Chapter 7: New Well Site Analysis

Springfield's growing population and industrial development puts an increasing demand on the existing water supply. Springfield needs an additional well in summer 1999 to meet the demands of growth. Evaluating potential sites from a groundwater risk perspective allows Springfield Utility Board (SUB) to select sites that have a relatively low-risk potential and to develop proactive approaches by guiding existing and future chemical use activities that protect the area. This chapter provides an evaluation and analysis of four potential new well sites for Springfield.

The proposed sites are analyzed from a groundwater risk perspective, although it is recognized that a variety of elements, such as distribution, productivity, and cost, may also be considered for the ultimate selection of Springfield's next water supply. This analysis also considers other potential sites, demonstrating that, by changing the proposed location, drinking water protection benefits or shortfalls may be realized. Selecting a preferred site from a groundwater risk view involves an analysis of various land use components, such as contamination risks associated with various land uses within that well's delineated protection area and the potential contaminant risk inventory in Chapter 4.

Selection Criteria

The proposed well sites were analyzed using several criteria associated with land use and inventoried risks. The Citizen Task Force recommended some of these criteria as it reviewed risks to the existing wellfields. When it is time for the selection of a new well site, it is suggested that consideration be given to the sites contamination potential using the criteria listed below.

Ownership or Legal Control of the Wellhead Property: Ownership or easement control of the property on which the well is located is considered a high priority for a new well. Having control over the immediate vicinity of the wellhead helps ensure protection of this most critical area.

Risks Associated with Current Land Uses: Existing land uses vary in the type and degree of potential risk to groundwater. The higher the overall risk associated with differing land uses within the drinking water protection area, the less desirable that site is for selection of a new well location.

Risks Associated with Expected Future Land Uses: Future land uses can influence the vulnerability of the drinking water protection area if future land uses are expected to pose a higher risk than existing land uses. General future land uses can be estimated by planned designations and whether or not proposed drinking water delineation areas have been included in the drinking water protection areas and land use controls applied.

Risks Associated with Transportation Corridors: Siting wells within the 1-year time-of-travel (TOT) to I-5 or Highway 126 posses a higher risk to contamination from accidents and

spills along these highways. Additional risk mitigation will be necessary if new wells are completed near these transportation routes.

Analysis

SUB currently has ownership, easements, or is in the process of establishing easements on the following four properties proposed for well sites. Land uses vary from agricultural to special light industrial. Rainbow Water District is not currently planing to drill new wells.

The following is an analysis of the proposed well sites related to the potential of groundwater contamination. All of the following wellhead areas are being included in the drinking water protection areas to assure that proactive measures are taken to protect these future well sites.

Wells No. 5, 6, and 7 at Thurston/Platt Wellfield: The Fox Property (approximately 80 acres) was recently purchased to provide for expansion of the Thurston Wellfield. A substantial portion of this property will be placed in fish and wildlife habitat reserve with the remainder used for new well sites and water treatment facilities. Most neighboring properties are rural residential or in agricultural use to produce hay. One landscape nursery is within the 5-year TOT.

All of the proposed new Thurston wells are within 500 to 700 feet of the existing wells.

The highest risks at the new well site is from surface water influence. Recent microscopic particulate analyses indicate little surface water influence.

Thurston Middle School: Thurston Middle School acreage is in public ownership and adjacent to the existing Platt wells. The adjacent properties are rural residential and small-scale agricultural operations mostly raising grass hay and feeding a limited number of cattle and horses. In the past, some of the nearby acreage has been used for strawberries and beans. All of the adjacent residential areas inside the urban growth boundary are or will be sewered.

No potential sources of contamination have been inventoried within the 5-year TOT with the exception of a petroleum spill at a nearby residence that was cleaned up.

17th and "Q" Street Well: The SUB has owned this well site property since the early 1980s. Most of the properties within the 1-year TOT are residential city lots, all of which are connected to the public sewer system. The 5-year TOT includes some commercial properties with inventoried underground storage tanks and hazardous material handlers. State Fire Marshal hazardous material inventories do not indicate large volumes of chemicals in storage, and there is no indication of Dense Non-aqueous Phase Liquids chemical use within the 5-year TOT.

This property is separated from Highway 126 by the "Q" Street drainage way and is not in an area where accidents or chemical spills have occurred along the highway.

Pierce Property Well: This property is a future park site for Willamalane Park and Recreation District, and SUB has an easement for a public water supply well. The adjoining property to the north is Briggs Middle School, and on the south and east is vacant land owned by the Pierce family and zoned for multi-family residential and special light industrial. The other adjoining properties are residential lots.

The risks associated with current land uses are very low, with some risks from septic systems in the unsewered area on the north. The Pierce property has been dry land farmed for wheat, oats, and grass seed.

The risks associated with future development on the Pierce property are from the multi-family residential area and the special light industrial property to the south.

Other Possible New Well Locations

It is anticipated that all new proposed well sites will be within the contaminant source inventory boundary and within the Springfield planning boundary or the immediately adjacent rural residential and agricultural lands. Additional wells will be drilled at the Thurston Wellfield and negotiations are continuing with the Willamalane Park and Recreation District and other property owners in the Thurston area. As noted on the contaminant source inventory maps and the discussion above, there is a lower risk of chemical contamination at these sites.

Additionally, new wells will be investigated in the North Gateway area. Additional growth in commercial, industrial, as well as residential development is anticipated to take place in this area and is desirable to add a new well site near this demand. Currently, no well site has been identified. As soon as a site is determined, delineations will be completed and added to the protection areas.

Appendix B

Executive Summary of Wellhead Protection Area Delineation Report
Project Number WHPA-2

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Appendix B

EXECUTIVE SUMMARY
WELLHEAD PROTECTION AREA DELINEATION REPORT
PROJECT NO. WHPA-2

Prepared for:

Springfield Utility Board
Springfield, Oregon

and

Rainbow Water District
Springfield, Oregon

Prepared by:

Golder Associates Inc.
Redmond, Washington

in association with

Adolfson Associates, Inc.
Seattle, Washington

July 6, 1995

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INTRODUCTION

The Springfield Utility Board (SUB) and the Rainbow Water District (RWD) have initiated a wellhead protection program with delineation of wellhead protection areas. In 1992, wellhead protection areas were determined for the SUB-RWD jointly-owned Weyerhaeuser Wellfield as a demonstration project funded by EPA, the State of Oregon, and SUB. Subsequent to the demonstration project, SUB and RWD developed the current project, Project No. WHPA-2. This project focuses on the wellhead protection area delineation for five wellfields. These wellfields are shown on Figure 1 and include three SUB wellfields (Maia/SP, Platt/Thurston, and Willamette) and two RWD wellfields (I-5 and Q Street).

SUB and RWD prepared a scope of work described in "Springfield Utility Board and Rainbow Water District, Request for Proposals, Project No. WHPA-2" (October, 1993) (RFP). The scope of work was slightly modified at the onset of the project. The final scope of services provided for Project No. WHPA-2 included the following tasks:

- Development of a hydrogeological conceptual model for the aquifer area relevant to the wellfields;
- Construction of a three-dimensional groundwater computer model using the US Geological Survey model, "MODFLOW";
- Evaluations of contributions from surface water to the wellfields;
- Evaluations of groundwater travel times and pathlines for the wellfields based on the USGS MODFLOW program output and the USGS particle tracking program MODPATH;
- Preparation of maps showing the 1-, 5-, 10-, and 20-year time-of-travel wellhead protection areas for the wellfields;
- Preparation of a vulnerability assessment for the two RWD wellfields, including a source inventory; and
- Preparation of the project report (dated April 19, 1995).

Golder Associates Inc. was the lead consultant for the project and provided services in hydrogeology, computer modeling, wellhead protection area delineation, and contaminant source risk assessment. Adolfson Associates, Inc. provided assistance in the vulnerability analysis in the areas of contaminant source inventory and groundwater management strategies.

HYDROGEOLOGY

The principal aquifers in the Springfield-Eugene area occur in the valley of the Willamette and McKenzie Rivers. The sediments that fill the valley are unconsolidated, consisting of clay, silt, sand, and gravel mixtures that are generally horizontally layered. Two geological formations are present and are referred to as the older alluvium and younger alluvium, respectively. The younger alluvium occurs nearest to the channels of the Willamette and McKenzie Rivers. The older alluvium underlies the younger alluvium and occurs at ground surface over the majority of the valley.

The hillsides bordering the valley plain are formed by bedrock materials, which vary from volcanic to sedimentary rocks. The bedrock materials provide little water to wells and appear to support only domestic groundwater supplies. In regards to this project, the bedrock materials were considered impermeable, forming barrier boundaries to the groundwater flow system.

The maximum sediment thickness is in excess of 400 feet and occurs in the northwest region of the project area near to the confluence of the Willamette and McKenzie Rivers. Most of the sediment consists of older alluvium, that in places is overlain by a thin layer of younger alluvium. The younger alluvium is on average about 35 feet thick. In the upstream directions, the sediment thickness declines to near 200 feet along the McKenzie River and to near 100 feet along the Middle and Coast Forks of the Willamette River.

Hydraulic conductivity data for the older alluvium formation range from a high of 67 ft/d to a low of only 4 ft/d. The average for these data is 31 ft/d. The data do not suggest any trends in which, for example, one part of the project area may have a notably smaller or larger average hydraulic conductivity than any other part. The younger alluvium formation has much larger hydraulic conductivity values. The range in hydraulic conductivity for the younger alluvium is from a low value of 132 ft/d to a high of 2,350 ft/d. The average value is about 950 ft/d.

