APPENDIX H
Source Water Assessment Report

SOURCE WATER ASSESSMENT REPORT

City of Stanfield
Stanfield, Oregon
PWS #4100842

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DRINKING WATER PROGRAM

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Prepared

by

Oregon Department of Human Services
Health Services
Drinking Water Program

and

Oregon Department of Environmental Quality
Water Quality Division
Drinking Water Protection Program

Available in Alternate Formats by contacting the DHS DWP at (541) 726-2587

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Summary

The Source Water Assessment Program, mandated by the 1996 Amendments to the Safe Drinking Water Act, requires that states provide the information needed by public water systems to develop drinking water protection plans if they choose. The information that is provided includes the identification of the area most critical to maintaining safe drinking water, i.e., the Drinking Water Protection Area, an inventory of potential sources of contaminants within the Drinking Water Protection Area, and an assessment of the relative threat that these potential sources pose to the water system.

This report identifies the Drinking Water Protection Area for the City of Stanfield as the area at the surface that overlies that part of the aquifer that supplies groundwater to the wells. ***The Columbia River Basalt aquifer most likely supplies the drinking water to the system. It is a confined layered basalt aquifer with a water-bearing zones between 290 and 1161 feet below the surface. The Main Well (#3) and the Emergency Well (#4) have construction logs which are included in Appendix D.***

The aquifer supplying the wells is considered highly sensitive based on the presence of elevated nitrate and the lack of specific casing seal construction information for the primary well. Thirty-three other wells occur in the section containing the system's wells and do not pose a significant risk to the system.

The primary intent of this inventory is to identify and locate significant potential sources of contaminants of concern within the City of Stanfield's drinking water protection area. The inventory was conducted by reviewing applicable state and federal regulatory databases and land use maps, interviewing persons knowledgeable of the area, and conducting a windshield survey by driving through the drinking water protection area to field locate and verify as many of the potential contaminant source activities as possible. It is important to remember the sites and areas identified are only <u>potential</u> sources of contamination to the drinking water. Environmental contamination is not likely to occur when contaminants are used and managed properly.

The delineated drinking water protection area for both of the wells is primarily occupied by residential and commercial land uses within the City of Stanfield. Some irrigated cropland is also present in the vicinity of Well #4 (located near Locust Street). A total of seven potential contaminant sources were identified within in the two-year TOT zones for both wells and include: a historic gas station, a RV Park, an abandoned well, the state highway, the railroad, the high density housing areas, and areas with sewer lines in close proximity to the wells. Eleven potential contaminant sources were identified in the area between the two-year TOT and the ten-year TOT for both of the wells. Municipal/residential sources of potential

contamination include the City drywells for stormwater disposal, the sewage treatment plant, a land application site, the city maintenance shop, the fire station, high-density residential areas, and private wells in the residential areas. Other potential sources include a manufacturing facility and irrigated crops. The transportation corridors (highway and railroad) and residential areas extend from the two-year TOT into the five-year and ten-year TOT zones. The potential contaminant sources all have relatively higher to moderate risk rankings with the exception of the RV park and fire station, which present a lower risk to the drinking water supply.

The size of the Drinking Water Protection Area is designed to approximate the next 10 years of groundwater supply for the City of Stanfield. The two year time-of-travel zone shown on the map is used as a conservative estimate of the survival time of some viruses in groundwater. There are sources of virus present within the two year time-of-travel, and the source is considered highly sensitive. Therefore, the drinking water source is susceptible to viral contamination.

The costs associated with contaminated drinking water are high. Developing an approach to protecting that resource will reduce the risks of a contamination event occurring. In this report, we have summarized the local geology and well construction issues as they pertain to the quality of your drinking water source. We have identified the area we believe to be most critical to preserving your water quality (the Drinking Water Protection Area) and have identified potential sources of contamination within that area. In addition, we provide you with recommendations, i.e., BMPS, regarding the proper use and practices associated with those potential contamination sources. We believe public awareness is a powerful tool for protecting drinking water. The information in this report will help you increase public awareness about the relationship between land use activities and drinking water quality.

1. City of Stanfield: Source Water Assessment Report

1.1 Introduction and Overview

Traditionally, water systems have relied on proper water system management, water quality monitoring and, if necessary, water treatment to ensure that the water they serve meets drinking water standards. In spite of the best of these efforts, contamination of drinking water still occurs. The costs, both tangible and intangible, to a water system contending with a contaminated water supply are significant. At minimum, there is the cost of increased monitoring that will be required to make certain that the water does not pose a significant health risk. At contaminant concentrations exceeding a drinking water standard, the system may be dealing with the cost of installing and maintaining treatment, the loss of the drinking water source, i.e., a well, and most assuredly, a concerned and often frightened public.

Beginning with the 1986 Amendments to the Safe Drinking Water Act, an additional "barrier to contamination" was recognized at the federal level. A shift from the "reactive" approach of water treatment to a "proactive" approach of prevention began to take place. Although water treatment may be necessary in some cases, it is much more cost effective to prevent the contamination from happening in the first place. The Oregon Department of Environmental Quality (DEQ) and the Department of Human Services Drinking Water Program (DHS) recently compared the estimated cost of prevention (less than $15 per resident) to the actual cost of investigation and treatment (more than $1500 per resident) in a small Oregon community impacted by a volatile organic contaminant that exceeded the drinking water standard.

