



CITY OF TUMWATER

WELLHEAD PROTECTION PLAN

DOH Water System ID 89700



Cover photo: Palermo Wellfield Aeration Facilities

Submitted To: City of Tumwater
Water Resources Program
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ACRONYMS AND ABBREVIATIONS

amsl	Above Mean Sea Level
AQP	Aquifer Protection Overlay
ASOC	Administrative Settlement and Order Consent
ATG	automated tank gauging
bgs	below ground surface
BMP	Best Management Practices
BTEX	ethylbenzene and xylene
CEC	contaminants of emerging concern
CEMP	Comprehensive Emergency Management Plan
cfs	cubic feet per second
City	The City of Tumwater
COO-ERP	City of Olympia June 2009 Emergency Response Plan
CSCS	Confirmed and Suspected Contaminated Sites
CSI	Contaminant Source Inventory
DNR	Department of Natural Resources
DOH	State of Washington Department of Health
EDR	Environmental Data Resources, Inc.
EIM	Environmental Information Management
EOC	Emergency Operations Center
ERP	Emergency Response Plan
ESF	Emergency Support Function
FS	Feasibility Study
GIS	Geographic Information Systems
GUI	graphical user interface
ICS	Incident Command System
LUST	List and Leaking Underground Storage Tank
mgd	million gallons per day
NAVD	North American Vertical Datum
NFA	No Further Remedial Action
PCE	tetrachloroethene
PFC	perfluorinated chemical
Qal	Surficial alluvial sediments
Qga	advance outwash
Qgo	Recessional outwash
Qgt	Vashon Till
Qpg	older glacial sequence
RI	Remedial Investigation
RMLP	Resource Management Plan & Logistics Plan
SCA	Sanitary Control Area
SDWA	Safe Drinking Water Act
TCC	Thurston County Code
TC-CEMP	Thurston County Comprehensive Emergency Management Plan
TCE	trichloroethene
TMC	Tumwater Municipal Code
TQu	Older undifferentiated sediments
UIC	underground injection control



USGS	US Geological Survey
UST	underground storage tank
VCP	Voluntary Clean-Up Program
VOC	volatile organic compounds
VOC	volatile organic compounds
WAC	Washington Administrative Code
WHPA	wellhead protection area
WHPP	Wellhead Protection Plan
WRIA	Ecology Water Resources Inventory Area
WRM	Washington Risk Matrix
WS-CEMP	Washington State Comprehensive Emergency Management Plan
WSDOT	Washington State Department of Transportation
WSP	water system plan
WSRP	Water Shortage Response Plan



1.0 INTRODUCTION

The City of Tumwater (City) currently appropriates groundwater from 14 supply wells located within three wellfields (Palermo, Port, and Bush Middle School Wellfields), including two isolated sources, to meet current water demand (Figure 1-1, Table 1-1). The City has plans to expand their source water capacity by developing additional sources in the Southwest Wellfield area, for which a water right application is pending. The Brewery Wellfield is currently used as an emergency source, and plans are under development with regional partners (i.e., the Cities of Lacey and Olympia) to fully maximize this source in future years. The partners will consider wellhead protection requirements as the process continues through source development and approval. A water right application is also pending for the Northeast Wellfield (Figure 1-1). The Northeast and Brewery Wellfields may be incorporated into a future Wellhead Protection Plan (WHPP) update.

The City is committed to protecting its groundwater sources through an engaged WHPP to help prevent groundwater contamination and maintain a safe and reliable community water supply. The City was among the first municipalities in Washington State to adopt a WHPP in 1997. The WHPP was last informally updated as part of the City's 2010 Water System Plan Update (HDR 2011).

1.1 Regulatory Background and Purpose

The 1986 amendments to the Safe Drinking Water Act (SDWA 1986) authorized the Wellhead Protection Program to protect and prevent potential contamination of public groundwater drinking water supplies. The SDWA allows each state to design its own Wellhead Protection Program in order to maximize effectiveness at the local level. The State of Washington Department of Health (DOH) requires Group A water systems to develop a WHPP; Washington Administrative Code (WAC 246-290). DOH has established requirements, guidelines, and materials to assist water systems in developing WHPPs. For a groundwater-supplied system, the following elements are required:

- Discussion of the hydrogeologic characteristics of the area
- Delineation of the wellhead protection areas (WHPAs)
- Susceptibility assessment of the source supplies
- Contaminant source inventory within the defined WHPAs
- Contingency plan for interruption of water supply
- Notification to owners/operators of potential contamination sources
- Notification to regulatory agencies and local governments of WHPA boundaries and contaminant source inventory findings
- Notification to local emergency responders of WHPA boundaries, results of the susceptibility assessment and contaminant source inventory, and contingency plan



New sources require a wellhead protection area delineation and initial contaminant inventory. The contaminant source inventory should be updated every two years. Although the water system plan is reviewed every six years, the WHPP does not have to be updated, unless substantive new information warrants doing so (e.g., new sources come on line, or significant changes in the understanding of the hydrogeology).