Groundwater throughout the valley is encountered at shallow depths, typically within 10 to 20 feet of ground surface. The near surface aquifer conditions are generally unconfined, whereas at depth the conditions are better classified as semi-confined. The semi-confined conditions appear to occur at depth due to heterogeneous layering in the sediments. Local cementation of the sediments also reduces permeability and can cause semi-confined aquifer behavior. A traceable low-permeability layer, such as a clay or silt aquitard, however, has not been identified in the valley.

Groundwater flow generally occurs in a direction parallel to the valley plain axis toward the north, northwest, and west depending on one's location in the valley. Groundwater enters the project area from the east along the McKenzie River drainage and from the south along the Coast Fork and Middle Fork drainages of the Willamette River. A large quantity of groundwater recharge also occurs by infiltration of precipitation onto the

valley plain in the Springfield-Eugene area. Groundwater leaves the project area by regional outflow as groundwater, and also by discharge to the McKenzie and Willamette Rivers. Groundwater is also withdrawn by water wells.

SUB and RWD are the primary users of groundwater in the project area. The Eugene Water and Electric Board (EWEB) is the other major water supplier in the area and withdraws its supply from the McKenzie River. The majority of the SUB and RWD water supply is obtained from the Weyerhaeuser and Willamette Wellfields, which combine for about 60% of the water supply. Significant contributions to the supply are also obtained from the Platt/Thurston and Chase Wellfields, which are used for about 30% to 35% of the water supply. The I-5 Wellfield provides approximately 10% of the water supply, whereas lesser quantities are obtained from the Q Street, Maia, and SP Wells. As in any water system, the demand is seasonal and many of the wells are used intermittently. The average day demand for the combined SUB-RWD water system is about 10 to 11 MGD. This demand peaks in the summer months at a rate of about 28 MGD.

GROUNDWATER COMPUTER MODELING

Groundwater computer modeling was conducted in order to delineate wellhead protection areas for each of the wellfields. The groundwater flow model selected for the project was the popular US Geological Survey Model, "MODFLOW". This model has the capabilities required for the aquifer conditions and wellfield configurations in the project area. The model is able to account for areal recharge from precipitation, hydraulic continuity with surface water, partially penetrating wells, and spatially variable aquifer hydraulic properties. The input data to the model are entered with the aid of digital base maps. These maps contain information on geology, aquifer thickness, groundwater recharge, river channel elevation, and well locations. The maps enable the input data to be accurately located.

Due to the mathematics of the MODFLOW program, it is required that the project area be represented in a grid. For this project, the grid was three-dimensional, including rows, columns, and layers. A schematic drawing of the grid overlain onto the project area is shown on Figure 16. The grid spacing for columns and rows was nonuniform, with the finest spacing of 250 feet by 250 feet occurring in the wellfield areas. The largest spacing for any column or row was 1,000 feet. Four layers were included in the model to represent vertical flow near river channels and partially penetrating wells.

Model boundary conditions were specified for each layer at the edges of the project area. Two types of boundaries were used: no-flow and constant head. No-flow boundaries were used wherever the alluvium materials contact bedrock, as shown on Figure 16. Constant head boundary conditions were specified along the drainages into and out of the project area.

The hydraulic conductivity input to the model was spatially variable. A value of 900 ft/d (horizontal directions) was assigned to the areas where the younger alluvium formation occurred. A value of only 30 ft/d (horizontal directions) was assigned to the areas where the older alluvium formation occurred, which included the majority of the valley, and therefore, the majority of the model domain. A small region at the contact of the younger- and older-alluvium formations was assigned a hydraulic conductivity (horizontal directions) of 500 ft/d to provide a transition zone. The vertical hydraulic conductivity was set equal to one-tenth of the horizontal hydraulic conductivity, thus, values were 90 ft/d, 3 ft/d, and 50 ft/d, respectively. The general distribution of hydraulic conductivity is also shown schematically on Figure 16.

Recharge to groundwater resulting from precipitation was also input as a spatially variable property. The recharge is known to vary due to variations in land use. The original and final infiltration rates used in the model were as follows:

Land Use	Original Recharge Rate	Calibrated Recharge Rate
Agricultural	21 in/yr	20 in/yr
Commercial/Industrial	5	4
Open	21	20
Residential	16	16
Residential + Septic	32	34

The calibrated recharge rates were determined by adjusting the original recharge rates (discussed below) to improve the fit of the model to field observations of groundwater elevation.

The McKenzie and Willamette Rivers were represented in the computer model. The Mill Race and recharge channel in the Willamette Wellfield were also represented. The river channel data were obtained primarily from cross-section data provided by FEMA in Washington, D.C. (c/o Baker Engineering, Inc.). The FEMA data consist of the river channel elevation at several points across the channel along a cross-section. Based on the cross-section data, which typically included 5 to 20 points, an average elevation was determined for the channel. Approximately 57 cross-sections were used to determine channel elevation at points along the rivers. Linear interpolation was used to estimate values at intermediate points.

A total of 29 pumping wells were represented in the groundwater computer model. The wells were located in the model based on a digital base map. The model layer from which the well withdrew groundwater was determined based on well construction logs, and generally coincided with the screened or perforated interval of the well. Many of the wells withdrew groundwater from more than one model layer. The well pumping rates were determined for each well based on meter data collected at the various wellfields. In cases due to intermittent use of a well, the annual average pumping rate was much smaller than the operating pumping rate. Consequently, to delineate

wellhead protection areas, a second larger pumping rate was determined based on the maximum capacity for the well, as limited by well construction and/or aquifer conditions.

Model calibration was completed by a manual trial-and-error procedure. Calibration is carried out to adjust the model input parameters in order to improve the fit of the model to actual observations in the aquifer. Model calibration parameters included hydraulic conductivity, areal infiltration rate, river bed conductance, and aquifer extent. During each calibration step, one or more of the calibration parameters is adjusted and the computer model is executed to generate a new simulation of the groundwater flow system. The results of the new simulation are evaluated statistically to determine the improved fit of the model to actual data. This procedure is repeated until the best fit is achieved.

An additional application of the model for the project consisted of determining the degree of wellfield hydraulic continuity with surface water. This analysis can be completed by using the model to calculate the leakage rate from surface water to groundwater in the wellfield areas. Based on this analysis, the following river leakage rates were determined, expressed as a percentage of the total wellfield production rate: Chase - 26%, I-5 - 0%, Maia/SP - 0%, Platt - 0%, Q Street - 0%, Thurston - 70%, Weyerhaeuser - 71%, and Willamette - 74%. Note these leakage rates apply to only the Willamette and McKenzie Rivers and do not include possible leakage from the Q Street Canal or Cedar Creek. Additional analyses were conducted to evaluate leakage from these smaller water bodies to the Q Street Well and the Platt Wells, respectively. These analyses determined the leakage was negligible.

WELLHEAD PROTECTION AREA DELINEATION

Wellhead protection areas (WHPAs) were determined for each of the wellfields under investigation. The wellhead protection areas were evaluated based on the groundwater time-of-travel. The zone of contribution (ZOC) to the wellfields was also determined.

Time-of-travel wellhead protection areas were determined for the 1-, 5-, 10-, and 20-year times-of-travel. The 1-year time-of-travel WHPA (or 1-year WHPA) encompasses an area within which the groundwater travel time to the well is less than 1 year. The 5-year WHPA encompasses an area within which the groundwater travel time to the well is less than 5-years, and so on. The zone of contribution for a well encompasses the entire recharge area to the well.

To determine WHPAs and ZOCs for the wellfields, the USGS program MODPATH was used along with the MODFLOW output for the calibrated groundwater flow model. The algorithm implemented by MODPATH consists of particle tracking. By this algorithm, hypothetical particles of groundwater are released into the groundwater flow system at the wells. The particles are then transported backwards from the wells according to the rates and directions of groundwater flow.

Plate 10 (reduced scale) presents WHPAs and ZOCs for each of the wellfields under investigation. There are a few items of note concerning the WHPAs and ZOCs:

- The ZOCs for the Thurston and Willamette Wellfields extend beyond the model boundary in the upstream directions. These results are noted on Plate 10. In both cases, it appears the majority (>90%) of the wellfield recharge comes from inside the model boundary;

- A large proportion of the recharge to the Thurston and Willamette Wellfields appears to come from the McKenzie and Willamette Rivers, respectively. Thus, although the WHPAs for these Wellfields cover moderately large land areas, most water entering the wellfields originates upstream in the watersheds of the respective rivers;

- WHPAs and ZOCs were developed using well pumping rates that are not currently realized in the wellfields. These pumping rates are based on planned uses of the wellfields during the next 20-year planning period. The pumping rates were determined based on the maximum capacities for the wellfields;

- In most cases, the WHPAs are projected onto ground surface and represent "horizontal" travel time to the well. For wellfields including mostly shallow wells, such as Thurston and Willamette, the results incorporate fewer projected time points. For wellfields including deeper wells, such as I-5, Maia/SP, Q Street, and Platt, time points were projected from greater depths in the aquifer; and

- Calculation of the WHPAs and ZOCs requires use of the aquifer effective porosity parameter. Both the younger alluvium and older alluvium formations were assigned effective porosity values of 0.25.

