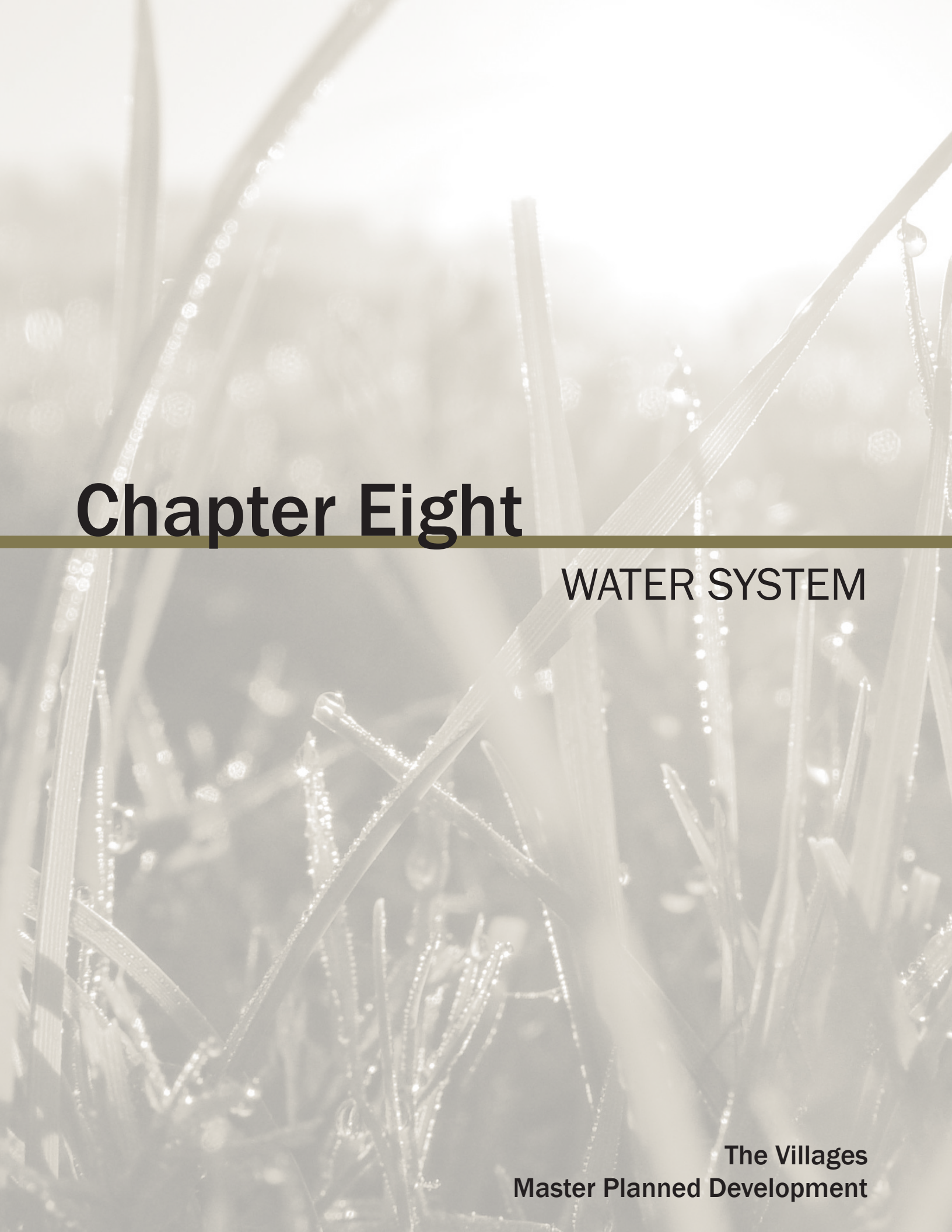


Chapter Eight

WATER SYSTEM

The Villages
Master Planned Development

8

CHAPTER

OVERVIEW

The Master Developer controls property with the rights to approximately 1,080,310 gallons of water per Day. This is determined through the "Three Party Agreement" dated August 8, 2003, wherein the property was allocated 4,400 ERUs through payment of the Tacoma System Development Charge, and 297 ERUs from the City's Spring Source (formerly Plum Creek and BDA). An ERU is defined in the "Three Party Agreement" as equal to 230 gallons. The total amount of water available can serve up to 6,000 ERUs assuming water use at 180 gallons per Day per ERU. Since water use can vary significantly depending on the land use, water conservation features, building size and site plan; projected water use per ERU will be determined at the preliminary plat, binding site plan or site plan approval stage and confirmed prior to Occupancy.

PROPOSED WATER SYSTEM

The Villages Main Property is located primarily within the 750 pressure zone. The conceptual water plan maintains consistency with the current Black Diamond Water Comprehensive Plan by proposing to serve the site from the city's 850 reservoir, and a new reservoir on Parcel BDA or Parcel F. Water from these two facilities will be delivered to the site using pressure reducing valves to reduce the water to the 750 zone. An off-site loop in the Pipeline road alignment, and upgrades to the main in the Auburn-Black Diamond Road are also proposed. Phase I development within The Villages main property will be served by upgrading the existing main in Auburn-Black Diamond Road, and will not require the off-site loop until fire flow is required. On-site water mains would be located within roads wherever possible. Since the entire site will not be built out prior to occupancy of one or more of the first phases, a storage reservoir may be used on an interim basis. Approximate facility locations are shown on the attached figures. Fire flow needs will be evaluated and improvements to provide adequate fire flow will be provided as necessary. The proposed water system is shown on Figure 8-1.

