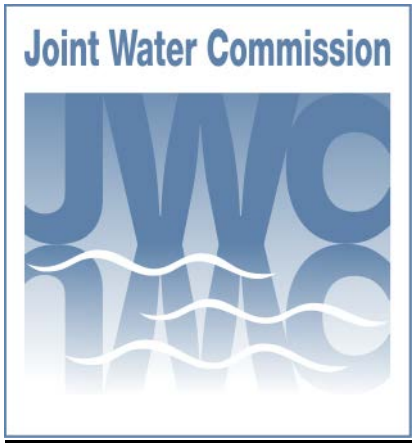
SOURCE WATER PROTECTION PLAN

FOR THE JOINT WATER COMMISSION

JULY 25, 2014



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ACRONYMS

BLM	US Bureau of Land Management
BOR	US Bureau of Reclamation
BRJOC	Barney Reservoir Joint Ownership Commission
CAFO	Concentrated Animal Feeding Operation
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CWA	Clean Water Act
CWS	Clean Water Services
DEQ	Oregon Department of Environmental Quality
DHS	Oregon Department of Human Services (currently known as OHA)
DWSA	Drinking Water Source Area
EPA	US Environmental Protection Agency
ESA	Endangered Species Act
FIFRA	Federal Insecticide, Fungicide, and Rodenticide Act
GIS	Geographic Information System
JWC	Joint Water Commission
MOU	Memorandum of Understanding
NPDES	National Pollution Discharge Elimination System
NRCS	US Natural Resource Conservation Service
ODA	Oregon Department of Agriculture
ODF	Oregon Department of Forestry
ODOT	Oregon Department of Transportation
OERS	Oregon Emergency Response System
OHA	Oregon Health Authority (formally known as DHS)
PPCP	Pesticides and Personal Care Products
RCRA	Resource Conservation and Recovery Act
SDWA	Safe Drinking Water Act
SWA	Source Water Assessment
SWCD	Soil and Water Conservation District
SWP	Source Water Protection
TAC	Technical Advisory Committee
TMDL	Total Maximum Daily Load
TPL	Trust for Public Lands
TVID	Tualatin Valley Irrigation District
TVWD	Tualatin Valley Water District
UIC	Underground Injection Control
USFS	US Forest Service
USFW	US Fish and Wildlife Service
USGS	United States Geological Survey
UST	Underground Storage Tank

INTRODUCTION

The Joint Water Commission (JWC) is a collective water supply agency formed as an ORS 190 intergovernmental entity consisting of the Cities of Hillsboro, Forest Grove, Beaverton and the Tualatin Valley Water District. The JWC is one of the primary drinking water suppliers in Washington County, Oregon and is responsible for treating, transmitting and storing potable water for approximately 400,000 customers. The City of North Plains and Westside Lutheran are wholesale customers of the JWC. The Cities of Cornelius, Gaston and the LA Water Co-Op are wholesale customers of the City of Hillsboro and receive a portion of their water supply from the JWC as shown on Figure 1.

Two additional drinking water systems are located within the JWC's drinking water source area (DWSA). In addition to receiving water from the JWC, the City of Hillsboro also operates a water treatment plant (WTP) serving about 2,000 people in unincorporated communities including Cherry Grove and Dilley. The City of Forest Grove also operates a WTP serving 21,000 people in Forest Grove. Even though the land area of interest to the JWC's source water protection plan will overlap with the watersheds of these WTPs, the planning efforts will focus on the JWC's goals and objectives.

In order to continue to provide high quality drinking water, the JWC has begun developing a source water protection program. A technical advisory committee (TAC) was formed, with participation from each partner agency and Clean Water Services, to provide guidance over an update of the Source Water Assessment (SWA) and assist in the development of a Source Water Protection (SWP) Plan. The SWA update was initiated to gather the most current information on potential risks to the JWC source water by reviewing historical information, developing a spatial analysis tool, and assessing the overall susceptibility of the watershed to potential impacts. The results of the risk assessment investigation were then used to provide recommendations for program prioritizations and guide the development of the SWP Plan.

GOALS AND OBJECTIVES

The goal of a source water protection (SWP) Plan is to maintain and safeguard the quality of the water, either from a stream or from an aquifer, which serves as a drinking water source[1] by assessing the potential contamination risks in the source water area and identifying programs to minimize the impacts from potential chemical or biological contamination. Source water protection plans and programs are unique to each water system. The final products and outcomes are highly dependent on the size and type of watershed or recharge area, area land uses, potential contaminant sources, and the water provider's goals. This Source Water

[1]Sham, C.H., et. al., Source Water Protection: Operational Guide to AWWA Standard G300, Denver, CO, 2010.

Protection Plan is intended to guide the implementation of future programs and prioritization of available funding.

Although completion of source water protection plans is voluntary, the development of a SWP Plan can generate additional financial, public education, and water quality benefits. Protecting JWC's source water quality by implementing a SWP Plan and programs may help avoid treatment costs, aid in protecting public health, improve aesthetic water quality characteristics, e.g., taste and odor problems, create opportunities to leverage funds from multiple sources, and provide additional messaging to communicate with the public.

VISION AND MISSION

The Source Water Protection TAC developed the following vision and mission statements for this program.

VISION

Utilize proactive watershed protection programs to maintain safe and sustainable drinking water supplies to be provided by the Joint Water Commission in the future.

MISSION

Develop and implement watershed protection programs to identify, prevent, minimize, and mitigate activities that have the potential to impact the level of treatment required to provide excellent quality drinking water. Promote stakeholder partnerships and public awareness to balance the need for the protection of public health, impacts to the local economy, and minimization of treatment costs.

CHARACTERIZATION OF THE DRINKING WATER SOURCE AREA

The drinking water source area (DWSA) for the JWC is comprised of two surface water systems as shown on Figure 2. The first surface water system is a 220 sq. mi. portion of the Tualatin River basin that drains to the Springhill Pump Plant at river mile 56. This area which encompasses 30% of the entire Tualatin River watershed, includes the Upper Tualatin-Scoggins Creek and Gales Creek sub-basins, and has 448 stream miles. Major Tualatin River basin tributaries within the DWSA include Carpenter, Dilley, Scoggins, Roaring, Lee, Sunday, Wapato and Ayers Creeks. The second surface water system is the 8.2 sq. mi. watershed of Barney Reservoir in the Upper Trask River basin that encompasses 19 stream miles. Water released from Barney Reservoir is diverted to the upper reaches of the Tualatin River at river mile 78.

The western section of the JWC's DWSA is in the Coast Range Mountains with steep terrain and forested land in timber production. The eastern section is dominated by flatter terrain and agriculture activities. The areas closest to the Springhill Pump Plant include residential land uses and major transportation corridors (highways and railroads). The DWSA is almost entirely in Washington County, with small areas in Yamhill County.

Common water quality constituents of concern for surface water sources include sediment, microbial pathogens, nutrients, hazardous chemicals and pesticides. In general, the upper, forested portion of the DWSA has better water quality than the lower portion. The Tualatin River in the lower valley section has lower dissolved oxygen levels and higher temperature, turbidity, nutrient and bacteria levels[2]. Elevated nitrate and ammonium levels impair water quality in the Upper Tualatin-Scoggins sub-basin, specifically Scoggins and Gales Creeks[3]. Other major concerns in the Gales Creek sub-basin include bacteria, temperature, dissolved oxygen and pH.

REGULATORY AUTHORITY AND PARTNER ORGANIZATIONS

Regulatory authorities that serve to protect and preserve general water quality are held by several agencies at all jurisdictional levels: federal, state, and local. The JWC has essentially no regulatory authority over the activities that occur in the Tualatin River basin above the drinking water intake. Therefore, the JWC must rely on existing rules and regulations administered by multiple organizations.

Since the JWC may have an interest in maintaining and improving the quality of the source water beyond the scope outlined in current laws and regulations, this section describes the regulatory framework that intersects with water quality to leverage projects that could meet regulatory goals and the JWC's interest in source water quality. The agencies whose regulatory or environmental regulations have primary and secondary effects on water quality in the JWC's DWSA are presented below.

FEDERAL

Environmental Protection Agency: The EPA has a wide range of responsibilities under its broad mission to protect human health and the environment including leading efforts on water quality, solid and hazardous waste disposal, and cleanup of contaminated sites. Essentially, the

[2]Tualatin River Watershed Council, *Gales Creek Watershed Assessment Project*, 1998.
[3]Tualatin River Watershed Council, *Upper Tualatin Watershed Analysis Summary*, 2000.

only environmental activities in which the EPA does not have authority over include the Endangered Species Act and nuclear energy.

- The Safe Drinking Water Act (SDWA) authorizes the EPA to set national health-based standards for drinking water and regulates the quality of delivered drinking water. In Oregon, the SDWA is administered by the EPA with primacy[4] held by the Oregon Health Authority (OHA). Generally, the SDWA does not provide a mechanism to protect, monitor, or restore the source waters of the drinking water providers to meet the Act's requirements. The one exception is that the SDWA regulates underground injections by preventing injection wells from contaminating underground sources of drinking water. Authority for protecting surface waters upstream of the intake is found primarily in the Clean Water Act.

- EPA administers major portions of the Clean Water Act regulating pollution discharges to waterways. Water quality is regulated through multiple programs including, designation of waterways as water quality limited, establishing Total Maximum Daily Loads (TMDL), and issuing National Pollutant Discharge Elimination System (NPDES) permits. EPA shares authority for in-water construction work with the US Army Corps of Engineers. When source waters for drinking water meet Clean Water Act water quality standards, then standard treatment technology should be sufficient to produce safe drinking water. The Oregon Dept. of Environmental Quality (DEQ) is the local primacy agency for these programs.