The WHPAs have an associated uncertainty due to uncertainties in the computer model input parameters. It is possible that different values for the model parameters could be used to achieve an equivalent model calibration. As a consequence, the WHPAs computed based on the model output may change in shape and size. It is noteworthy that making arbitrary changes in the model parameters as a means to assess WHPA sensitivity is invalid. Changes to parameter values must be made in a manner that achieves equal or better agreement between the simulated results and the calibration targets.

VULNERABILITY ASSESSMENT FOR THE I-5 AND Q STREET WELLS

The vulnerability assessment was completed for the I-5 and Q Street Wells. The scope of work for the vulnerability assessment included conducting a contaminant source inventory, reviewing and updating the pesticide use survey, identifying potential transportation-related hazards, conducting a relative risk assessment of potential

sources, and identifying potential ground water management strategies. The analysis focused on the 20-year time-of-travel wellhead protection area (WHPA).

The I-5 WHPA includes three land-use jurisdictions, the City of Springfield, the City of Eugene, and Lane County. Land use within the City of Springfield portion of the WHPA is predominantly single-family residential and commercial. Commercial areas exist primarily along Gateway Street near the Interstate 5 interchange. Limited industrial development is located along International Way. The portion of the WHPA within the City of Eugene and unincorporated Lane County is predominantly low density residential and agriculture. The Q Street WHPA lies entirely within the City of Springfield. Land use in this portion of the city is predominantly single-family residential. Commercial areas exist principally along Q Street.

Known and potential sources of contamination that exist within the WHPAs were identified by reviewing records and conducting a field survey. Data collection efforts focused on existing and historical land uses within the WHPAs. Data sources reviewed included approximately 16 environmental listings maintained by the US Environmental Protection Agency, Oregon Department of Environmental Quality, Oregon State Fire Marshal, Springfield and Eugene Fire Departments, and SUB (pesticide use survey).

Known contaminant releases in the WHPAs have been identified, but have not impacted water wells. Six facilities have recorded leaking underground storage tanks in the I-5 WHPA. Two facilities in the Q Street WHPA have recorded leaking underground storage tanks. The Office of State Fire Marshal also has records of two diesel spills along I-5.

Approximately 20 facilities exist in the I-5 and Q Street WHPAs (combined) that could be contaminant sources to groundwater and are therefore classified as potential contaminant sources. These facilities handle primarily gasoline in underground storage tanks, although a few facilities also handle paints and solvents. In addition to these facilities, right-of-way pesticide/herbicide usage and agricultural chemical applications (I-5 only) also are potential sources for groundwater contamination. In parts of the I-5 WHPA, the use of septic systems also is a potential source for groundwater contamination.

A source risk evaluation was conducted for the potential contaminant sources. The risk evaluation utilized a US EPA method to rate a source in terms of the risk for contamination to a water supply well. The method accounts for the manner in which chemicals are handled at the source, the quantities and rate of use, and the aquifer attenuation properties. The analysis results indicated the Q Street Well is at low risk of contamination. The I-5 Wellfield was determined to be at high risk due to the agricultural source and the single contaminant EDB. Without considering EDB, the I-5 Wellfield is at low risk. The risk levels apply only to contamination from those sources evaluated and are conditional on the assumptions that were used to complete the

analysis. As new sources are developed, or existing sources discovered, these results may change.

The potential management strategies presented in the report represent a moderate level of resource protection. They are intended to be implementable without severe disruption of existing land use activities or placement of significant burdens on source control agencies. More stringent measures, such as property acquisition, phase-in (out) zoning, or pesticide use prohibitions, may need to be considered depending upon the perceived level of risk associated with current or future land use activities and the communities acceptance or tolerance of risk. Based on the findings of the risk evaluation, the present level of risk appears to be low (with the exception of EDB), primarily due to the high percentage of residential land use area in the WHPAs.

The report presents management strategies for a variety of different sources including: 1) underground storage tanks; 2) hazardous materials storage and handling; 3) transportation related sources; 4) on-site waste disposal; 5) agricultural pesticide and fertilizer use; and 6) transportation and utility right-of-way spraying. These recommendations are summarized below.

Underground Storage Tanks:

1. RWD and SUB should collaborate with the Department of Environmental Quality concerning development of a notification system for new underground storage tank installations and modifications to existing underground storage tanks within the WHPAs.

2. RWD and SUB should consider initiating efforts to evaluate whether farm fuel and home heating oil tanks are present in sufficient numbers to warrant further action.

3. If home heating oil tanks are determined to represent a significant threat to ground water quality in the WHPAs, RWD and SUB should confer with the Springfield Fire and Life Safety Department regarding the potential and legal authority for instituting home heating oil tank permitting requirements.

4. RWD and SUB may wish to consider seeking amendments to the City of Springfield zoning code to preclude installation of underground chemical storage tanks within Wellhead Protection Areas of public water systems.

Hazardous Materials:

1. RWD and SUB should consider pursuing amendments to the City of Springfield zoning code to prevent or restrict the siting of additional facilities that use or store large quantities of hazardous materials within the WHPAs.

2. The City of Springfield should utilize "land use compatibility statements" as a means of ensuring that applicable new commercial and industrial developments will not create a significant risk of ground water contamination.

3. RWD and SUB could initiate aggressive educational programs aimed at disseminating information concerning proper commercial and household hazardous material use and storage and hazardous wastes disposal practices.

Transportation Hazards:

1. RWD and SUB should provide all spill response and incident command agencies with information concerning the location of the Wellhead Protection Areas and all wellheads. RWD and SUB should review with these respective agencies spill response measures that are appropriate for mitigation of groundwater contamination potential. RWD and SUB should continue to request that spill response and incident command agencies directly notify RWD and SUB when spills occur within the Wellhead Protection Areas. In addition, SUB should continue to map all reported spills indicating the spill date, material quantity, and remediation status.

2. RWD and SUB should consult with the Oregon Department of Transportation and the City of Springfield regarding the need for and feasibility of the installation of improved spill containment facilities along truck routes within the Wellhead Protection Areas.

On-site Sewage Disposal Systems:

1. RWD and SUB should confer with Lane County concerning the adequacy of the existing on-site sewage disposal system standards in protecting ground water quality in the vicinity of the I-5 Wellfield.

2. RWD and SUB should request that Lane County notify and consult with RWD and SUB regarding any proposed zoning changes or proposed land developments in the vicinity of the I-5 Wellfield.

Agricultural Chemical Applications:

1. RWD and SUB should coordinate with the Oregon State University Cooperative Extension Service and the Soil Conservation Service concerning recommendations for pesticide use on commercial farms in the I-5 Wellhead Protection Area. Cooperative Extension and the Soil Conservation Service should be requested to identify Best Management Practices for ground water protection and to attempt to incorporate those practices into conservation and management plans for farms within the Wellhead Protection Area. The Best Management Practices should be based on local conditions and stress non-

chemical means of pest control and/or selection of chemicals that represent a low risk of leaching.

2. RWD and SUB should review nitrogen fertilizer and EDB use in the I-5 Wellfield and request that Cooperative Extension and the Soil Conservation Service incorporate appropriate Best Management Practices into farm conservation and management plans. The nitrogen use practices should be specific to soils, growing season length, and rainfall patterns in the vicinity of the I-5 Wellfield.

Right-of-way Chemical Applications:

1. RWD and SUB should consult with the Southern Pacific Railway, transportation authorities, and local utilities concerning right-of-way spraying practices. These entities should be requested to substitute pesticides with low leaching potential and, where possible, to utilize mechanical or other non-chemical means of vegetation control within Wellhead Protection Areas.