Table 1-1: City of Tumwater Groundwater Supply Well Summary

Tumwater Production Well No.	DOH Source # (well or wellfield)	Ecology Well ID	PLS Location (TRS)	Year Installed	Current Operational Production Rate (gpm)	Depth (feet)	Screened Geologic Unit
WELLS FOR WHICH WHPAs ARE DELINEATED IN THIS PLAN							
Palermo Wellfield (DOH Source #S02)							
3	S17	AAA-953	18N/02W-35	1944	0	96	Qal
4	S18	AAA-951		1949	187	90	
6	S20	AAA-954		1967	248	120	
8	S08	AAA-955		1982	166	67	
16 ¹	S16	APP-311		2013	400	97	
17 ¹	S17	APP-314		2014	350	93	
Port Wellfield (DOH Source #S09)							
9	S21	AAA-960	17N/02W-10	1972	321	99	Qga
10	S22	AAA-959		1965	442	109	
11	S15	ABA-869	17N/02W-03	1993	357	115	
15	S23	AAA-958	17N/02W-10	1991	508	145	
Bush Wellfield (DOH Source #S14)							
12	S12	ABF-588	17N/02W-10	1994	578	118	Qga
14	S13	ABE-826	17N/02W-11	1994	1,916	118	
Southwest Wellfield (future source, in development)							
TW-04-01 ¹	—	AGH-990	17N/02W-16	2004	2,226	158	Qga
Individual Wells							
Lathrop	WA DOH ID # 07344X	AHF-062	17N/02W-21	1981	340 ¹	175	Qga
Lakeland Manor	WA DOH ID # 450874	AAF-152	17N/02W-06	1965	100 ¹	95	

**Table 1-1: City of Tumwater Groundwater Supply Well Summary (continued)**

WELLS FOR WHICH WHPAs MAY BE INTEGRATED INTO THIS PLAN IN THE FUTURE							
Brewery Wellfield (emergency source)							
24 (S26)	S26	AAB-517	18N/02W-35	1970	500	103	DVA(c)
Northeast Wellfield (possible future source)							
TW-00-01 ²	'—'	AFT 308	18N/02W-25	2000	2,000 ³	340	DVA(c)

¹ Production rate reported is well capacity as listed in WA Department of Health database (SENTRY Database), Ownership of this well has been transferred to the property owner and the City intends to construct a nearby production well.

² Not yet in production

³ Production rate is the applied for instantaneous rate

'—'Source number not yet assigned

1.2 Past WHPP Work

The City of Tumwater was among the first in Washington State to develop a WHPP. The plan was issued in 1997 (EES and others 1997). At that time, the City operated the Palermo Wellfield (wells 2-6 and 8), Port Wells (Wells 7, 9-11 and 15), Bush Middle School Wells (12 and 14) and the Trails End Well (Well 20), Table 1-1 and Figure 1-1. Since that time, the Trails End Well was decommissioned because of poor production and sanding, and Well 7 was decommissioned due to poor water quality and to make way for a new fire station.

Capture zones in the first WHPP used 1992 production rates plus a 5% increase to approximate capture zones. Delineation of the capture zones used a computer groundwater flow model using analytical methods (QuickFlow). Manual adjustments were made to the orientation of the simulated capture zones to better match observed groundwater flow directions, and the zones were rotated 10% clockwise and counter-clockwise to create a safety buffer zone.

The WHPP was updated in the 2010 Water System Plan (HDR 2011). The 2010 WHPP used the 1997 WHPAs, and delineated capture zones for the following additional future sources to the drinking water system:

- Brewery Wells 9, 27, 39
- The Northeast Wellfield
- The Southwest Wellfield

These additional WHPAs were delineated using spreadsheet analytical methods. WHPAs were developed for two additional small sources – the Lathrop and Lakeland Wells – using the calculated fixed radius method.



1.3 Scope and Authorization

The City contracted Golder Associates Inc. to update the WHPP as follows:

- Develop a groundwater flow model to simulate capture zones for the Palermo, Port, Bush and Southwest Wellfields.
- Review Source Susceptibility Assessments and conduct a Contaminant Source Inventory.
- Review the existing public outreach, coordination with other agencies, and consideration of groundwater nitrate concentrations associated with land use.
- Provide recommendations for a groundwater monitoring program.
- Evaluate contingency planning for discontinued use of a wellfield.
- Review WHPP-related ordinances.
- Assess the programmatic capacity of the City to implement the WHPP.

1.4 Plan Overview

This WHPP update includes the following elements:

- Section 2.0 Physical Setting and Hydrogeology: Presents the current understanding and characterization of hydrogeology in the Tumwater area.
- Section 3.0 Wellhead Capture Zone Delineations: Identifies the six-month and one-, five-, and ten-year WHPAs for City's existing sources (Palermo, Port, and Bush Middle School Wellfields, and the Lathrop and Lakeland Manor Wells) and a planned future wellfield (Southwest). The Northeast and Brewery Wellfields may be incorporated into a future WHPP update.
- Section 4.0 Contaminant Source Inventory: Presents an inventory of known and potential contaminant sources, identifies and discusses land use activities in the Tumwater area and within the WHPAs, and assesses the potential risk these land use activities and associated contaminants may have to the supply sources.
- Section 5.0 Groundwater Management Strategies: Presents an overview of the City's management of groundwater protection and coordination of activities among state agencies, local governments, emergency responders, and owner/operators of potential contaminant sources, and others. This section also provides general considerations for new monitoring wells and required City resources to implement and manage the WHPP.
- Section 6.0 Water Supply Contingency Plans: Contingency plans for back-up sources and discussion of related plans (such as the water system plan [WSP] contingency plans). This section references the WSP and provides information related to wellhead protection for the planned future sources.
- Section 7.0 Spill and Incident Response Plan: Response to spills and incidents that affect drinking water sources is outlined and coordinated with Tumwater's Emergency Management Team.
- Section 8.0 Summary of Key Findings and Recommendations: Presents an overview of the wellhead protection areas and the City's groundwater management strategies. Recommended changes to the wellhead protection program and associated cost estimates are provided.