

4.4 WATER USE EFFICIENCY PROGRAM

The City of Vancouver is committed to ensuring Vancouver's water resources are used efficiently to protect and preserve the community's high quality of life for current residents and generations to come. In keeping with this commitment, the City employs a comprehensive approach to water use efficiency that combines water system design, engineering, and operations with community education and outreach. The City's Water Use Efficiency (WUE) Program activities affect thousands of its water utility customers annually. The program engages incentives that encourage wise water use and utilizes technologies and processes associated with City activities to improve water savings.

This section presents the City's Water Use Efficiency (WUE) Program for the next six years.

4.4.1 WUE Program Background

In 2003, the Washington State Legislature passed the Engrossed Second Substitute House Bill 1338, known as the Municipal Water Law or the Water Use Efficiency (WUE) rule, to address the increasing demand on Washington's water resources. This law established that all municipal water suppliers (MWS) must use water more efficiently in exchange for water right certainty and flexibility to help them meet future demand.

The WUE rule, which became effective on January 22, 2007, emphasizes the importance of measuring water use and evaluating the effectiveness of the water supplier's WUE program. The intent is to minimize water withdrawals and water use by implementing water saving activities and adopting policies, resolutions, ordinances, or bylaws. This chapter follows the guidelines set forth in the Water Use Efficiency Guide Book, Third Edition, (January 2011) as well as the Water System Planning Handbook (April 1997). The WUE Guide replaces the Conservation Planning Requirements, March 1994.

As part of a WUE Program, municipal water purveyors must establish supply-side and demand-side water use efficiency goals, approved by the elected governing board or the governing body of the utility (WAC 246-290-830(1)).

The City has an ongoing, successful WUE Program (previously called the Conservation Program). Prior to this report, the City updated its water conservation goals in 2009 to meet the DOH requirements. The following goals were adopted by the Mayor and City Council in 2009:

- **Supply-Side Goal:** Reduce annual water loss from the water distribution system to six (6) percent or less within six years.

- **Demand-Side Goal:** Reduce the average equivalent residential unit annual water consumption by one (1) percent within six years.
- The following sections describe the current program and its effectiveness.

4.4.2 Water Supply Characteristics

As summarized in Chapter 1 and Section 4.4.1 above, the City obtains its drinking water from 40 active wells at 10 water stations that produce, treat, store, and pump water into the distribution system. These wells draw from the Orchards, Troutdale, and Sand & Gravel regional aquifers below the City that also serve neighboring communities in Clark and Multnomah Counties. Proper management of these aquifers is imperative to ensuring adequate water supply to sustain the local population and supporting environment, now and in the future.

The supply analysis above shows that the City has secured adequate water rights for the 20-year planning horizon to meet both average and maximum day demands. However, some of the City's water system facilities are limited in capacity and require improvement to meet higher water demands from new customers, especially peak season demands. Implementing a WUE Program will help to delay these capital projects and defer construction costs, as described below. By improving water use efficiency, the City's water system will be able to serve more customers without acquiring new water supply sources.

4.4.3 Current WUE Program

The City's current WUE Program includes multiple measures to encourage efficient water use for supply and demand. The following summarizes the current program.

4.4.3.1 Supply-Side Measures

The City implements the following supply-side measures to meet its supply-side goal:

1. Record and monitor supply source production.
2. Test and re-calibrate supply well metering.
3. Record and monitor customer demands through customer water meters.
4. Replace water meters exceeding two million gallons of use.
5. Record end-line flushing and main or service line leaks.
6. Work with the Vancouver Fire Department and Fire District 5 to measure water used in training exercises, hydrant testing, and firefighting.
7. Record backwash water discharged from water treatment facilities.
8. Replace deteriorating water mains.
9. Pursue cases of water theft without appropriate meter and connection, using newly adopted penalties.

10. Reclaimed Water: the City implemented a reclaimed water system at its Westside and Marine Park Water Reclamation Facilities. Reclaimed water is used for irrigation during the summer, seal water for pumps, sprays for surface control of floating foam and solids, and washing and cleaning of basins. At the Westside Water Reclamation Facility, reused water is also used for the air pollution equipment. The Ellsworth Water Treatment Plant recycles backwash water by settling out solids and pumping the remaining water into treatment filters.
11. Perform regular leak studies of the distribution system piping and repair leaks.