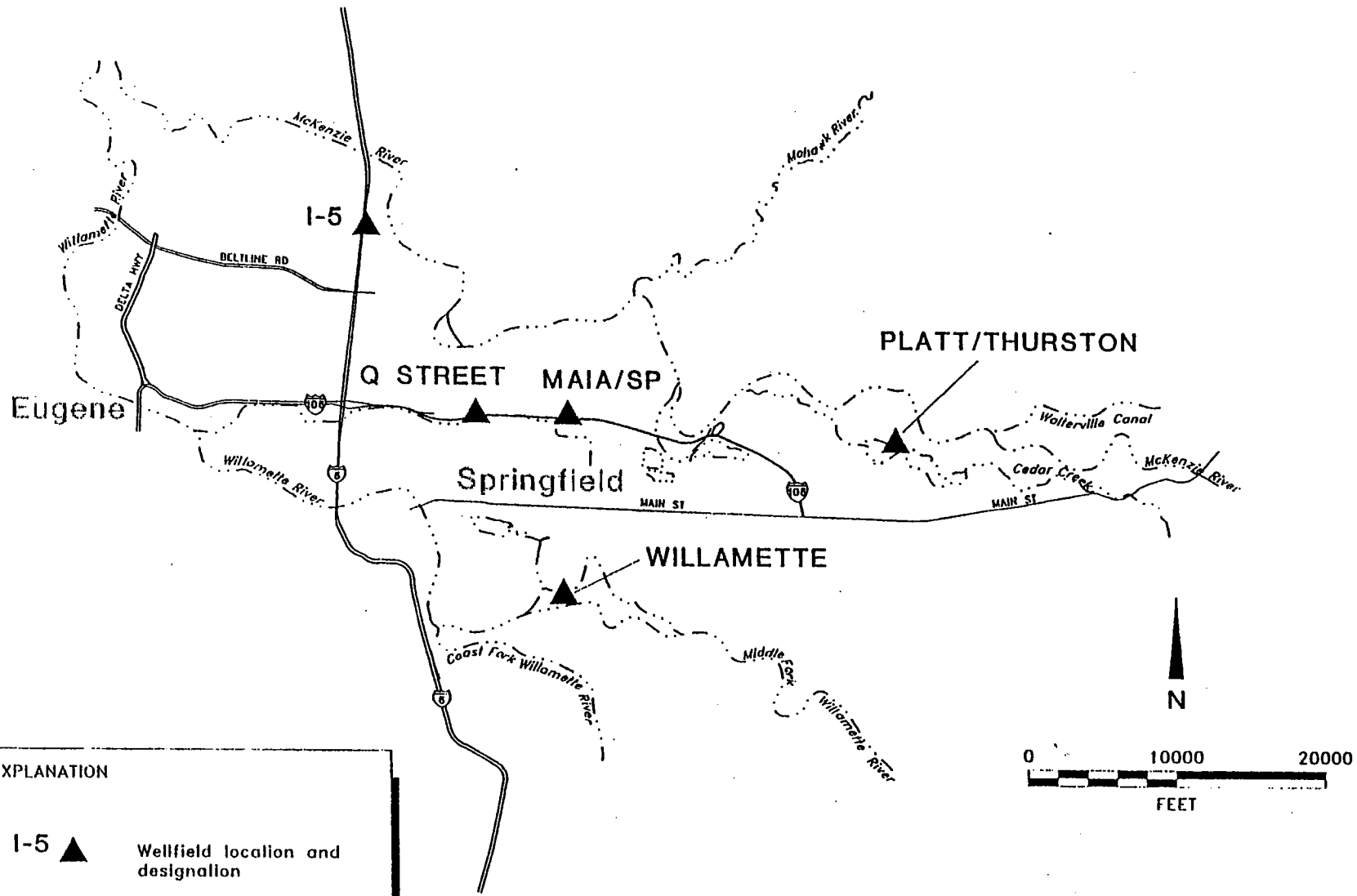

FIGURE 1
PROJECT AREA
SUB-RWD/WHPA-2/OR

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Golder Associates

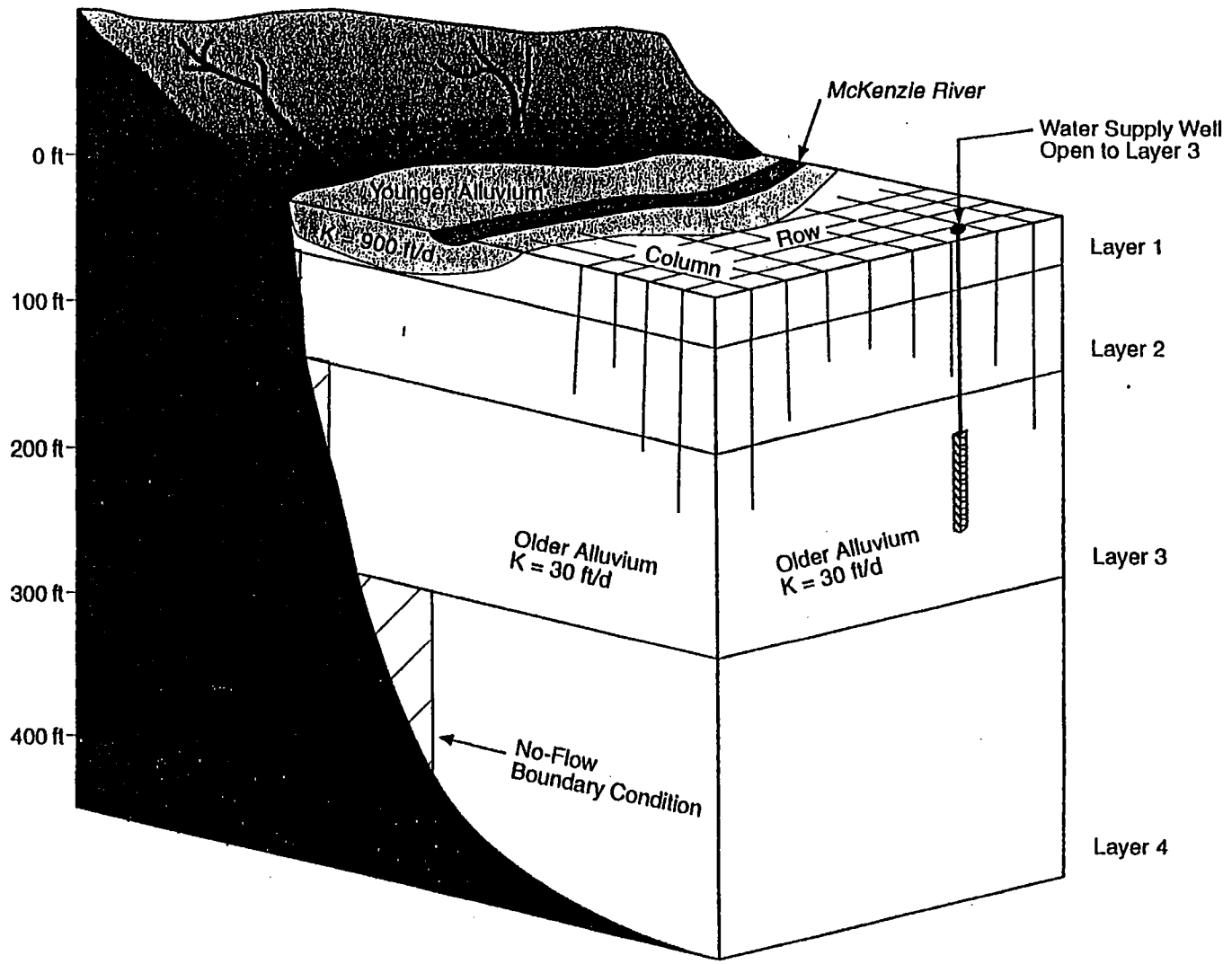

FIGURE 16
SCHEMATIC DRAWING OF MODEL SETUP
SUB-RWD/WHPA-2/OR

PROJECT NO. 943-1493.003 DRAWING NO. 40982 DATE 1/24/95 DRAWN BY TB

Golder Associates

Appendix C

Wellhead Protection Inventory Report
Van McKay, 9/17/96

If the original list was in paper format, the sites within the area were typed into an MS Word table or an Excel spreadsheet. If the original list was in electronic format (either floppy disc or email) the sites outside the study area were deleted.

The EPA sent latitude and longitude measurements for site locations. From a USGS map, latitude range of 122 degree and 50 minute to 123 degree and 5 minute, and longitude range of 44 degree and 1 minute to 44 degree and 7 minute was used to determine if the sites were outside or within the study area.

In some instances an original list contained sites with addresses and sites without addresses (for example, I-5 and Beltline). These lists were separated into different tables.

List Formats

Each list contains a header, a table with data, and a footer. The header contains the list's title and a definition of its data. Exception: on the hazardous material handler lists the header is on a cover sheet. Each table has columns of data and column headings that include:

- COUNT- a running total of sites
- ID_NUM- a unique identifying number for the site
- SITE_NAME- the facility or responsible party name
- H-NUMBER- the business or house number
- DIR- the street direction
- STREET- the name of the street
- TYPE- the type of street
- MAILCITY- the city where the facility is located
- ZIPCODE- the zip code for that address.

Exceptions on column headings: the EPA sent site locations in latitude and longitude measurements, and the State Fire Marshal did not have unique identifying numbers for sites. If enough room warranted, other columns of data were included that were specific for that type of list. These columns were not required for siting a contamination point on a map but were for informational purposes. For example, the Hazardous Material Handler list contains a column for chemicals. The footer contains the agency name, file name, and date.

Mapping the Sites

Part of the Wellhead Protection Inventory includes a map with all sites from the study area lists plotted on it. This part of the Inventory is to be performed by the City of Springfield and Brandt Mellick the probable draftsperson. Through several meetings with Brandt, an electronic list format was determined to help him plot the sites. This included the list's above bulleted column headings, a unique identifying number, the split addresses, the absence of characters that may be construed as delimiters (e.g., -), capitals, and saved in DBF 4 format.

Latitude and Longitude Map

Brandt Mellick requested that an outline map of the study area be made using latitude and longitude measurements for the corners. From the Cadastral Survey Department of the Bureau of Land Management in Portland, a listing of latitude and longitude measurements for section corners was obtained for all sections except those in Township 18. This listing is in both paper

and electronic format. A guide to using this database was included. From the Internet a copy of Corpscon and WUUDO applications are included to convert latitude and longitude measurements into x-y coordinates. The x-y coordinates will be easy to enter into AutoCad for creating the map. This map has not been created.

Next Step

The next step is to make overlaying maps of each type of site. For example, underground storage tanks will be on an overlay and hazardous material handlers will be on another overlay. Two floppy discs containing a lists of the Wellhead Protection Inventory are ready to be delivered to Brandt Mellick for map generation.

Any of the lists can be updated. Updates once every two years is satisfactory. An agency and contact person list for all Wellhead Protection Inventory lists is included. The contact list has agencies, contact persons, and dates that original lists were generated. Agencies can be contacted and reports generated of new entries since the last report was generated.

