WATER SYSTEM PLAN

HMC MANAGEMENT WATER SYSTEM

Prepared for

HMC Management
P.O. Box 119
Lakebay, WA 98349

Prepared by

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September 2009

The HMC Management Board of Directors has reviewed and approves the HMC Management Water System Plan, as submitted to the Washington State Department of Health (DOH) in September 2009.

HMC Management Board of Directors:

Fred Fath, President	Date
Kathy Deuster, Vice President	Date
Janet Podell, Secretary	Date
Judy Greinke, Treasurer	Date
Patrick Pitt, Member at Large	Date

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ADD	Average Daily Demand
APWA	American Public Works Association
AWWA	American Water Works Association
cm	centimeter
CMP	Coliform Monitoring Plan
DOH	Washington State Department of Health
EPS	extended period simulations
ERP	Emergency Response Program
ERU	Equivalent Residential Unit
FVT	financial viability test
gpd	gallons per day
gpm	gallons per minute
HMC	Herron Maintenance Company (former name of HMC Management)
HP	horsepower
KW	kilowatt
MCL	maximum contaminant levels
MDD	Maximum Daily Demand
mg/L	milligrams per liter
MHHI	median household income
MWL	Municipal Water Law
NTU	Nephelometric Turbidity Unit
PHD	Peak Hourly Demand
psi	pounds per square inch
PSRC	Puget Sound Regional Council
SEPA	State Environmental Policy Act
WAC	Washington Administrative Code
WDM	Water Distribution Manager
WFI	Water Facilities Inventory
WSDOT	Washington State Department of Transportation

Prepared under the supervision of:

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1 DESCRIPTION OF WATER SYSTEM

1.1 Ownership and Management

The HMC Management Water System is owned and operated by HMC Management. The HMC Management Water System is a non-profit, Group A water system (Department of Health [DOH] I.D. # 325505).

1.2 System Background

The HMC Management Water System serves the residents of Herron Island. Herron Island is located in Pierce County, in the Case Inlet (see Figure 1). The island is one of the few private islands in Puget Sound. It was incorporated in 1958 as Herron Maintenance Company (HMC), consisting of the property owners on Herron Island. The official name of HMC was changed in 2005 to HMC Management.

Figure 2 shows the parcels on the island. The island was originally subdivided into 550 lots and 3 tracts. There are currently a total of 521 tax parcels. Existing land use on the island consists of single-family residences, many of which are part-time residences. It is estimated that only 64 residences are permanently occupied. An additional 209 residences on the island are considered part-time residences. In addition to residential properties, the parcels on the island include recreational properties, community properties, and vacant parcels.

1.3 Inventory of Existing Facilities

Existing water facilities are also shown in Figure 2. The most current Water Facilities Inventory (WFI) form on file with DOH is included in Appendix A. Existing water supply facilities are located near the center of the island along W. Madrona Boulevard in the NE ¼ of the SW ¼ of Section 32, T-21N, R-01W. Water supply facilities consist of two wells:

- Well No. 1 (S01) is approximately 200 feet deep and has a capacity of 150 gallons per minute (gpm).
- Well No. 2 (S02) is approximately 210 feet deep and has a capacity of 221 gpm.

Because of proximity, the wells are considered as a single well field source (S03) with a combined capacity of 370 gpm. The models and types of pumps used in the wells are not known. The wells discharge into a 99,000-gallon (nominal capacity) above-ground concrete tank that was constructed in the summer of 2005 to replace an older 30,000-gallon concrete

tank that was leaking. The old tank has been abandoned. The existing tank represents all of the water storage capacity available in the water system and has an overflow elevation of 144.3 feet.

Three booster pumps deliver water from the storage tank to the water distribution system. The pumps include:

- Two 2.5-horsepower (HP) Sta-Rite pumps, with a combined capacity of approximately 134 gpm at 30 pounds per square inch (psi) and 156 gpm at 20 psi. These two pumps are approximately 7 years old.
- One 7.5-HP Gould model GH2 pump, with a capacity of approximately 260 gpm. This pump is older than the smaller pumps.

Currently, the total capacity with three pumps operating is approximately 394 gpm at a normal operating head of approximately 30 psi. There is a 60-kilowatt (KW) diesel generator with an automatic transfer switch located next to the pumphouse for emergency purposes. The booster pumps discharge into a steel pressure tank with a capacity of 1,250 gallons. The smaller pumps are the primary pumps and control the pressure in the distribution system during normal operating conditions.

The water distribution network is made up of 2-inch plastic pipe, 4-inch asbestos cement pipe, and 6-inch asbestos cement pipe. Table 1-1 summarizes the estimated lengths of the pipe in the distribution system. The system includes only one hydrant, adjacent to the pumphouse and wells. When the new tank was constructed in 2005, yard piping between the tank and booster pumps was replaced with 8-inch and 4-inch ductile iron piping. The existing hydrant was removed and a new hydrant was installed adjacent to W. Madrona Boulevard. The new piping and valves installed will allow for fire flow to be supplied to other areas within the distribution system when additional piping upgrades are made.

Table 1-1
Current HMC Management Water System Pipe Network

Pipe	Estimated Length (feet)
2-inch plastic	24,056
4-inch asbestos cement	5,569
6-inch asbestos cement	449

1.4 Related Plans

The most recent water system planning report was prepared by Montgomery Water Group (MWG; now Anchor Environmental, L.L.C.) in 1995. That report consisted of:

- Documentation of pumphouse and well improvements since 1983
- A comparison between existing facilities and DOH-recommended standards
- A determination of the appropriate level of service for Herron Island

A technical memorandum was also submitted to DOH in August 2004 as the engineering report for the concrete reservoir that was constructed in 2005. Other planning documents related to this plan include the *Pierce County Comprehensive Plan* (Pierce County 2009), the *Pierce County Key Peninsula Community Plan* (Pierce County 2008), and the *Pierce County Zoning Code* (Pierce County 2009).

1.4.1 Compatibility with Regional Supplement

The *Pierce County Coordinated Water System Plan and Regional Supplement* (Pierce County 2001) was developed under the authority of the State of Washington Public Water System Coordination Act and has been adopted by the Pierce County Council. Applicable criteria developed as part of that plan will be met by HMC Management.

1.4.2 Comments Received

This plan will be submitted to the Pierce County Utilities Planner and the Pierce County Fire Prevention Bureau for review concurrent with the submittal to DOH. Comments received from Pierce County will be included in Appendix A of this report.

1.5 Existing and Future Service Area Characteristics

The area currently serviced by HMC Management includes all of Herron Island. The HMC Management service area is shown in Figure 2. A copy of a Standard Service Area Agreement that will be placed on file with Pierce County is included in Appendix A. Because the service area is an island, no future changes to service area boundaries are anticipated.

1.6 Service Area Agreement, Policies, and Conditions of Service

Domestic water service is one of several public services provided to the residents of Herron Island by HMC Management. HMC Management's Articles of Incorporation describe the services that HMC Management will provide to the residents of Herron Island. Article 13, included on page 10 of the HMC Management Articles of Incorporation, states that one of the reasons the corporation was formed was "To appropriate, purchase, divert, acquire and store water from streams, water courses, wells or any other source and to distribute the water so appropriated and acquired to its members for use open the lands of said members for domestic purposes…." A copy of this language from the HMC Management Articles of Incorporation is included in Appendix B.

Domestic water service is funded by revenues from annual assessments paid by residents of Herron Island. Major capital projects have typically been funded by special assessments voted on and approved by the HMC Management Board of Directors and the residents of the island. This Water System Plan provides guidelines for system improvements, including installation of customer service meters. It is recommended that HMC Management develop written policies and conditions of service for domestic water service that allow for billing for domestic water service based on metered usage.

2 BASIC PLANNING DATA AND WATER DEMAND FORECASTING

2.1 Current Population, Service Connections, Water Use, and Equivalent Residential Units

2.1.1 Existing Land Use

As was indicated in Section 1, Herron Island is a private island, comprised primarily of permanent and seasonal single-family residences. A small park and HMC Management office building are located roughly in the center of the island. Three other parks are located at North Beach, South Beach, and in a wetland area. Pierce County has jurisdiction over the zoning on Herron Island. The island is currently zoned Rural-10, which would limit future subdivision of island property to one dwelling unit per every 10 acres, or up to two units per every 10 acres if 50 percent of the parcel is designated as open space. The island was subdivided to its current number of lots before current zoning was adopted. Additional subdivision of existing parcels is not anticipated.

2.1.2 Population and Service Connections

The HMC Management Water System currently includes more than 400 service connections. Original drawings of the system do not exist and customer services are not metered, so making an accurate inventory of service connections is difficult. HMC Management has made an inventory of the number and type of existing parcels, as shown in Table 2-1. As was noted previously, Herron Island was originally subdivided into 550 lots and 3 tracts. HMC Management indicated that there are currently 521 tax parcels. HMC Management's inventory of existing parcels indicated that there are 524 lots that are served, or could potentially be served by the water system.

HMC Management estimated that there are currently 273 homes on the island. Only 64 of those are permanently occupied. An estimated 209 homes on the island are occupied part-time as second homes or vacation homes. The island also has several recreational properties that do not have permanent dwelling units, but may be occupied at times by a camper or trailer. There are also community parcels used for parks, HMC Management water storage and production facilities, an HMC Management office building, and the ferry landing. HMC Management estimates that there are water service connections at each full-time residence, part-time residence, recreational property, and community property. Additional properties are either vacant, not suitable

for building, or have been combined with a neighboring lot to create a single large building lot. HMC Management indicated that it is not clear how many of these properties have service connections.

