; for the south the ramp descends north from the southeast corner of the reservoir. Both basins had revisions soon after construction to deter leakage. A three-inch thick overlay of asphaltic concrete exists over the original concrete liner. Cracks in this asphalt are patched with different materials including a white sealant caulk (Vulkem manufacturer, NSF 61 potable water grade).

Condition/Observations: Due to revisions to the system, excess water is not spilled from the overflow. The level is kept approximately four feet below the prior spill level. This lower level line exposes portions of the basin and gatehouse structure not normally visible. The reservoir structure is generally in good condition and likely does not need relining due to water loss. The asphalt topping appears to be problematic when it creeps down slope.

Treatment Recommendations:

Option A.1: Preserve and Repair – Preserve the existing structure and liner

Priority: Maintain

Option A.2: Repair-Replace – Remove bituminous patching, new replacement liner

Priority: Long-term

Site Wall (Parapet Wall) Assembly

Joint to outlet house Reservoir 6

Bordering the basin is a low concrete wall with wrought iron fence. The wall is designed with a projecting crowned and chamfered cap, an apron beneath and a projecting base. It is smooth finished concrete without pattern. The fence consists of decorated upper and lower rails, and vertical bars alternating in height, all with a spear design. Fence segments are set into the concrete cap and have a curved brace on the reservoir side. At approximately every eighth segment (approximately 90-foot spacing) there is a four-sided ornamental fence column. Alternate columns have tapered tops. Those originally were fitted with a twin-armed lamp to serve as walkway lamp posts; the other alternating column posts have a cast iron ball cap. The concrete wall projects to receive the columns. Most such posts and tops survive, though few lamp arms are intact; no lamp shades are extant. Provisions are made in the wall and fence for access to the vehicle ramps. At the gatehouses the wall curves to connect to the building corners.

Condition/Observations: The low wall has normal wear and tear associated with its age. There have been some prior patching repairs, but many other defects now are evident. There is a wide joint to the outlet house that appears to be quite old and as a result of some settlement. The fencing is in reasonably good condition and retains many upper post assemblies. Lighting was discontinued long ago, and few of the fixture arms are in place. Electrical conduit feeds for the newer lighting are surface mounted to the walkway side of the low wall and provide a junction point to feed each of the newer metal lamp posts (ca 1978, 250w High Pressure Sodium lamps, 50-foot spacing).

Treatment Recommendations:

Option A.1: Preserve and Repair – Clean and provide minor degree of patching at damaged areas

Priority: Long-term

Option A.2: Repair-Replace – Replace existing non historic pole lighting at around perimeter walkway; utilize historically compatible design and products, underground wiring, remove surface mounted conduit; restore metal fencing

Priority: Long-term

Option A.3: Replace-Restore – Fence lighting; repair-restore alternate wrought iron fence post tops (many still exist); install new LED lighting using small cabling

Priority: Long-term

Walkways

The basin wall is surrounded by a 12-foot wide concrete walkway. The walk is scored in three foot squares and has a light finish. On the east side, the toe of the hillside is at the edge of the walk. There are historic cast iron grates at the edge of the walk and a variety of cast iron lids for equipment access.

Condition/Observations: The walkway has many damaged areas, including broken slabs, corners, spalls, roughened surfaces and settlement. There does not appear to be much of a base remaining for the concrete slabs. Water Bureau Project No. 3366 has recently replaced much of the center squares (this line was chosen since it was the most damaged) in order to install underground conduit for power and data. This work occurred on most of the west, east and south sides. The finish of the replacement matches the light texture of the original concrete.

Treatment Recommendations:

Option A.1: Preserve and Repair – Provide minor degree of patching or replacement at damaged areas, much of the center section has recently been replaced; preserve assorted cast iron grates and lids

Priority: Long-term

Stairway

There are two historic concrete stair flights with metal railings on the west side descending to SE 60th.

Condition/Observations: The concrete stairs have a few replacement areas that do not match the original surface finish; there are a few steps that have broken corners or spalls.

Treatment Recommendations:

Option A.1: Preserve and Repair – Provide minor degree of patching or replacement at damaged areas; preserve historic railing

Priority: Long-term

Option A.2: Replace – In addition to Option A.1 repairs, replace newer concrete not matching original finish with that which does

Priority: Long-term

RESERVOIR 7

Reservoir 7 is located on a grassy knoll just north of the physical top of Mt. Tabor. It consists of an underground storage tank and an adjacent former pump house building that is not currently used for pumping. The reservoir serves the areas of higher elevation and neighborhoods to the north and northeast of Mt. Tabor. The tank structure and the building are for the sake of the district nomination considered separate historic structures.