Oregon has a Drinking Water Protection Program in place for groundwater systems, i.e., wells and springs. In order to protect a drinking water resource, a water system must know where the drinking water comes from, what potential sources of pollution exist and what level of threat each presents to the system's drinking water. Up until recently, the costs associated with acquiring this information were the responsibility of the water system, a financial burden that even the most proactive water systems found hard to meet. The 1996 Amendments to the Safe Drinking Water Act lifted that burden from water systems by requiring that the states conduct Source Water Assessments for the water systems within their respective boundaries. <u>The purpose of the Assessment is to provide the water systems with the information that they need to develop a strategy to protect their source of drinking water if they choose.</u>

As mandated by the 1996 Amendments, a Source Water Assessment consists of the following: (1) the identification of the area that directly overlies that part of the aquifer supplying drinking water to the well or spring, (2) an inventory of potential sources of contamination within that area, and (3) the evaluation of the susceptibility of the water system to contamination from those sources. Funding for assessments was provided to the states through the Act as part of the state's Drinking Water Revolving Loan Fund.

The DEQ and DHS worked with a citizen's advisory committee and with DHS' Drinking Water Advisory Committee to design a program that would meet the needs of Oregon's public water systems. The Environmental Protection Agency (EPA) has certified that Oregon's plan meets the requirements of the Safe Drinking Water Act. Within the program, DHS has the responsibility of working with groundwater systems and the DEQ works with surface water systems and conducts potential contaminant inventories.

Within this report, you will find general descriptions of the various elements of the Source Water Assessment Program, as well as specific information identifying the source of your water system and an inventory of the potential threats to your drinking water quality. Although developing a Drinking Water Protection Plan is voluntary in Oregon, it is hoped that the information provided in the Source Water Assessment Report will be used as a basis for reducing the risk of contamination to your source. Later in this report, you will be given some specific recommendations on how to accomplish this risk reduction for your system. The bulk of these recommendations center on an Drinking Water Protection Plan, providing information to those residences, agricultural operations and businesses, etc., that live or operate within the identified area.

Additional assessment analysis will be made available to you should you decided to proceed with the development of a drinking water protection plan. This analysis will include a more in-depth description of the local hydrogeology as well as the susceptibility of the drinking water source to the potential contaminant sources identified through the inventory process.

1.2 Groundwater Basics

In order to protect a groundwater source of drinking water, it is important to understand how the groundwater system works, e.g., where groundwater comes from, how it occurs in the subsurface, how it moves and how it can become contaminated. Included in this report is as Fact Sheet about groundwater that you can use to help increase the awareness of others regarding groundwater (see Appendix G) and its susceptibility to contamination.

When a well is drilled, the driller passes through a distance of soil, sediments and/or bedrock in which all the open spaces between the soil and sediment particles and in the fractures of the bedrock are filled with air. No water can be derived from this zone, referred to as the vadose zone. If the driller continues, he or she will eventually encounter a depth in which all the open spaces are filled with water. This is groundwater and we have just crossed the water table to reach it. Groundwater, therefore, does not occur as underground rivers, pools or veins, rather it simply occurs within the open spaces within the geologic material. We refer to any geologic material that contains water and that can yield the water to a well as an aquifer. Aquifers can be any geologic material, e.g., sand and gravel, porous lava flows, fractured bedrock, etc., that can hold water and when drilled into will supply that water to the well.

So where does the groundwater in the aquifer come from? Groundwater is part of the hydrologic cycle that controls the distribution of water on the surface of this planet. It is therefore linked to other sources of water, notably surface water as streams, rivers and lakes. Virtually without exception, the groundwater originates as precipitation at the surface that sinks through the soil and percolates down to the water table. This is what makes groundwater vulnerable to contamination. The water recharging the aquifer originates at the surface. The downward percolating water has to pass through whatever is at the surface or just below it. As it does so, the water can dissolved contaminants and carry them downward to the aquifer.

The direction and speed in which groundwater moves is controlled by the slope of the water table, which has high areas and low areas just like the ground surface, and the permeability of the aquifer. In general, groundwater moves at a velocity of inches to a few feet per day. The pumping of a well can significantly influence the movement of groundwater by drawing down the water table in its vicinity. This produces a "capture zone" that can draw groundwater in from some distance away. We identify this distance during the delineation phase of the assessment.

2. Delineation of the Drinking Water Protection Area

The delineation of the Drinking Water Protection Area identifies the area on the surface that directly overlies that part of the aquifer that supplies groundwater to the well, well field or spring. The delineation exercise requires the use of site-specific information so that the area identified reflects the hydraulic characteristics of the aquifer and the operation of the water system.

The level of hydrogeologic assessment performed during the delineation depends on the population served, the presence of potentially interfering wells and the complexity of the local hydrogeology. The delineation methods are described in the table and text below. The method used for your delineation is indicated in Appendix E (Parameters Used in the Delineation Model).