Appendix D

Well Log Study
1995 Wellhead Protection Area Project

Appendix D

Well Log Study
1995 Wellhead Protection Area Project

Executive Summary

The SUB Water Department has conducted a well log study that is part of the Wellhead Protection Area project. The boundaries of the study include the City of Springfield and its urban growth boundary, adjacent unincorporated Lane County, and a portion of the City of Eugene. Goals of this study were:

1. Obtain copies of well logs and groundwater rights of wells from Oregon Water Resources Department (OWRD)

2. Map wells cross-referenced with groundwater right application numbers

3. Have this information organized and available for quick and easy use by the Water Department.

4. Have written documentation on the study's use

The well log study resulted in a manual database composed of several parts. Well logs with corresponding water rights can be cross-referenced. From the well logs, maps, and WRIS reports, a variety of information can be found on each well. Listed below are the various parts of the data base:

1. OWRD Water Resource Information System (WRIS) report on groundwater rights

2. WRIS plat card report

3. Photocopies of original plat cards

4. Maps of wells with groundwater rights referenced

5. Photocopies of 1,212 water and 285 monitoring well logs. The 1,212 water well logs are sorted by section and identified by depth, yield legal location, and application number.

This study can be used as a resource for the following purposes:

- Refine Wellhead Protection Area delineations
- Evaluation of hydrogeology and groundwater aquifers in area
- Investigation of current and potential groundwater contamination
- Identify well locations to be used for contaminant testing
- Help determine viable new water supply well sites

- Monitor water levels with medium to large wells
- Identify water right owners and priority dates
- Detect high yield water wells
- Basis for future studies (presorted well logs will simplify this)

History and Need for Doing Study

It is important to have efficient and effective information to monitor groundwater. No information on wells in the Springfield area (except most of SUB's wells) was available in the Water Department. SUB needed to obtain groundwater information and summarize it to create a localized source of helpful data.

With this gathered data, SUB may investigate a "sole source aquifer" designated for the area and take other steps to protect its aquifer, to manage the aquifer to its best efficiency, and to protect the groundwater quality.

Other locations have taken similar steps to protect their municipal aquifer. For example, Ione, Heppner, and Lexington, Oregon have worked with OWRD to create a state classification within a five-mile radius of a municipal well. New wells in this radius are subject to OWRD approval, with consideration of public interest. Similar work is currently underway at several other locations in the state. These include Florence (with its dunal sole source aquifer), the wellhead protection areas of Portland and Boardman, and Coburg.

How the Study was Done

The following is a list of steps taken to complete the well log study:

1. Obtained copies of water well and monitoring well logs at OWRD (1/20/95), and copies of plat cards.
2. Ordered WRIS reports on wells with water rights (1/23/95), and plat cards.
3. Used Post-it flags to sort well logs by section and identify logs by groundwater right, depth, quality of lithologic data, and yield.
4. Placed well logs in three-ring binders and created title pages for each volume.
5. Examined USGS study for new wells.
6. Examined well logs housed at Lane County Water Masters office to find well logs the Salem OWRD may have lost.
7. Matched WRIS groundwater rights report with well logs.
8. Outlined study area on three base maps, one for each volume. The well area covered in each volume was outlined.
9. Mapped wells with groundwater rights using well log section and surveyor locations.
10. Wrote documentation for study.

Resources

At OWRD, photocopies of water well logs, monitoring well logs, and original plat cards were obtained. This was done at a self-serve photocopier in the basement of OWRD where the above originals and groundwater right certificates are found.

The area of study includes:

- 17S/1W, sections 29, 30, 31, 32
- 17S/2W, sections 19, 25-36
- 17S/3W, sections 9, 10, 14-16, 21-28, 33-36
- 18S/2W, sections 2-6
- 18S/3W, sections 1, 2

Computer generated reports were also ordered from OWRD. Kathy Geers, who is the Information Services Specialist, sent reports from the WRIS database. These reports included well groundwater rights, supplemental current owner list, and plat cards.

Water Well and Monitoring Well Logs

The study has four binders of well logs, three volumes of water wells, and one volume of monitoring wells. Well logs can be searched for a variety of information that may include owner, yield, construction date, driller, depth, etc.

Twelve hundred and twelve (1,212) water well logs were sorted and tagged using the following coding:

- Violet tags indicate wells under 50 feet
- Blue tags denote wells deeper than 50 feet
- Orange tags have the groundwater right application number for that well on them
- White tags are land section markers
- Red tags indicate high yield wells (a loose guideline of 100 GPM for 4 hours on pump tests was used)
- Green tags indicate wells with exact location.

The title page in each volume contains a color key. A subsort of wells with exact location but poor strata and wells with poor location but good strata was done. This will help in any further studies that map wells or examine their strata.

Two-hundred-eighty-five (285) monitoring well logs were tagged by section. Only the top page and map page (if available) were photocopied at OWRD. Many monitoring well logs had more than two pages, and most of this subsequent information was chemical analysis. No monitoring wells were mapped.

WRIS Groundwater Rights Report

The WRIS Groundwater Rights Report contains water right information on wells. The report is sorted by drainage and lists all information from original water right certificates including:

- Owner name and address
- Yield and priority date
- Well application, permit, and certificate numbers
- Intended use
- Legal and section location of well and place of usage

Note: The WRIS report is sorted by drainage. Sections are not sequential and some are repeated, making it is hard to find wells easily. The top page lists the order of sections. Also, the report includes extra wells (marked with an X) that are outside the study area and are of no use in this study.

OWRD does not have a link between a well's log and its groundwater right. This study has matched water well logs with corresponding WRIS groundwater rights. To verify the water right and well log were the same well, the applicant, application number, 1/4 section, and date were used. Not all WRIS well rights and well logs could be matched. Out of 135 water rights, 95 were matched (70 percent). Part of the reason OWRD well logs were not matched was because of poor information on well logs.

Plat Cards

Plat cards list the acreage of use from a well, and this is shown by 1/4-1/4 sections. Plat cards come in two forms; 1) photocopies of original plat cards and 2) a computer generated WRIS report. The WRIS report is not one document, but is in three sections. Plat cards note each well application number, and if granted, permit, and certificate numbers. Information on plat cards has minimal use for this study.

Maps

Each binder has a map of water wells with corresponding water rights. Water well logs matched with groundwater rights were mapped. The groundwater right application number was used as an identifier on the map. Using the application number and section number from the map, the well log can be easily found in the well log volume, and vice versa.

USGS Groundwater Site Inventory/GWSI Data Base Report

The USGS studied a sample of wells in the Lane County region (Lanewells groundwater site inventory), and the Water Department obtained a listing of these wells. This well database has most of the information found on an OWRD well log. Strata are missing from this report, although lithologic information can be obtained from the USGS. In addition, latitude and longitude measurements are given. Out of the 34 wells in the well log study area, 26 were matched with OWRD well logs, and

latitude/longitude measurements from the USGS report were added to well logs in this report. No extra well logs were found.

OWRD Well Log Data Base

OWRD is in the process of creating a database of their well logs. Since 1992, all well logs received have been entered into a database. Log entry before 1992 has been stopped due to budgetary and priority concerns, and not all Lane County wells have been entered.

A report of well logs can be obtained from OWRD in paper or diskette formats. The well log database can be sorted in three menu options of increasing information. The third and "complete" option has the data fields found in the table below (figure 1). Paper and diskette forms of this "complete option" database were received that contain Lane County well logs entered into the database. The OWRD data file template for a relational database was also obtained.

Since not all well logs in Lane County have been entered into this database, it currently has limited use. For updates on the well log study, a database report of recent well logs can be obtained, and this can be used to find and photocopy new well logs at OWRD.

WRD Info:	**Owners Info:**	**Type/Test Info:**
WRD Well #	Owner's Well #	Use
WM Dist. #	Owner's Name	Type of Work
Start Card	Owner's Address	Type of Well
Water Right ID		Depth First Found
Received Date	**Artesian Info:**	Static Level
	Artesian Flow Depth	Static Level Date
Well Location Info:	Artesian Flow	Pump Test
Location	Date	Yield
Tax Lot	Artesian Pressure	Drawdown
Lot	Date	Drill Stem
Block		Temperature
Subdivision	**Driller Info:**	Other Analysis
Street of Well	Company Job #	Depth Drilled Completed Depth
Legal Description	License #	Special Standards
	Driller's Name	Date Started
	Driller's Company	Completed Date

Figure 1

Recommendations

Well Identification

A major problem was how to devise a well identification system where a well found on a map could be quickly referenced to well logs (and vice-versa). Water right application numbers were used in this study. However, with the trend to geographic information system (GIS) mapping, it is recommended that

Appendix E

Springfield Utility Board
1992 Water Resource Division
Mandated Interim Water Curtailment Plan

Background:

1. On July 17, 1992, the Water Resources Division declared the State of Oregon is in a continuing drought.

2. The Water Resources Division mandated water curtailment plans be prepared for review and approval by the division.

3. Water Curtailment plans may be activated by the Springfield Utility Board or by the governor.

4. Drought emergencies have been declared in 13 counties, with all counties in the state qualifying for inclusion in this declaration.

5. Statewide precipitation for 1991-92 has ranged from 50-70 percent of normal.

6. Average statewide stream flow is significantly less than average with many streams setting new low flow records. Reservoirs throughout the state have dropped below 40 percent of normal average.