Reservoir 7 – Building

Reservoir 7 Building

The building is located just south of the tank, and is partially dug into the hillside. It is a concrete building, rectangular in shape except for chamfered front corners. The building is approximately 14 feet wide by 11 feet long and 9 feet high, and has 10-inch thick board formed walls. The concrete roof is enclosed with a single course of rough-faced basalt and slopes to the southeast. There is a recessed drain collector box and through wall leader. The building has vent openings on each side and a single arched door on the front (north). The east vent is covered with plywood while the west vent retains its wooden louvers. Both vents have exterior security gratings. The arched door is constructed of vertical planks, has replacement hinges and a replacement surface-mounted slide bolt.

Condition/Observations: The building is in fair condition. The drainage system is prone to clogging from tree debris. There is water damage evident (cracks and deposits) at the upper wall at the height of the roof deck. The stone roof curb has many deteriorated joints. The access door has non-historic hardware and intrusive security provisions. Part of the frame molding is missing. The wood louver vents are badly deteriorated.

Treatment Recommendations:

Option A.1: Preserve and Repair – Repair wood door and frame, suitable hardware; repair wood louver vents where venting required; where not required provide protective overlay; repair stone and crack damage at roof and upper wall; remedy roof drainage

Priority: Short-term

Option A.2: Preserve and Repair – In addition to repairs described in Option A.1 above, restore louver vents on sidewalls

Priority: Long-term

Reservoir 7 - Underground Tank Structure

Reservoir 7 Underground Tank Structure

The most visible feature of the tank is the round and slightly cone shaped, concrete cap. The cap is approximately 40 feet in diameter and 6 inches thick at the edge. There is a north chamber area with two manholes for tank access. On the south side there is a three-foot concrete cube with steel lid. The tank is a foot above the adjacent grade. Various pipes elbow out of the structure near the underside of the lid.

Condition/Observations: The tank is reported to be in good condition. A new tank top was installed in 2007.

Treatment Recommendations:

Option A.1: Maintain – Ongoing maintenance as required

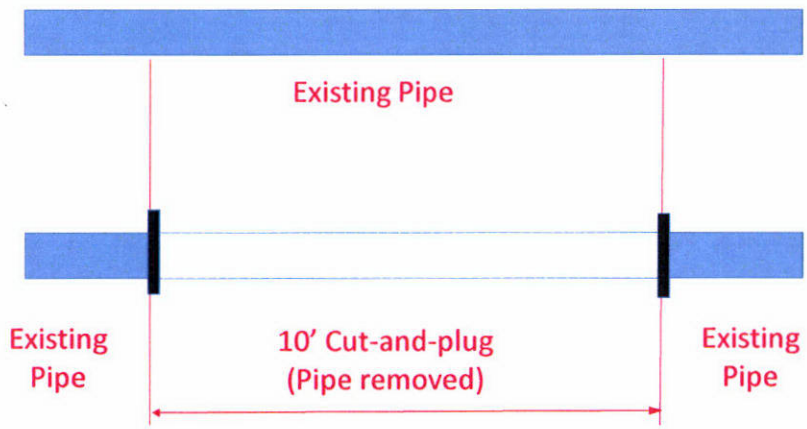
Priority: Maintenance

Air Gap & RP Backflow Comparison

10-inch RP device in California

8-inch RP device in Portland

10-foot Air Gap



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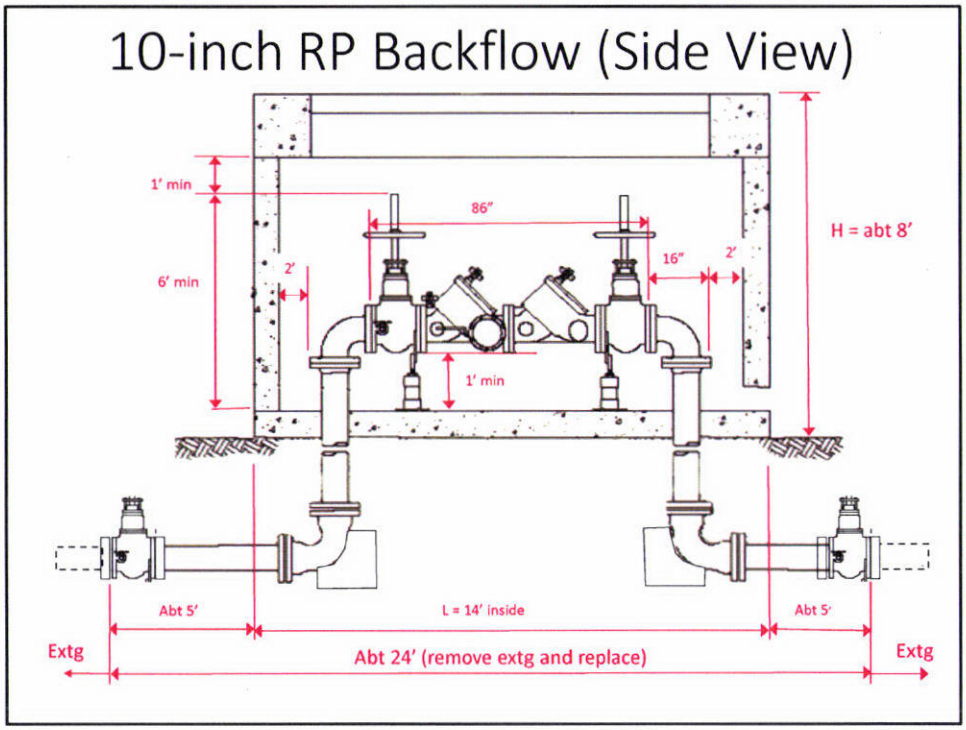
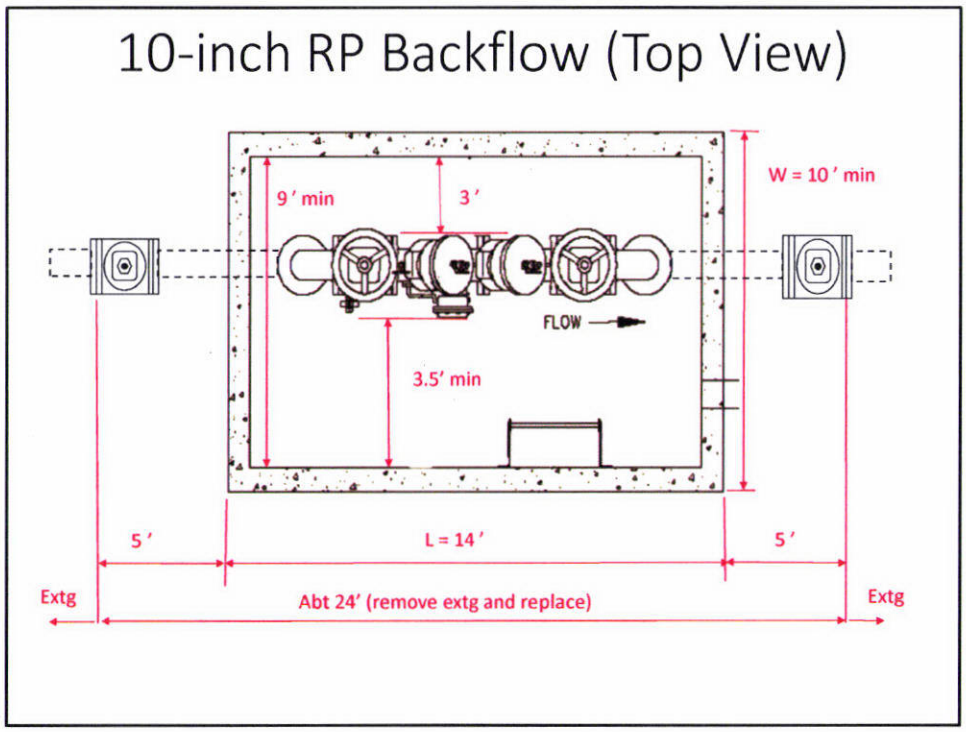

10-inch RP Backflow (Side View)
1' min
6' min
86"
2'
16"
2'
H = abt 8'
1' min
Abt 5'
L = 14' inside
Abt 5'
Extg
Abt 24' (remove extg and replace)
Extg


10-inch RP Backflow (Top View)
9 ' min
3 '
W = 10 ' min
FLOW
3.5' min
5 '
L = 14 '
5 '
Extg
Abt 24' (remove extg and replace)
Extg

333-061-0070 Cross Connection Control Requirements

(1) Water suppliers shall undertake cross connection control programs to protect the public water systems from pollution and contamination.