4.4.3.2 Demand-Side Measures

The following measures are implemented by the City to meet its demand-side goal:

1. Promote efficient water use by including a volumetric charge in its water rates.
 2. Include comparisons of current and past water consumption on customer's utility bills.
 3. Promote water use efficiency through billing inserts.
 4. Alert customers who show a significant water increase to the potential of leaks at their service.
 5. Assist customers in identifying the location of water leaks beyond the water meter.
 6. Promote WUE and provide tips on the City website.
 7. Establish efficient water use through City standards for landscaping (VMC 7592 20.925.100).
- 8-16. Public Education Measures (see below).

4.4.3.3 Public Education – Water Resources Education Center

Public education has long been a vital component of the City's ongoing conservation program. At the heart of the City's program is the Water Resources Education Center, funded and operated directly by the City of Vancouver. Opened in 1996, the Water Resources Education Center was established to help ensure a safe and healthy water supply for current and future generations of people, plants, and animals. The 16,000-square-foot Center, overlooking the Columbia River near Marine Park in Vancouver, provides continuous environmental education through programs, exhibits, events, and volunteer opportunities for the community and thousands of school children each year. Water Center staff members are also responsible for stewardship of the city's adjacent 50 acres of wetlands that serve as a natural outdoor laboratory for students of all ages.

The Center, a division of the City's Public Works Department, receives ongoing funding primarily through Vancouver's water, sewer and storm water utility revenues, with supplemental support from grants, private donations and community room rental income.

The City seeks to inform the local and regional community about upcoming events at the Center through, quarterly and annual reports, flyers, websites, YouTube videos, and limited advertising in select publications. The following demand-side measures in public education are achieved through the Center:

8. Present on water issues to neighborhood associations and other interested groups.
9. Maintain WUE exhibits at the Center. The Center had a total of 5,240 walk-in visitors in 2014. An additional 9,624 visitors attended events booked in the Bruce E. Hagensen Community Room.
10. Maintain a demonstration garden promoting native and low-water use plants.
11. Host school group visits at the center. During 2014, the Center hosted 41 classroom visits serving a total of 1,772 students plus their teachers and chaperones.
12. Promote WUE at school science fairs and local festivals.
13. Lead the Student Watershed Monitoring Network. This water quality monitoring program served 2,626 students from 21 schools and was supported by 53 teachers during the 2014/2015 school year.
14. Hold Special Events: Sturgeon Festival, Science in the Park (weekly during summer), Second Saturday activities, St. Paddy's Day Event, The Home and Garden Idea Fair, The Street Team Earth Day Event, the Heritage Farm Springs Event, World Water Day, Columbia River Watershed Festival, and the Old Apple Tree Festival.
15. Coordinate regular teacher workshops and multi-day camps for K-12 teachers to provide curricula and activities focused on water.
16. Partnerships & Joint Activities:
 - a. EPA Water Sense.
 - b. "Food and Film Series" (Vancouver Watersheds Alliance (VWA)).
 - c. Columbia Springs Environmental Education and Outreach Program.
 - d. Xeriscaping Workshops for Landscape Professionals (Clark County Department of Environmental Services and Washington State University Clark County Extension).

4.4.4 Effectiveness of Current WUE Program

The City's current WUE Program comprises measures for which quantifying improved water use efficiency is difficult to estimate. The program relies heavily on public education through the Water Center, and very little on rebates or give-aways of low-water use devices and appliances, which are easier to track in terms of numbers and measurable water reduction. Published water savings as a result of WUE public education programs is limited, and is highly variable for each water agency.

The effectiveness of the City's current WUE Program can be evaluated by reviewing historical trends in water use developed in Chapter 2. The water use parameters of interest for assessing demand-side WUE efforts include the average water use per ERU, and the MDD to ADD

peaking factors. Figure 4.4 presents the water use per single-family residential customer. As seen in the figure, water use has declined from over 252 gpd/ERU to 207 gpd/ERU from 2003 to 2012. This represents an 18 percent decrease in water use over this ten-year period. In 2009, when the City's goals were last established, the water use per ERU was 230 gpd.