7. Stream flow, reservoirs, and precipitation are not expected to improve significantly before this winter.

Springfield Utility Board's Water Situation:

1. For Springfield Utility Board (SUB) and other similarly situated public water suppliers who are 100 percent groundwater supply, the impacts of this drought are minimized by recharge to groundwater from the McKenzie and Willamette Rivers. Both river flows have been augmented by waters held in reservoir storage. Minimum stream flow has provided necessary recharge to normalize aquifer levels to the wellfields.

2. Anticipated peak demand in SUB's east/west system is 14 MGD. Historical peak day for the north system is 4.2 MGD. Total anticipated peak day demand is 18.2 MGD.

3. SUB has 22 wells (does not include SP/MAIA) with a capacity of 12 MGD. Additionally, contractual arrangements with Rainbow Water District provide for an

additional water purchase of 6.25 MGD with the potential for additional amounts at significantly higher costs if Rainbow has a surplus. Total anticipated production capabilities are 18.25 MGD.

4. At the end of this summer, an evaluation will be made of the interactive water transfer capabilities of the water supply system to determine if additional water supply wells will be needed in the short-term to meet peak-day demands.

Potential Benefits of a Water Curtailment Plan:

1. In the event of the loss of a water supply source due to equipment failure or contamination, having a curtailment plan in place will allow Water Department personnel to activate policies in place to preserve drinking water quantities and fire fighting capabilities.

Conservation and Curtailment Measures Currently in Place:

1. SUB currently is involved with a voluntary water-by-the-numbers program that requests residents to irrigate outside landscaping on either the odd or even days of the month based on their address. This program was initiated to help shave off the peak during peak-day demand times. By minimizing the peak-day demand, we are able to postpone construction of new wells that would only be used during the few weeks during the year that these demands exist.

2. Additionally, SUB has printed numerous pamphlets to educate customers on the water conservation benefits of proper watering techniques for lawn and landscape maintenance. SUB has constructed xeriscape and lawn demonstration projects for customer education. Low-flow showerheads are being installed as part of a BPA energy conservation grant project.

Proposed Curtailment Stages and Activities:

Stage 1 Continuing Water Conservation:

Water conservation information will be continued on a year-round basis. Since landscape irrigation is the primary reason for peak summertime demands, a continued effort would be made to inform customers on proper irrigation practices.

Continue the water-by-the-numbers program starting on June 1 and ending in mid-September.

Curtailment Activities:

Bill stuffers, newspaper releases, newspaper articles, radio announcement, and television interviews.

Stage 2 Water Warning Status:

During long, hot spells when continuing demand, lowered water table conditions, or equipment malfunctions cause reservoir levels to drop below minimums established for fire fighting capabilities, a water warning status would be initiated by the Board or designated staff

Curtailment Activities:

Increase the public notification by newspaper, radio, and TV announcement. Strongly request that all lawn and garden watering be done in late evening and early morning hours in conjunction with the water-by-the-numbers program.

Stage 3 Critical Water Warning Status

A critical water warning status would be activated by the Board or designated staff when reservoir levels and water pressure continue to drop below the established fire fighting minimums or when equipment failure emergencies create a situation where demands could not be met. Long periods of weather above 95 degrees, with a forecast of hot dry weather, catastrophic equipment failure, or multiple groundwater contaminations may create a situation that would put the utility in this critical status.

Curtailment Activities:

Restrict all non-essential water use by:

A. No watering of established lawn/turf.

B. No wasting running water such as unattended hoses, hoses without shutoff nozzles, obvious leaks, etc.

C. No hosing/washing of sidewalks, patios, parking lots, driveways, streets, etc.

D. No non-recirculating ornamental fountains or ponds.

Enforcement and Implementation:

In addition to the curtailment activities previously identified, the Board will
establish escalating service charges to deter those customers whom, after one written warning, continue to disregard the required curtailment activities. BOARD NOTE: Rainbow Water District has addressed the Stage 4 Water Emergency Status by providing for two written warnings and then water termination on the third violation of water user restrictions.

Stage 4 Water Emergency Status

A water emergency status would be activated by the Board or designated staff when long-term inability to meet customer demands are anticipated.

This could be brought on by long periods of weather above 95 degrees with the continued forecast of hot dry weather, when reservoir levels and water pressure have required that the utility valve off reservoirs to maintain emergency fire fighting capabilities, catastrophic equipment failure, or multiple groundwater contaminations.

Curtailment Activities:

Enforce restriction on all essential water use by:

A. No watering of established lawn/turf

B. No wasting running water such as unattended hoses, hoses without shutoff nozzles, obvious leaks, etc.

C. No hosing/washing of sidewalks, patios, parking lots, driveways, public streets, etc.

D. No non-recirculating ornamental fountains or ponds.

Enforcement and Implementation:

All previously identified curtailment activities in force will be escalated commensurate with the identified emergency. In addition, the following steps may be taken:

1. Water service termination to replace fines after one written warning is issued.

2. A priority list for reduced water use will be established for public, commercial, and industrial customers.

    a. Customers will be required to reduce consumption. Customer classes and specific customers within a class will receive an allocation of water. Exceeding allocation will result in termination. An appeals process will be established to allow customer challenges to the water allocation or termination.

    b. A prioritized customer list will be established for continuance of necessary service. Maintaining service to the hospital will be a high priority. Low priority would be customers who refused to comply with the mandated conservation measures.

3. SUB will work with their regional water supply partners to assist if emergencies exist within their service areas and will require districts taking water from the SUB system to comply with the measure listed.

SUB's Water Master Planning Update:

This interim water curtailment plan is being provided to meet the requirements of the July 17, 1992, Water Resources Division mandate for curtailment plans to be submitted by August 31, 1992. The Springfield Utility Board Water Department is in the process of updating the Master Plan to include a comprehensive water management plan that addresses water conservation, curtailment planning, and water resource projections for 50 years into the future. When the Master Plan is adopted, the provisions of the curtailment plan will replace this interim process.

Appendix F

1998 Wellhead Protection Inventory Update Report

Appendix F

1998 Wellhead Protection Inventory Update Report

Background

In 1995, the Environmental Protection Agency (EPA) certified Oregon's Wellhead Protection Program; a voluntary program developed to meet requirements of the Safe Drinking Water Act (SDWA). Oregon's Wellhead Protection Program includes a state certification process for local jurisdictions that develop plans. The Department of Environmental Quality (DEQ) and the Oregon Health Division (OHD) Administrative Rules provide the framework for developing a drinking water protection program leading to this certification. The DEQ and OHD developed a guidance manual, *Oregon's Wellhead Protection Program Guidance Manual,* to assist local communities in following these rules and preparing a drinking water protection plan.

The following report is specifically about Springfield Utility Board's (SUB) update to the 1996 Inventory of Potential Contaminant Sources, which is being completed as part of the certification application. *Oregon's Wellhead Protection Program Guidance Manual* (pg. 3-38) describes the methodology for accomplishing the inventory of potential sources:

- Develop a detailed base map of the delineated area
- Collect existing sources of information
- Divide the wellhead protection area into different land uses
- Prepare an inventory form
- Conduct a windshield survey and plot the existing data
- Rank the estimated risks or threats

The following report will detail the steps involved in developing a detailed base map of the delineated area and collecting existing sources of information.

Collecting Information and Developing a Map (1996)

In September of 1996, SUB Water Department prepared an inventory of potential contaminant sources. The *Wellhead Protection Inventory* compiled lists from the DEQ, the State Fire Marshal, and the EPA on underground storage tanks, leaks, spills, solid waste facilities, hazardous material handlers and hazardous material generators. This fulfilled the requirement of the inventory of potential contaminant sources to include 1) past practices, which may have resulted in a potential threat to the groundwater; 2) potential sources of contamination presently existing; and 3) potential sources, which may exist in the future. This information was recorded in the *Wellhead Protection Inventory.* The original data from the DEQ, State Fire Marshal, and the EPA was kept in a separate binder called *Wellhead Protection Inventory Appendices.* Additionally, the lists were saved as Microsoft Excel files on a floppy disk and included in the report binder.

Once the *Wellhead Protection Inventory* was completed, the lists were used to create a map of the wellhead protection area with listed sites designated on the map with symbols. The University of Oregon's Infographics Department created the Wellhead Protection Area Map

using the Land Council of Government's base maps, delineations from SUB's consultants, and the inventory in a bias relief format for use and display.

Updating Information and Map (1998)

Although the DEQ recommends the Wellhead Protection Inventory be updated every five years, SUB Water Department decided that an update should be performed every two years. This update involved collecting current information and updating the Wellhead Protection Map developed in 1996. The 1998 update will be used in SUB's Wellhead Protection Plan certification application. The update is also useful as an aid in on-site work with different businesses that use large volumes of chemicals and Dense Non-Aqueous Phase Liquids (DNAPL).