Table 2-1
Existing Parcels and Estimated Equivalent Residential Units

Land Use	ERUs/ Service Connection	Parcels	Estimated Service Connections	Estimated ERUs
Full-Time Residence	1.00	64	64	64
Part-Time Residence	0.50	209	209	105
Recreational Properties	0.25	144	144	36
Community Properties	0.25	12	12	3
Vacant Parcels/Double Lots/Unbuildable Lots	0.25	95	N/A	21
TOTAL		**524**	**400+**	**229**

Note:
ERUs Equivalent Residential Units

An Equivalent Residential Unit (ERU) is used in water system planning to equate water usage for non-residential or multi-family uses to water usage for a typical single-family residence. In order to estimate the number of ERUs served by the system, a factor was used to equate service connections to ERUs for each type of land use listed above. Based on the factors listed in Table 2-1, it is estimated that the HMC Management Water System serves approximately 229 ERUs.

Herron Island is located in 2000 Census Tract No. 726.02. The average household size of occupied households in this tract for 2007 was estimated to be 2.48 persons per household by the Puget Sound Regional Council (PSRC). As indicated in Section 1, approximately 64 homes are permanently occupied. Therefore, the estimated permanent population of Herron Island is approximately 159 people.

2.1.3 Historical Water Usage

Average Daily Demand (ADD) was estimated by reviewing well source meter records. Source production records were provided for the period 2002 to 2007, as shown in Table 2-2. The total water production for the HMC Management Water system ranged from 9.3 million gallons (28 acre-feet) in 2004 to 13.7 million gallons (42 acre-feet) in

2006. The average daily well production ranged from 25,332 gallons per day (gpd) in 2004 to 37,678 gpd in 2006.

Table 2-2
Historical Water Production

Year	Estimated ERUs	Total (gallons)	Average Daily (gpd)	Average Daily (gpm)	Average Daily (gpd/ERU)	Average for Peak Month (gpd)	Average for Peak Month (gpd/ERU)	Annual Volume (Acre-feet)
2002	217	11,904,440	32,615	23	150	52,813	243	37
2003	219	11,302,145	30,965	22	141	64,423	294	35
2004	221	9,271,443	25,332	18	115	27,660	125	28
2005	223	11,331,680	31,046	22	139	81,273	364	35
2006	225	13,752,622	37,678	26	167	67,915	302	42
2007	227	11,740,681	32,166	22	142	55,738	246	36
Avg.	**222**	**11,550,502**	**31,634**	**22**	**142**	**58,304**	**262**	**35**

Notes:
ERU Equivalent Residential Unit
gpd gallons per day
gpm gallons per minute

Table 2-2 indicates that an average of 142 gpd/ERU of water was delivered by the source wells for consumption from 2002 through 2007. The average production ranged from 115 gpd/ERU in 2002 to 167 gpd/ERU in 2004. The average production during the month of peak demand (July 2005) for the same period was 364 gpd/ERU.

DOH provides a formula for calculating average daily demand when no historical data are available. The average that would result from the DOH formula would be much higher than the historical average. The relatively low water usage on Herron Island is likely due to a number of factors, including landscaping, the size of the typical home, and family size. HMC Management has indicated that residential landscaping on the island is not typically irrigated, the homes are generally modest in size, and the number of occupants in each home is less than a typical single-family home in an urban setting.

DOH recommends that a minimum ADD of 200 gpd/ERU be used for facility planning purposes. In order to be conservative, the DOH-recommended ADD of 200 gpd/ERU

was used to estimate existing and future demands for use in the planning and design of improvements for the HMC Management Water System.

Maximum Daily Demand (MDD) and Peak Hourly Demand (PHD) were calculated using the following equations from the *Water System Design Manual* (DOH 2001):

MDD = 2 x ADD

Where:

MDD = Maximum Daily Demand in gpd/ERU

ADD = Average Daily Demand = 200 gpd/ERU

PHD = (MDD/1440)((C)(N) + F) + 18

Where:

PHD = Peak Hourly Demand in gpm

MDD = Maximum Daily Demand in gpd/ERU

C = Coefficient for 101 to 250 ERUs = 2.0

N = Number of ERUs

F = Factor for 101 to 250 ERUs = 75

Table 2-3 provides an estimate of existing (2008) water demand based on service to 229 ERUs, an ADD of 200 gpd/ERU, and an MDD of 400 gpd/ERU. No records are kept to document the number of hours the well pumps operate to meet MDD conditions. However, a comparison of the estimated MDD (64 gpm) and the combined well capacity (370 gpm) indicates that the well pumps operate less than the 18-hour per day maximum pumping duration recommended by DOH to allow for down time and maintenance of pumping facilities.

Table 2-3
Estimate of Existing Water Demand

Demand Type	Estimated ERUs	Demand		
		gpd/ERU	gpd	gpm
ADD	229	200	45,800	32
MDD	229	400	91,600	64
PHD	229	N/A	N/A	166

Notes:

ADD	Average Daily Demand
ERUs	Equivalent Residential Units
gpd	gallons per day
gpm	gallons per minute
MDD	Maximum Daily Demand
N/A	Not applicable
PHD	Peak Hourly Demand

2.2 Projected Land Use, Future Population, and Water Demand

2.2.1 Projected Land Use and Service Connections

Future water use will depend upon the number of new residences built and the change in the type of use of existing properties. HMC Management indicated that development will likely occur on the island, but that it is unlikely that every lot on the island will be developed because several owners currently own two lots and use both lots for one residence. Other lots are not suitable for building. Buildout of all vacant lots is not anticipated and was not addressed as part of this plan.

For planning purposes, HMC Management estimated that the number of full-time residences would increase by an average of 2 residences per year for the next 20 years. It was assumed that the increase in full-time residences would result from conversion of part-time residences, construction of new residences on recreational properties, and construction of new homes on vacant properties. Tables 2-4 and 2-5 summarize the projected land use, number of service connections, and ERUs that will be served by the HMC Management Water System in 2014, at the 6-year planning horizon, and in 2028, at the 20-year planning horizon. HMC Management estimated that of the 12 full-time residences that would be added during the next 6 years, and that approximately half of those would already have service connections. As a result, an increase of 1 service connection per year is projected for the 6-year planning period.

Table 2-4
Projected Service Connections and ERUs – 2014

Land Use	ERUs/ Service Connection	Parcels	Estimated Service Connections	Estimated ERUs
Full-Time Residence	1.00	76	76	76
Part-Time Residence	0.50	205	205	103
Recreational Properties	0.25	140	140	35
Community Properties	0.25	12	12	3
Vacant Parcels/Double Lots/Unbuildable Lots	0.25	91	82	21
TOTAL		**524**	**515**	**238**

Note:
ERUs Equivalent Residential Units

Table 2-5
Projected Service Connections and ERUs – 2028

Land Use	ERUs/ Service Connection	Parcels	Estimated Service Connections	Estimated ERUs
Full-Time Residence	1.00	104	104	104
Part-Time Residence	0.50	195	195	98
Recreational Properties	0.25	131	131	33
Community Properties	0.25	12	12	3
Vacant Parcels/Double Lots/Unbuildable Lots	0.25	82	82	21
TOTAL		**524**	**524**	**259**

Note:
ERUs Equivalent Residential Units

2.2.2 Projected Population and Future Service Area

If the average household size remains constant and the number of full-time residences increases as shown in Tables 2-4 and 2-5, the total full-time population of the island will reach 188 people in 2014 and 258 people in 2028. As was noted previously, the service area is an island, so no future changes to service area boundaries are anticipated.

2.2.3 Projected Water Demand

Water demand at the end of the 6-year and 20-year planning periods was projected, based on an ADD of 200 gpd/ERU and the equations for MDD and PHD outlined in

Section 2.1. It should be noted again that, on average, the system currently uses much less than 200 gpd/ERU. However, an ADD of 200 gpd/ERU was used for projections to ensure that the sizing and design of proposed improvements is conservative. Consequently, the projected demands are conservative. Actual demands will likely be smaller. The projected demand for 2014 is shown Table 2-6 and the projected demand for 2028 is shown in Table 2-7.

Table 2-6
Projected Water Demand - 2014

Demand Type	Estimated ERUs	Demand		
		gpd/ERU	gpd	gpm
ADD	238	200	47,600	33
MDD	238	400	95,200	66
PHD	238	N/A	N/A	171

Notes:
ADD Average Daily Demand
ERUs Equivalent Residential Units
gpd gallons per day
gpm gallons per minute
MDD Maximum Daily Demand
PHD Peak Hourly Demand

Table 2-7
Projected Water Demand - 2028

Demand Type	Estimated ERUs	Demand		
		gpd/ERU	gpd	gpm
ADD	259	200	51,800	36
MDD	259	400	103,600	72
PHD	259	N/A	N/A	182

Notes:
ADD Average Daily Demand
ERUs Equivalent Residential Units
gpd gallons per day
gpm gallons per minute
MDD Maximum Daily Demand
PHD Peak Hourly Demand

2.3 Fire Flow Requirements

Fire flow requirements for Herron Island are included in the *Pierce County Code, Title 17c, Building and Fire Codes* (Pierce County 2008). The minimum fire flow requirement for new single-family residences in rural areas is 750 gpm for 45 minutes. In addition, existing lots that are larger than 1 acre are exempt from fire flow requirements. Herron Island is designated as a rural area in the Pierce County Comprehensive Plan and, therefore, only the rural fire flow requirements apply. The water system was not built to deliver fire flow. However, HMC Management has expressed an interest in upgrading the system to provide fire protection on the island. This plan outlines upgrades that would be required to enable the water system to provide a fire flow of at least 750 gpm for 45 minutes. The water system only has three existing hydrants. The Pierce County Fire Prevention Bureau recommends that existing hydrants be bagged or marked "Not for Fire Fighting" so that fire protection personnel can easily recognize that fire flow is not available from these existing hydrants.