Compared to the average in 2012 (207 gpd/ERU), the City's water use is decreasing by approximately 3 percent per year. Thus, the City is already exceeding its 2009 demand-side WUE goal. It is important to note that decreasing water use trends may also be influenced by weather, economics, new development with higher-efficiency requirements, and the natural turnover rate of low-efficiency appliances and fixtures.

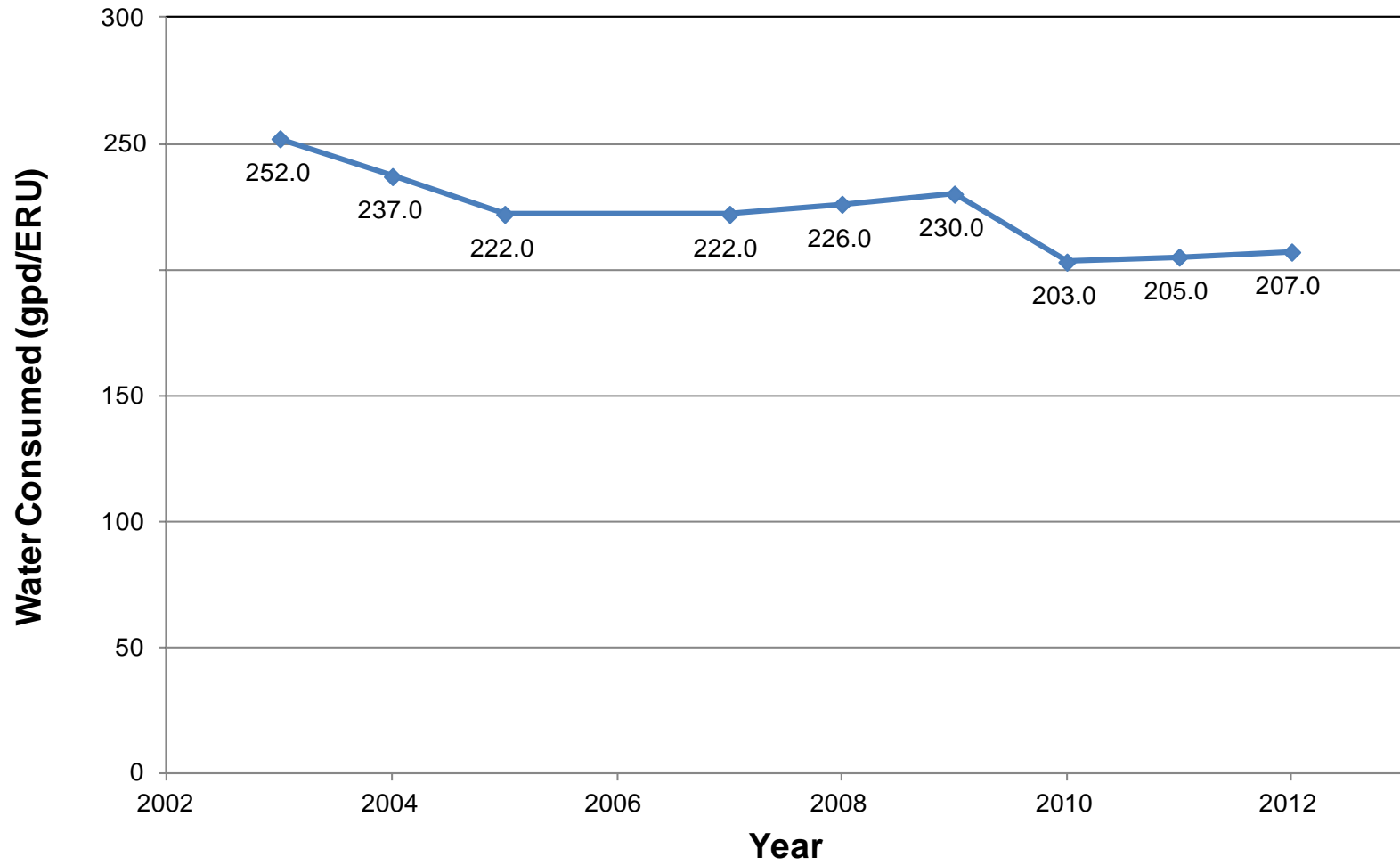
Figure 4.5 presents the MDD to ADD peaking factor from 2003 to 2012. The peaking factor varies from 1.93 to 2.14, and does not appear to be decreasing over this time period. This may indicate that WUE efforts do not target outdoor water use as effectively as indoor water use. However, the peaking factor trend is also very dependent on temperature, humidity, and rainfall for a given year and short-term extreme events during the dry season.