(2) The water supplier's responsibility for cross connection control shall begin at the water supply source, include all public treatment, storage, and distribution facilities under the water supplier's control, and end at the point of delivery to the water user's premises.

(3) Water suppliers shall develop and implement cross connection control programs that meet the minimum requirements set forth in these rules.

(4) Water suppliers shall develop a procedure to coordinate cross connection control requirements with the appropriate local administrative authorit having jurisdiction.

(5) The water supplier shall ensure that inspections of approved air gaps, approved devices, and inspections and tests of approved backflow prevention assemblies protecting the public water system are conducted:
  (a) At the time of installation, any repair or relocation;
  (b) At least annually;
  (c) More frequently than annually for approved backflow prevention assemblies that repeatedly fail, or are protecting health hazard cross connections, as determined by the water supplier;
  (d) After a backflow incident; or
  (e) After an approved air gap is re-plumbed.

(6) Approved air gaps, approved devices, or approved backflow prevention assemblies, found not to be functioning properly shall be repaired, replaced or re-plumbed by the water user or premises owner, as defined in the water supplier's local ordinance or enabling authority, or the water supplier may take action in accordance with subsection (9)(a) of these rules.(7) A water user or premises owner who obtains water from a water supplier must notify the water supplier if they add any chemicals or substance to the water.

(8) Premises isolation requirements:
  (a) For service connections to premises listed or defined in Table 48 (Premises Requiring Isolation), the water supplier shall ensure an approved backflow prevention assembly or an approved air gap is installed;
    (A) Premises with cross connections not listed or defined in Table 48 (Premises Requiring Isolation), shall be individually evaluated. The water supplier shall require the installation of an approved backflow prevention assembly or an approved air gap commensurate with the degree of hazard on the premises, as defined in Table 49 (Backflow Prevention Methods);
    (B) In lieu of premise isolation, the water supplier may accept an in-premises approved backflow prevention assembly as protection for the public water system when the approved backflow prevention assembly is installed, maintained and tested in accordance with these rules.

(b) Where premises isolation is used to protect against a cross connection, the following requirements apply;
  (A) The water supplier shall:
    (i) Ensure the approved backflow prevention assembly is installed at a location adjacent to the service connection or point of delivery;
    (ii) Ensure any alternate location used must be with the approval of the water supplier and must meet the water supplier's cross connection control requirements; and
    (iii) Notify the premises owner and water user, in writing, of thermal expansion concerns.
  (B) The premises owner shall:
    (i) Ensure no cross connections exist between the point of delivery from the public water system and the approved backflow prevention assemblies, when these are installed in an alternate location; and
    (ii) Assume responsibility for testing, maintenance, and repair of the installed approved backflow prevention assembly to protect against the hazard.

(c) Where unique conditions exist, but not limited to, extreme terrain or pipe elevation changes, or structures greater than three stories in height, even with no actual or potential health hazard, an approved backflow prevention assembly may be installed at the point of delivery; and

(d) Where the water supplier chooses to use premises isolation by the installation of an approved backflow prevention assembly on a one- or two-family dwelling under the jurisdiction of the Oregon Plumbing Specialty Code and there is no actual or potential cross connection, the water supplier shall:
  (A) Install the approved backflow prevention assembly at the point of delivery;
  (B) Notify the premises owner and water user in writing of thermal expansion concerns; and
  (C) Take responsibility for testing, maintenance and repair of the installed approved backflow prevention assembly.

(9) In community water systems, water suppliers shall implement a cross connection control program directly, or by written agreement with another agency experienced in cross connection control. The local cross connection program shall consist of the following elements:

(a) Local ordinance or enabling authority that authorizes discontinuing water service to premises for:
  (A) Failure to remove or eliminate an existing unprotected or potential cross connection;
  (B) Failure to install a required approved backflow prevention assembly;

(C) Failure to maintain an approved backflow prevention assembly; or
(D) Failure to conduct the required testing of an approved backflow prevention assembly.