3 SYSTEM ANALYSIS

3.1 System Design Standards

The most recent criteria for transmission and distribution, storage, and booster pump facilities are specified in Washington Administrative Code (WAC) 246-290 and summarized in the DOH *Water System Design Manual* (DOH 2001). The criteria are summarized below. It should be recognized that existing facilities may not meet all current DOH criteria because water systems are required to have a greater capacity now than when the existing facilities were installed. This does not mean that the facilities do not meet the applicable DOH criteria; rather, they would not meet the most recent criteria. HMC Management strives to meet DOH criteria and will use the latest criteria when designing upgrades to the water system.

Design criteria related to transmission and distribution facilities include:

- Distribution pipelines shall deliver PHD while maintaining a pressure of no less than 30 psi at all service connections.
- Fire flows shall be delivered in combination with MDD while maintaining a minimum residual pressure of 20 psi at all service connections.
- The minimum pipe diameter in the distribution system shall be 6 inches, unless smaller pipe sizes are justified through hydraulic analysis. The diameter of pipes designed to transmit fire flow shall be 6 inches minimum.

Design criteria related to system storage include:

- Operational Storage shall be provided to allow for normal cycling of booster pumps under normal operating conditions.
- Equalizing Storage shall be provided to meet periodic peak demands placed on the water system, when those demands exceed the system's water supply capacity.
- Standby Storage shall be provided as a measure of reliability in case source operation is lost due to power failure or similar short-term emergency.
- Fire Suppression Storage shall be provided to supply an adequate volume of water to fight fires. Fire flow requirements for Herron Island are specified in the Pierce County Fire Code (Pierce County 2008).

Design criteria relating to system sources include:

- Sources (wells) must be able to reliably provide sufficient water to meet the maximum demand that will be placed on the system. DOH recommends that source capacity be provided such that Fire Suppression Storage can be replenished during a 72-hour period while concurrently supplying MDD. Equalizing Storage may be provided so that the source water can be stored to supply demands that exceed the MDD. If Equalizing Storage capacity is not provided, then the source capacity should be enough to provide sufficient water supply to meet PHD.

Design criteria related to booster pump stations include:

- A closed booster pump station (i.e., pumping into a pressurized system without an open reservoir) shall be capable of meeting the PHD, while maintaining pressures of no less than 30 psi throughout the distribution system. For reliability purposes, it is recommended that pump stations have this capacity with the largest booster pump out of service.
- For closed booster pump stations, fire flow requirements (if any) shall be supplied by fire pumps, or a combination of fire pumps and domestic pumps.

Additional criteria for water systems are provided in the *Pierce County Coordinated Water System Plan* (Pierce County, 2001) and the *Pierce County Code, Title 19D.130 – Pierce County Coordinated Water System Plan Minimum Standards and Specifications for Public Water System Planning, Design and Construction* (Pierce County, 2009). Applicable criteria developed as from these documents will be met by HMC Management.

3.2 Water Quality Analysis

Complete inorganic chemical tests are performed on the domestic water supply from Wells No. 1 and 2 at 3-year intervals in accordance with DOH requirements. Recent test results indicate that the water from the well sources did not exceed the DOH maximum contaminant levels (MCL) for inorganic compounds when the water was tested. Inorganic test results are summarized in Table 3-1.

Recent bacteriological test results for samples taken from the water distribution system are included in Appendix C. The test results indicate that there was one positive test for

coliform bacteria in January 2007. The system was retested the same month and all of the results were negative. No other positive results have occurred since the tank was replaced in the summer of 2005.

Table 3-1
Recent Inorganic Chemical Test Results – Wells No. 1 and No. 2

Analyte	DOH Maximum Contaminant Level	Sample Dates	
		6/11/04	10/9/07[1]
Arsenic	0.01 mg/L	ND	<0.002
Barium	2.0 mg/L	ND	n/a
Cadmium	0.005 mg/L	ND	n/a
Chromium	0.1 mg/L	ND	n/a
Mercury	0.002 mg/L	ND	n/a
Selenium	0.05 mg/L	ND	n/a
Beryllium	0.004 mg/L	ND	n/a
Nickel	0.1 mg/L	ND	n/a
Antimony	0.006 mg/L	ND	n/a
Thallium	0.002 mg/L	ND	n/a
Cyanide	0.2 mg/L	ND	n/a
Fluoride	4.0 mg/L	ND	n/a
Nitrite	1.0 mg/L	ND	n/a
Nitrate	10.0 mg/L	2.7 mg/L	n/a
Total Nitrate/Nitrite	10.0 mg/L	2.7 mg/L	n/a
Iron	0.3 mg/L	ND	n/a
Manganese	0.05 mg/L	ND	n/a
Silver	0.1 mg/L	ND	n/a
Chloride	250 mg/L	ND	n/a
Sulfate	250 mg/L	ND	n/a
Zinc	5.0 mg/L	ND	n/a
Sodium	--	9 mg/L	n/a
Hardness	--	84 mg/L	n/a
Conductivity	700 umhos/cm	209 umhos/cm	n/a
Turbidity	1.0 NTU	0.3 NTU	n/a
Color	15 units	ND	n/a
Total Dissolved Solids	500 mg/L	ND	n/a
Lead	--	ND	n/a
Copper	--	ND	n/a

Notes:

Results are for water sampled at the pump house, and represent the combined water quality of Wells No. 1 and No. 2. For reporting purposes, the wells are considered a single well field source (SO3).

1. Only arsenic was tested for the sample that was taken on October 9, 2007.

cm	centimeter
mg/L	milligrams per liter
n/a	Not applicable (see Note 1)
ND	Non-detect
NTU	Nephelometric Turbidity Unit

3.3 System Description and Hydraulic Analysis

3.3.1 Source Production Capacity

The first of the two wells on the island was drilled in 1959. It has a depth of 200 feet and an existing capacity of 150 gpm. The groundwater right allows for a maximum pumping rate of 500 gpm, and no more than 432 acre-feet per year total withdrawal for domestic water supply. The second well was drilled in 1982 to a depth of 210 feet. It has an existing capacity of 221 gpm. The groundwater right allows for a maximum pumping rate of 221 gpm, and an annual withdrawal of no more than 177 acre-feet per year as a supplemental domestic water supply. Because of proximity, the wells are considered to be a single well field with a capacity of 370 gpm.

As summarized previously, the existing design ADD is estimated to be 32 gpm, or 51 acre-feet per year. The projected ADD at the end of the 6-year planning period (2014) is 33 gpm, or 53 acre-feet per year. The projected ADD at the end of the 20-year planning period (2028) is 36 gpm, or 58 acre-feet per year. The well sources have adequate water rights and capacity to supply both the existing and projected total annual volume of water supply required. In addition, the existing PHD is estimated to be 166 gpm. The projected PHD at the end of the 6-year planning period is 171 gpm. The projected PHD at the end of the 20-year planning period is 182 gpm. The existing well source capacity exceeds both the existing and projected PHD. As a result, no Equalizing Storage is required to supply peak demands. It is estimated that the wells have sufficient source capacity to supply up to 654 total ERUs without relying on Equalizing Storage to supply peak demands.

3.3.2 Storage Capacity

The source wells deliver water to a 94,000-gallon above-ground concrete tank that was constructed in the summer of 2005. The storage tank replaced an older 30,000-gallon concrete tank that was leaking. The overflow elevation in the storage tank is 144.3 feet.

DOH storage requirements include five components, as listed below:

1. Operational Storage – allows for normal cycling on and off of well pumps under normal operating conditions
2. Equalizing Storage – enables the system to meet periodic peak demands, when demands on the system exceed the source capacity
3. Standby Storage – ensures that adequate water supply exists during power failures or pump outages
4. Fire Flow Storage – includes an adequate volume of water to fight fires
5. Dead Storage – includes storage in the reservoir that is not usable.

Storage capacity requirements for the HMC Management Water System were calculated as described in the subsections below.

3.3.2.1 Operational Storage

The Operational Storage is the top foot of storage in the existing reservoir. The design of the reservoir assumed that the Operational Storage was 3,000 gallons.

3.3.2.2 Equalizing Storage

Because the source capacity exceeds the current and projected PHD, no Equalizing Storage is required.

3.3.2.3 Standby Storage

The *Water System Design Manual* (DOH 2001), recommends that Standby Storage capacity be calculated as follows:

SB = 2 x ADD – 1440(Qs); for systems with multiple sources

Where:

SB = Standby Storage, in gallons

ADD = Average Daily Demand, in gallons

Qs = Sum of all source supply capacities, minus the actual installed capacity of the largest source continuously available to the system, in gpm

As shown in Table 3-2, no Standby Storage is currently required if calculated based on the formula above. However, DOH recommends that a minimum Standby Storage volume of 200 gallons per ERU be provided.