4.4.4.1 Distribution System Leakage

The water use parameter of interest for assessing supply-side WUE effectiveness is distribution system leakage (DSL) as discussed in Section 2.3.4. The estimate of DSL is largely dependent on accurate meter readings for both supply sources and customer meters, and accounting of non-revenue water use such as fire hydrant flushing, street cleaning, and water used for construction. Table 2.6 and Figure 4.6 present the historic trend in DSL from 2003 to 2012. As seen in the table, DSL varies from 3.3 to 8.1 percent of total production, and has not exceeded 10 percent (the maximum value recommended by DOH) during this time period. Overall, DSL does not appear to be decreasing with time. It is likely that the variability year to year of DSL reflects changes in accounting for non-revenue water and possibly errors in recorded meter data. A comparison of DSL to the City's goals is discussed below.

In an effort to reduce DSL, the City contracted with a leak detection company in 2013 to locate leaks in the City's water distribution network. Leak detection was performed on all of the City's non-ductile iron pipe in the water system that was not planned for replacement, (total of 182 miles). In total, 125 leaks were detected amounting to approximately 459 gpm, the majority of which were on hydrants and water mains. The City anticipates providing similar leak detection services in the future and may expand the service to include all mains in the distribution system.

The City is implementing changes to its existing Hansen and SCADA systems that will provide additional data that can assist in prioritizing projects that improve the integrity of the distribution system. The Hansen system improvements are planned for incorporation into the City's asset management program.