To begin the update, Ben Zublin, a Work Study Student from Lane Community College, obtained updated lists from the DEQ, the State Fire Marshal, and the EPA. He contacted these agencies using the *SUB Wellhead Protection Inventory Lists and Contact Persons* sheet developed in the1996 *Wellhead Protection Inventory Report.*

Ben reviewed these original lists and remove sites outside the study area and sites that were previously recorded. Thus, the 1998 lists contain only the updated information, and not a compilation of the 1996 lists and the updates. Elizabeth Barg, a temporary worker at SUB, created the following lists from the data that Ben had obtained and edited:

1. Underground Storage Tanks
2. Leaking Underground Storage Tanks Addressed sites
3. Leaking Underground Storage Tanks Non-addressed sites
4. Petroleum Releases Addressed sites
5. Petroleum Releases Non-addressed sites
6. Underground Storage Tank Cleanup List Addressed sites
7. Underground Storage Tank Cleanup List Non-addressed sites
8. Registered Hazardous Waste Generators Addressed sites
9. Registered Hazardous Waste Generators Non-addressed sites
10. Spills Addressed sites
11. Spills Non-addressed sites
12. Environmental Cleanup Sites Addressed sites
13. Environmental Cleanup Sites Non-addressed sites
14. New Solid Waste Facilities
15. Closed Solid Waste Facilities
16. State Fire Marshal:
17. Hazardous Material Handlers (single entries of companies)
18. Hazardous Material Handlers (all chemical entries)
19. Hazardous Material Handlers (no longer registered)
20. Hazardous Material Incidents Addressed sites
21. Hazardous Material Incidents Non-addressed sites
22. Superfund Sites
23. Toxic Releases

24. Discharging Facilities

This information was recorded in the *1998 Wellhead Protection Inventory.* Additionally, the lists were saved as Microsoft Excel files on a floppy disk (included in the report binder) and on hard disk at S:/chuckd/wellhead/Inventory/Update 98. The original data from the DEQ, State Fire Marshal, and the EPA was kept in a separate binder called *1998 Wellhead Protection Inventory Appendices.* Included in this binder was digital data from the State Fire Marshal and the Portland Office of the DEQ. These floppy disks were attached to the dividers labeled *State Fire Marshal* and *Solid Waste Facilities.*

Once the *1998 Wellhead Protection Inventory* was completed, the lists were used to update the wellhead protection area map. Andrea Soule, working as a GIS specialist with the City of Springfield, added the updated list information to the map layers.

Appendix G

1998 Inventory of Potential Sources: Windshield Survey Report

Appendix G

1998 Inventory of Potential Sources: Windshield Survey Report

Background

In 1995, the Environmental Protection Agency (EPA) certified Oregon's Wellhead Protection Program; a voluntary program developed to meet requirements of the Safe Drinking Water Act (SDWA). Oregon's Wellhead Protection Program includes a state certification process for local jurisdictions that develop plans. The Department of Environmental Quality (DEQ) and the Oregon Health Division (OHD) Administrative Rules provide the framework for developing a drinking water protection program leading to this certification. The DEQ and OHD developed a guidance manual, *Oregon's Wellhead Protection Program Guidance Manual,* to assist local communities in following these rules and preparing a drinking water protection plan.

The following report is specifically about Springfield Utility Board's (SUB) Windshield Survey Portion of the Inventory of Potential Contaminant Sources, which was completed as part of the certification application. *Oregon's Wellhead Protection Program Guidance Manual* (pg. 3-38) describes the methodology for accomplishing the inventory of potential sources:

- Develop a detailed base map of the delineated area
- Collect existing sources of information
- Divide the wellhead protection area into different land uses
- Prepare an inventory form
- Conduct a windshield survey and plot the existing data
- Rank the estimated risks or threats

The following report will detail the steps involved in dividing the wellhead protection area into different land uses, preparing an inventory form, conducting the windshield survey, plotting the existing data, and ranking the estimated risks or threats.

Dividing the wellhead protection area into different and uses

A layer of the Wellhead Protection Area Map, developed by the University of Oregon's Infographics Department for the 1996 Wellhead Protection Inventory, was used to create a land use map. The map showed the following details:

- Wells
- Incident locations (from 1996 Wellhead Protection Inventory)
- Zones of Contribution (1 year Time of Travel (TOT), 5 year TOT, and 10 year TOT)
- Zoning (Industrial Commercial Residential, Public Lands and Open Spaces)
- Springfield City Limit
- Urban Growth Boundary

- Tax Lot Lines
- Township/Section/Range

Preparing Inventory Form

An inventory form is used during the windshield survey to record information on potential sources of contamination. SUB developed an inventory form adapted from the DEQ's Form 3-1: Wellhead Protection Inventory Form (*Oregon's Wellhead Protection Program Guidance Manual*, pg.3-42 & 3-43). The form was adapted to more adequately address local land use conditions.

SUB's Wellhead Protection Inventory form had fields for site identification (wellhead area and business name and address), TOT zone, risk level, possible Dense Non-Aqueous Phase Liquids (DNAPLs), site activities, State Fire Marshal Inventory confirmation, contamination history, and comments/observations (see Appendix A). A copy of the inventory form can be found at S:\schuckd\wellhead\invenfrm.wpd.

Windshield Survey

The windshield survey involved driving through the seven wellfield areas filling out an inventory form for each business located within commercial or industrial areas. Locations of potential contamination sources identified in the 1996 *Wellhead Protection Inventory* were checked to assure map accuracy. Laura White, Chris O'Brian, and Elizabeth Barg performed the surveys.

In the field, the surveyors had with them:

- **The 1996 *Wellhead Protection Inventory***
  The 1996 Inventory was used to check map accuracy in displaying site incidents and locations. DEQ, State Fire Marshal and EPA identification numbers for site incidents were copied from the inventory to the survey form.
- **Eugene/Springfield phone book**
  The phone book was used to find address of business that displayed a name but no visible address number. The Internet or a cross-reference phone book were used to find business names when a address number was visible, but no name.
- **Table 3-2- Potential Sources of Groundwater Contaminants** (*Oregon's Wellhead Protection Program Guidance Manual*, pg. 3-33 – 3-37) (see Appendix B)
  In some cases, potential sources of groundwater contaminants were listed on the survey form. When potential sources where listed, they were identified as "DEQ's Guidance Manual Potential Sources" and a page number was listed.
- **Table 3-3: Ranking the Potential Contaminant Sources** (*Oregon's Wellhead Protection Program Guidance Manual*, pg. 3-45 & 3-46) (see Appendix C)
  Table 3-3 was used to rank potential contaminant sources.

- **The map that divided the wellhead protection area into different land uses**
  The map was used to locate commercial and industrial areas within the wellfield, as well as incident sites. It was also updated for address numbers and incident locations.

Description of Wellfield Areas:

Sportsway:
This wellfield area is comprised of an even mix of commercial, industrial, and residential zoning within the 1 to 10-year TOT.

Q Street:
The northwestern section of the 1 to 10-year TOT is in commercial use. There is one lot in the southeast section of the 10-year TOT that is zoned commercial. Also, a section of a lot zoned as public land borders the 10-year TOT delineation line. The remainder of the wellfield is in residential use.

MAIA/SP:
This wellfield area is comprised of large areas of industrial and commercial lots within the 1 to 10-year TOT. There are pockets of land in residential use.

Weyerhaeuser:
The western end of wellfield has a large area of industrial zoning in 1 to 5- year TOT. The eastern edge is zoned for residential and some public lands. The McKenzie River flows through the western corner of the wellfield.

Willamette:
There is a small commercial area located in the 5 year TOT. The northern section of the 5 to 10-year TOT is in residential use. The Middle Fork of the Willamette River flows through the southern portion of the wellfield.

Chase:
One lot of commercial property is located in the 10 year TOT. Remainder of the area is in residential use. The McKenzie River flows through northwest corner of wellfield.

Thurston:
Small southwest corner of wellfield is zoned residential, while western edge is zoned for public lands and open space. The McKenzie River flows through northern section of wellfield. There are no commercial or industrial areas in the Thurston Wellfield, therefore, there are no survey completed for the Thurston Wellfield.

Plotting Data

The map taken into the field was marked with corrections or additions to accurately display business addresses and incident locations. Once the survey was complete, the maps were given to Andrea Soule, at the City of Springfield, for updating. The updates

to the map were a benefit both to the inventory update as well as the City of Springfield, as they were able to verify the accuracy of their base map.

Ranking the estimated risks or threats

Determining which potential contamination sources pose the greatest threat is the last step in the inventory process. Surveyors classified potential sources into general risk categories using Table 3-3: Ranking the Potential Contaminant Sources (*Oregon's Wellhead Protection Program Guidance Manual,* pg.3-45 & 3-46) (see Appendix C). Table 3-3 provides a list of potential contaminant sources in higher, moderate, and lower risk categories.

Appendix H

Oregon Department of Environmental Quality, Western Region Information Directory

Appendix H

Oregon Department of Environmental Quality, Western Region Information Directory

Steve Greenwood	WR Administrator
COOS BAY OFFICE	(541) 269-2721
Martin Abts/22	AQ/Open burning, water shed & stream restoration WQ/Monitoring, ACDP inspections/compliance, complaint investigation
Pam Blake/27	WQ/Coos Bay Toxic Study. Water shed council support & stream shipyard BMP, dredging 401 Certifications and contaminated sediments
Del Cline/25	WQ/On-site, General WPCF On-site permits
Ruben Kretzschmar/23	WQ/Municipal/Industrial permitting/Large on-site permitting/Ship yard permits and inspection
Geri Sledd/0	WQ/On-site, general clerical support, Office Administration
EUGENE OFFICE	(541) 686-7838
Steve Greenwood/224	WR Administrator
Dena Burian/231	Administrative Assistant to WR Administrator/PSR
Jennifer Boudin/235	WR Public Affairs Representative
Mark Richardson/222	Office Coordinator/General Office Support
Sara Schwake/221	Office Specialist/General Office Support
WATER QUALITY	
Gary Arnold/247	Regional TMDL Permit Specialist, NPS Pollution in Bear Creek, Surface Water Monitoring and Stream Biology, Team leader for Governor's Coastal Salmon Restoration Initiative for the Rogue Basin.