Table 3-2
Standby Storage Requirements

Year	ERUs	ADD (gpd)	SB Required – Based on Source Capacity (gallons)	SB Recommended – Based on Min. 200 gal/ERU (gallons)
2008	229	45,800	0	45,800
2014	238	47,600	0	47,600
2028	259	51,800	0	51,800

Notes:

ADD	Average Daily Demand
ERUs	Equivalent Residential Units
gpd	gallons per day
SB	Standby Storage

3.3.2.4 Fire Suppression Storage

The *Water System Design Manual* (DOH 2001) provides the following equation for estimating Fire Suppression Storage:

$$FSS = FF \times t_m$$

Where:

FF = Required Fire Flow Rate = 750 gpm

t_m = Specified Duration of Fire Flow = 45 minutes

FSS = Volume of Fire Suppression Storage (gallons) = 750 gpm x 45 minutes = 33,750 gallons

The Herron Island Water System does not currently have the piping or pumping capacity to distribute fire flow. The system currently includes one hydrant located near the existing booster pump station and tank, and two other hydrants. However, Fire Suppression Storage was included in the evaluation of storage capacity to reflect HMC Management's goal of upgrading the system to provide capacity for fire flow.

3.3.2.5 Summary of Storage Requirements

The total storage required was calculated as the sum of the Operational Storage, Equalizing Storage, and the greater of the Standby Storage and Fire Suppression Storage. DOH allows for nesting the Standby Storage and Fire Suppression Storage together. For this reason, the total storage capacity required includes only the larger of the two volumes. The total storage requirement for the existing and projected conditions is shown in Table 3-3, with Standby Storage calculated based providing a minimum of 200 gallons/ERU.

Table 3-3
Total Storage Requirement – Based on Standby Storage of 200 gpd/ERU

Year	Projected ERUs	Operational Storage (gallons)	Equalizing Storage (gallons)	Fire Suppression Storage (gallons)	Standby Storage (gallons)	Total Storage (gallons)
2008	229	2,992	0	33,750	45,800	48,792
2014	238	2,992	0	33,750	47,600	50,592
2028	259	2,992	0	33,750	51,800	54,792

Notes:
ERUs Equivalent Residential Units

The new tank has a usable storage capacity of approximately 94,000 gallons, which is sufficient to serve existing and projected conditions through 2028. It is estimated that the new tank has the capacity to serve up to approximately 455 ERUs with 200 gallons/ERU of Standby Storage.

3.3.3 Booster Pump Capacity

The existing PHD was estimated to be 166 gpm. The projected PHD for the 6-year planning period is 171 gpm. The project PHD for the 20-year planning period is 182 gpm. The existing booster pump capacity (394 gpm) exceeds both the existing and

projected PHD. The booster pumps have the capacity to supply up to 700 ERUs, but do not have the capacity to deliver fire flows. The DOH *Water System Design Manual* recommends that the booster pumps be able to deliver PHD with the largest pump out of service. The booster pump capacity with the largest pump out of service is 134 gpm. HMC Management recognizes that the system does not have the capacity to deliver PHD with the largest pump out of service and has accepted this reduced level of service. Additional pumping capacity will be added in the future.

3.3.4 Pressure Tank Capacity

The *Water System Design Manual* (DOH 2001) recommends that horizontal pressure tanks be size as follows:

$$V_t = \frac{[(P_1 + 14.7)]}{(P_1 - P_2)} \times \frac{(15 \times Q_p)}{N} \times (MF)$$

Where:

V_t = Total Volume of Tank in gallons
P_1 = Pump off Pressure
P_2 = Pump on Pressure
N = Number of Operating Cycles/Hour
Q_p = Pump Discharge
MF = Multiplying Factor

Using the largest of the three booster pumps, the required volume is estimated as follows:

P_1 = 56 psi N = 6 MF = 1.07
P_2 = 36 psi Q_p = 260 gpm

$$V_t = \frac{[(56 + 14.7)]}{(56 - 36)} \times \frac{(15 \times 260)}{6} \times 1.07$$

V_t = 2,459 gallons

The current pressure tank, which has a capacity of 1,250 gallons, is undersized. As a result, under certain demand conditions the pumps may be cycling on and off more than

the DOH-recommended maximum of 6 times per hour. However, the results of the hydraulic analysis outlined below indicate that the cycling may not be as frequent as indicated by the calculation above, because the largest pump is set to operate only under peak demand conditions. The two smaller pumps cycle on and off to meet normal demand conditions.

It is recommended that HMC Management monitor the wear and tear on the 7.5-HP pump. If the condition of the pump deteriorates to the point where the pump needs to be replaced, HMC Management should consider replacing that pump with two smaller pumps that have a combined capacity equal to the existing pump. Installing two smaller pumps would reduce cycling and prevent unnecessary wear and tear without increasing the size of the pressure tank. As an option, HMC Management could also install a variable frequency drive, which would allow the pump to automatically respond to fluctuations in demand by adjusting its speed rather than starting and stopping.

3.3.5 Hydraulic Analysis

A hydraulic model of the water distribution system was prepared to evaluate the capacity of the distribution system. WaterCAD hydraulic modeling software from Haested Methods, Inc. was used to model the system. The model was used to evaluate the performance of the distribution system under a variety of scenarios and determine the upgrades needed to mitigate any deficiencies. Extended period simulations (EPS) were used to model the change in hydraulic conditions throughout the water system during a period of 24 hours.

A summary of the hydraulic analysis is included in Appendix D. The results indicate that the existing potable water distribution system meets the criteria for delivering the existing PHD while maintaining a minimum pressure of at least 30 psi throughout the distribution system. The analysis indicates that the system also meets the criteria for projected PHD conditions.

The results of the analysis also indicate that the system does not currently have the capacity to deliver the required fire flow of 750 gpm for a duration of 45 minutes. Fire flow is unavailable for two reasons:

- Distribution piping is not currently sized to deliver fire flow. The system is comprised primarily of 2-inch and 4-inch distribution piping. Because normal demands on the system are significantly smaller than the fire flow requirement, the system is able to distribute PHD while meeting minimum pressure requirements. However, larger pipe is needed to provide capacity for fire flow.
- The booster pump station does not have capacity to pump fire flow. Piping at the booster pump station site includes a check valve that allows water to bypass the pump station and flow directly from the tank into the water system when the discharge gradient at the booster pump station falls below the water level in the tank. However, the water surface elevation in the tank is not sufficient to provide adequate fire flow pressures at the highest points in the system.

3.4 Summary of System Deficiencies

The hydraulic analysis indicates that the follow deficiencies exist:

- The system does not have enough piping or pumping capacity to deliver fire flow.
- Most of the existing pipe is old, small-diameter asbestos cement pipe. HMC Management suspects that the system may have leaks that have not been detected.
- The system does not have enough valves to enable proper isolation, operation, and maintenance of the system.
- The system does not have customer service meters to allow for customer billing and monitoring of water usage.

3.5 Justification of Proposed Improvements

The WaterCAD model was used to identify and evaluate upgrades that will mitigate the deficiencies related to the capacity of the distribution system. The analysis of the proposed upgrades is summarized in Appendix D as part of the summary of the hydraulic analysis. The analysis indicates that the following improvements are needed:

- Replacement of the distribution system with 4-inch, 6-inch, and 8-inch pipe.
- Installation of customer service meters, hydrants, valves, and other appurtenances.
- Installation of additional pumping capacity (approximately) 500-gpm pump at the booster pump station.

4 CONSERVATION PROGRAM AND SOURCE OF SUPPLY ANALYSIS

4.1 Conservation Program Development and Implementation

Development of a conservation program is required as part of water system planning by DOH. The Municipal Water Law (MWL) requires that conservation planning specifically address water use reporting, demand forecasting, and the conservation program.

4.1.1 Water Use Reporting

The HMC Management Water System does not currently have meters at individual customer services. Customers pay for water as part of their annual assessment. Because water usage is not metered at customer services, it is not possible at this time to accurately measure unaccounted-for water, which is the difference between metered production and metered usage. Unaccounted-for water represents water lost in the distribution system through leaks and unmetered water use. System leaks and breaks have not been monitored and recorded until recently. A copy of a log of recent water system repairs is included in Appendix I.

Water production is metered at the well sources. Water production records indicate that the overall average water demand has been relatively low and generally consistent. The meters at the well sources are monitored regularly to ensure that usage is consistent. When a meter reading is abnormally high, it usually indicates that the system is leaking or that a plumbing fixture somewhere on the island needs repair. HMC Management recently refurbished Well No. 1 and added a meter. That meter was calibrated when it was installed. The meter at Well No. 2 and the meter at the booster pump station are older and have not been calibrated since they were installed. It is recommended that HMC Management check both meters and calibrate them during the next 4 years and recalibrate each of the meters every 6 years.

Metering of individual customer services is recommended and will be implemented to enable HMC Management to monitor customer usage and identify causes of unaccounted-for water. New service connections will be installed with water meters, and water meters will be added to existing service connections as resources become available for metering and the other improvements that are outlined in Section 8.

4.1.2 Demand Forecasting

Water demands were projected for the HMC Management Water System, as outlined in Tables 2-6 and 2-7, for the 6-year and 20-year planning horizons, respectively. These projections assume that the HMC Management Water System will serve 238 ERUs at the end of the 6-year planning period and 259 ERUs at the end of the 20-year planning period. Development of a conservation program will ensure that HMC Management can continue to manage supplies to meet the expected increase in water demand.

4.1.3 Conservation Program

Washington State requires that small public water systems develop a conservation program that includes metering of sources and water services, conservation pricing, and program promotion. Because the average water demand per connection has been relatively low and consistent, it is not anticipated that near-term water conservation measures will significantly reduce demand. However, the following are proposed to meet the requirements of the conservation program:

- As previously noted, the HMC Management Water System does not currently have meters at individual customer services. The MWL requires that customer service meters be installed by 2017. DOH indicated that the Roger's Ruling of June 2008 challenges the requirement for private water systems to install customer service meters. Because of the ruling, DOH can not currently allow private water systems to receive MWL benefits or require them to meet water use efficiency obligations, such as customer metering. The ruling is being appealed by the State of Washington. Regardless of the outcome, it is recommended that HMC Management install meters at all new customer services and add meters to existing customer services as funding becomes available to upgrade water mains and customer services throughout the system.
- HMC Management will continue to monitor production by regularly reading the meters at the well sources. The existing system includes a meter at both wells and a meter in the booster pump station that measures flow to the system from both sources. When customer usage data become available, HMC Management will review the data to determine additional conservation measures that may be implemented to reduce water use.