- The Resource Conservation and Recovery Act (RCRA) regulates the use and disposal of solid and hazardous wastes. Its "cradle to grave" program requires intensive tracking of the creation, transport, storage and disposal of hazardous wastes. This applies to a wide variety of facilities including landfills, incinerators, industrials users, and drinking water treatment facilities. RCRA also regulates the permitting and operation of underground storage tanks. The DEQ is the local primacy agency for these programs.

- The Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) requires reporting of actual and threatened releases of hazardous chemicals and regulates the cleanup of 'Superfund' sites. The DEQ is the local primacy agency for these programs.

- The Fertilizer, Insecticide, Fungicide, and Rodenticide Act (FIFRA) outlines the appropriate sale, labeling, and use of these chemicals. Under this Act, the EPA determines which chemicals are available for sale and sets consequences for inappropriate use. The Oregon Dept. of Agriculture is the primacy agency for administering this rule.

- The Toxic Substances Control Act (TSCA) regulates the production, importation, use, and disposal of industrial chemicals (excluding pesticides). It focuses on chemical

[4] Primacy means that the federal agency has given authority to implement the law to a state agency. The federal agency retains the final control of the regulation.

manufacturing and importing, but not the by-products of manufacturing such chemicals. This law restricted the use of PCBs, CFCs, hexavalent chromium, and others. The Oregon Dept. of Environmental Quality is the primacy agency for administering this rule.

US Fish and Wildlife Service: The mission of the US Fish and Wildlife Service (USFWS) is divided between land management and regulation of wildlife protection. USFWS creates and maintains wildlife refuges and carries out the mission of the Endangered Species Act for terrestrial and fresh water species. Recently the USFWS established the Wapato Lake National Wildlife Refuge near Gaston, OR and is in the process of determining the future management scenarios for the site.

National Marine Fisheries Service: The mission of the National Marine Fisheries Service (NMFS) is to steward and manage marine species and their habitats under the authority of the Marine Mammal Protection Act and the Endangered Species. In the Pacific Northwest, NMFS manages threatened and endangered salmon species and ensures compliance with fisheries regulations.

Bureau of Land Management: The Bureau of Land Management (BLM) manages all federal land not classified as National Parks or National Forest. Under the Federal Land Management and Policy Act there are hundreds of land use regulations. In the JWC's DWSA, the BLM is a significant land owner with a primary focus on forestry activity. The City of Hillsboro established a memorandum of understanding (MOU) with the BLM providing for cooperative implementation of programs and management of land to maintain or improve the water quality of Barney Reservoir and the upper Tualatin River.

Natural Resources Conservation Service: The mission of the Natural Resources Conservation Service (NRCS) is to improve, protect, and conserve natural resources on private lands through partnerships. It focuses on providing technical assistance to farmers, especially in the form of best management practices for fertilizer and pesticide use and land management options. Oftentimes, this assistance includes a secondary goal to improve water quality. It operates under the authority of the Soil and Water Resources Conservation Act and Farm Security and Rural Investment Act.

Bureau of Reclamation: Working in the 17 western states, the Bureau of Reclamation (BOR) develops water storage and delivery facilities to meet irrigation demands. The BOR owns over 600 dams that supply water to irrigate 10 million acres of farmland and 58 of those dams produce hydro-electric power. Locally, the BOR owns Scoggins Dam, the Springhill Pumping Plant and ancillary facilities. The JWC leases space within the Springhill pump plant to convey water from the Tualatin River to the water treatment plant. BOR's local assets are managed by the Tualatin Valley Irrigation District.

STATE

Oregon Health Authority: Formally known as the Dept. of Human Services (DHS), the Oregon Health Authority (OHA) has primacy over the federal Safe Drinking Water Act, maintaining regulatory control over drinking water treatment and distribution. This does not include regulating activities affecting the drinking water source. OHA provides public notice and guidance to public drinking water systems for toxic algal blooms. In coordination with DEQ (below), OHA administers a grant for source water protection activities.

Oregon Department of Environmental Quality (DEQ): The DEQ has primacy for several federal regulations including the Clean Water Act, RCRA, and CERCLA. DEQ's main activities in relation to drinking water include the permitting of pollution discharge permits for private and public parties (with the exception of most agricultural discharges), development and implementation of TMDLs for beneficial uses, non-point source program, and developing and enforcing water quality standards, and oversight of cleanup actions.

Oregon Department of Forestry (ODF): ODF, a significant land owner in the basin, operates three main programs authorized under the Oregon Forest Practices Act. The first is to manage ODF land for timber production. The second is to regulate and permit private timber operations in the state. Both these tasks include approval of harvesting plans directly affecting water ways, setting of timber retention areas around water ways, and approving road building and maintenance. The third is to perform habitat restoration work.

Oregon Department of Agriculture (ODA): Since ODA has primacy of FIFRA it manages pesticide use, including issuing permits for individual and commercial applicators and monitoring pesticide use across the state. Under the authority of Senate Bill 1010, it requires water quality agriculture management plans for basins with developed TMDLs. ODA manages discharges by most agricultural operations including concentrated animal feeding operations (CAFOs) (DEQ manages discharges from other uses).

Oregon Department of Geology and Mineral Industries: DOGAMI has oversight of and permits mining operations, including surface, aggregate, and chemical process mining. In addition to DEQ, DOGAMI administers two water quality permits at mine sites: the water pollution control facilities (WPCF) and national pollutant discharge elimination system (NPDES) permits.

Oregon Department of Land Conservation and Development: DLCD is the primary land use planning and regulatory agency. It provides a method for coordinated land use development, coordination between local governments, provides protection for lands in agriculture and forestry production. DLCD's strategic goals center on integrated, coordinated land use, transportation planning, encouraging economic development while conserving farm, forest, and riparian lands by guiding development to less sensitive areas.

Oregon Office of Emergency Management: OEM operates the Oregon Emergency Response System (OERS). OERS purpose is to coordinate and manage state resources in response to natural and technological emergencies involving multi-jurisdictional cooperation. It is an all-hazards system that responds to a variety of emergencies including floods, wildfire and earthquakes. The OERS notifications and response efforts relating to water quality are in coordination with OHA and DEQ.

LOCAL

The agencies described below may impact water quality through owning, managing, regulating, or conducting activities on, properties within the drinking water source area.

Metro: As a regional government, Metro's primary responsibility is land use planning in the Portland metropolitan area through urban growth boundary management, setting the boundaries of a 20-year supply of developable land. Metro also provides transportation planning, waste disposal and recycling management, and preservation and restoration of natural areas. Metro coordinates extensively with Counties and Cities on these efforts. Metro executes the vision of the DLCD for the Portland metropolitan region.

Washington County: Oregon's Land Conservation and Development Act requires counties and cities to perform land use planning, and to implement and administer those plans, with oversight provided by Metro. Implementation is mainly accomplished through zoning regulations that outline the types of activities allowed on a parcel of land. Counties are also involved in economic development, building regulation and permitting, permitting septic systems, and maintenance of roads and parks. The Washington County Parks department manages the recreation facilities surrounding Scoggins Dam/Hagg Lake.

Cities: Like counties, cities are also required under Oregon's Land Conservation and Development Act to develop and implement comprehensive land use plans. These regulations have the potential to impact drinking water quality by outlining the potential contaminant sources allowed on the landscape. Cities are often the holders of NPDES and MS4 permits to allow for discharges of point sources and stormwater, which are issued by DEQ. The Cities of Hillsboro and Forest Grove each manage a water treatment plant within the JWC's drinking water source area with independent source water protection programs.

Clean Water Services: As the wastewater agency in the Tualatin River basin, CWS operates four wastewater treatment facilities. Even though none of those facilities are upstream of the Springhill Pump Plant, its operations may have an impact on source water quality. CWS holds a

watershed NPDES permit which requires temperature abatement activities that are met by releases from stored water and by substantial tree planting in the watershed. Also, in tandem with cities, CWS is a major stormwater authority that reviews and permits urban non-point source discharges.

Tualatin Valley Irrigation District: TVID locally operates the Bureau of Reclamation's Scoggins Dam, two pump stations and 120 miles of distribution pipeline to deliver irrigation water to its members. Scoggins Dam was developed to store water to meet several needs: irrigation use, municipal and industrial use, pollution abatement, flood control, and recreation. TVID manages water levels and releases in Hagg Lake to meet these needs.

Barney Reservoir Joint Ownership Commission: The BRJOC is an ORS 190 intergovernmental entity consisting of the Cities of Hillsboro, Forest Grove, Beaverton, the Tualatin Valley Water District and Clean Water Services for the purpose of providing water reservoir storage management and operation. The BRJOC facilities include the Eldon S. Mills Dam and a pipeline diverting water to the Tualatin River. The water stored in Barney Reservoir is used to fulfill the need for municipal and industrial water use and for pollution abatement.

Tualatin Soil and Water Conservation District: Soil and water conservation districts (SWCDs) are established under state law and in Oregon one exists for each county. Even though they do not possess regulatory authority, they accomplish their mission of watershed enhancement through cooperatively providing technical assistance and education to land owners. They work closely with multiple agencies, especially the Natural Resource Conservation Service (NRCS).

Tualatin River Basin Watershed Council: The Council is a watershed stewardship organization working to restore watershed health, function and public use through the cooperation of 20 basin stakeholders. The Council leads stream restoration projects that connect volunteers and land owners to the watershed. Watershed Councils throughout the state are supported by the Oregon Water Enhancement Board and the Network of Oregon Watershed Councils.

Tualatin Riverkeepers: The Tualatin Riverkeepers are a nonprofit environmental advocacy group promoting efforts that support high water quality, restored rivers and streams, public access to waterways, and watershed education.

Oregon State University Extension: Faculty in the Extension programs focus research efforts and education on issues relevant to local areas and people. In addition, they provide resources for local people to develop and implement projects. Their focus areas include the environment and sustainability, trees and woodlands, and small farms.