(b) A written program plan for community water systems with 300 or more service connections shall include the following:
(A) A list of premises where health hazard cross connections exist, including, but not limited to, those listed in Table 48 (Premises Requiring Isolation);
(B) A current list of certified cross connection control staff members;
(C) Procedures for evaluating the degree of hazard posed by a water user's premises;
(D) A procedure for notifying the water user if a non-health hazard or health hazard is identified, and for informing the water user of any corrective action required;
(E) The type of protection required to prevent backflow into the public water supply, commensurate with the degree of hazard that exists on the water user's premises, as defined in Table 49 (Backflow Prevention Methods);
(F) A description of what corrective actions will be taken if a water user fails to comply with the water supplier's cross connection control requirements;
(G) Current records of approved backflow prevention assemblies installed, inspections completed, backflow prevention assembly test results on backflow prevention assemblies and verification of current Backflow Assembly Tester certification; and
(H) A public education program about cross connection control.

(c) The water supplier shall prepare and submit a cross connection control Annual Summary Report to the Authority, on forms provided by the Authority, before the last working day of March each year.

(d) In community water systems having 300 or more service connections, water suppliers shall ensure at least one person is certified as a Cross Connection Control Specialist, unless specifically exempted from this requirement by the Authority.

(10) Fees: Community water systems shall submit to the Authority an annual cross connection program implementation fee, based on the number of service connections, as follows:

Service Connections:	Fee:
15-99	$30.
100-999	$75.
1,000-9,999	$200.
10,000 or more	$350.

(a) Billing invoices will be mailed to water systems in the first week of November each year and are due by January first of the following year;
(b) Fees are payable to Oregon Health Authority by check or money order;
(c) A late fee of 50 percent of the original amount will be added to the total amount due and will be assessed after January 31 of each year.

(11) In transient or non-transient non-community water systems, the water supplier that owns and/or operates the system shall:
(a) Ensure no cross connections exist, or are isolated from the potable water system with an approved backflow prevention assembly, as required in section (12) of this rule;
(b) Ensure approved backflow prevention assemblies are installed at, or near, the cross connection; and
(c) Conduct an annual cross connection survey and inspection to ensure compliance with these rules, and test all backflow assemblies annually. All building permits and related inspections are to be made by the Department of Consumer and Business Services, Building Codes Division, as required by ORS 447.020.

(12) Approved backflow prevention assemblies and devices required under these rules shall be approved by the University of Southern California, Foundation for Cross-Connection Control and Hydraulic Research, or other equivalent testing laboratories approved by the Authority.

(13) Backflow prevention assemblies installed before the effective date of these rules that were approved at the time of installation, but are not currently approved, shall be permitted to remain in service provided the assemblies are not moved, the piping systems are not significantly remodeled or modified, the assemblies are properly maintained, and they are commensurate with the degree of hazard they were installed to protect. The assemblies must be tested at least annually and perform satisfactorily to the testing procedures set forth in these rules.

(14) Tests performed by Authority-certified Backflow Assembly Testers shall be in conformance with procedures established by the University of Southern California, Foundation for Cross Connection Control and Hydraulic Research, Manual of Cross-Connection Control, 10th Edition, or other equivalent testing procedures approved by the Authority.

(15) Backflow prevention assemblies shall be tested by Authority-certified Backflow Assembly Testers, except as otherwise provided for journeyman plumbers or apprentice plumbers in OAR 333-061-0072 of these rules (Backflow Assembly Tester Certification). The Backflow Assembly Tester must produce three copies of all test reports. One copy must be maintained in the Tester's permanent records, one copy must be provided to the water user or property owner, and one copy must be provided to the water supplier.
(a) Test reports must be provided within 10 working days; and

(b) The test reports must be in a manner and form acceptable to the water supplier.

(16) All approved backflow prevention assemblies subject to these rules shall be installed in accordance with OAR 333-061-0071 and the Oregon Plumbing Specialty Code.

(17) The Authority shall establish an advisory board for cross connection control issues consisting of not more than nine members, and including representation from the following:

(a) Oregon licensed Plumbers;
(b) Authority certified Backflow Assembly Testers;
(c) Authority certified Cross Connection Specialists;
(d) Water Suppliers;
(e) The general public;
(f) Authority certified Instructors of Backflow Assembly Testers or Cross Connection Specialists;
(g) Backflow assembly manufacturers or authorized representatives;
(h) Engineers experienced in water systems, cross connection control and/or backflow prevention; and
(i) Oregon certified Plumbing Inspectors.