- When customer service meters are installed, HMC Management will be able to bill customers based on water use and implement a rate structure that will encourage conservation. Conservation pricing of water generally includes charging each customer a base monthly rate and applying a tiered rate structure for usage beyond the minimum volume of water that is included in the base rate. The tiered rates are intended to charge customers more for excessive water use.
- As customer service meters are installed and changes are made to the way customers are billed for water usage, HMC Management will make an effort to inform customers of the changes and educate the customers about water conservation issues. This objective should be easy to accomplish, thanks in part to the Water Conservation Brochures made available by DOH. Copies of those brochures have been included in Appendix E and are available online at http://www.doh.wa.gov/ehp/dw/our_main_pages/water_use_efficiency.htm.
- HMC Management will continue to monitor main breaks and leakage by logging repairs and customer complaints. Each repair will be listed by the type of repair, the date of the repair, and the location of the repair.

4.1.4 Municipal Water Supply Efficiency Requirements

The reporting and management of customer water usage, the impact of water rates on customer usage, and other conservation measures will be evaluated at the end of the 6-year planning period to determine how effective these measures will have been in reducing water use, as required by municipal water supply efficiency requirements adopted as part of the MWL.

4.2 Source of Supply Analysis

The capacity of the HMC Management Water System well sources was outlined in Section 3.3.1. As noted in that section, the well sources have adequate capacity and water rights to supply both the existing and projected annual volume of water demand. The well source capacity also exceeds both the existing and projected PHD. It is estimated that existing wells sources have the capacity to supply up to 654 ERUs.

4.3 Water Right Evaluation

HMC Management currently holds two water rights for domestic use on the island. Table 4-1 lists the water rights information, and provides a comparison of the water rights to existing and projected water usage. Copies of the water right certificates and associated water right self assessment forms are attached in Appendix F.

Table 4-1
Water Rights Evaluation

Number	Priority Date	Source	Existing Water Rights		Existing (2008) Water Usage		Projected (2014) Water Usage	
			Annual Use (AF/year)	Maximum Use (gpm)	Annual Use (AF/year)	Maximum Use[1] (gpm)	Annual Use (AF/year)	Maximum Use[1] (gpm)
6208	11/15/62	Well 1	432	500		150		150
G2-26761	7/23/85	Well 2	177	221		221		221
Totals			**609**	**721**	**51**		**53**	

Notes:
1. Wells No. 1 and No. 2 currently alternate operation to refill the storage tank.

AF acre-feet
gpm gallons per minute

4.4 System Reliability

The previous water system engineering report prepared by MWG in 1995 indicated that the HMC Management Water System did not have sufficient storage capacity to provide reliable, uninterrupted service during a power outage or other similar emergency-type situation. After reviewing the preliminary information organized for that report, the HMC Management Board of Directors adopted a resolution stating that their current level of service of the water system, although lacking in reliability, was appropriate given the rural and part-time nature of the community it serves. However, as part of an effort to upgrade the level of service and improve the reliability of the system, HMC Management upgraded the storage capacity by replacing the old 30,000-gallon reservoir with a new 94,000-gallon reservoir that has the capacity to reliably meet system needs. In addition, HMC Management has an emergency generator that is capable of providing power to the booster pumps and well pumps during a power outage or other emergency.

4.5 Existing and Proposed Interties

The area currently serviced by the HMC Management includes all of Herron Island. Because the service area is constrained by the shoreline of Herron Island, there are no interties with neighboring water systems and none are proposed.

5 SOURCE WATER PROTECTION

5.1 Wellhead Protection Program

Due to the small size of the HMC Management Water System, when the water system planning process began, DOH indicated that the most current Susceptibility Assessment Survey would be acceptable as a minimum Wellhead Protection Program for the island. In addition, DOH requested that letters be circulated to property owners with septic tanks located within the 1-year groundwater time of travel zone to alert them of the wellhead protection area and their responsibility to protect groundwater resources. Letters have also been sent to local emergency responders, including Tacoma Pierce County Health Department, Pierce County Fire District No. 16, Peninsula Light, Century Tel, and Red's Electric, to notify them of the wellhead protection area.

5.2 Susceptibility Assessment Survey

A Susceptibility Assessment Survey was completed in 1996. From the survey, a drawing showing groundwater travel time was created. Anything in the range of the 10-year travel time to the wells should be examined and treated as a possible contamination source for the wells. Figure 3 shows Herron Island with groundwater travel time. The Susceptibility Assessment Survey is attached in Appendix G.

6 OPERATION AND MAINTENANCE PROGRAM

6.1 Water System Management and Personnel

HMC Management has a part-time Island Manager, Claudia Ellsworth, who oversees the operation and maintenance of the potable water system, as well as the other HMC Management-owned facilities. HMC Management has two additional employees, and one contract employee that help operate, manage, and maintain the water system under the direction of the Manager. HMC Management also recently created a Water Committee, consisting of volunteers. The Water Committee assists HMC Management in the management of the water system and has played a key role in the development of this Water System Plan. HMC Management employees and volunteers are governed by a board elected by the property owners on Herron Island. The board has five members. The board members are active in the management and maintenance of the water system.

6.2 Operator Certification

HMC Management has an on-call contract with Mike Davis, a Herron Island resident and certified Water Distribution Manager (WDM 3), to serve as Water System Chairman. He assists with system management, maintenance, and operations.

6.3 System Operation and Control

Routine drive-by inspections of the active well and storage tank are made daily by the Manager and/or water system operator when the source meters are read and recorded. Any warning signs of malfunction at the well and storage tank, signs of vandalism, or any obvious distribution system problems are noted. More detailed inspections of the system are made on an as-needed basis. Maintenance of potable water system facilities is performed by HMC Management on a continual basis to keep the system operating in an efficient and reliable manner. Maintenance problems are brought to the Manager's attention through customer complaints.

6.4 Comprehensive Monitoring Plan

Water quality monitoring procedures for the HMC Management Water System are based on the requirements set forth in WAC 246-290-300 through 330. Bacteriological samples are taken monthly as detailed in the Coliform Monitoring Plan (CMP), attached as Appendix H. The CMP was developed as part of the water system planning process to meet the DOH

requirements for coliform monitoring. As part of the CMP, monthly bacteriological sampling will continue, with monthly samples taken from one of three sites on a rotating schedule. Also included with the CMP are copies of DOH guidelines for monitoring coliform, following up on an unsatisfactory test, troubleshooting, emergency disinfection, and public notification that will be posted in the event that the coliform MCL is exceeded.

6.5 Emergency Response Program

Emergencies generally consist of minor leaks and plumbing fixture problems. However, more serious emergencies may occur, including serious line breaks, extensive damage to pumping facilities, or fecal coliform contamination. An Emergency Response Program (ERP) was prepared by HMC Management, and includes information regarding emergency contacts and response procedures. The ERP is included in Appendix I. Until recently, HMC Management has not maintained a log of repairs and work on the water system. A log has been maintained since 2007. The log is included with the ERP. It is recommended that HMC Management continue to maintain a log of repairs to the water system, detailing the problem being repaired, the location, and the date the work completed.

6.6 Safety Procedures

HMC Management personnel follow standard safety procedures when maintaining the water system and working with chlorine and other chemicals. However, HMC Management will work to formalize safety procedures and post them at critical locations as operation and maintenance practices are upgraded. Construction safety will be practiced as required in the Standard Specifications in Appendix K.

6.7 Cross-Connection Control Program

HMC Management has not previously implemented a formal Cross-Connection Control Program (CCCP). As part of this planning effort, a CCCP has been initiated to address the cross-connection hazards that may exist. The CCCP was prepared per the guidelines in WAC 246-290-490, and is included in Appendix J.

6.8 Customer Response Program

Customers currently report problems with utility and other services to HMC Management. Because the system is small and the customers are familiar with HMC Management

personnel, this process works well. Complaints typically consist of minor leaks and lower than expected pressures. As customer service meters are installed and water surcharge billing is implemented, HMC Management will encourage additional customer response by providing contact information with water bills and encouraging feedback from customers. It is recommended that HMC Management also keep a log of all customer complaints, including the date, the time, the person who made the complaint, a description of the complaint, and any follow up action that was taken.

6.9 Recordkeeping and Reporting

Records related to water quality testing, operation and maintenance activities, and system upgrades are generated by the Manager and kept on file at the HMC Management office on Herron Island. The Manager is also responsible for providing water quality information, as required, to DOH.

6.10 Operations and Maintenance Improvements

Maintenance of the HMC Management Water System has been difficult. Most of the distribution facilities are aging. Locating and maintaining buried pipe and valves can be difficult because accurate as-built information is not available. The installation of the new storage tank has improved operations and maintenance. Additional upgrades are recommended as a part of this plan that will further improve operations and maintenance. New facilities will be designed for more effective maintenance. In addition, HMC Management will use the Water System Plan as a guide in performing operations and maintenance duties. In addition to this plan and the documents included in the Appendices, the following will be maintained on file and updated as needed to meet operations and maintenance needs:

- Water quality sampling schedule
- An inspection and maintenance schedule
- Operator certifications
- As-built information
- Equipment information, including catalog data, pump curves, and operating manuals
- A log of leaks, main breaks and other repairs to the system

7 DISTRIBUTION FACILITIES DESIGN AND CONSTRUCTION STANDARDS

7.1 Project Review Procedures

Design drawings and specifications for water system upgrades are reviewed by the Manager and, as needed, by the HMC Management Board of Directors. Design review procedures have not been standardized and are generally handled on a project-by-project basis.