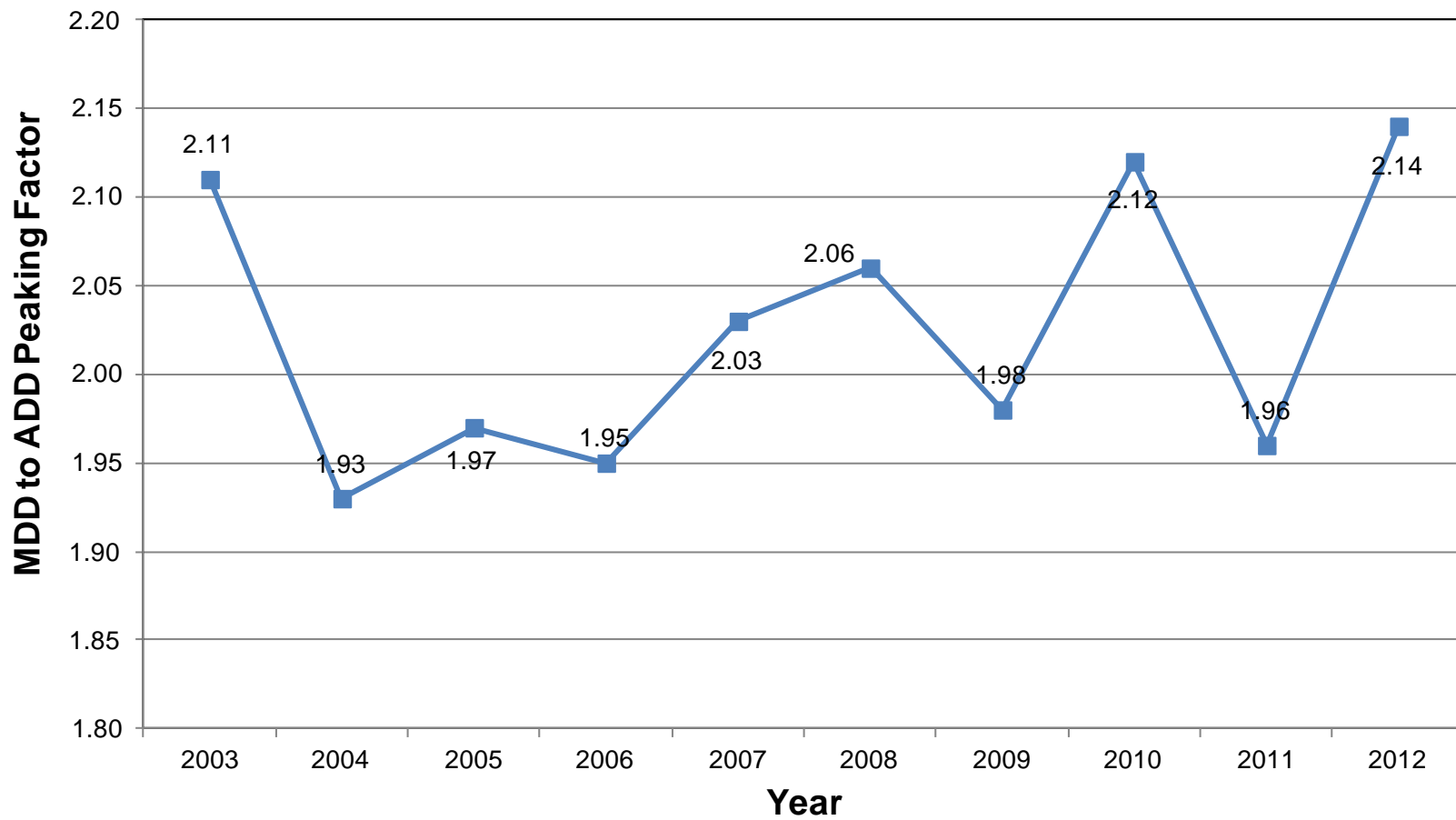


**ANNUAL WATER
CONSUMPTION: SINGLE FAMILY
RESIDENCES**

FIGURE 4.4

CITY OF VANCOUVER
COMPREHENSIVE WATER SYSTEM PLAN

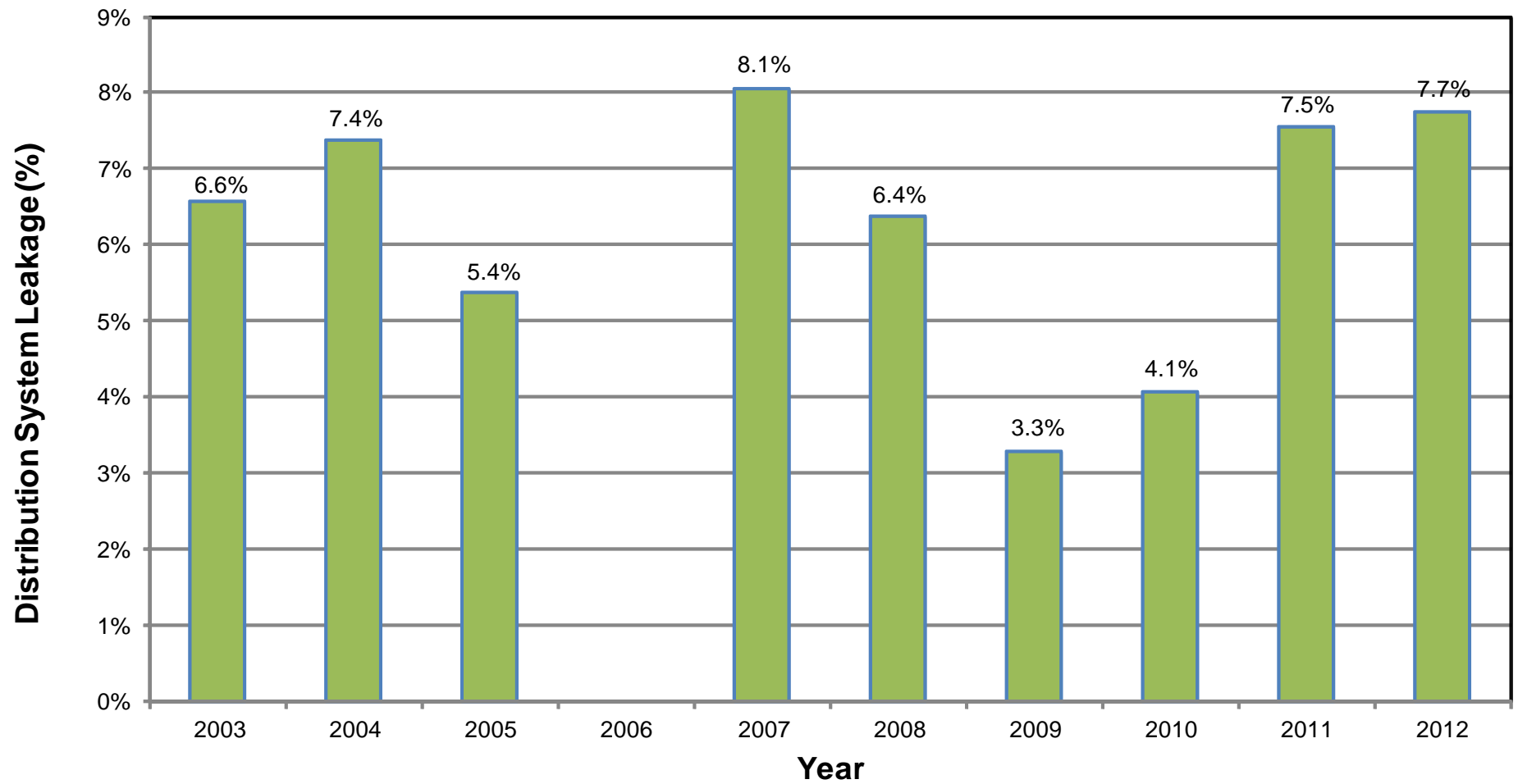




**ANNUAL MDD TO ADD
PEAKING FACTOR**
FIGURE 4.5

CITY OF VANCOUVER
COMPREHENSIVE WATER SYSTEM PLAN





**DISTRIBUTION SYSTEM
LEAKAGE**
FIGURE 4.6

CITY OF VANCOUVER
COMPREHENSIVE WATER SYSTEM PLAN



4.4.5 Future WUE Program

The City plans to continue its efforts in encouraging efficient water use and protecting water as a valuable resource. With ongoing investments in the Water Resources Education Center, its metering program, leak detection program, and others, the City is saving money by deferring capital investments and ensuring sufficient water for current and future customers. The following sections outline the City's WUE goals, measures to meet the goals, and anticipated program effectiveness. This program was reviewed and adopted by the City Council through a formal public process as part of adopting this Comprehensive Water System Plan as described in Chapter 10.

4.4.5.1 WUE Goals

The following goals will continue to assist the City in targeting its WUE measures to promote water use efficiency both in its internal operations and for water customers:

- **Supply-Side Goal:** Maintain annual distribution system leakage (DSL) to six (6) percent or less.
- **Demand-Side Goal:** Reduce the average equivalent residential unit annual water consumption by one (1) percent per six years, to achieve 200 gpd/ERU.

These WUE goals were presented to City Council in a public workshop on August 10, 2015. A public meeting was held following this workshop in order to allow the public to comment on the goals. This public meeting was advertised on both the DOH website and in Vancouver's local newspaper, The Columbian. Vancouver City Council approved the goals on September 14, 2015. Appendix 10D includes the meeting notifications and results.

4.4.5.2 Future WUE Measures

To meet the established goals, the City intends to continue its current 11 supply-side and 16 demand-side WUE measures, as listed in Section 4.4.3. No additional demand-side measures are proposed at this time as the current level of effort for the program is already exceeding the City's established demand-side goal. The 2009 goal was to reduce water use per ERU by one percent over six years. Through the established WUE measures, the City has achieved an average reduction of 1.8 percent per year (compared to 2003), as noted in Section 4.4.4. The City will continue to track production, customer billing, and unmetered water use such as hydrant flushing, construction watering, etc., in order to decrease estimated DSL to meet its supply-side goal.