This wide variety of regulatory programs, regulatory agencies, community organizations, and land management organizations provide many potential partnerships and opportunities since

many common paths are crossed. While regulations may not specifically focus on protecting or preserving water quality for drinking water purposes, many ancillary benefits are gained from the current regulatory structure.

SOURCE WATER ASSESSMENT

The potential for contamination of a drinking water source is dependent on three things: a facility or land use releasing a contaminant into the environment, the location of the release, and the hydrologic and/or soil characteristics allowing transport of the contaminant to the drinking water intake. Identifying and evaluating each of these factors is an important part of source water protection planning. In 2003, the first Source Water Assessment (SWA) was performed for the JWC's watershed by DEQ and OHA. JWC completed an update of the SWA in 2013. The results of each SWA are summarized below.

SOURCE WATER ASSESSMENT: 2003

In 2003, a source water assessment of JWC's DWSA was completed by a cooperative effort between Oregon DEQ, DHS (now OHA) and the JWC[5]. The assessment delineated the source area supplying the JWC, identified areas sensitive to contamination, and inventoried potential contamination sources. Each component is briefly summarized below and a more detailed summary is provided in the JWC's Source Water Protection Framework[6].

POTENTIAL CONTAMINANT RISKS

The assessment identified 306 potential contamination sources, 200 of which were classified as high risk and located in sensitive areas. Each of the 306 potential contaminant sources was given a risk rating based on the type of contaminant that could potentially be released in a worst case scenario situation (i.e. more hazardous substances in higher quantities receive a higher risk rating). The inventory classified 25 potential contaminants sources as low risk, 72 as moderate risk, and 209 as high risk.

The potential contaminant sources were also broadly categorized by land use: Residential and Municipal; Commercial and Industrial; Forestry and Agriculture; and Miscellaneous Land Uses. Within each of these broad categories, 73 more specific land use categories were identified.

The inventory of potential contaminant sources needed updating since major land use changes have occurred. Also, more investigation and analysis were needed to specify the activities associated with each potential contaminant source because such a large number were

[5]Oregon Department of Environmental Quality and Oregon Department of Human Services. *Source Water Assessment Report: The Joint Water Commission and Hillsboro-Cherry Grove, OR*. August 19, 2003.
[6] Joint Water Commission. *Source Water Protection: Framework*. January 2012.

categorized as high risk. For example, no information was gathered on the crop grown, acres the crop covered, or pesticides applied.

LOCATION

To more fully understand the risks to source water quality, the locations of potential contaminant sources are needed. The latitude/longitude coordinates for all 306 potential contaminant sources were gathered in the 2003 SWA, but the acreage of land uses (i.e. timber harvests, urban lands or agricultural fields) was not included. Also, no proximity analysis was performed to identify if potential sources should be given a higher risk rating because they are located close together. Since the JWC's DWSA is so large, the 2003 SWA recommended a higher risk designation for sources within an 8 hour travel time to the Springhill Pump Plant because there is little time to become aware of, and mitigate for, contamination events. In 2003 it was estimated that the travel time from the confluence of Scoggins Creek and the Tualatin River to the Springhill Pumping plant was 8 hours.

HYDROLOGIC AND SOIL CHARACTERISTICS

In addition to activities occurring on the landscape and their location, the third component of characterizing potential contamination risks is an analysis of the hydrologic and soil characteristics of the DWSA to determine the likelihood and condition of a released contaminant being present in the source water. The 2003 SWA began this work by defining "sensitive areas" as areas within 1,000 ft of a perennial water way, areas with high soil erosion potential, areas with high permeability soils, or soils with high runoff potential. That definition classified a large percentage of the DWSA as a sensitive area which, as a result, did not provide sufficient detail to prioritize areas and focus Source Water Protection activities. The 2003 SWA recommended the JWC also investigate areas of transient snow zones (higher than 1,500 ft in the Coast Range), high rainfall areas, and high risk landslide areas for inclusion in the definition of sensitive areas.

2003 SOURCE WATER ASSESSMENT RESULTS

The 2003 SWA's three-part analysis of potential contaminant sources, their location, and the hydrology and soil characteristics of the drinking water source area (DWSA) found that 200 of the 306 potential contamination sources were classified as high risk and located in a sensitive area. State agencies recommended that prior to moving forward with protection strategies, the assessment information be updated and enhanced using local knowledge of the water system and community.

SOURCE WATER ASSESSMENT: 2013

The 2003 Source Water Assessment (SWA) provided good information for the purposes of that initial assessment, but lacked sufficient detail and up-to-date information to fully inform a current Source Water Protection Plan and to develop specific programs resulting in actionable items. Thus, an update of the 2003 SWA began to better characterize and understand the potential contaminant risks and sensitive areas of the drinking water source area. The goal was to determine the overall susceptibility of the source water to potential risks or impacts. To meet this objective, data created by other organizations was identified, gathered and analyzed. The data was used to create a GIS tool including the development of spatial techniques for assessing risks to water quality. Contamination risks and watershed sensitivities were combined in the GIS tool to guide the SWP TAC in determining the highest priorities for the program to address as described in more detail below. Additionally, a water quality database was developed that enables viewing water quality monitoring sites and data on maps.

The increased availability of spatial information and power of GIS capabilities have greatly improved the ability to perform SWAs. The JWC utilized these advancements in several ways. First, the JWC obtained several spatial datasets created by other organizations on permitted discharges, forestry activities, and satellite data on crop types. The JWC researched information on agricultural and forestry chemical usage and applied that information directly to the spatial datasets. Second, the JWC utilized several spatial analysis techniques. Analyses identified similar potential contaminant sources in close proximity to each other and within the 8-hour time of travel to the Spring Hill Pump Plant. GIS analysis also allowed inference of potential contamination sources when the direct data wasn't available (especially for septic tanks and agricultural chemical use).

Like the approach used in the 2003 SWA, the 2013 SWA quantified the risk associated with various potential contamination sources and identified sensitive lands within the drinking water source area. Unlike the 2003 SWA, the 2013 SWA summarized activities by number of acres since more detailed information on crop types and forestry activities was available and included. In addition to identifying sensitive lands, these lands were ranked high, medium and low categories, similar to the risks. This was achieved by researching literature and using best professional judgment. The SWP TAC guided and reviewed the risk and sensitivity rankings. Once risk and sensitivity were quantified, they were combined using geospatial analysis techniques to quantify susceptibility of the drinking water source area to contamination.

A summary of the various potential contamination risks, land sensitivity, and the resulting susceptibility are presented in the following subsection. A full description of all the data sources and methodologies can be found in Technical Memorandum 1[7]. Analysis of the information and

[7] GSI Water Solutions, Inc. *Technical Memorandum 1: Source Water Assessment Geodatabase Development and Explanation of Geospatial analysis Methodology and Results.* October, 17, 2013.

development of new geographic data layers and maps unique to the JWC led to the prioritization of program funds and refinement of the program's targeted goals. This completed GIS database and analysis framework will easily incorporate updated information to adjust for future risks and JWC priorities. The 2013 SWA produced a robust and flexible source water assessment tool.

POTENTIAL CONTAMINATION RISKS

The contaminant risk analysis incorporated GIS data for the following categories.

- Agricultural Chemical Applications
- Forestry Chemical Applications
- Permitted and Unpermitted Point Sources
- Septic Tanks
- Urban Development
- Transportation Networks (public roads and railroads)

Each category was analyzed separately by identifying the location of each source and then risk rankings were assigned to differentiate high, medium and low risk sources. The contaminant risks were then weighted by type of risk and combined to represent the distribution of the overall potential contamination risk. A detailed description of the data sources, spatial analysis and results, and maps are presented in Technical Memorandum 1[8].

After combining all the risk categories, about 5% of the drinking water source area had a relatively high risk ranking. Medium risk activities occur over 12% of the land area and low risk activities occur over 35% of the land area. About 48% of the land area had very low risk.

SENSITIVE AREAS

Sensitive areas are those physical watershed features that may contribute directly to increased risk of water quality degradation (e.g., unstable soils) or are in of themselves sensitive to contamination (e.g., wetlands). The sensitivity analysis incorporated GIS layers associated with a variety of watershed features including

- Flood Zones
- Forestry Activities (i.e. disturbed soils from harvests and road building)
- Surface Water Networks
- Time of Travel for Surface Water
- Unstable and/or Vulnerable Soils
- Wetlands

[8] Ibid.

Each category was analyzed separately and all were combined to represent the overall distribution of sensitive areas. Highly sensitive areas cover only 1% of the drinking water source area. Medium sensitivity was given to 5% of the area, and low sensitivity to 32%. About 62% of the area was defined as very low sensitivity. A detailed description of the data sources, spatial analysis and results, and maps are presented in Technical Memorandum 1[9].

SUSCEPTIBILITY OF DRINKING WATER SOURCE AREA

The overall susceptibility of the watershed to contamination was determined by combining Potential Contamination Risks with the Sensitivity Characteristics of the watershed.

Risk × Sensitivity = Susceptibility

This method was utilized because the same activity that creates a risk of contamination can have a different impact if it occurs within an area with a different sensitivity. Overall results were that 2% of the area that had a relatively high contaminant risk ranking that was located in a highly sensitive area. About 71% of the drinking water source area did not have a risk present in a sensitive area.

These results are difficult to compare to the 2003 SWA due to the different information utilized and the slightly different methodologies. The 2013 SWA results are an improvement because more detailed information is now readily available to the JWC for use in describing general areas of activities, as opposed to the 2003 SWA representing land areas as points. The 2013 SWA susceptibility information will be useful in determining which areas of the DWSA the JWC may choose to target some of the potential source water protection programs.