Parcel B is proposed to be served via a loop from the Lawson North Triangle property. The main would run south in the spine road from the north boundary of Parcel B to the south and then east to connect to the City main in SR 169. This loop is conceptually shown on the 2000 Comprehensive Water System Plan as Improvement 'G', and on the draft Comprehensive Water System Plan as Improvement '3', but has not yet been constructed.

Alternate means of achieving water service may be authorized through an engineering permit.

CHAPTER 8

VILLAGES WATER CONSERVATION PLAN

The Villages MPD has been proposed with an emphasis on reducing the overall impact of the development on the environment. Water conservation is a critical element of the comprehensive environmental plan for the MPD. The proposed Water Conservation Plan for The Villages is to require that indoor appliances and plumbing fixtures meet the EPA WaterSense specifications in effect at the time of building permit application. Specifications equivalent to the EPA WaterSense specifications may be used with the concurrence of the City and Master Developer.

The current EPA WaterSense specifications are summarized below:

A. Toilets

Single Flush Toilets - The effective flush volume shall not exceed 1.28 gallons (4.8 liters).
Dual Flush Toilets - The effective flush volume shall not exceed 1.28 gallons (4.8 liters). The effective flush volume is defined as the composite, average flush volume of two reduced flushes and one full flush.

B. Lavatory Faucets

The maximum flow rate shall not exceed 1.5 gallons per minute (gpm) at a pressure of 60 pounds per square inch (psi) at the inlet, when water is flowing; and
The minimum flow rate shall not be less than 0.8 gpm (3.0 L/min) at a pressure of 20 psi at the inlet, when water is flowing. A lavatory faucet is also considered to meet this flow rate requirement if equipped with a lavatory faucet accessory that meets this requirement.

C. Kitchen Faucet

Maximum flow rate of 2.2 gpm at 60 psi

D. Showerheads

Maximum flow rate of 2.5 gpm @ 80 psi

E. Appliances

Dishwashers must be ENERGY STAR qualified or equivalent.

Clothes washers must be ENERGY STAR qualified with a water factor of less than or equal to 6.0 gallons of water per cycle per cubic foot of capacity.