7.2 Policies and Requirements for Outside Parties

HMC Management does not have specific requirements set forth for design and construction work done by outside parties. Requirements are set forth through contracts established for individual projects.

7.3 Design Standards

Standard design details for the construction of new water mains and appurtenances have been developed for HMC Management. Those details are attached in Appendix K. Additional design and construction standards are outlined in the *Pierce County Coordinated Water System Plan* (Pierce County, 2001) and the *Pierce County Code, Title 19D.130 – Pierce County Coordinated Water System Plan Minimum Standards and Specifications for Public Water System Planning, Design and Construction* (Pierce County, 2009).

7.4 Construction Standards

Standard Specifications for construction of new water mains and appurtenances have also been developed for HMC Management based on American Water Works Association (AWWA) and Washington State Department of Transportation (WSDOT)/American Public Works Association (APWA) standards. The specifications are also included in Appendix K.

7.5 Construction Certification and Follow-up Procedures

The Manager or other local HMC Management personnel generally provide inspection and oversight of construction of water system improvements to ensure that design requirements are met. When needed, a consultant is hired to provide assistance and oversight during construction.

8 IMPROVEMENT PROGRAM

8.1 Prioritized Improvement Plan

As noted in the system analysis in Section 3, replacement of the distribution system and additional pumping are recommended to enable the system to deliver fire flow. Installation of hydrants, valves, customer service meters, and other appurtenances are recommended with the replacement of the distribution system. In addition to providing capacity for fire flow, these improvements will improve system operations, maintenance, and management.

The recommended improvements are shown graphically in Figure 4. A list of the proposed improvements, along with an opinion of the probable costs associated with their implementation is included in Table 8-1. Because HMC Management intends to replace the distribution system and make the recommended upgrades as a single project funded by a low-interest loan or grant, no priority has been assigned to the recommended improvements. However, if HMC Management decides in the future to pursue the project in phases, priority should be given first to replacing distribution pipe near the source and storage facilities. The work should progress from the center of the island to the north and south. Priority should also be given to adding capacity for fire flow at the booster pump station.

The unit costs shown in Table 8-1 include the cost of all materials and work required to install and complete work related to each item. A contingency and taxes have also been included. The total estimated cost of all improvements, including contingency and taxes, is approximately $2.78 million.

8.2 Improvement Schedule

Because these improvements are needed to provide fire flow capacity on Herron Island, HMC Management is already planning for the needed upgrades. HMC Management is currently investigating funding options for the improvements. The schedule for implementing the improvements will be dictated by the requirements of the funding option that is used. In order to meet DOH requirements, customer service meters should be installed by 2017, at the latest.

Table 8-1
Improvement Plan – Opinion of Probable Cost

Item		Unit	Unit Cost	Quantity	Cost
Design/Permitting					
1	Civil Engineer	LS	$40,000	1	$40,000
2	Surveyor[1]	LS	$40,000	1	$40,000
			Design/Permitting/Inspection Subtotal		$80,000
Construction					
3	Replace Existing Main With 8" Main (PVC C900)[2]	LF	$42	20,806	$873,852
4	Replace Existing Main With 6" Main (PVC C900)[2]	LF	$34	6,763	$229,942
5	Replace Existing Main With 4" Main (PVC C900)[2]	LF	$26	2,577	$67,002
6	Install Fire Hydrant Assembly (3-port)	EA	$3,500	41	$143,500
7	Install 6" Gate Valve	EA	$1,000	12	$12,000
8	Install 8" Gate Valve	EA	$1,200	55	$66,000
9	Install 2" Blow-off Assembly	EA	$3,000	5	$15,000
10	Install 5/8" Customer Service Meter	EA	$150	524	$78,600
11	Refurbish Existing Pressure Reducing Stations[3]	EA	$5,000	4	$20,000
12	Install New 15-HP Pump (500 GPM at 75 Feet TDH)[4]	LS	$15,000	1	$15,000
13	Upgrade Booster Pump Station Plumbing	LS	$5,000	1	$5,000
			Construction Subtotal[5]		$1,525,900
			Island Cost Index		1.35
			Island Construction Subtotal[5]		$2,060,000
			Wash. State Sales Tax (8.2%)		$173,040
			Construction Total[5]		$2,233,000
			Total (Construction + Design/Permitting/Inspection)[5]		**$2,313,000**
			Contingency (20%)		$462,600
			Total (With Contingency)[5]		**$2,775,600**

Notes:

1. The cost of surveying may be optional. The engineer may be able to produce a biddable set of construction drawings with existing topographical information and aerial photography.
2. Water main replacement costs include materials, installation, connection to existing services, trenching, backfilling, pressure testing, and disinfection. Construction costs are estimates. Actual costs may vary depending on factors such as pipe material costs and contractor used to install pipe.
3. Costs include replacement of pressure reducing valves and plumbing to enable pressure reducing valves to work with new distribution system. Costs will vary depending upon the condition of each pressure reducing station.
4. A new pump is needed to enable the pump station to deliver fire flow during maximum daily demand. Costs assume the new pump will be located in the existing pump station. Costs include piping and fittings that will be needed to connect the new pump to the system.
5. Subtotals and Totals are rounded to the nearest 100 dollars.

9 FINANCIAL PROGRAM

9.1 Past and Present Financial Status

As noted previously, the HMC Management Water System is a privately-owned, non-profit, Group A public water system. The system is owned and operated by HMC Management, a homeowner's association funded by the landowners on Herron Island through annual assessments, reserve accounts, and special assessments. HMC Management provides the budget for the operation and maintenance of the water system from assessments paid by island property owners. Water system expenses are tracked as one of the expense sections within the total budget for island maintenance. In addition to the water system, assessments cover expenses related to the roads, parks, transportation, docks, and administration of Herron Island. At this time, HMC Management is able to stay within the water budget by absorbing some costs in as administrative expenses, such as payroll, water testing, and accounts payable. HMC Management has operated as a financially viable homeowner's association since 1958.

9.2 Available Revenue Sources

HMC Management has the obligation to provide quality drinking water to all members on Herron Island. HMC Management also has the obligation to improve, maintain, and repair other community-owned facilities appropriate for the use and benefit of its members. At this time, a majority of the revenue used to fund regular water system operations comes from annual member-approved assessments. Funding for water system improvement and expansion comes from member-approved reserves and special assessments. The current water system connection charge is $500. The connection charge will be increased in the future. Because the HMC Management Water System does not currently have any customer service meters, customers cannot be billed based on water usage. Installation of customer service meters and development of a rate schedule that encourages conservation are recommended as part of this plan.

When any facility requires a capital expenditure of over $10,000, the proposal with estimated cost is sent to all members. They are asked to vote for or against the proposal. The HMC Management Board of Directors can designate a special assessment (HMC By-Law 1.6.5) to cover the costs for these projects, or use some reserves in combination with a special assessment. Special assessments have funded such projects as purchasing a new

ferry, replacing docks and ramps on island and mainland, installing a new reservoir, and replacing our small boat docks at the community beach.

9.3 Allocation of Revenue Sources

Normal operating expenses for the HMC Management Water System include contracted services, utilities, testing and treatment, supplies, transportation, maintenance, taxes, and licenses. Revenue generated through annual assessments is used to pay for normal operating expenses.

An improvement plan was outlined in Section 8. The costs of that plan were estimated to be $2.78 million. At this time, special assessments are used to fund large capital improvements. HMC Management is also investigating other funding options. A list of low-interest loan and grant programs published by DOH is included in Appendix L. When the improvements recommended in Section 8, which include replacement of most of the HMC Management distribution system, are brought before the Board of Directors, they will then send out a voting packet to obtain members' approval before proceeding. At that time, all financial data will be substantiated with bids and costs for the improvements.

9.4 Program Justification

Application of a financial viability test (FVT) is required as part of the planning process for expanding Group A water systems (DOH 1995). The four components of the test examine the adequacy of the system's operating budget, operating cash reserve, emergency replacement reserve, and the ability of system users to afford water rates that help fund system maintenance and expansion.

9.4.1 Operating Budget

An operating budget covering non-capital costs for the next 6 years was developed for the HMC Management Water System by HMC Management. That budget is outlined in Table 9-1. As noted previously, capital expenditures during the next 6 years may include costs associated with implementing some or all of the improvements outlined in Section 8. The estimated cost of the improvements is $2.78 million. HMC Management is actively working towards identifying a funding source for the capital improvements outlined in Section 8.

Discussion has occurred through multiple community meetings regarding water system improvements and how those improvements would be funded. Under the first option being considered, HMC Management would retain ownership of the system and establish a special assessment to repay loans required to implement the project. A contract with a water management company or certified water system manager would be set up to manage the system and implement improvements. A budget is outlined in Table 9-2 that includes the impact of the cost on the operating budget that would result from HMC Management pursuing this option. The annual assessment would have to be increased to hire a new water management company or certified water system manager and compensate for delinquent special assessments.

Under a second option, HMC Management would transfer ownership of the system to another company or utility. The new owner would manage and operate the system, fund the cost of the improvement project and define a repayment plan for the customers. Under the final option being considered, HMC Management would retain ownership of the system, but would contract with others to manage the system, secure funding and implement upgrades. A final decision on how the water system replacement would be funded has not been made yet.