Population	Interfering Wells?	Complex Hydrogeology?	Delineation Method	Parameters Needed[1]
25-500	N	N	CFR	Q,n,b
25-500	Y	Y/N	Enhanced CFR	Q,b,n,K
501-3300	Y/N	N	Analytical	Q,b,n,K,i
501-3300	Y/N	Y	Analytic or Numerical	Q,b,n.K,i,h
3301-50,000	Y/N	N	Analytical	Q,b,n,K,i,h
3301-50,000	Y/N	Y	Analytic or Numerical	Q,b,n,K,i,h
50,000+	Y/N	Y/N	Numerical	Q,b,K,i,h
Spring	NA	Y/N	Hydrogeologic Mapping	Local Geology

1. Q = pump rate; n = aquifer porosity; b = aquifer thickness; K = hydraulic conductivity (permeability); i = gradient (slope of the water table); h = hydraulic head (elevation of the water table).

CFR: The calculated fixed radius method determines the volume of the aquifer that would be needed to supply the system for next 15 years. The delineation is circular in shape, centered on the well.

Enhanced CFR: If the water system has more than one well and there is a potential for interference between the wells, a more sophisticated analytical method is used. Specifically, an analytical model that allows well interference to be accommodated. As with the CFR, the next 15 years of groundwater are identified.

Analytical: Neither the CFR or Enhanced CFR methods take into account the direction and rate of groundwater flow. Analytical models incorporate the groundwater gradient into the calculations. Because of the more site-specific nature of this model, only the next 10 years of groundwater is identified. For systems serving 501 to 3300 and not having complex boundaries, the groundwater gradient is either taken from published reports or is estimated. For water systems serving more than 3300, the gradient may be determined directly by field measurement.

Analytic or Numerical: These more sophisticated models allow for the incorporation of complex boundaries such as streams and formation contacts, can be checked with local water levels, and in the case of the numerical model, can incorporate variations in aquifer properties.

Specific information regarding the delineation of your system's Drinking Water Protection Area can be found in Appendix E.

2.1 Location of the Drinking Water Source

We have located your source(s) using a Trimble GeoExplorer II Global Positioning System (GPS) unit. The data have been differentially corrected to remove some of the common positioning errors. The location of the source(s), with the corresponding Drinking Water Protection Area, has been placed in a Geographic Information System (GIS) layer and overlain onto a U.S.G.S. 7.5 minute topographic map (NAD 1927 Datum) that is included within this report.

The well was located using Trimble GeoExplorer II GPS unit. Data collection specifics include:

- 150 individual measurements,
- linked to a minimum of four satellites,
- a PDOP of less than 6 (pertains to precision of measurement),
- a signal to noise ratio of greater than 5

The raw data were subjected to differential correction using the PATHFINDER software. The location data (WGS 1984 Datum) for your wells are as follows:

Well #3 (Main Source)
45° 46' 52.428" North Latitude
119° 13' 06.457" West Longitude

Well #4 (Emergency Source)
45° 47' 16.843" North Latitude
119° 13' 32.146" West Longitude

2.2 Nature and Characteristics of the Aquifer

The aquifer supplying the drinking water for the City of Stanfield consists of layered Columbia River Basalt with water bearing zones between 290 and 1161 feet below the surface.

The aquifer supplying the wells is identified as the Columbia River Basalt Aquifer. It is overlain by approximately 45 feet of 'sand and gravel' and 245 feet of 'basalt'. The layered volcanic Columbia River Basalt Aquifer produces water from fractured inter-flow zones. The static water level (water level in the well when it is at rest, i.e. not being pumped) was reported by the driller as approximately 290 feet below the surface. There are multiple water bearing zones, many of which are at great depth. The layered basalt aquifer is a confined aquifer. The massive basalt flow interiors immediately above the aquifer are likely to be of low permeability and probably serves as a confining layers. **The aquifer is considered to be a confined volcanic basalt flow aquifer with a confining layer thickness of at least 245 feet.**

2.3 Well Construction

The Main Well (#3) was originally drilled in 1959, and was later deepened in 1962 and 1964, and was reconditioned in 1982. The diameter of the original hole is not known, but the well was constructed with a 16-inch casing to 53 feet, and a 12-inch casing to 70 feet. The deepenings consist of a 12-inch hole extending to a final depth of 776 feet. The exact details of the seal construction are not included on the well construction log. The casing seal should be constructed to provide protection from surface and near surface water from gaining access to the well bore. The casing seal is not known to have been constructed properly. The open interval extends from at least 70 feet to 776 feet, and it is in this intervals that the well draws the bulk of its water. The construction report and logs for this well can be found in Appendix D.

The Emergency Well (#4) was originally drilled in 1978. The 16-inch borehole was drilled to a depth of 157 feet, with a 12-inch hole extending to a final depth of 1161 feet. 12-inch steel casing was installed to a depth of 157 feet, with a neat cement casing seal constructed to 157 feet below the surface. The casing seal should be constructed to provide protection from surface and near surface water from gaining access to the well bore. The casing seal has been constructed properly. The open interval extends from at least 157 feet to 1161 feet, and it is in this intervals that the well draws the bulk of its water. A construction report for this well can be found in Appendix D.

2.4 Other Wells

Other wells proximity to the production well may pose a risk if their construction is inadequate or has been compromised. Such wells may act as a conduit, providing access of shallow potentially contaminated water to the well. The risk of this is assessed by evaluating the number and age of wells within the section containing the public water supply well. Well report records indicate that there are thirty-three other wells within the section containing the system's wells. Nine of those wells were constructed before 1979. This leads to an Other Well score of 60, well below the score of 400, which is regarded as significant risk to the water system.