In order to reduce the overall consumption of water below the threshold of 230 gallons per day per equivalent residential unit (as per BDMC 18.98.190) both indoor and outdoor water uses were evaluated. According to the American Water Works Association (AWWA) Research Foundation study of Residential End Uses of Water the mean per capita indoor

daily water use was 69.3 gallons. Multiply this by the 2.63 person per household ratio provided in the Black Diamond Comprehensive Plan and the result is 182.23 gallons per day of indoor water use per residential household. By utilizing water efficient plumbing fixtures, indoor water use can be significantly reduced. According to the US EPA, utilizing fixtures that meet the WaterSense specifications, a potential water savings of 20% can be achieved as compared to conventional fixtures. A table comparing conventional fixtures to newer water efficient fixtures is provided below.

Fixture /End Use	Conventional Fixture Water Use	Water Efficient Fixture Water Use
Toilet	1.6 gallons per flush	1.3 gallons per flush
Clothes washer	40-50 gal. per load	20-25 gal. per load
Shower	2.5 gallons per min.	2.0 gallons per min.
Lavatory Faucet	2.5 gallons per min.	1.8 gallons per min.
Kitchen Faucet	2.5 gallons per min.	1.8 gallons per min.
Dishwasher	8-12 gal. per load	6-8 gal. per load

OPTIONAL WATER CONSUMPTION REDUCTION MEASURES

Exterior water use conservation generally focuses on landscape design techniques, the use of efficient irrigation products, and water reuse. The AWWA study shows that exterior water use can be as much as 58% of the overall water use annually per household. Placing specific parameters on the landscape design utilized within the Villages MPD is an effective tool in reducing exterior water use. These parameters include techniques such as; restricting lawn to no more than 40% of the overall landscaped area, requiring drought tolerant plant material, the use of compost rich soil mixes, and placing a layer of mulch in planting areas. Efficient irrigation design and scheduling is another proven exterior water saving technique. The use of weather based control systems, drip irrigation products, and water budget requirements are all effective means of achieving water savings in the landscape. Water reuse techniques can also greatly reduce the overall potable water use for irrigation. By encouraging the installation of rain barrels and other water re-use techniques for residents; significant savings in irrigation are possible.

In addition to implementing EPA WaterSense specifications throughout the Villages, the following is a description of additional water conservation measures that may be implemented on the site at the discretion of the Applicant/Master Developer:

WATER CONSERVATION TECHNIQUES

EXTERIOR WATER USE

Irrigation / Landscape

Drought tolerant landscaping (xeriscape)
Highly efficient irrigation products (drip, ET based controls, rain sensors)
Reduce or restrict the use of lawn

Compost amended soil
Mulch layer
Rain barrels for individual homes

INDOOR WATER USE – FIXTURE RESTRICTIONS

Toilets

Low Flow Toilets – flow rate less than 1.3 gallons per flush
Toilets to meet US E.P.A Water Sense specification
Public use toilets must be dual flush and meet requirements of ASME A112.19.14 or meet the same flow requirements of residential toilets