Table 48

Premises Requiring Isolation* By an Approved Air Gap **or** Reduced Pressure Principle Type Of Assembly Health Hazard
1. Agricultural (e.g. farms, dairies)
2. Beverage bottling plants**
3. Car washes
4. Chemical plants
5. Commercial laundries and dry cleaners
6. Premises where both reclaimed and potable water are used
7. Film processing plants
8. Food processing plants
9. Medical centers (e.g., hospitals, medical clinics, nursing homes, veterinary clinics, dental clinics, blood plasma centers)
10. Premises with irrigation systems that use the water supplier's water with chemical additions (e.g., parks, playgrounds, golf courses, cemeteries, housing estates)
11. Laboratories
12. Metal plating industries
13. Mortuaries
14. Petroleum processing or storage plants
15. Piers and docks

16. Radioactive material processing plants and nuclear reactors
17. Wastewater lift stations and pumping stations
18. Wastewater treatment plants
19. Premises with piping under pressure for conveying liquids other than potable water and the piping is installed in proximity to potable water piping
20. Premises with an auxiliary water supply that is connected to a potable water supply
21. Premises where the water supplier is denied access or restricted access for survey
22. Premises where the water is being treated by the addition of chemical or other additives

* Refer to OAR 333-061-0070(8) premises isolation requirements.
** A Double Check Valve Backflow Prevention Assembly could be used if the water supplier determines there is only a non-health hazard at a beverage bottling plant.

Table 49

Backflow Prevention Methods Used For Premises Isolation	
DEGREE OF IDENTIFIED HAZARD	
Non-Health Hazard (Pollutant)	Health Hazard (Contaminant)
Backsiphonage or Backpressure	Backsiphonage or Backpressure
Air Gap (AG)	Air Gap (AG)
Reduced Pressure Principle Backflow Prevention Assembly (RP)	Reduced Pressure Principle Backflow Prevention Assembly (RP)
Reduced Pressure Principle-Detector Backflow Prevention Assembly (RPDA)	Reduced Pressure Principle-Detector Backflow Prevention Assembly (RPDA)
Double Check Valve Backflow Prevention Assembly (DC)	
Double Check-Detector Backflow Prevention Assembly (DCDA)	

Stat. Auth.: ORS 448.131
Stats. Implemented: ORS 431.110, 431.150, 448.131, 448.150, 448.268, 448.271, 448.273, 448.278, 448.279, 448.295 & 448.300

333-061-0071 Backflow Prevention Assembly Installation and Operation Standards

(1) Any approved backflow prevention assembly required by OAR 333-061-0070 shall be installed in a manner that:
   (a) Facilitates its proper operation, maintenance, inspection, and in-line testing using standard installation procedures approved by the Authority, such as, but not limited to, University of Southern California, Manual of Cross-Connection Control, 10th Edition, the Pacific Northwest Section American Water Works Association, Cross Connection Control Manual, 7th Edition, or the local administrative authority having jurisdiction;
   (b) Precludes the possibility of continuous submersion of an approved backflow prevention assembly, and precludes the possibility of any submersion of the relief valve on a reduced pressure principle backflow prevention assembly; and
   (c) Maintains compliance with all applicable safety regulations and the Oregon Plumbing Specialty Code.

(2) For premises isolation installation:
   (a) The approved backflow prevention assembly shall be installed at a location adjacent to the service connection or point of delivery; or
   (b) Any alternate location must be with the advance approval of the water supplier and must meet the water supplier's cross connection control requirements; and
   (c) The premises owner shall ensure no cross connections exist between the point of delivery from the public water system and the approved backflow prevention assembly.

(3) Bypass piping installed around any approved backflow prevention assembly must be equipped with an approved backflow prevention assembly to:
   (a) Afford at least the same level of protection as the approved backflow prevention assembly being bypassed; and
   (b) Comply with all requirements of these rules.