This type of analysis is very flexible and can be easily tailored to JWC's future needs. The overall results allows for prioritizing program efforts to areas of high risk and sensitivity. Utilizing the developed data for each of the individual Risk and Sensitivity categories allows detailed review for specific questions and land use tracking. The spatial data and analysis will inform future program development and monitoring efforts.

CURRENT AND FUTURE SOURCE WATER PROTECTION PROGRAMS

The next section outlines proposed projects in nine different categories that may be completed in the next 5 years. The categories were developed after reviewing the results from the 2013 Source Water Assessment and after SWP TAC discussions about appropriate first steps for the JWC. The program categories include: Agricultural Runoff, Forestry, Septic Systems, Point

[9] Ibid.

Source Discharges, Nonpoint Sources, Water Quality and Turbidity Projects, Public Outreach, Research and Education, and Monitoring.

Descriptions of each category include both past projects the JWC has performed, on-going activities, and new program tasks that may be recommended for implementation in the next 5 years. JWC staff will utilize this selected list of projects that targets specific potential contamination risks as a guide to develop an annual implementation plan. JWC staff will investigate each project proposal and provide more detail on schedule, specific project scope and tasks, and budget. Each year, the JWC's source water protection TAC will meet to discuss the past year's progress, revisit program prioritizations, and approve the tasks for the next year's proposed program implementation for inclusion in the JWC's budget process. For the Source Water Protection program, the JWC has initially planned to spend approximately $55,000 each year for 10 years. The budget for the first two years was allocated to the 2013 SWA and the development of this Source Water Protection Plan. The timing and estimated costs of program implementation are outlined on Table 1. The following sections describe the elements as recommended by the SWP TAC to consider implementing as part of the SWP Plan's programs.

AGRICULTURAL RUNOFF

Agricultural lands comprise approximately 23% (or about 45,000 acres) of the DWSA. Of the 50 crops identified, the crops covering the most acres between 2009 and 2011 were hay, sod/grass seed, wheat, clover, tree crops (including Christmas trees), and corn. The SWA identified over 100 pesticides that may be used to manage these agricultural lands. The goal of this program is to reduce inputs of chemicals, nutrients, sediment, and micro-organisms either through reduction of their use or prevention of their movement into surface waters.

The JWC has already participated in source water protection efforts related to agricultural runoff, including:

1) Two pesticide collection events. In 2012, the Tualatin Soil and Water Conservation District (SWCD) obtained a 319 grant to hold a pesticide collection event. The JWC was a matching partner along with several other organizations. The event successfully collected 21,136 lbs of pesticides for safe disposal from 33 farmers. A second event held in March 2014 collected 15,822 lbs of waste. The JWC TAC recommended funds be allocated to support this event until the need and/or interest has dissipated.

2) Agricultural Crop Analysis. As part of the 2013 SWA, USDA satellite data was gathered for agricultural crops grown in the drinking water source area. The information provided was summarized and presented in the Source Water Assessment Technical Memorandum 1[10].

The JWC will continue to perform many of the same activities and investigate future project and outreach opportunities. Some agricultural uses, namely for confined animal feedlot operations (CAFOs), require permits. The programs associated with these risks are described under the Point Source Discharges section. The following were recommended by the TAC for continuation or implementation.

1) Continue supporting Pesticide Collection Events as long as stakeholder and landowner interest remains. The total cost of each event is about $30,000 and a variety of watershed stakeholders provide financial and in-kind contributions. JWC's contribution has been $5,000 per event.

2) Bi-annually update the geodatabase with current satellite data from USDA on crop types and summarize the crop type information and associated risk rankings.

3) Support outreach and educational events on best management practices for pesticide and fertilizer applications and preventing soil erosion with partner agencies, especially the Tualatin SWCD.

4) Stay abreast of current agricultural practices including specific pesticides in use, land management practices, and fertilizer application methods. This will be done through conversations with agricultural experts including: individual farmers, OSU Extension office, local agricultural suppliers, and local and state agencies.

Monitoring specifically for agricultural chemicals identified in the 2013 SWA will happen twice a year for two years at critical sites (see Monitoring).

FORESTRY

About half of the DWSA was identified as deciduous, evergreen or mixed forest by USDA in 2011. Of forested land, 31% is managed by Oregon Dept. of Forestry (ODF) and 7% is managed by the Bureau of Land Management (BLM). The remaining 63% is owned either by corporations, individual foresters, or local agencies. The goal of this program is to understand and track forestry activities (harvesting, road building/maintenance, and chemical applications) and to develop partnerships with private foresters.

Tasks already implemented and are on-going by the JWC include communicating with federal and state foresters on harvest impacts to drinking water quality and providing input on forestry regulations. Specific activities already implemented include:

[10] Ibid.

1) Tracking changes in federal, state and private forestry activities and management regulations. Providing comments to lawmakers on regulations when requested.

2) Annually meet with and review Bureau of Land Management and Oregon Department of Forestry annual operations plans for timber harvesting. These reviews included commenting on harvest location, density, and stream buffers, road placement and maintenance, and site management after harvest. The City of Hillsboro has established an MOU with the BLM providing for cooperation on forestry activities.

3) Host informational tours with forest agency staff to visit forestry activity sites and water treatment plants.

4) Monitor for pesticides after federal or state herbicide applications (see Monitoring).

In addition to continuing the above activities, the JWC TAC recommends increasing communications with private foresters. Other activities recommended to improve forestry activity knowledge in the watershed include:

1) Subscribe to ODF's notifications of private forestry activity. Private foresters are required to obtain permits and report their activities to ODF. The JWC can subscribe to be notified when activities are permitted within the drinking water source area. This will allow staff to be more aware of the private foresters active in the DWSA, the general areas of high activities, and activities that occur frequently. It also allows for discussion about highly sensitive areas or activities with the foresters before they occur.

2) One task of the 2013 SWA was to reformat ODF's notifications described above and insert them into GIS tool to allow for mapping and spatial analysis. ODF staff has indicated they are working to make the end product available directly to the public. The first release is anticipated to be in 2014 or 2015. Once that occurs, the JWC may annually obtain that updated information and re-analyze the forestry activities that have occurred in the DWSA.

3) Track harvesting activities via aerial imagery. Another way to understand forestry activities in the drinking water source area on a larger scale is to view satellite and/or aerial imagery for major landscape changes.

4) Increase communications with private industrial foresters (i.e., Weyerhaeuser, Stimson) and contractors often hired to perform forestry work. Investigate forestry organizations (such as Oregon State University Extension and Oregon Forest Resources Institute) for potential programs or educational events that provide outreach to private non-industrial foresters (i.e., small woodland owners). Hold one-on-one communications with larger private industrial harvesters to discuss the potential impacts on water quality. Offer water treatment plant tours to private foresters.

5) As mentioned above, monitoring for pesticides after ODF & BLM pesticide applications will continue. Monitoring after select private owners can be added once more timely notice (see above) is implemented. Monitoring for forestry chemicals identified in the 2013 SWA twice a year for two years at critical sites will also occur (see Monitoring).

SEPTIC SYSTEMS

In the 2013 SWA, a GIS analysis identified 3,362 tax lots (31% of all tax lots) as most likely to have septic tanks in the DWSA. A cluster analysis was performed identifying adjacent tax lots smaller than 2 acres. This analysis was severely limited by the lack of available septic tank information and did not include information on septic system age or proximity to surface waters.

The goal of this program is to maintain an inventory of septic systems, and to encourage their proper placement, maintenance, repair and replacement.

The JWC has not undertaken any previous projects centered on potential impacts from septic systems. In the next 5 years, the JWC anticipates working more closely with Washington County Environmental Health to better identify septic tank locations and to encourage septic tank maintenance. Specific anticipated activities are described below:

1) Septic tanks are permitted and managed through Washington County Environmental Health Program. The JWC will obtain a better understanding of the permitting process and current tracking system. JWC will coordinate with Washington County to determine if old records can be digitized and new records can be efficiently cataloged. This would more easily provide the information needed to better identify where septic tanks actually exist and their age.

2) In coordination with Washington County, develop and implement support of their septic system program. Potential projects that have been identified for further investigation include supporting educational workshops on septic system maintenance targeted towards residents living in areas of septic tank clustering and areas in close proximity to surface waters, or supporting Washington County's permitting and inspection process.

3) The JWC will track the implementation and success of similar programs developed in other watersheds, notably the McKenzie and Clackamas River basins, prior to implementing similar programs.

4) Monitoring of septic system parameters twice a year for two years at critical sites (see Monitoring).

POINT SOURCE DISCHARGES

The 2013 SWA identified 1,085 potential point sources present in the watershed, of which 650 were hazardous storage sites and 87 were underground storage tanks. It also identified the variety of potential point sources in the DWSA, including:

- National Pollution Discharge Elimination System discharges (NPDES)
- Water Pollution Control Facilities (WPCFs) (these are septic systems serving several facilities, individual septic tanks were evaluated under the Septic Systems program)
- Concentrated Animal Feeding Operations (CAFOs)
- Above and Underground Storage Tanks (DEQ has identified 16 of these are leaking)
- Hazardous Materials Storage (a variety of facilities obtain these permits, including water and waste water treatment plants)
- Gravel Mining
- Dry Cleaners

The goal of this program is to reduce the risk of chemical releases into surface waters from point sources. Most of the potential contamination sources in this category are permitted, but not all. The main focus of JWC activities will be to inventory and track point sources that have been identified by state agencies, support permitting agencies to bring non-compliant permit holders into compliance, and educating facilities on proper chemical storage and disposal. Planning for accidental releases of contaminants (particularly along transportation corridors in the watershed) is led by the existing JWC emergency response program. The JWC has already performed tasks related to this program, including:

1) Review discharge permits for select industrial and agricultural activities. Permits include stipulations on the timing and quality of releases and the permit holder's monitoring requirements. Provide comments to regulatory agencies on permit conditions as needed.