Faucets

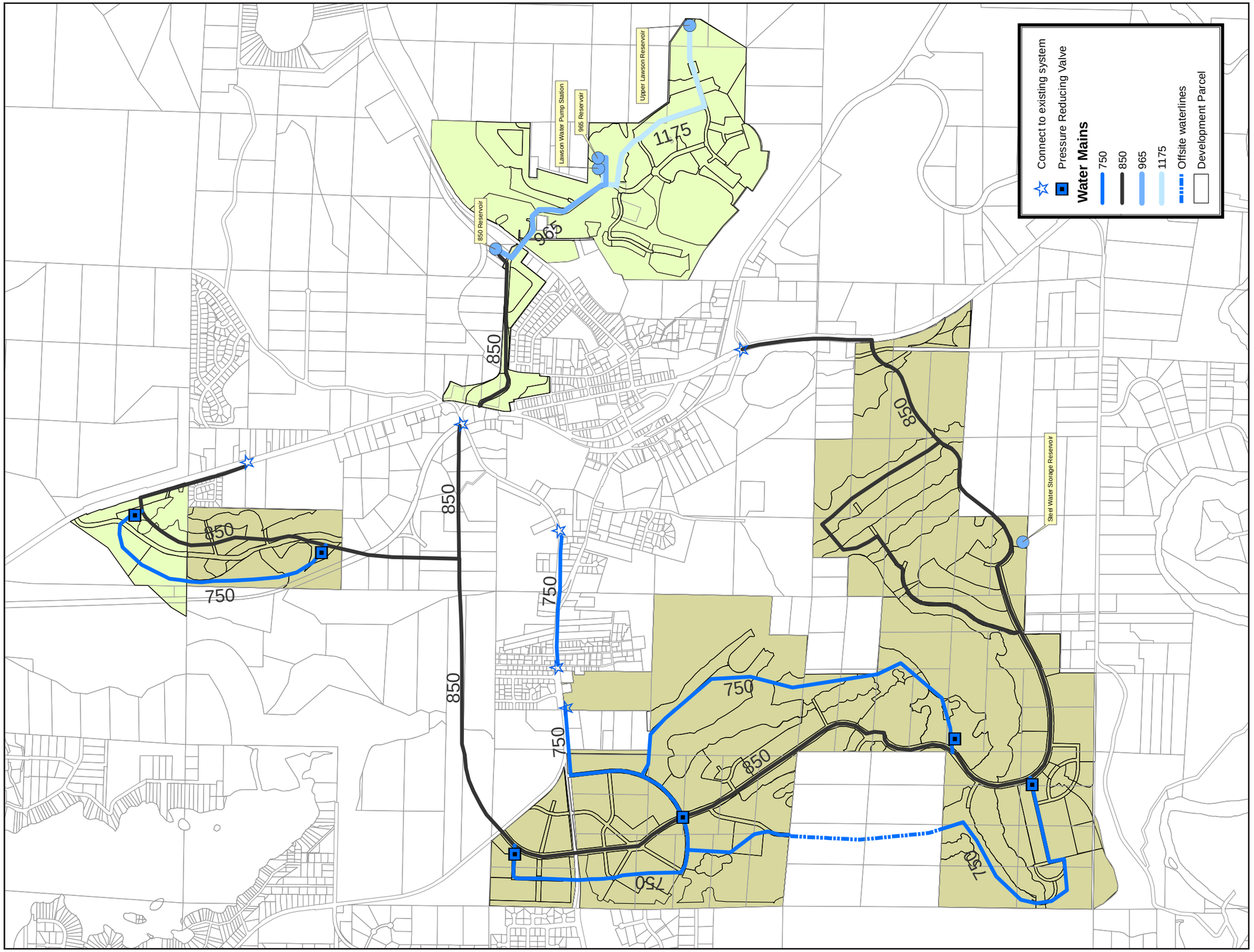
Flow rates for lavatory and kitchen faucets must be less than or equal to 2 gallons per minute

Showers

Flow rates for shower fixtures must be less than or equal to 2 gallons per minute

Efficient Hot Water Distribution System

Design and install efficient hot water distribution system. Including limiting the length of hot water branch lines, consider central manifold distribution systems, structured plumbing systems, and compact design for conventional hot water systems.