9.4.2 Operating Cash and Emergency Reserves

These two components of the FVT require the water system to demonstrate its ability to withstand cash flow fluctuations and cover the cost of an emergency or failure of its most vulnerable system component. The HMC Management Water System is owned and operated by HMC Management, a private, non-profit homeowner's association with reserves sufficient to cover a water system emergency, if needed.

In the six year operating budget provided in Table 9-1, HMC Management has allocated $40,000 of existing money as operating reserves for the water system and has budgeted for establishing an emergency reserve fund of $100,000 by 2014 for emergency replacement of the key components of the system, such as well replacement. Because water system operation is currently funded by the budget for the overall homeowner's association expenses, reserve accounts designated for the operation of other HMC Management facilities may be used for operational contingencies, upgrades and

emergencies for the water department, when needed. At present, HMC Management has $362,605 in various reserve accounts.

Table 9-1
Water System Six-Year Operating Budget

	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14
Revenues							
HMC Assessments	19,390	20,708	21,344	20,700	22,175	22,870	22,586
Connection Fees	460	500	500	800	1,000	1,000	2,000
Emergency Reserve Assessments	--	--	20,000	20,000	20,000	20,000	20,000
Total Revenues ($)	**19,850**	**21,208**	**41,844**	**42,500**	**43,175**	**43,870**	**44,586**
Operating Expenses							
Contracted Services	600	700	721	743	765	788	811
Utilities (Phone & Power)	3,500	2,500	2,575	2,652	2,732	2,814	2,898
Testing & Treatment	700	400	412	424	437	450	464
Supplies/Maintenance	2,500	3,000	3,090	3,183	3,278	3,377	3,478
Transportation	--	--	500	515	530	546	563
Emergency Replacement Reserve[2]	--	--	20,000	20,000	20,000	20,000	20,000
Operating Reserve In/(Out)[3]	2,500	3,400	3,002	3,092	3,185	3,281	3,281
Payroll	6,450	7,400	7,622	7,851	8,086	8,329	8,579
Payroll Taxes	900	1,008	1,038	1,069	1,101	1,135	1,169
Education	150	250	258	265	273	281	290
Permits, Taxes & Licenses	1,350	1,350	1,391	1,432	1,475	1,519	1,565
Membership – Evergreen Rural Water	150	150	155	159	164	169	174
Other/Miscellaneous	300	300	309	318	328	338	348
Excise Tax	750	750	773	796	820	844	869
Total Expenses ($)	**19,850**	**21,208**	**41,844**	**42,500**	**43,175**	**43,870**	**44,586**
Operating Budget Surplus (Deficit) ($)	0	0	0	0	0	0	0
Operating Reserve[3]	40,000	40,000	40,000	40,000	40,000	40,000	40,000
Emergency Replacement Reserve[2]	--	--	20,000	40,000	60,000	80,000	100,000

Notes:

1. Revenue and expenses were increased at 3% per year from 2008-09 (starting in 2009-10).
2. The budget assumes that HMC Management's Emergency Replacement Reserve will be funded at $20,000 per year for 5 years starting in the 2009-10 budget year to build funds for the replacement costs of HMC Management Water System's most valuable components.
3. The budget assumes that an operating reserve of $40,000 will be maintained over the next 6 years.

Table 9-2
Water System Six-Year Operating Budget – Retained Ownership

	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14
Revenues							
HMC Assessments[1]	19,390	20,708	21,344	20,700	62,175	62,870	62,586
Connection Fees	460	500	500	800	1,000	1,000	2,000
Emergency Reserve Assessments	--	--	20,000	20,000	20,000	20,000	20,000
Total Revenues ($)	**19,850**	**21,208**	**41,844**	**42,500**	**83,175**	**83,870**	**84,586**
Operating Expenses							
Contracted Services[2]	600	700	721	743	40,765	40,788	40,811
Utilities (Phone & Power)	3,500	2,500	2,575	2,652	2,732	2,814	2,898
Testing & Treatment	700	400	412	424	437	450	464
Supplies/Maintenance	2,500	3,000	3,090	3,183	3,278	3,377	3,478
Transportation	--	--	500	515	530	546	563
Emergency Replacement Reserve[3]	--	--	20,000	20,000	20,000	20,000	20,000
Operating Reserve In/(Out)[4]	2,500	3,400	3,002	3,092	3,185	3,281	3,281
Payroll	6,450	7,400	7,622	7,851	8,086	8,329	8,579
Payroll Taxes	900	1,008	1,038	1,069	1,101	1,135	1,169
Education	150	250	258	265	273	281	290
Permits, Taxes & Licenses	1,350	1,350	1,391	1,432	1,475	1,519	1,565
Membership – Evergreen Rural Water	150	150	155	159	164	169	174
Other/Miscellaneous	300	300	309	318	328	338	348
Excise Tax	750	750	773	796	820	844	869
Total Expenses ($)	**19,850**	**21,208**	**41,844**	**42,500**	**83,175**	**83,870**	**84,586**
Operating Budget Surplus (Deficit) ($)	0	0	0	0	0	0	0
Operating Reserve[4]	40,000	40,000	40,000	40,000	40,000	40,000	40,000
Emergency Replacement Reserve[3]	--	--	20,000	40,000	60,000	80,000	100,000

Notes:

1. HMC membership assessment will be raised by $40,000 anually to cover additional expense for contracted services.
2. Additional contracted expenses will include hiring a new Water Management Company and/or Certified Water Manager and additional expenses for special assessment delinquencies.
3. The budget assumes that HMC Management's Emergency Replacement Reserve will be funded at $20,000 per year for 5 years starting in the 2009-10 budget year to build funds for the replacement costs of HMC Management Water System's most valuable components.
4. The budget assumes that an operating reserve of $40,000 will be maintained over the next 6 years.

9.4.3 Household Income Index

The purpose of this test is to measure the ability of system users to pay operating and facility charges. HMC Management intends to pay for system upgrades through special assessments and fees and may secure financing, in part, to cover capital expenditures.

A measure of the system user's ability to pay is to compare current water bills to 1.5 percent of the average annual median household income (MHHI). The MHHI for Pierce County was estimated at $57,100 in 2006 (PSRC 2007). One and one-half percent of the MHHI would be $857. When HMC Management installs customer service meters and begins to bill customers based on water usage, this number should be used as a benchmark in setting water rates. With customer service meters, the annual assessment will rise to cover increased expenses for maintenance, meter reading, and other operations activities. HMC Management intends to have the first 200 to 250 gpd of average monthly household water usage included in the property owner's annual assessments. Rates for property owners using more than 200 to 250 gpd will be billed at rates to be established by HMC Management.

9.4.4 Summary

The HMC Management Water System is viable because the revenue generated through assessments and connection fees covers operating expenses and reserves. In addition, HMC Management has money in various reserve accounts and has the ability to designate special assessments for capital improvement projects.

The estimated cost of the capital improvements outlined in this plan is $2.78 million. Discussion has occurred through multiple community meetings regarding water system improvements and how those improvements would be funded. Notes and information from a few of those meeting are included in Appendix B. A community water information meeting was held on July 25, 2009. The meeting resulted in a productive exchange of ideas and questions. At the August 8, 2009 HMC Management Board of Directors meeting, the Board authorized the creation of a Water Project Committee to look and financing options and develop a schedule for improvements. The Water Project Committee is working on their evaluation and will present findings to the Board.

10 MISCELLANEOUS DOCUMENTS

No State Environmental Policy Act (SEPA) checklist is required for this Water System Plan because the HMC Management Water System has less than 1,000 connections. The water service area agreement, susceptibility survey, and other documents are included in the Appendices.

11 REFERENCES

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DOH. 2007. "Water Use Efficiency Excerpt Group A Public Water Systems Chapter 246-290 WAC." Washington State Department of Health. January.

Pierce County. 2001. "Pierce County Coordinated Water System Plan and Regional Supplement."

Pierce County. 2008. "Pierce County Code, Title 17c, Building and Fire Codes."

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Pierce County. 2009. "Pierce County Code, Title 18A, Pierce County Zoning Code"

Pierce County. 2009. "Pierce County Code, Title 19A, Pierce County Comprehensive Plan."