2) Monitor for water quality above and below the NPDES permitted discharge closest to the JWC WTP intake.

Future tasks will be centered on tracking and evaluating point source discharges, and supporting permitting agencies. Evaluation and tracking of permitted storage and discharges is needed to ensure that the JWC is aware of changes in permit status, permit renewals, and locations.

1) In addition to the previously mentioned on-going activities, specific programs the JWC may be interested in implementing include establishing a tracking mechanism for permits, permit status, correction of non-compliant permits, and other related information (i.e., business participation in spill reduction programs). Continue to utilize GIS to map permits and discharges.

2) Compile information on compounds being created, stored, used, and discharged in the drinking water source area.

3) Review guidance materials on permit types, the permitting process, and compliance status reports. Ensure permitting agencies are aware that the Tualatin River is a drinking water source before authorizing new permits and during permit evaluations.

4) Contact permitting agencies for additional information on compliance status of permits. Request compliance inspections and technical assistance for facilities that are high risk or located in a sensitive area. Facilitate and encourage ways to bring non-compliant permit holders into compliance.

5) Support regulatory agencies education of facilities on the potential degradation to community water supplies that could result from poor waste management and handling practices. This can include facilitation of employee training on proper material handling and storage, spill cleanup and disposal, completion of spill response and notification plans, and support of business certifications and awards for reducing pollution and waste.

6) Monitoring twice a year for two years at critical locations (see Monitoring).

NONPOINT SOURCES

Traditional nonpoint sources such as agriculture, forestry and septic systems each have a separate category with proposed actions already described above. The goal of this Nonpoint Source program will be to understand and assess potential impacts from three types of potential nonpoint source contamination: stormwater runoff, roadside vegetation management, and recreational uses.

The JWC has been involved in specific nonpoint source projects by local government agencies, including proposed recreational changes at Hagg Lake Park operated by Washington County. Also, the JWC receives notification of Washington County's insecticide application along roadways for mosquito control. Some commercial and industrial facilities in the watershed are required to have stormwater discharge permits. Permits for facilities located close to the intake have been reviewed by JWC staff.

Due to limited staff time and JWC priorities, the future of this program is limited in the near term to allow the Research & Education, Turbidity & Water Quality, and Septic System programs to develop more fully. Tasks on Nonpoint Sources will focus on assessing the potential impact of expansion of recreational uses at Hagg Lake and establishing agency contacts to make other agencies aware of JWC's interest in these potential nonpoint sources of contamination.

1) Recreational Activities

a) Continue to review and comment on recreational activity plans, especially at Hagg Lake Park.

b) Investigate effective 'clean' boater programs, including the Oregon Clean Boater Program and providing boater spill kits. Understand the current invasive species inspection and control programs and investigate ways to strengthen them. Coordination and implementation would occur with Washington County Parks department.

2) Roadside Vegetation Maintenance

a) Begin communicating with and understanding Washington County's and ODOT's road maintenance programs and activities. Review current ODOT and County vegetation management programs. Receive information on insect controls by Washington County.

b) Develop strategies to encourage improved methods of roadside maintenance, including the use of integrated vegetation management and/or use of less toxic/persistent chemicals in road maintenance activities.

3) Stormwater Management

a) Review CWS's and Cities' programs' for stormwater management, and begin communications with stormwater managers.

b) During/immediately after storm events, drive around the DWSA and identify where runoff problems exist.

c) Investigate ways to support reductions of urban stormwater runoff through best management practices (i.e., detention ponds, retention ponds, vegetated swales and filter strips, urban forestry, street cleaning, eco-roofs).

4) Monitoring for volatile organic compounds (VOCs) commonly associated with stormwater runoff twice a year for two years at critical locations (see Monitoring).

WATER QUALITY AND TURBIDITY PROJECTS

The goal of this program is to support organizations working locally to implement projects that benefit water quality in the JWC's DWSA. Several organizations are already working in the watershed to enhance soil and water quality. This program will support their work and encourage more projects to consider impacts to drinking water quality.

Currently JWC has been participating in these activities, including:

1) Staff is serving on the board of Tualatin River Watershed Council in which a variety of stakeholder groups work cooperatively towards restoring full watershed health.

2) JWC property (Hutchinson) is in conservation easement with Natural Resource Conservation Service (NRCS) and is actively being restored.

In addition to the previously mentioned activities above, JWC plans to consider implementing the following to further the program's objectives:

1) Begin a competitive small grant program to support local organizations interested in implementing projects that further the JWC's water quality goals. Local organizations will be invited to apply for JWC funding to implement projects. Grantees will be required to submit project reports after implementation. The grant will only be available for projects that meet the following criteria:

a) Located in the JWC's drinking water source area.

b) Focused on water quality parameters of interest to the JWC, including *E. coli*, turbidity, nutrients, and pesticides or support another one of this SWP Plan's program categories.

c) Have a history of successful project completion.

2) Investigate participating in the Enhanced Conservation Reserve Enhancement Programs (ECREP) and the Vegetated Buffer Areas for Conservation Program (VEGBAC) programs collaboratively sponsored by Tualatin SWCD, CWS, and NRCS. These programs create incentives for private agricultural landowners to implement best management practices and conservation easements.

PUBLIC OUTREACH

The goal of this program is to communicate the JWC's efforts to the public and other agencies. Another goal is to increase community and individual support for source water protection efforts through educating the public and individuals about what they can do to support healthy watersheds. Currently, the JWC's only public outreach effort centering on source water themes is its participation in the Children's Clean Water Festival to educate elementary school students about the many ecosystem services provided by a healthy watershed.

The future planned programs will be developed and implemented in coordination with the JWC Public Information programs and staff. For items that require funding, a cost share between the two budgets may occur.

Some future tasks described in other categories of this plan may recommend a public outreach component. Those will also be coordinated through either the JWC's and/or the partnering

agencies' public outreach staff. These items may include event advertisements, press releases, and informational handouts. Their development will occur on an as-needed basis.

1) Provide information to the public on the updated source water assessment, JWC's protection efforts, and what citizens can do to protect their watershed. Create a page on the JWC website and language for JWC's partner agencies for inclusion in their Consumer Confidence Reports (CCRs).

2) Coordinate and host a public 'watershed day' with other basin agencies. The day could include tours of the JWC WTP, Hagg Lake (and potentially Barney Reservoir), and nearby facilities of partnering agencies.

3) Create classroom and event materials. An interactive display board of the watershed for use in classrooms and at events may be created. This will be supplemented by handouts describing the key points of the watershed and educational tips on protecting water quality. For events, banners and signage that include photos of the watershed and source water protection messages will be created.

4) Participate in other agencies outreach efforts as requested and available. USFWS has begun outreach to the Gaston elementary school to create an educational program on the activities at Wapato. USFWS invited the JWC to participate in that effort. Educational information will focus on water supply, the source water assessment results and source water protection.

5) Coordinate with Washington County Parks department to create and install signage at Hagg Lake Park. These educational signs will identify Hagg Lake as a drinking water source, and include tips to prevent water quality contamination.

6) Coordinate with Washington County and ODOT transportation to create and install signage where major road cross the Tualatin River and the primary tributaries.

RESEARCH AND EDUCATION

Generally, the goal of this program is to support research on water quality, potential contamination risks, and understanding the watershed's sensitive areas. Specific attention will be given to informing the development of the Wapato Lake National Wildlife Refuge.

To date, the JWC has supported and been involved in a number of research projects.

1) JWC has partnered in several DEQ research efforts, including investigation of turbidity levels at drinking water intakes in forested watersheds and raw water monitoring of emerging contaminants, such as pharmaceuticals and personal care products (PPCPs), pesticides, and hormones. The Tualatin River Watershed Demonstration project sponsored by DEQ and the Trust for Public Lands, involved numerous Tualatin River stakeholders and identified land areas most important to water quality and wildlife habitat.

2) JWC projects focused on Wapato Lake began with participation in developing the Wapato Lake Water Quality Management Plan for Wapato Improvement District (July 2009) and the Wapato Improvement District water Quality Monitoring Plan (April 2010) by DEQ. JWC participated in development of the Comprehensive Conservation Plan (September 2013) by USFWS. Additional projects have been undertaken in partnership with USFWS, USGS and with Clean Water Services. JWC staff has coordinated with USGS on water quality and quantity monitoring at Wapato Lake and has drafted a report documenting the events that occurred at the lake in 2007 and 2008 and associated taste and odor event. An additional report is being drafted with Clean Water Services, analyzing the water quality data collected at Wapato Lake.

3) The JWC is participating in the Willamette 2100 climate change research initiative and reviews climate change literature for potential impacts to water quality.

Future research projects will focus primarily on the restoration of Wapato Lake. Additional projects to support local Universities' research efforts and student training will also be investigated.

1) Continue to coordinate with USFWS on their restoration efforts and USGS and CWS on the research of the Wapato Lake National Wildlife Refuge. The JWC TAC recommends continuing to support USGS's monitoring of water levels at the site and the completion of a water budget. Water level monitoring is needed to inform USFWS and the JWC of discharge volumes and timing at the site. The water budget will quantify the sources of water to the site and will form a foundational piece of determining future restoration alternatives. Future research efforts may be needed and will be based upon the results of the current work and the USFWS restoration plans.

2) Investigate and develop opportunities to utilize students in research and monitoring efforts. Outreach has begun with Pacific University, but no partnership projects have been developed to date.

3) Investigate opportunities to participate in Water Research Foundation projects, as they become available.