Connect to existing system
Pressure Reducing Valve
Water Mains
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850
965
1175
Offsite waterlines
Development Parcel
Upper Lawson Reservoir
Lawson Water Pump Station
965 Reservoir
850 Reservoir
Steel Water Storage Reservoir
1175
965
850
850
750
850
750
850
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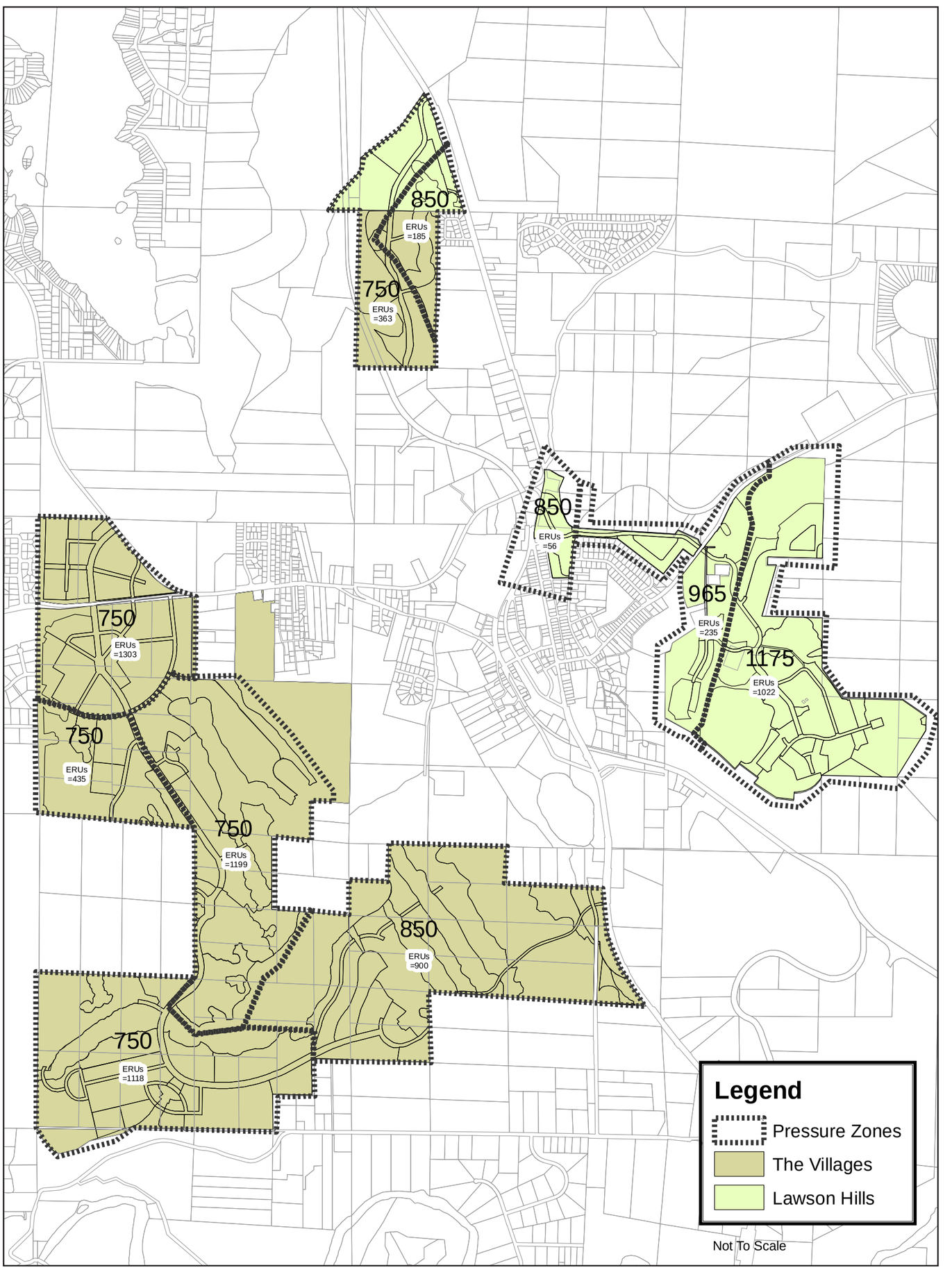
750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ERUs
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750
ERUs
=363
850
ERUs
=56
965
ERUs
=235
1175
ERUs
=1022
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Legend
Pressure Zones
The Villages
Lawson Hills
Not To Scale