4.4.5.3 Projected Demands with WUE Goals

Projected demands considering the City's future WUE goals were developed to estimate the water savings as a result of the WUE Program. Chapter 2, Section 2.5.1 presents the projected water demands, including a low, medium, and high projection. The demand projection with WUE goals was compared to the medium demand projection provided in Chapter 2. The medium

demand projection assumes a 2014 demand of 223 gpd/ERU, an average peaking factor of 2.10, and an initial DSL value of 6.3 percent. For the WUE projections, this demand was reduced at a rate of one percent over six years, with a minimum average demand of 200 gpd/ERU over the duration of the planning period (2014-2034). At this rate of reduction, the ERU water use reduces to 215.2 gpd/ERU by the year 2034, thus the minimum is not reached. DSL was maintained at 6.0 percent rather than 6.3 percent.

Table 4.8 presents the comparison of WUE demands to the medium demand projections for the year 2034. With improvements in WUE, the medium ADD was reduced by 1.34 mgd, or 3.8 percent, by 2034. MDD was calculated by multiplying ADD (excluding 3.80 mgd of industrial reserve demands) by a peaking factor of 2.10, corresponding to the medium demand scenario in Chapter 2. The 2034 MDD was estimated to be reduced by 2.83 mgd, or 4.0 percent. Figure 4.7 shows projected demands with and without WUE goals included.

Table 4.8 WUE Demand Projections				
Demand Scenario	2034 Medium Projection (mgd)	2034 WUE Projection⁽¹⁾ (mgd)	Water Savings (mgd)	Percent Savings
ADD ⁽²⁾	35.46	34.12	1.34	3.8%
MDD ⁽³⁾	70.31	67.48	2.83	4.0%

Notes:
(1) Based on water use per ERU reduction of 1% per six years and a DSL value of 6%.
(2) Includes a 2034 industrial reserve of 3.80 mgd.
(3) No peaking factor was applied for the industrial reserve.