It is possible that other wells exist within the section that were either drilled prior to when it became a requirement to submit well reports (around 1960) or were illegally installed.

2.5 Monitoring History

Monitoring records at the Division of Human Resources - Drinking Water Program indicate that nitrate has been detected within the system or at the source at 6 mg/L on 12/7/00. Nitrate is commonly considered to indicate a pathway to surface and near surface contamination. Nitrate concentrations are known to vary seasonally, with the lower concentrations occurring in the rainy season as a result of dilution by recharging rainfall.

Positive total coliform detections have not been reported in at the source, but have been detected in the distribution system. Coliform detections at the source may be indicative of a pathway to near surface activities. It is important to confirm positive detections and the system must ensure that coliform sampling is in compliance.

Sodium occurs at 71 mg/L (8/13/01), and is well above the 20 mg/L level where it is recommended that area doctors be notified so that they can take this into account for their patients on a reduced sodium diet.

2.6 Sensitivity Summary

The aquifer sensitivity for the system is summarized on the sensitivity summary sheet in the appendix. If a criterion on the form is checked "No", it implies that, based on our evaluation, that criterion does not contribute significantly to the aquifer's sensitivity. We have identified the following criteria which we believe increase the aquifer's sensitivity to contamination from the surface.

2.6.1 Highly Sensitive Criteria

Since there is no specific seal construction information on the well log for the primary well (#3), the exact underground construction of the well is unknown. It is not known if the casing seal is composed of an appropriate material or if the seal extends to a depth that limits the potential for contamination from the surface or shallow subsurface area from entering the well. **The fact that there is no specific casing seal construction information makes the aquifer highly sensitive.**

Contributing to the sensitivity of the system is the fact that nitrate has been detected in the aquifer at significant concentrations. This implies that there is a pathway for near surface contaminants to reach the aquifer used by this system. Continued sampling must be accomplished and monitored carefully to ensure that the nitrate levels are not increasing with time. **The elevated nitrate concentrations in the well indicate that the aquifer is highly sensitive to potential contaminant sources at the surface or shallow subsurface.**

2.6.2 Moderately Sensitive Criteria

The ages of the wells, originally constructed before 1978, also contribute to the sensitivity of the system. Casing seals do deteriorate with time. The system is therefore considered to be moderately sensitive to contamination from surface activities.

The estimated travel time for water crossing soils in the area from the surface under saturated conditions is approximately 50 hours. For soils with travel times of less than 65 hours, little opportunity for degradation of a contaminant within the soil zone would occur for contaminants such as nitrate. All of the soils fall into this category. On the sensitivity map in Appendix B, patterns for soil sensitivity are shown. The entire DWPA is covered with high sensitivity soils.

3. Inventory of Potential Contaminant Sources

3.1 Methodology

The primary intent of an inventory is to identify and locate significant potential sources of any of the contaminants of concern within the drinking water protection area. Significant sources of contamination can be defined as any facility or activity that stores, uses, or produces the contaminants of concern and has a sufficient likelihood of releasing such contaminants to the environment at levels that could contribute significantly to the concentration of these contaminants in the source waters of the public water supply. The inventory is a very valuable tool for the local community in that it:

- Provides information on the locations of potential contaminant sources, especially those that present the greatest risks to the water supply,
- Provides an effective means of educating the local public about potential problems, and
- Provides a reliable basis for developing a local management plan to reduce the risks to the water supply.

Inventories were focused primarily on the potential sources of contaminants regulated under the federal Safe Drinking Water Act (SDWA). This includes contaminants with a maximum contaminant level (MCL), contaminants regulated under the Surface Water Treatment Rule, and the microorganism Cryptosporidium. The inventory was designed to identify several categories of potential sources of contaminants including micro-organisms (i.e., viruses, Giardia lamblia, Cryptosporidium, and bacteria); inorganic compounds (i.e., nitrates and metals); and organic compounds (i.e., solvents, petroleum compounds and pesticides). Contaminants can reach a water body (groundwater, rivers, lakes, etc.) from activities occurring on the land surface or below it. Contaminant releases to water bodies can also occur on an area-wide basis or from a single point source.

It is advantageous to identify as many potential risks as possible within the drinking water protection area during the inventory. It is important to remember the sites and areas identified in this section are only potential sources of contamination to the drinking water. Environmental contamination is not likely to occur when contaminants are used and managed properly. Not all of these inventoried activities pose actual high risks to your public water supply. The day-to-day operating practices and environmental (contamination) awareness varies considerably from one facility or land use activity to another.

When identifying potential risks to a public water supply, it is necessary to make "worst-case" assumptions. This is important because it is the potential risk that we are attempting to determine. The worst-case assumption that has to be made when considering potential risks to water bodies is that the facility or activity is not employing good management practices or pollution prevention. Also, assumptions are made about what sources are included in particular types of land use. For example, it is assumed that rural residences associated with farming operations have specific potential contamination sources such as fuel storage, chemical storage and mixing areas, and machinery repair shops. Any errors in these assumptions can be easily corrected as the community moves beyond the assessment to develop a protection plan.

Past, current, and possible future potential sources of contaminants were identified through a variety of methods and resources. In completing this inventory, DEQ used readily available information including review of DEQ and other agencies' databases of currently listed sites, interviews with the public water system operator, and field observation as discussed below. In-depth analysis or research was not completed to assess each specific facility's compliance status with local, state and/or federal programs or laws. Further, the inventory process did not include an attempt to identify unique contamination risks at individual sites such as facilities (permitted or not) that do not safely store potentially hazardous materials.