MONITORING

Water quality monitoring can be a valuable tool, not only to assess current risk and impacts to water quality in the JWC DWSA, but also to track changes in the area over time. The goal of past source water monitoring by the JWC has been to identify the source of particular events causing increased treatment demands at the JWC WTP or to collect background data on nutrients. Additional goals associated with this monitoring program may be to gather site specific data based on the basin evaluation generated by the SWA, revise and integrate the current monitoring program to better cover the entire DWSA, and to focus on contaminants of concern at specific sites near their use in the watershed.

The JWC has been performing routine water quality monitoring in the source water area for many years. Brief descriptions of important past and current monitoring efforts are below.

1) Semi-annual treatment plant monitoring: Several federal regulations under EPA require monitoring of inorganic and organic compounds, including some pesticides, of the JWC WTP finished water. JWC has elected to do a more frequent and expansive monitoring program than is required and has also elected to monitor untreated water at the treatment plant intake[11]. This elective monitoring includes a list of unregulated semi-volatile organic chemicals (SOCs) that was developed with certain industrial uses in mind.

2) Tualatin Basin Streams: JWC currently monitors several points in the mid-Tualatin River basin for nutrients, algae, and physical characteristics[12]. Originally begun as a Disinfection Byproduct (DBP) precursor study, the monitoring evolved into a routine program to track common water quality parameters, nutrients, and algal populations at sites on the mainstem Tualatin River and several tributaries.

3) Barney Reservoir: Routine monitoring is conducted at the deepest point of the pool and at three tributaries entering the reservoir. Physical parameters, nutrients, and algal speciation are collected monthly[13]. This monitoring began as a result of an algal bloom. Also, select pesticide monitoring occurs after forestry applications.

4) Scoggins Reservoir: JWC collected nutrient, algae and physical characteristic data at Scoggins Reservoir (also known as Hagg Lake) and three of its tributaries from 1999 to 2005 as part of a cooperative study by the Tualatin River Flow Management Technical Committee[14].

5) Outside agency studies: The USGS did a monitoring project in 2002 which sampled the JWC intake for an extensive list of pesticides[15]. The DEQ also did a monitoring project in 2008 that looked at pesticides, steroids and hormones, and pharmaceuticals.

Going forward, several of the current monitoring programs may be re-evaluated and revised. Also, results from the risk analysis performed in the 2013 SWA have informed a targeted future monitoring effort as follows:

1) Source Water Assessment monitoring: A basin specific list of pesticides, VOCs, and human indicators was developed as part of the 2013 SWA. Sampling will occur at the intake and 8 other sites in the Drinking Water Source Area as shown on Figure 2. Locations were selected based on the risk and susceptibility geospatial analysis. The majority of the locations coincide with current monitoring locations for Tualatin Streams and Barney Reservoir programs discussed above but two new sites were also recommended (Cherry Grove and Upper Gales Creek). This targeted monitoring will be done twice a year for two years.

[11] Joint Water Commission. *Joint Water Commission Sampling*. March 2014.
[12] Joint Water Commission. *Joint Water Commission Sampling*. March 2014.
[13] Barney Reservoir Joint Ownership Commission. *Barney Reservoir Sampling Plan 2014*. March 2014.
[14] Flow Science Incorporated. *Hagg Lake Monitoring Project Report: 1999 to 2005.* April 2007.
[15] Rounds, S.A. et.al. *Reconnaissance of Pharmaceutical Chemicals in Urban Streams of the Tualatin River Basin, Oregon, 2002*. United States Geological Survey Report 2009-5119.

Findings from this targeted monitoring will be used along with a review of any contaminants detected in raw water at the JWC treatment plant or parameters that are of treatment or regulatory concern, to refine the unregulated portion of JWC's Semi-annual monitoring parameter list.

2) Reevaluation of Tualatin Streams & Barney Reservoir monitoring: The Tualatin Streams sampling program may see a reduction in frequency of field readings and total organic carbon (TOC) collection due to the level of data collected over the last six years. After analysis of the data is complete, sampling may be reduced to monthly or quarterly depending upon the analyte.

3) Barney Reservoir and tributary sampling may be reduced to every other month beginning in October of 2014. At that time the initial five year monitoring period will be complete, as was recommended in the Barney Reservoir Monitoring Plan[16]. There is no intention to reduce the number of parameters monitored.

4) Develop Scoggins Reservoir monitoring: JWC staff has proposed a reintroduction of routine monitoring at Scoggins Reservoir beginning in the fall of 2014 with the intent to monitor for a minimum of three years. This monitoring will be supported by a partnership with Clean Water Services. Monitoring would include the main pool and the three tributaries sampled during the 1999-2005 study (Sain, Scoggins, and Tanner Creeks). Reservoir and tributaries will be monitored every other month.

Field readings will be taken at tributary monitoring sites established during the 1999-2005 study and as a hydrologic profile at the deepest point of the reservoir. Grab samples for TOC, nutrients, and algal populations will be collected at these sites**.**

PROGRAM SCHEDULE

All the potential projects described above are listed on Table 1. The table's columns are the 9 program categories described in this SWP Plan. The first row describes the activities that have occurred to date. Subsequent rows list potential projects for the next 5 fiscal years, or until June 30, 2019. The table differentiates between programs that are an annual event or a continuation from the previous FY, and programs that may be undertaken for the first time. This schedule is dependent upon annual budget approvals and annual program approval from the SWP TAC.

CONCLUSION

Although completion and implementation of this source water protection plans is voluntary, doing so can generate additional financial, public education, and water quality

[16] Annear, R. et.al. *Barney Reservoir Monitoring Plan: Plan Development.* Portland State University, Technical report EWR-03-08. June 2008

benefits. Protecting JWC's source water quality by implementing a SWP Plan and programs may help avoid treatment costs, aid in protecting public health, improve taste and odor problems, create opportunities to leverage funds from multiple sources, and provide additional messaging to communicate with the public.

This Source Water Protection Plan is intended to guide the implementation of future programs and prioritization of available funding. The goal of implementing the proposed projects is to maintain and safeguard the quality of the water in the Tualatin River basin that serves as the JWC's drinking water source. Programs are designed to support other organizations and agencies, leverage funding sources and emphasize water quality issues important to the JWC. Other projects investigate how permitting and partner agencies perform their programs to inform the JWC's efforts. These programs set the groundwork to implement an effective Source Water Protection Plan.

TABLE 1: JWC SOURCE WATER PROTECTION 5-YEAR IMPLEMENTATION PLAN

JWC Source Water Protection Programs **July 11, 2014**

5-year Implementation Plan

	Agricultural Runoff	Forestry Activities	Septic Systems	Point Source Discharges	Nonpoint Sources	Turbidity & Water Quality Projects	Public Outreach	Research & Education	Monitoring
Completed by close of FY13-14	Supported two pesticide collection events led by Tualatin Soil and Water Conservation District (SWCD). SWA analyzed USDA satellite data on crop type.	Established MOU with BLM on forest activity mgmt. Reviewed and commented on ODF and BLM Annual Operations Plans and specific harvest plans. Held tour exchanges with ODF and BLM staff. SWA analyzed forestry activity information.	SWA identified tax lots most likely on septic tanks, and performed a cluster analysis identifying areas that likely contain septic tanks on several adjacent small tax lots.	Reviewed and commented on selected discharge permits. Monitored above and below one of the permitted discharges. The SWA inventoried all permitted uses and discharges.	Reviewed and commented on select stormwater permits and mgmt plans. Received information on mosquito controls from Wash. County. Provided input to Wash. County on recreational developments at Hagg Lake Park.	Served on board of Tualatin River Watershed Council. JWC property (Hutchinson) is being restored under conservation easement with NRCS. Participated in collaborative monitoring and grant opportunities.	Led planning efforts for the Children's Clean Water Festival. (Programs are developed and implemented in coordination with the JWC's Public Outreach program.)	Cooperated with State and Federal agencies on various projects including: -wrote report on 2008 taste and odor event with USGS, -supported Wapato flow monitoring by USGS ($3,600), -supported Wapato water budget development ($5,000), -monitored PPCPs with DEQ, -supported turbidity analysis by DEQ, -participated in watershed analysis work with DEQ and Trust for Public Lands.	Monitored source waters including: -unregulated monitoring at the JWC WTP, -a 5-yr Barney Reservoir baseline monitoring, -Tualatin streams and JWC Intake. (Programs are developed and implemented in coordination with the JWC and Barney Water Quality programs.)
Program Cost									
$ 13,600	$ 5,000	Staff Time	Staff Time	Staff Time	Staff Time	Staff Time	Staff Time	$ 8,600	Funds from JWC and Barney Monitoring Budgets
FY 14-15 Ongoing	Support annual pesticide collection event, led by Tualatin SWCD ($5,000).	Track ODF's progress on providing spatial data of forestry activities. (ODF estimates this to be available in FY15-16.)		Review and comment on select discharge permits. Monitor above and below one of the permitted discharges.	Review and comment on select stormwater permits and mgmt plans. Receive information on mosquito controls from Wash. County. Provide input to Wash. County on recreational developments at Hagg Lake Park.	Serve on the board of the Tualatin Watershed Council. Support restoration of JWC property (Hutchinson) under conservation easement with NRCS.	Participate in the Children's Clean Water Festival.	Support USFWS restoration of Wapato Lake National Wildlife Refuge: -fund USGS stage gauge to allow water level tracking and mapping ($5,000) -support development of water budget or water quality model ($5,000) -assist CWS with writing a research article on water quality conditions at Wapato Lake -determine project support needed for next FY	
FY 14-15 New	Support a geographically targeted agricultural outreach event with Tualatin SWCD ($500).	Register to obtain notification of all State and Private forestry activities in the watershed ($1,500). Increase communication with private industrial foresters.	Understand Wash. County Environmental Health's septic tank program and permitting process.			Begin competitive small grant to organizations to perform local projects improving water quality in areas of interest to the JWC.	Coordinate and host a Watershed Day with partner agencies. The event will include tours of the JWC WTP and Hagg Lake. Create a page for the JWC website. Provide JWC partner agencies with CCR language.		Monitor chemicals most likely used in the basin with high toxicity or persistence. Monitor for indicators twice a year at critical sites (funds supplement the Monitoring budgets). Implement Scoggins Reservoir monitoring in partnership with Clean Water Services (funds in the Monitoring budget).
Program Cost									
$ 55,000	$ 5,500	$ 1,500	Staff Time	Staff Time	Staff Time	$ 18,000	Staff Time	$ 10,000	$ 20,000