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FIGURES

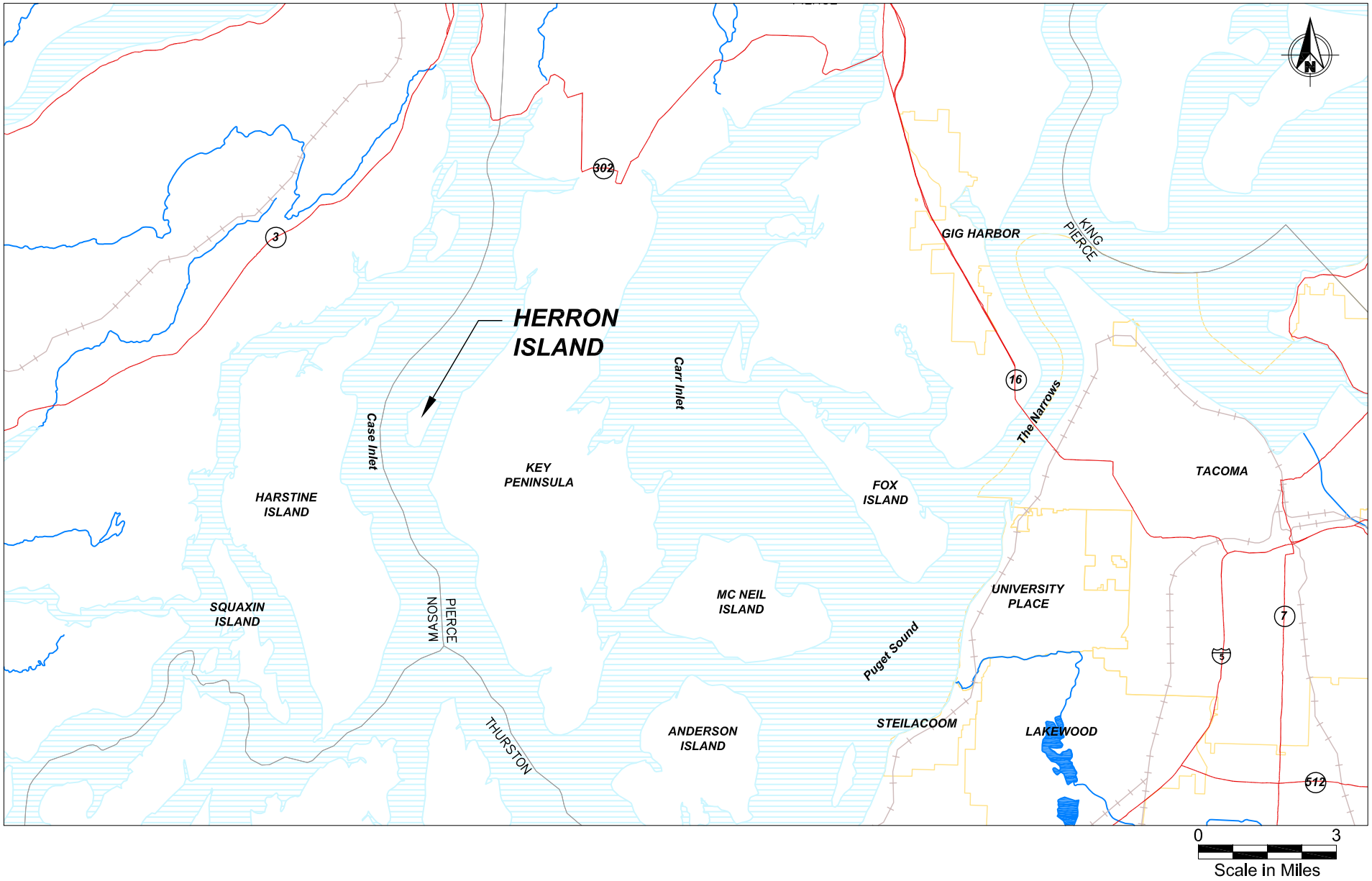

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Figure 1
Location Map
HMC Management
Water System Plan

LEGEND:

- FIRE HYDRANT
- BLOWOFF VALVE
- LINE VALVE
- PRESSURE REDUCING STATION
- WATER LINE

W HERRON PL
W HERRON BLVD
E HERRON BLVD
YEW BLVD
W YEW BLVD
MAPLE DR
FERRY ST
HERRON LN
W MADRONA BLVD
E MADRONA BLVD
S HERRON BLVD

BOOSTER PUMP STATION
(2 2.5-HP PUMPS, 1 7.5-HP PUMP
TOTAL CAPACITY~394 GPM,
WITH 1,250-GALLON PRESSURE TANK)

EXISTING TANK
(94,000 GALLONS)

WELLS
(WELL 1 ~ 170 GPM
WELL 2 ~ 221 GPM)

APPROXIMATE HERRON
ISLAND SHORELINE

HMC MANAGEMENT
SERVICE AREA

N

0 400
Scale in Feet

Aug 21, 2009 12:15pm drice L:\Company Shared Folders\MWG Projects\5000\5012 Herron Island\01 Water System Plan\Drawings\Figure 2 - System Map.dwg Figure 2

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Figure 2
Existing Water System
HMC Management
Water System Plan

HERRON ISLAND

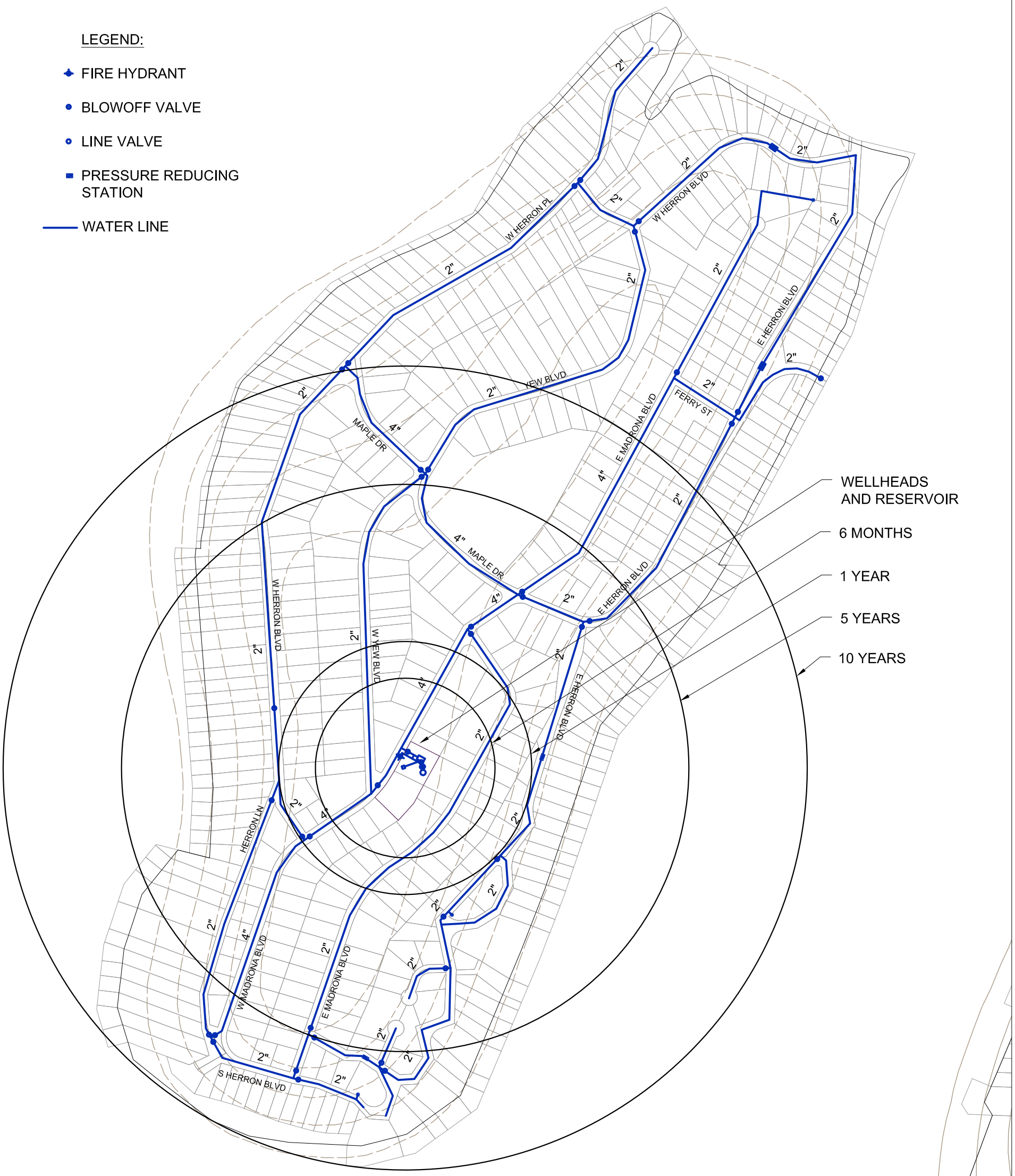
Aug 24, 2009 8:32am drice L:\Company Shared Folders\MWG Projects\5000\5012 Herron Island\01 Water System Plan\Drawings\Figure 3 - Property Inventory.dwg Figure 3

PREPARED BY HMC MANAGEMENT

Figure 3
Inventory of Existing Properties
HMC Management
Water System Plan

LEGEND:

- FIRE HYDRANT
- BLOWOFF VALVE
- LINE VALVE
- PRESSURE REDUCING STATION
- WATER LINE



NOTE:

RINGS INDICATE ESTIMATED DISTANCE (FROM WELL SOURCES AND RESERVOIR) THAT GROUND WATER TRAVELS WITHIN THE TIME OF TRAVEL SHOWN.

0 500
Scale in Feet

Figure 4
Groundwater Time of Travel Map
HMC Management
Water System Plan

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EXISTING | PROPOSED

FIRE HYDRANT

BLOWOFF VALVE

LINE VALVE

PRESSURE REDUCING STATION

WATER LINE
(EXISTING PIPE TO BE REPLACED AS SHOWN BY PVC C900 PIPE)

BLOWOFF ASSY. (TYPICAL ALL DEAD END LINES)

INSTALL METERS AT ALL CUSTOMER SERVICES.

REFURBISH EXISTING PRESSURE REDUCING STATION. SET TO DISCHARGE AT HGL=175 FEET (TYPICAL OF 4)

PROVIDE ADDITIONAL 15-HP PUMP FOR FIRE FLOW CAPACITY (500 GPM AT 75 FEET TDH)

VALVE TO NORMALLY BE CLOSED

0 400
Scale in Feet

L:\Company Shared Folders\MWG Projects\5000\5012 Herron Island\01 Water System Plan\Drawings\Figure 5 - Improvement Plan.dwg Figure 5
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Figure 5
Proposed Water System Improvements
HMC Management
Water System Plan