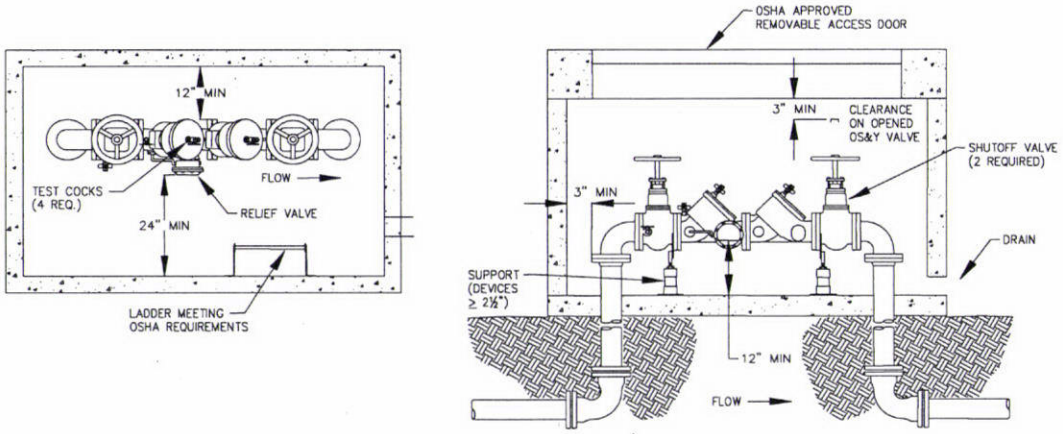
(4) All Oregon Plumbing Specialty Code approved residential multi-purpose fire suppression systems constructed of potable water piping and materials do not require a backflow prevention assembly.

(5) Stand-alone fire suppression systems shall be protected commensurate with the degree of hazard, as defined in Table 49 (Backflow Prevention Methods).

(6) Stand-alone irrigation systems shall be protected commensurate with the degree of hazard, as defined in Table 49 (Backflow Prevention Methods).

(7) A Reduced Pressure Principle Backflow Prevention Assembly (RP) or Reduced Pressure Principle-Detector Backflow Prevention Assembly (RPDA):

Figure 1



(a) Shall conform to bottom and side clearances when the assembly is installed inside a building. Access doors may be provided on the top or sides of an above-ground vault;

(b) Shall always be installed horizontally, never vertically, unless they are specifically approved for vertical installation;

(c) Shall always be installed above the 100 year (1 percent) flood level unless approved by the appropriate local administrative authority having jurisdiction;

(d) Shall never have extended or plugged relief valves;

(e) Shall be protected from freezing when necessary;

(f) Shall be provided with an approved air gap drain;

(g) Shall not be installed in an enclosed vault or box unless a bore-sighted drain to daylight is provided;

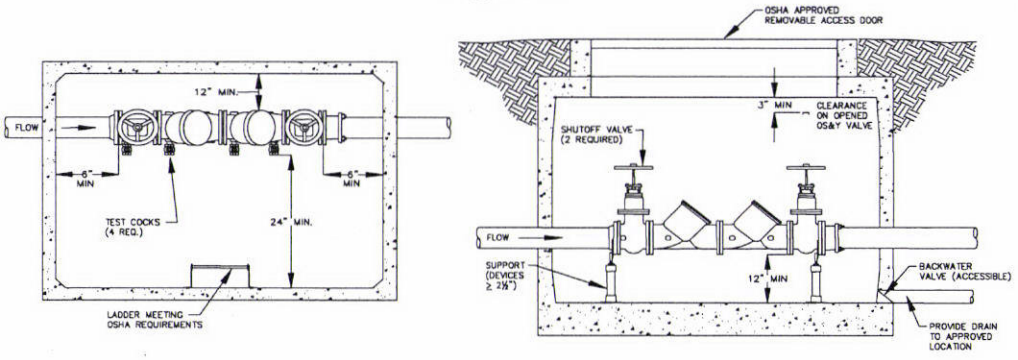
(h) May be installed with reduced clearances if the pipes are two inches in diameter or smaller, are accessible for testing and repairing, and approved by the appropriate local administrative authority having jurisdiction;

(i) Shall not be installed at a height greater than five feet unless there is a permanently installed platform meeting Oregon Occupational Safety and Health Administration (OR-OSHA) standards to facilitate servicing the assembly; and

(j) Be used to protect against a non-health hazard or health hazard for backsiphonage or backpressure conditions.

(8) A Double Check Valve Backflow Prevention Assembly (DC) or Double Check Detector Backflow Prevention Assembly (DCDA):

Figure 2



(a) Shall conform to bottom and side clearances when the assembly is installed inside a building;

(b) May be installed vertically as well as horizontally provided the assembly is specifically listed for that orientation in the Authority's Approved Backflow Prevention Assembly List.