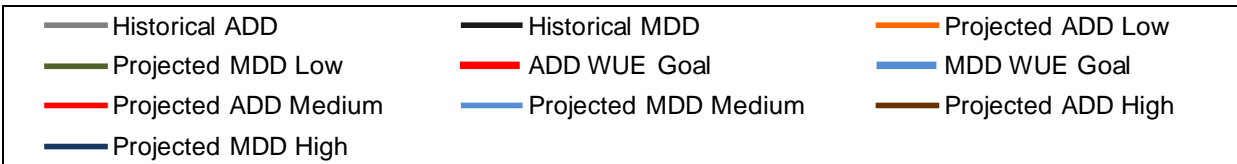
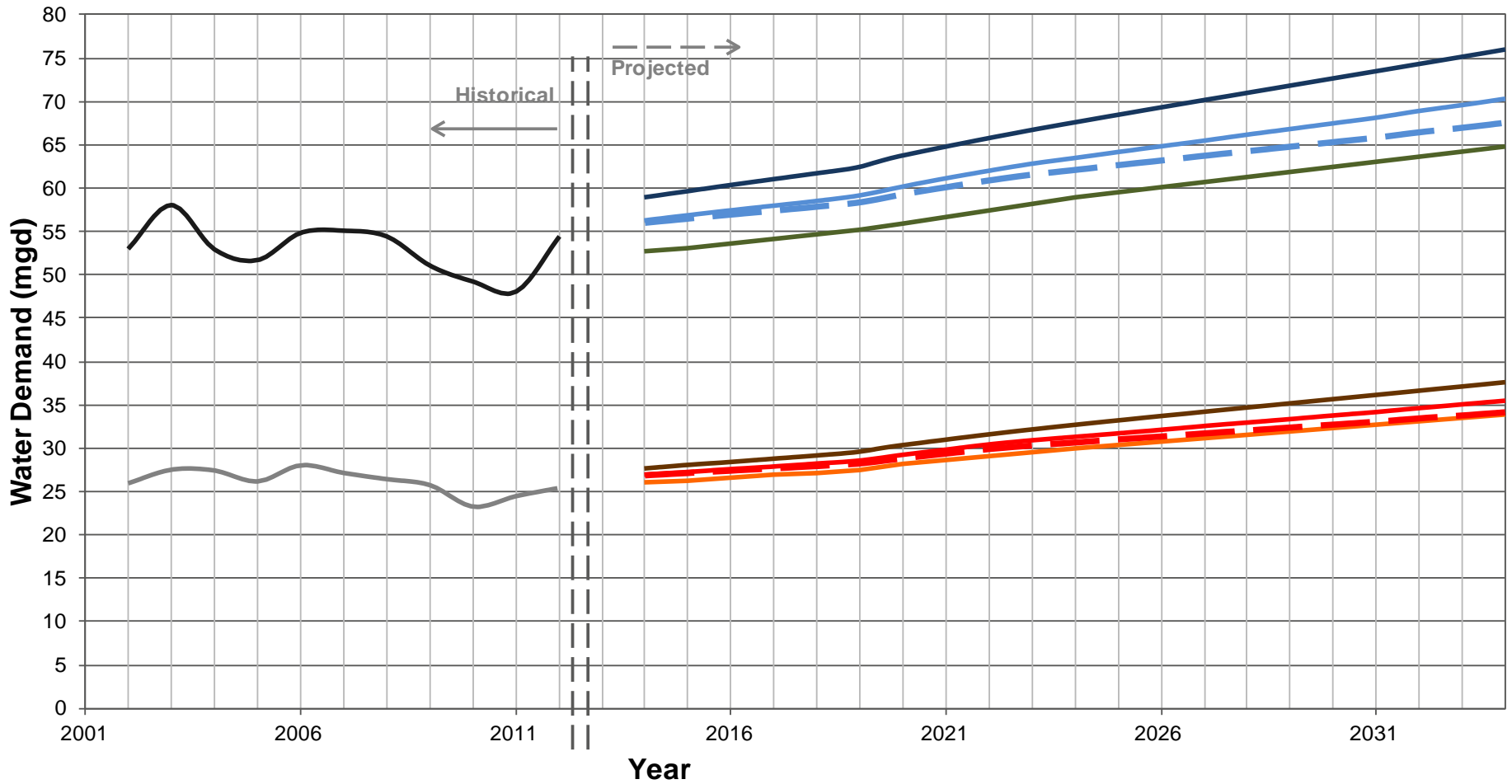
4.4.5.4 Future WUE Program Effectiveness

As noted above, estimating the actual water savings directly resulting from the City’s WUE Program is difficult because the measures are not directly quantifiable. Measures such as rebates for low-efficient washing machines, toilets, showerheads, etc. have correlating water savings for each rebate provided to a customer. The impacts on customer water use as a result of public education, which is the main focus of the City’s WUE Program, is challenging to measure, as the response of each participant varies greatly.

One method to measure the effectiveness of the City’s WUE program, is to target its public education programs to customers in a particular area. This area could be limited to a particular pressure zone, group of neighborhoods, etc., but should be an area for which the City can track water use before and after participation in WUE activities or events. The first step is to establish a baseline water use, such as average monthly water use per household for one year. Winter months would provide an estimate on indoor water use, since outdoor water use, such as irrigation, are kept to a minimum during the winter. Summer months could provide an estimate on total indoor and outdoor water use. The second step is to evaluate the resulting water use after promoting WUE through targeted activities and events to customers in the defined area. It is

recommended that water use be tracked monthly for an additional year to identify seasonal trends. Some consideration would need to be given to variations in weather and economic conditions.

Another method would be to perform the same before/after water use analysis for WUE Program participants who volunteer and provide their address. Both suggested methods of evaluating the City's WUE Program may require the involvement of several City staff. The resulting information would be valuable for the City to correlate its WUE Program efforts with direct water savings for its customers.



PROJECTED DEMANDS WITH WATER USE EFFICIENCY
 FIGURE 4.7

CITY OF VANCOUVER
 COMPREHENSIVE WATER SYSTEM PLAN