JWC Source Water Protection Programs **July 11, 2014**

5-year Implementation Plan

	Agricultural Runoff	Forestry Activities	Septic Systems	Point Source Discharges	Nonpoint Sources	Turbidity & Water Quality Projects	Public Outreach	Research & Education	Monitoring
FY 15-16 Ongoing	Support annual pesticide collection event, led by Tualatin SWCD ($5,000). Support a geographically targeted agricultural outreach event with Tualatin SWCD ($500).	Obtain notification of all State and Private forestry activities in the watershed ($1,500)		Review and comment on selected discharge permits. Monitor above and below select permitted discharges.	Provide input to Wash. County on recreational developments at Hagg Lake Park. Review and comment on select stormwater permits and mgmt plans. Receive information on mosquito controls from Wash. County.	Provide competitive small grant to organizations to perform local projects improving water quality in areas of interest to the JWC. Serve on the board of the Tualatin Watershed Council. Support restoration of JWC property (Hutchinson) under conservation easement with NRCS.	Host public Watershed Day, and participate in the Children's Clean Water Festival. Provide JWC partner agencies with CCR language.	Support USFWS restoration of Wapato Lake as identified in FY14-15. This could include USFWS and USGS research, or support of a graduate student to perform research ($10,000).	Monitor chemicals most likely used in the basin with high toxicity or persistence. Monitor for indicators twice a year at critical sites. (Funds supplement the Monitoring budgets). Monitor Scoggins Reservoir in partnership with Clean Water Services. (Funds are in the Monitoring budget).
FY 15-16 New **Program Cost** **$ 55,000**	Update geodatabase with USDA satellite data on crop type. $ 5,500	Determine level of effort needed to integrate ODF's spatial data into the JWC's geodatabase. (Timing and level of effort dependant upon ODF's final product). Investigate obtaining aerial imagery. $ 1,500	In coordination with Wash. County, determine level of effort needed to migrate hard copy files to electronic format. Determine level of effort needed to: -track septic installation and maintenance -refine status of septic systems w/in clusters. Staff Time	Determine level of effort needed to update discharge information into JWC's geodatabase and establish a tracking mechanism. Staff Time	Staff Time	$ 16,500	Create classroom and event display of the watershed to include: -interactive display of the watershed -event banners -handouts with educational information on source water protection (Costs to be shared with the JWC Public Outreach). $ 1,500	$ 10,000	$ 20,000
FY 16-17 Ongoing	Support annual pesticide collection event led by Tualatin SWCD. Support a geographically targeted agricultural outreach event with Tualatin SWCD ($500).	Obtain notification of all State and Private forestry activities in the watershed ($1,500). Continue outreach efforts with Federal, State, and Private foresters.		Review and comment on selected discharge permits. Monitor above and below select permitted discharges.	Provide input to Wash. County on recreational developments at Hagg Lake Park. Review and comment on select stormwater permits and mgmt plans. Receive information on mosquito controls from Wash. County.	Provide competitive small grant to organizations to perform local projects improving water quality in areas of interest to the JWC. Serve on the board of the Tualatin Watershed Council. Support restoration of JWC property (Hutchinson) under conservation easement with NRCS.	Host public Watershed Day, and participate in the Children's Clean Water Festival. Provide JWC partner agencies with CCR language.	Continue collaboration with partners on restoration activities at the Wapato Lake National Wildlife Refuge. Re-evaluate need to financially support USFWS efforts.	Monitor Scoggins Reservoir in partnership with Clean Water Services. (Funds are in the Monitoring budgets.)
FY 16-17 New **Program Cost** **$ 55,000**	Review current information on agricultural chemicals and their application. $ 5,500	If feasible, integrate ODF's spatial data on forestry activities into JWC's geodatabase ($5,000). $ 6,500	If feasible, implement the migration of hard copy files to electronic format. If feasible, implement: -tracking septic installation and maintenance and -refining status of septic systems w/in clusters. $ 15,000	Integrate updated discharge information into JWC geodatabase and begin tracking new discharges. Communicate with permitting agencies on compliance status, and encourage compliance inspections. Staff Time	Investigate development of a 'clean' boater programs. Staff Time	Investigate participating in the ECREP and/or VEGBAC programs. $ 18,000	Update JWC website with current SWP information. Participate in a USFWS lead effort to educate the Gaston elementary school on the watershed. Staff Time	Investigate potential future research project opportunities with Universities, USGS, and Water Research Foundation. $ 10,000	Review water quality monitoring data collected the last two FYs. Determine need for future water quality monitoring programs. Refine list of chemicals for long-term semi-annual analysis at JWC WTP. Staff Time

JWC Source Water Protection Programs **July 11, 2014**

5-year Implementation Plan

	Agricultural Runoff	Forestry Activities	Septic Systems	Point Source Discharges	Nonpoint Sources	Turbidity & Water Quality Projects	Public Outreach	Research & Education	Monitoring
FY 17-18 Ongoing	Support annual pesticide collection event led by Tualatin SWCD ($5,000). Support a geographically targeted agricultural outreach event with Tualatin SWCD ($500).	Obtain Forestry Activity Notifications ($1,500). Continue outreach efforts with Federal, State, and Private foresters.		Review and comment on select discharge permits. Monitor above and below select permitted discharges.	Review and comment on select stormwater permits and mgmt plans. Receive information on mosquito controls from Wash. County.	Provide competitive small grant to organizations to perform local projects improving water quality in areas of interest to the JWC. Serve on the board of the Tualatin Watershed Council. Support restoration of JWC property (Hutchinson) under	Host public Watershed Day, and participate in the Children's Clean Water Festival. Provide JWC partner agencies with CCR language.	Continue collaboration with partners on restoration activities at the Wapato Lake National Wildlife Refuge.	Continue Tualatin basin, Scoggins and Barney Reservoir monitoring. (Funds are in the Monitoring budgets.)
FY 17-18 New	Update geodatabase with USDA satellite data on crop type.	Update geodatabase with ODF data on forestry activities.	Review septic system programs implemented by other drinking water providers. In coordination with Wash. County, investigate development of either a: -a septic tank maintenance workshop, or -support of Wash. County's inspection program.	Develop program to support DEQ's permitting and compliance process. Compile information on compounds being discharged.	Review CWS and Cities' stormwater mgmt policies and programs. Review Wash. County and ODOT's roadside vegetation mgmt program.		Create and install educational signage at Hagg Lake Park.	As identified in previous FY, implement either continued finacial support of restoration activities at Wapato or another research project.	Need for additional programs will be determined in FY 16-17 after review of water quality monitoring data.
Program Cost									
$ 55,000	$ 5,500	$ 1,500	Staff Time	Staff Time	Staff Time	$ 30,500	$ 2,500	$ 15,000	Staff Time
FY 18-19 Ongoing	Support annual pesticide collection event led by Tualatin SWCD ($5,000). Support a geographically targeted agricultural outreach event with Tualatin SWCD ($500).	Receive Forestry Activity Notifications ($1,500). Continue outreach efforts with Federal, State, and Private foresters. Update geodatabase with ODF data on forestry activities.		Review and comment on selected discharge permits. Monitor above and below one of the permitted discharges.	Review and comment on select stormwater permits and mgmt plans. Receive information on mosquito controls from Wash. County.	Provide competitive small grant to organizations to perform local projects improving water quality in areas of interest to the JWC. Serve on the board of the Tualatin Watershed Council. Support restoration of JWC property (Hutchinson) under conservation easement with NRCS.	Host public Watershed Day, and participate in the Children's Clean Water Festival. Provide JWC partner agencies with CCR language.	Continue collaboration with partners on restoration activities at the Wapato Lake National Wildlife Refuge.	Continue Tualatin basin, Scoggins and Barney Reservoir monitoring. (Funds are in the Monitoring budgets.)
FY 18-19 New		Investigate outreach programs/events targeting private and small woodland owners to be implemented in a future year.	If feasible, implement a project identified the previous FY. Potential options include a maintenance workshop or support Wash. County's inspection program.	If feasible, support DEQ to bring non-compliant permit holders into compliance. If feasible, support DEQ programs that educate facilities on proper chemical storage and disposal.	Encourage use of less toxic/persistent chemicals or integrated pest management. Investigate ways to support reductions of stormwater runoff through best management practices.		Create and install educational signage at major river crossings. Update JWC website with current SWP information.	As identified in previous FY, implement either continued finacial support of restoration activities at Wapato, or another research project.	Need for additional programs will be determined in FY 16-17 after review of water quality monitoring data.
Program Cost									
$ 55,000	$ 5,500	$ 1,500	$ 7,000	$ 7,000	Staff Time	$ 16,500	$ 2,500	$ 15,000	Staff Time