Barbara Burton/225	Manager for WQ North, WQ permit manager for WR
Julie Berndt/234	NPDES domestic discharges (minor) for Lane, Linn, Benton counties. Complaints for Lane County
Francis Dzata/238	Municipal finance program, project engineer seven county area, engineering review of pump stations for region
Joe Edney/237	Municipal finance program, project officer seven county area Phyto-Remidiation Coordinator, Wetland Coordinator for WR, handle all SRF program for the 10 counties in WR
Jaime Isaza/233	Municipal finance program, project officer seven county area, handle all SRF program for the 10 counties in WR
Daryl Johnson/256	On-site/Large System WPCF
Bobbi Lindberg/242	Watershed and stream restoration, Coastal Nonpoint Program
Bill Perry/236	Minor Industrial discharges, Lane, Linn, and Benton counties; complaints in Benton and Linn county; technical permit reviewer for WPCF Industrial permits. Washwater permits, General Permits for Linn, Lane and Benton counties
Randy Trox/230	Holding Tanks/WPCF/On-site

TANKS

Merlyn Hough/227	WR Tanks Manager
Dave Belyea/232	Cleanup/Compliance

ENVIRONMENTAL CLEANUP PROGRAM

Kerri Nelson/226	WR Cleanup Program Manager
Greg Aitken/252	Cleanup Program, Project Manager, Hydrogeologist
Keith Andersen/246	Cleanup Program, Project Manager; Voluntary Cleanup Program Representative
Dena Burian/231	Administrative Assistant to Cleanup Program

Matt Clouse/241	Cleanup Program, Technical and Field Support
Marilyn Daniel/239	Cleanup Program, Project Manager
Bill Mason/257	Cleanup Program, Project Manager, Hydrogeologist
Mike McCann/253	Cleanup Program, Project Engineer, WR Cleanup program Brownfield's Coordinator
Karl Morgenstern/255	Cleanup Program, Project Manager
Randy Ogg/254	Cleanup Program. Project Manager
Norman Read/240	Cleanup Program, Project Manager, Hydrogeologist
Max Rosenberg/228	Cleanup Program, Project Manager, Hydrogeologist
Jared Rubin/261	Cleanup Program, Project Manager, Toxicologist
Michele Shupe/259	Cleanup Program, Project Manager, Project Engineer

SPILL PROGRAM FOR WR

Mike Szerlog/262	Spill Program Coordinator

GRANTS PASS OFFICE (541) 471-2850

Terri Easter/22	Office Specialist/WQ On-site
Rick Blake/23	Environmental Specialist/WQ On-site
Sherry Brierty/21	Office Coordinator/WQ-On-site
Chuck Costanzo/24	Lead Worker/Environmental Specialist/WQ-On-site
Wayne Kauzlarich/25	Environmental Specialist/WQ On-site

MEDFORD OFFICE (541) 776-6010

Dana Bailey/0	Reception/AQ & WQ support/complaints intake
Mari Belsky/233	Reception/Tanks & WMC support/complaints intake

AIR QUALITY

John Becker/224	Air Quality Manager
Robert Durham/256	ACDP source compliance/permits, TA, complaints/syn minor permits/compliance/NESHAP/HAP TV/Open burning
Byron Peterson/229	
Tom Peterson/247	TV Major source, Pulp/Paper, chemical, PSD/NSR
Kenan Smith/225	TV Permits/compliance, CEM, LAN Admin
Keith Tong/238	Asbestos Compliance, TA, Oxy-fuels TA/compliance

ENVIRONMENTAL CLEANUP PROGRAM

HAZARDOUS/SOLID WASTE SECTION

Audrey Eldridge/223	Hydrogeologist
Bob Guerra/236	Solid Waste Compliance/Technical Assistance/deals with waste tire program and waste tire carriers for the entire state
Rai Peterson/232	Inspector

TANKS

Claudia Johansen/228	Cleanup/Compliance
Eric Clough/249	Cleanup Compliance

WATER QUALITY

Dennis Belsky/226	WQ Manager
Jon Gasik/230	Municipal/Industrial Permitting/compliance/plan review
Andy Ullrich/246	Stormwater and Washwater Permitting/compliance
John Blanchard/240	

ROSEBURG OFFICE	(541) 440-3338
Greg Farrell/227	WQ-On-site Manager
Carole Charette/221	WQ-On-site general clerical support, program tracking
Paul Heberling/224	WQ-On-site, Variance Officer, General WPCF On-site Permits, Contract County Oversight
Paul Kennedy/228	WQ/Municipal/industrial, Biosolids/Large On-site permitting/compliance
Mike Kucinski/235	WQ-On-site direct service
Marilyn Lindsay/222	WQ/On-site general clerical support, office administration
David Livengood/230	HW/TA
Nick McKibbin/229	WQ/Municipal/Industrial Large On-site/permitting/compliance
Steve Nichols/234	Cleanup Program, Site Assessment Project Manager

SALEM OFFICE	(503) 378-8240
Jennifer Claussen/0	General Office Support
Pauline Harms/222	General Office Support
Samantha Schaffer/223/281	General Office Support/WQ Permits
Ken Thomas/274	WR LAN Administrator

AIR QUALITY DIVISION

Gary Messer/229	AQ Manager
Gary Andes/234	Title V Sources/VOC Lead
Dottie Boyd/272	Field Burning, Stage 1 Vapor & Oxyfuel Permits for Marion, Polk and Yamhill counties, handles minimal and regular ACDP permit compliance for Boilers and Bulk Gasoline Plants

Jim Boylan/243	Title V Sources, Wood products, Incinerators, Source Testing backup
Steve Crane/254	Field Burning Program, Title V Source Tester
Claudia Davis/257	Open Burning Program, Agriculture Sources, Crematoria
Patty Hamman/225	Regional AQ permit coordinator/all related databases, maintains AQ database for master source list, inspections, compliance tracking, enforcement and NCs
Barbara Michels/231	Regular and Synthetic Minor ACDP Compliance; wood products; VOC emitters
Ali Nikukar/255	Remote location

WASTE MANAGEMENT AND CLEANUP DIVISION

HAZARDOUS WASTE SECTION

Gil Hargreaves/227	HW Manager
Jim Billings/265	TSDF Compliance/Permitting
John Borden/245	TSDF Compliance/Permitting
Bart Collinsworth/253	Tech Assistance
Joe Petrovich/248	TSDF Compliance/Permitting
Dave Rozell/258	Toxic Use Reduction
John Taylor/230	Generator Compliance Inspector
Cheryll Parr/237	Generator Compliance Inspector

SOLID WASTE SECTION

Chuck Donaldson/266	SW Manager

Felica Sonnenschein/252	Permit Coordinator for NWR/WR, Assistant to Solid Waste Manager
Bob Barrows/269	Waste Reduction/Technical Assistance
Bruce Dessellier/267	Hydrogeologist
Tom Fisher/236	Inspection/Complaint Response/Small Permits
Nancy Sawka/262	Hydrogeologist

NWR SOLID WASTE STAFF

Tim Spencer	(503) 229-5826	Engineer
Ernie Schmidt	(503) 229-5157	Engineer
Fred Bromfield	(503) 229-6210	Engineer/Waste Tire Storage Permits
Monty Morshed	(503) 229-5585	Engineer
Greg Dahmen	(503) 229-5108	Engineer

UNDERGROUND STORAGE TANKS PROGRAM

Ginny Deck//251 378-3684 TTY/V	Interpreter/Support Staff/process UST Decommissioning for Salem and Medford
Virginia Esmond/ (503) 684-1577 TTY/V (503) 624-6451 FAX (503) 378-3684 SALEM TTY/V	Cleanup
Jim Glass/249	UST Cleanup & Compliance
Jim Parr/242	Compliance/Cleanup
Bruce Scherzinger/244	Cleanup/Lead Worker

WATER QUALITY DIVISION

Barbara Burton/264	Water Quality Manager

Jack Arendt/240	Hydrogeologist, WQ/NPDES and WPCF, Industrial and Domestic permitted for 12 counties in WR, review all mining related issues for the state
Robert Dicksa/246	NPDES domestic discharges (minor) for Lincoln, Yamhill, Polk, and Marion counties. Complaints for Lincoln, Yamhill, Polk and Marion counties
Tom Fisher/236	Industrial Permits including general permits (minor) for Marion/Polk/Yamhill/Lincoln Counties; Large Food Processors Biosolids for seven county area
Rick Kepler/277	Special Groundwater studies, assisting/participating in Watershed teams
Linda Fry/238	WQ/Individual Permit Clerk, process/issue permits for Industrial permits
Mark Hamlin/239	Major Domestic dischargers, seven county area, Lead Worker, domestic discharge source staff Salem/Eugene
Tim McFetridge/235	Major industrial dischargers, seven county area, industrial plan review for seven county area, technical permit reviewer for NPDES industrial permits, Lead Worker, industrial/stormwater source staff/Municipal Engineering plan review for IW Waste Water
Raghu Namburi/233	1300-J and Stormwater Industrial & Construction permits
Don Yon/247	Willamette River Basin Coordinator/staff to Governor's Willamette River Basin Task Force/Staff to DEQ's Willamette River Basin's Technical Advisory Steering Committee/DEQ's Basin Coordinator for TMDL's

Appendix I

Maps