The process for completing the inventory for City of Stanfield's drinking water protection area included several steps, which are summarized as follows:

1. Relevant information as of March 2001 were collected from applicable state and federal regulatory databases including the following lists:

- DEQ Environmental Cleanup Site Information System (ECSI) which includes the U.S. EPA National Priorities List (NPL) and the U.S. EPA Comprehensive Environmental Response, Compensation and Liability Information System (CERCLA) list;
- DEQ leaking underground storage tank (LUST) list;
- DEQ registered underground storage tank (UST) list;
- DEQ Source Information System (for water discharge permit sites including National Pollutant Discharge Elimination System (NPDES) permits, Water Pollution Control Facility (WPCF) permits, storm water discharge permits, and on-site sewage (septic) system permits);
- DEQ Active Solid Waste Disposal Permits list;
- DEQ Dry Cleaners list;
- State Fire Marshall Hazardous Material Handlers (HAZMAT) site list (information on materials in a gas-form was not used since gaseous compounds rarely pose a threat to surface water or groundwater);
- DEQ Underground Injection Control (UIC) list of facilities with registered underground injection control systems; and
- DEQ Hazardous Waste Management Information System (HWIMSY) list which includes U.S. EPA Resource Conservation Recovery Act (RCRA) generators or notifiers and U.S. EPA RCRA Treatment, Storage, and Disposal Facility (TSDF) Permits.

Because of the way various state and federal databases are set up, the specific location of listed sites is not always given or accurate within the database. DEQ verified the presence and approximate location of potential contaminant sources within the drinking water protection area by consulting with local community members and/or by driving through the area (windshield survey) as discussed below in subsequent inventory steps.

1. Public water system officials, or someone they designated as knowledgeable of the area, were interviewed to identify potential sources that are not listed elsewhere in databases or on maps and to assist in locating potential sources listed in the state and federal databases.

2. A windshield survey was conducted by driving through the drinking water protection area to field locate and verify as many as possible of the potential contaminant source activities. We looked for potential contaminant sources within four general categories of land use: residential/municipal, commercial/industrial, agricultural/forest, and other land uses (see Appendix C, Table 1).

3. Relative risk levels of higher-, moderate-, or lower-risk were assigned to each potential contaminant source based on the Oregon Source Water Assessment Plan (1999). A summary of the types of potential contaminant sources and level of assigned risk is presented in Appendix C, Table 1 (Summary of Potential Contaminant Sources by Land Use). The comments section of Appendix C, Table 2 (Inventory Results- List of Potential Contaminant Sources) provides justification for any modifications to the risk rating that may have resulted from field observations that were different from what is typically expected for the specific facility. For example, a "random dumpsite" is typically considered a moderate risk to groundwater. However, if disposal of hazardous or toxic substances was observed during the field visit, the risk rating may be modified to "higher". Relative risk ratings are considered an effective way for the water supply officials and community to prioritize management efforts for the drinking water protection area. When the local water supply officials and community "team" enhance the inventory for use in developing management options, further analysis may need to be conducted to more closely evaluate the actual level of risk.

4. A final summary of the inventoried sources and the GIS base map were prepared and included in this report.

Not all of the activities that are potential contaminant sources were inventoried in the entire drinking water protection area. The inventory of sources of microorganisms such as bacteria, viruses and cryptosporidium focused primarily on areas within the 2-year time-of-travel because of limitations on survivability of the organism. Potential sources of microbes are highlighted on Appendix C, Table 1.

3.2 Results

The results of the inventory were analyzed in terms of current, past, and future land uses; their time of travel (TOT) relationship to the well site; and their associated risk rating. In general, land uses that are closest to the well and those with the highest risk rating pose the greatest threat to your drinking water supply. Inventory results are summarized in Appendix C, Tables 1 and 2 and are shown on Figure 2.

3.2.1 Within Two-Year Time of Travel

The delineated two-year time of travel zone for Well #3 (located near City Hall) is primarily dominated by residential and commercial land uses within the City of Stanfield. The delineated two-year time of travel zone for Well #4 (located near Locust Street) is primarily dominated by residential land uses but also has some irrigated cropland surrounding the well. A total of seven potential contaminant sources (Reference Numbers 2, 6, 7, 11, 12, 13, and 14 on Figure 2 and Appendix C, Table 2) were identified in the two-year TOT zones. The potential contaminant sources within the two-year TOT all have relatively higher to moderate risk rankings with the exception of the RV Park, which presents a lower risk to the drinking water supply. The higher to moderate risk sites include a historic gas station, an abandoned well, the state highway, the railroad, the high density housing areas, and areas with sewer lines in close proximity to the wells. Two of the potential contaminant sources have a high risk of transmitting micro-organisms to the groundwater including the sewer lines and the RV Park.