(c) May be installed below grade in a vault, provided that water-tight fitted plugs or caps are installed in the test cocks, and the assembly shall not be subject to continuous immersion;

(d) Shall not be installed at a height greater than five feet unless there is a permanently installed platform meeting Oregon Occupational Safety and Health Administration (OR-OSHA) standards to facilitate servicing the assembly;

(e) May be installed with reduced clearances if the pipes are two inches in diameter or smaller, provided that they are accessible for testing and repairing, and approved by the appropriate local administrative authority having jurisdiction;

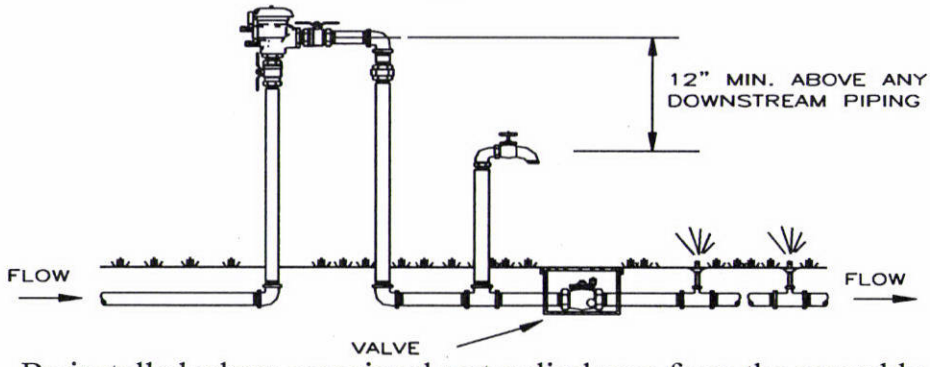
(f) Shall have adequate drainage provided except that the drain shall not be directly connected to a sanitary or storm water drain. Installers shall check with the water supplier and appropriate local administrative authority having jurisdiction for additional requirements;

(g) Shall be protected from freezing when necessary; and

(h) Be used to protect against non-health hazards under backsiphonage and backpressure conditions.

(9) A Pressure Vacuum Breaker Backsiphonage Prevention Assembly (PVB) or Spill-Resistant Pressure Vacuum Breaker Backsiphonage Prevention Assembly (SVB) shall :

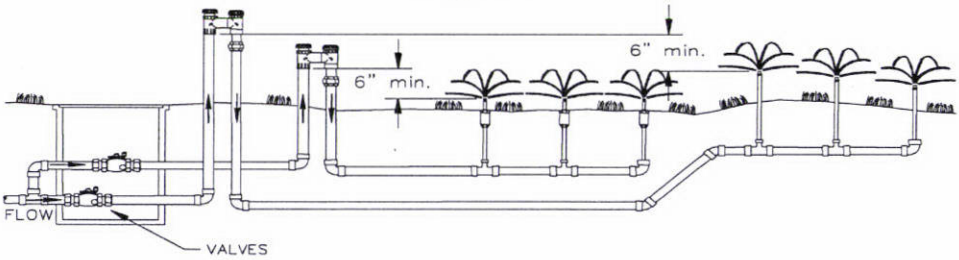
Figure 3



(a) Be installed where occasional water discharge from the assembly caused by pressure fluctuations will not be objectionable;
(b) Have adequate spacing available for maintenance and testing;
(c) Not be subject to flooding;
(d) Be installed a minimum of 12 inches above the highest downstream piping and outlets;
(e) Have absolutely no means of imposing backpressure by a pump or other means. The downstream side of the pressure vacuum breaker backsiphonage prevention assembly or spill-resistant pressure vacuum breaker backsiphonage prevention assembly may be maintained under pressure by a valve; and
(f) Be used to protect against backsiphonage only, not backpressure.

(10) An Atmospheric Vacuum Breaker (AVB) shall:

Figure 4



(a) Have absolutely no means of shut-off on the downstream or discharge side of the atmospheric vacuum breaker;
(b) Not be installed in dusty or corrosive atmospheres;
(c) Not be installed where subject to flooding;
(d) Be installed a minimum of six inches above the highest downstream piping and outlets;
(e) Be used intermittently;
(f) Have product and material approval under the Oregon Plumbing Specialty Code for non-testable devices.
(g) Not be pressurized for more than 12 hours in any 24-hour period; and
(h) Be used to protect against backsiphonage only, not backpressure.

Stat. Auth.: ORS 448.131
Stats. Implemented: ORS 431.110, 431.150, 448.131, 448.150, 448.268, 448.273 & 448.279