FIGURE 1: MAP OF JWC DELIVERY AREAS

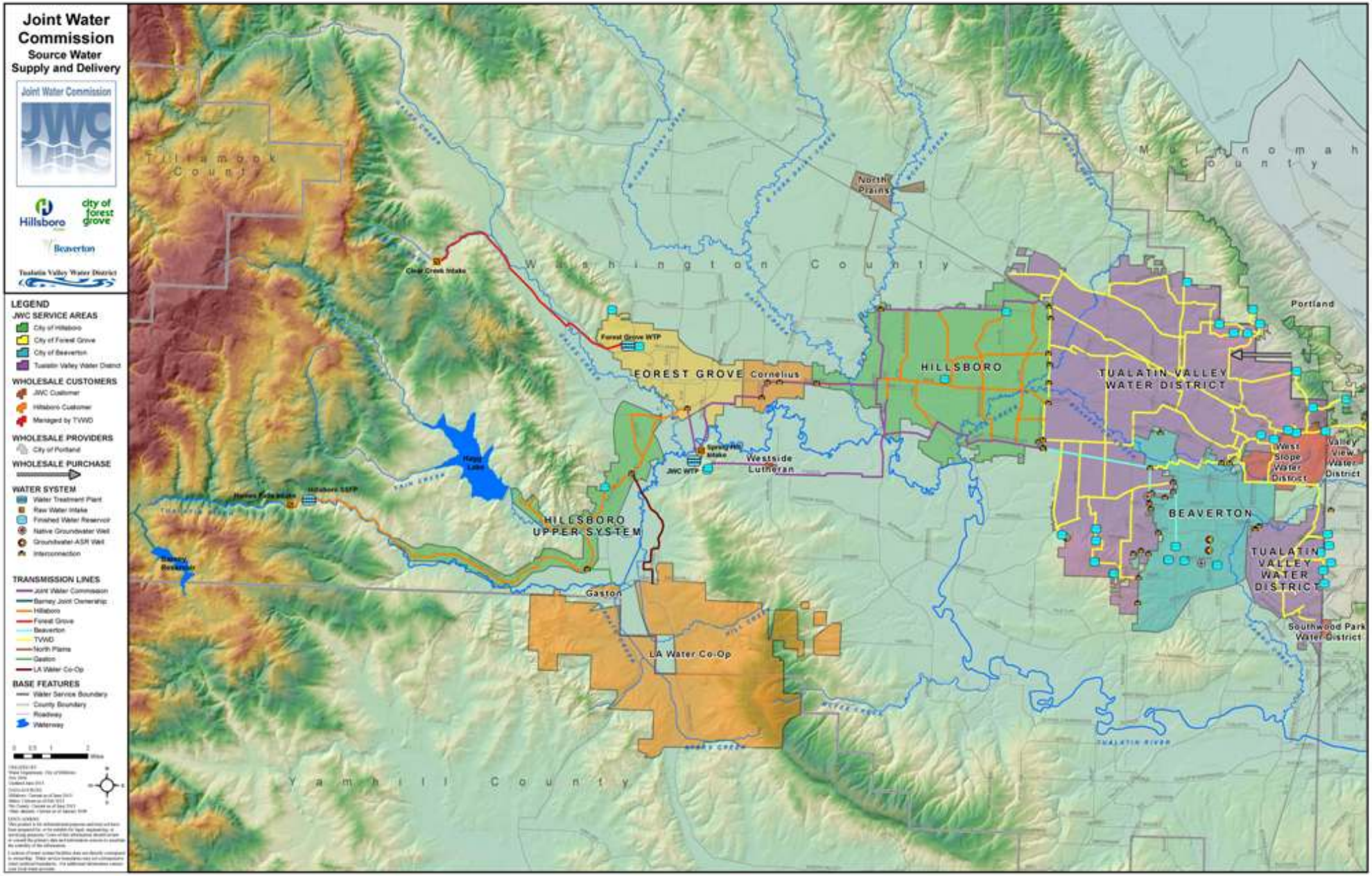
Joint Water Commission
Source Water Supply and Delivery
Joint Water Commission
Hillsboro
city of forest grove
Beaverton
Tualatin Valley Water District
LEGEND
JWC SERVICE AREAS
City of Hillsboro
City of Forest Grove
City of Beaverton
Tualatin Valley Water District
WHOLESALE CUSTOMERS
JWC Customer
Hillsboro Customer
Managed by TVWD
WHOLESALE PROVIDERS
City of Portland
WHOLESALE PURCHASE
WATER SYSTEM
Water Treatment Plant
Raw Water Intake
Finished Water Reservoir
Native Groundwater Well
Groundwater-ASR Well
Interconnection
TRANSMISSION LINES
Joint Water Commission
Barney Joint Ownership
Hillsboro
Forest Grove
Beaverton
TVWD
North Plains
Gaston
LA Water Co-Op
BASE FEATURES
Water Service Boundary
County Boundary
Roadway
Waterway
Tillamook County
Washington County
Multnomah County
Yamhill County
Clear Creek Intake
Forest Grove WTP
FOREST GROVE
Cornelius
North Plains
HILLSBORO
Portland
TUALATIN VALLEY WATER DISTRICT
Hagg Lake
JWC WTP
Westside Lutheran
West Slope Water District
Valley View Water District
BEAVERTON
HILLSBORO UPPER SYSTEM
Gaston
LA Water Co-Op
TUALATIN VALLEY WATER DISTRICT
Southwood Park Water District

FIGURE 2: MAP OF JWC DRINKING WATER SOURCE AREA AND SWA MONITORING SITES

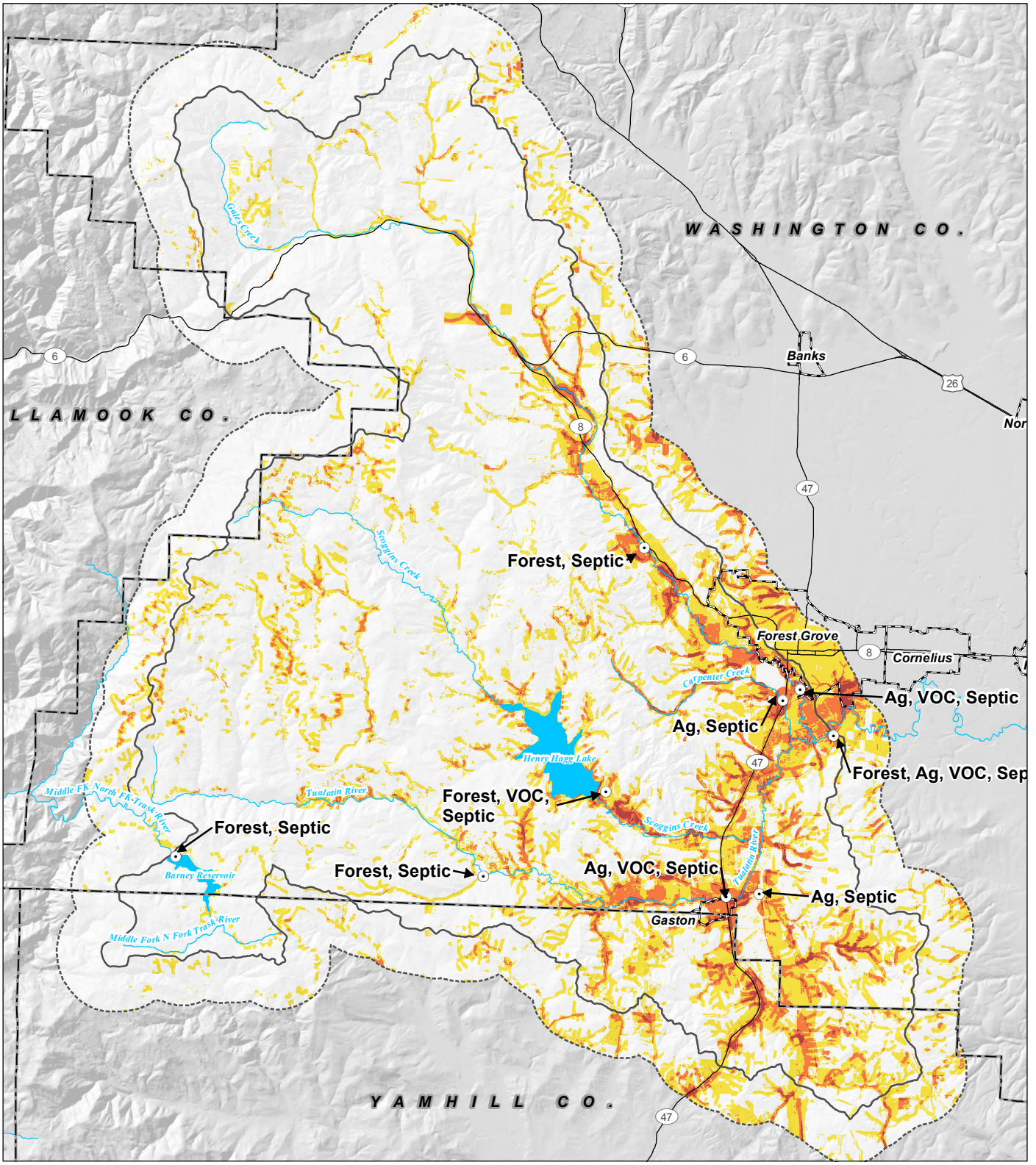

Figure 2

Drinking Water Source Area
Proposed Monitoring Sites and Parameter Groups
Susceptibility Analysis
Equal Weighted Overlay Analysis Results
Classified by Natural Breaks (Jenks)

JWC Source Water Protection Plan
July 2014

MAP NOTES:
Date: August 8, 2013
Data Sources: FEMA, ODF FACTS, USDA, USDA NRCS, DOGAMI, The Wetlands Conservancy, METRO RLIS, Yamhill Co, City of Hillsboro, OR DEQ, ODOT, USGS, ESRI

LEGEND

All Other Features
- Study Area
- 1 Mile Buffer of Study Area
- Counties
- Cities
- Waterbodies
- Highways
- Monitoring Site

N

0 1.75 3.5
Miles

GSI Water Solutions, Inc.

File Path: P:\Portland\254 - Joint Water Commission\010-Source Water Assessment\Project_GIS\Project_mxds\TM1\Final\Figure22_Suscep_Results_v2.mxd