3.2.2 Overview of Inventory Results within Five-Year and Ten-Year Time of Travel

The delineated drinking water protection area between the two-year TOT and the ten-year TOT for both of the wells is primarily occupied by residential and commercial land uses within the City of Stanfield. Eleven potential contaminant sources were identified in this area, which are detailed on Table 2 in Appendix C. Municipal/residential sources of potential contamination include the City drywells for stormwater disposal, the sewage treatment plant, a land application site, the city maintenance shop, the fire station, high-density residential areas, and private wells in the residential areas. Other potential sources include a manufacturing facility and irrigated crops. The transportation corridors (highway and railroad) and residential areas are shown on Figure 2 in the location nearest to the well (within the two-year TOT) but extend into the five-year and ten-year TOT zones. The potential contaminant sources identified between the two-year TOT and the ten-year TOT all have relatively higher to moderate risk rankings with the exception of fire station, which presents a lower risk to the drinking water supply.

This review of the presence of potential contaminant sources within the City of Stanfield's drinking water protection area provides a quick look at the potential sources of contaminants that could, if improperly managed, adversely impact the city's drinking water source. Even very small quantities of certain contaminants can significantly impact water bodies.

4. Susceptibility of the Drinking Water Source

The final step in the Source Water Assessment is the susceptibility analysis, i.e., how vulnerable is the drinking water source to potential contaminants at or near the surface. Whether or not a given drinking water source is susceptible depends primarily on two issues: are there potential sources of contamination within the Drinking Water Protection Area, and is the aquifer sensitive to contamination, i.e., is it likely that a contaminant at the surface would migrate to the water table and into the well. The identification of potential contaminant sources within the Drinking Water Protection Area was accomplished during the inventory phase of the assessment. Aquifer sensitivity depends on a number of factors that can collectively or individually allow the aquifer to become contaminated. These are described below and are summarized in the Appendix F, Aquifer Sensitivity Summary.

4.1 Aquifer Sensitivity

Aquifer sensitivity refers to those factors, those characteristic of the aquifer and overlying materials, as well as those that are imposed upon the aquifer, e.g., well construction, that increase the potential of contaminants from the surface gaining access to the aquifer.

4.1.1 Depth to the water-bearing zone

The shorter the distance downward to the water table, the greater the potential of a contaminant, if released, to migrate to the aquifer. **The depth to the aquifer supplying the City of Stanfield wells is approximately 290 to 1161 feet.** Shallow water bearing zones could be connected hydraulicly to the deeper water-bearing zones if the wells are not adequately constructed.

4.1.2 Nature of the Aquifer

Aquifers are often classified as unconfined or confined. Unconfined aquifers are often shallow and are not separated from the surface by a protective low-permeability layer. Confined aquifers are often deeper and are overlain by a protective low-permeability layer. Unconfined aquifers are more sensitive than confined aquifers. **The aquifer here is considered confined and is separated from the surface by a thick succession of massive basalt flow interiors.**

4.1.3 Characteristics of the Aquifer

Aquifers that are highly permeable, i.e., gravels and boulders, sand and gravel without significant clay layers, etc., or do not provide for natural filtration as water moves through them, i.e., are fractured, are considerably more sensitive than other types of aquifers. **The Columbia River Basalt aquifer supplying the City of Stanfield consist of volcanic interflow zones and are considered highly permeable.**

4.1.4 Characteristics of the Confining Layer

The thicker the confining unit the more likely it is to be persistent laterally and the more it retards the movement of contaminants downward. Confining units consisting of plastic clay and unfractured rock are much more protective than those consisting of silt. **The confining layer for the shallowest water-bearing zone within the aquifer is described in the well report as having a thickness of at least 245 feet and consists of unfractured basalt.**

4.1.5 Soil Types

Some types of soils are thinner and/or have higher permeability than others. We consider those soils in which water could move through under saturated conditions in less than 65 hours as being highly sensitive. Recognition of these soil types and their occurrence within the Drinking Water Protection Area can indicate those parts of the Drinking Water Protection Area where contamination is most likely to cross the soil zone. **The bulk of the soil in the Drinking Water Protection Area for the City of Stanfield wells are of high permeability (see Figure 2, Appendix B).**

4.1.6 Well Construction

When a well is drilled in soft or loose materials, a casing (steel or plastic pipe) is inserted to hold the hole open during and after drilling. The casing does not in itself provide adequate protection from contaminated shallow water gaining access to the well. Contaminated shallow water can migrate to the casing and follow the casing directly down to the well. The real protection from potentially contaminated shallow water is the casing seal. This seal is put in place by drilling a hole that is at least four inches greater in diameter than the final casing. After the larger hole is drilled, casing is put in and the annular space between the casing and seal is filled with a sealant, either bentonite (an expanding clay), cement, or a combination of the two. The casing seal must by law be placed a minimum of 18 feet below the surface, however, it should be placed to a depth that is controlled by the local geology, e.g., for a confined aquifer, the casing seal should extend down to the confining layer. Having a well drilled by a licensed well constructor greatly reduces the risk that the well will be improperly constructed. **The primary well (#3) appears to not have been constructed properly. Nothing is known of the casing seal. The emergency well (#4) appears to have been constructed properly.**

4.1.7 Other Wells

An additional threat to drinking water quality within the Drinking Water Protection Area are old wells or production wells that have been improperly constructed. Wells are used to extract groundwater form the aquifer, however if they have lost their integrity or were improperly constructed, they may provide a conduit for contaminants to move directly to the aquifer. We assume that the greater the number of wells in the vicinity of the public water supply well, the greater the risk of encountering a well has been improperly constructed. Even a properly constructed well has a given life-time. The seal may begin to deteriorate with time and eventually may fail, allowing shallow waters to gain access to the aquifer. As an estimate of the potential risk posed by other wells in the area, we total the number of well reports that are on file at the Water Resources Department in the section containing the system's production well and develop a score based on number and age as follows:

Other Well Score = (No. of wells 1979 or younger) + 4 x (No. of wells older than 1979)

An Other Well score greater than 400 is considered to cause the aquifer to be moderately sensitive to contamination from the surface. **Records indicate that thirty-three other wells occur within the section containing the City of Stanfield wells. This leads to an Other Well Score of 60, well below the score of 400, the point at which other wells pose a significant risk to the system.**

It should be noted that the numbers above only represent wells on record at the Water Resources Department. Prior to 1960, well reports were not required to be filed. In addition, unauthorized wells are not uncommon in many areas. The Other Well Score should therefore be considered as a minimum assessment of risk.

4.1.8 Monitoring History

The record of water quality as indicated by the routine monitoring history of the water system provides an indicator of relative risk to the system. Clearly, if a contaminant is detected at the source, there is a pathway from the surface to the aquifer that allowed that contaminant to reach the water table. Coliform and nitrate detections are particularly useful as indicators of the existence of contaminant pathways. Coliform bacteria are ubiquitous in the environment and their presence in the source water may indicate a microbial source nearby, or that a pathway exists, either naturally as a result of soil and aquifer characteristics, or artificially, through a failed or inadequate casing seal. Nitrate provides similar information, and given its mobility in the subsurface, will arrive at the well sooner than other contaminants that may also be moving toward the aquifer. **Coliform has not been detected at the source, but has been detected in the distribution system.** Confirmation sampling would be required to determine the source of the coliform.

Nitrate has been detected at the source at 6 mg/L on 12/7/00. Nitrate is commonly considered to indicate a pathway to surface and near surface contamination. Nitrate concentrations are known to vary seasonally, with the lower concentrations occurring in the rainy season as a result of dilution by recharging rainfall.

Sodium occurs at 71 mg/L (8/13/01), and is well above the 20 mg/L level where it is recommended that area doctors be notified so that they can take this into account for their patients on a reduced sodium diet.

4.2 The Presence and Distribution of Potential Contaminant Sources of Moderate- and High-Risk

The presence of Potential Contaminant Sources (PCSs) within the DWPA provides the potential sources of chemicals that could, if improperly managed or released, impact the water quality of the aquifer. Small quantities of these chemicals, in some cases a gallon or less, can significantly impact aquifers. The DEQ and DHS strongly recommend that the community address all high- and moderate-risk PCSs that occur within their DWPA in order to reduce the risk of their drinking water supply becoming polluted. How the PCSs are prioritized and the level of management strategies that are appropriate depend on the proximity of the PCS to the well or well and whether the sensitivity of the aquifer at the PCS site is high, medium or low.
The results of the PCS inventory performed for the City of Stanfield by the Department of Environmental Quality is shown on the accompanying map (Appendix B, Figure 2) and are summarized as a function of time-or-travel zones in the table below.

4.2.1 Potential Contaminant Sources and Time-of-Travel Zones

In general, PCSs within the shorter time-of-travel zones pose greater risk than those in the longer time-of-travel zones. Also of concern is the location and distribution of these sources with respect to high and moderately sensitive areas. <u>Overlaying the PCS location map and the sensitivity map for the Water System provides a tool to determine the susceptibility of the community's drinking water supply to contamination from each PCS</u> (see Appendices). The table below indicates the relationship between susceptibility of the drinking water from a specific PCS and the identified PCS risk and aquifer sensitivity at the site. The community can use the PCS location numbers on the inventory map in conjunction with the displayed aquifer sensitivity and relative risk rankings for each PCS from Table 2 (Appendix C) to identify the susceptibility of the drinking water source to contamination from each PCSs and take steps to reduce the risk accordingly.

Potential Risks as a Function of Time-of-Travel Zone

PWS No. 4100842

	Within 2-yr TOT	Between 2-yr and 5-yr TOT	Between 5-yr and 10-yr TOT	Just Outside DWPA	Total
Total Number of High and Moderate Risk PCSs	7	5	5	0	17
Total High Risk PCSs	1	1	0	0	2
Total Moderate Risk PCSs	3	3	2	0	8
Total Low Risk PCSs	3	1	3	0	7
TOTAL PCSs	7	5	5	0	17

4.2.2 Relative Susceptibility Matrix

In figure 4, Appendix B, we have combined the location and relative risk rankings of the PCSs with aquifer sensitivity. For any given PCS, the water system can determine the susceptibility of the drinking water source to contamination by comparing PCS field risk and aquifer sensitivity at the site using the matrix below.

		Aquifer Sensitivity[1]		
		Low	**Moderate**	**High**
Field Risk[2]:	Moderate	*Low*	*Moderate*	*High*
	High	*Moderate*	*High*	*High*

1. As indicated on Figure 3, Appendix B
2. As indicated for the facility in question in Table 1, Appendix C

When a public water system is determined to have a high or moderate susceptibility from a specific site, i.e., a given PCS, as a result of a particular conditions or set of conditions, it means that a significant risk of contamination of the drinking water system exists. The susceptibility analysis cannot predict when, or if, contamination will occur, but it does recognize conditions that are highly favorable for contamination to occur. If a contaminant release to soils or groundwater should occur in the area of high susceptibility, it is very likely that contamination of the aquifer would occur if remedial actions are not completed as soon as possible.

If a public water system's drinking water source is determined to be of high or moderate susceptibility relative to a given PCS, it is recommended that the system identify the condition(s) that led to that susceptibility rating and take immediate steps to protect the resource through remedying the condition, e.g., repairing or replacing faulty well construction, working directly with the facility operator(s) to implement sound management practices, etc.

Water systems with a low susceptibility relative to a given PCS should consider all identified factors that could lead to a high susceptibility rating in the future and take action to prepare a strategy to mitigate those factors. Raising public awareness through signs and other education programs, encouraging proper well construction, encouraging the use of best management practices in existing facilities, use zoning to maintain low density, etc. are good ways of ensuring that the water source retains its low susceptibility.

5. Recommended Use of the Source Water Assessment Report

The process for developing a Drinking Water Protection Plan can be summarized as follows:

5.1.1 Assessment Phase (Source Water Assessment provided by DHS and DEQ)

- Delineate the area that serves as the source of the public water supply (Drinking Water Protection Area (DWPA))
- Inventory the potential risks or sources of contamination within the DWPA
- Determine the areas most susceptible to contamination

5.1.2 Protection Phase (performed by the water system or community)

- Assemble a local Drinking Water Protection Team
- Enhance the Source Water Assessment if necessary
- Develop a plan to reduce the risk of contamination (protect the resource)
- Develop a contingency plan to address the potential loss of the drinking water supply
- Certify (optional) and implement the Drinking Water Protection Plan

The assessment phase was funded by the federal Safe Drinking Water Act. Its purpose is to supply the water system within the information necessary to develop the protection plan. Developing the plan is voluntary.

Prior to moving into the protection phase, DEQ recommends the inventory presented in this document be reviewed in detail to clarify the presence, location, operational practices, actual risks, etc. of the identified facilities and land use activities. The SWA inventory should be regarded as a preliminary review of potential sources of contamination within the drinking water protection area. Resources within the community should be used to do an "enhanced inventory" to refine this preliminary list of potential sources of contamination.

It is also important to remember that not all of the inventoried activities will need to be addressed if you choose to develop a Drinking Water Protection Plan. When developing a protection plan, sources which pose little or no threat to your drinking water source can be screened out. For example, if any of the land use activities are conducted in a manner that already significantly reduces the risk of a contamination release, the facility would not need to re-evaluate their practices based on drinking water protection "management". One of the goals of developing a plan based on the inventory results is to address those land use activities that do pose high or moderate risks to your public water supply. The system should target these facilities with greater levels of education and technical assistance to minimize the risk of contamination.

Limited technical assistance is available through the DEQ and Drinking Water Program at DHS for water systems that choose to move beyond the assessments and voluntarily develop a Drinking Water Protection Plan. Using the results of the assessment, the water system/community can form a Drinking Water Protection Team of individuals that have a stake in the plans implementation.

Forming a local team to help with the development of a protection plan is very important. Oregon's drinking water protection approach relies upon the concept of "community based protection", as are many other water quality programs. This simply refers to the concept of allowing local control and decision-making to implement the water quality protection effort. Community-based protection is successful only with significant local citizen stakeholder involvement. Community-based protection can draw on the knowledge and successful adaptive practices within the area. Landowners generally know best how to achieve water resource restoration and protection as long as a thorough explanation of the problem is provided, the objectives to solve the problem are clearly defined and technical assistance is available.

In community-based protection, citizens have more control and are therefore more likely to participate in the program and be more willing to assist with the educational and outreach effort which will make the plan successful. *We recommend that the protection plan be developed so as to minimize any burdens on individual property owners, but maximize the equity in responsibility for reducing the risks of future contamination.*

Protecting the drinking water supply in a community can also be a very effective way to encourage all citizens to participate in an issue which directly affects everyone in that community. This often leads to more public involvement in other significant local decisions concerning future livability issues, e.g., land use planning. In communities already developing and implementing Drinking Water Protection Plans, the process has served to bring many diverse interests together on a common goal and strengthen the local rural and urban relationships through communication and increased understanding. The risks and sources of water quality problems are not only from industries, farmers and managed forests, but every individual living commuting and working in that area.

Communities/water systems interested in developing Drinking Water Protection Plans may contact the Department of Environmental Quality (503-229-5413) or the DHS Drinking Water Program (541-726-2587) for further information.

Appendices

A. References

B. Figures

C. Inventory of Potential Contaminant Sources

D. Well Report(s)

E. Parameters Used in Delineation Model

F. Sensitivity Summary

G. Groundwater Fact Sheet

Additional copies of the appendix materials are available upon written request to the following address:

Groundwater Coordinator
Drinking Water Program
Department of Human Services
442 A Street
Springfield, OR 97477

Appendix A: References

Robinson, James H., 1971. Hydrology of basalt aquifers in the Hermiston-Ordnance area Umatilla and Morrow counties, Oregon. U.S. Geological Survey Hydrological Investigation HA-387.

Morton, M.A. and Bartholomew, W.S., 1984. Update of ground water conditions and declining water levels in the Butter Creek area, Morrow and Umatilla counties, Oregon. State of Oregon Water Resources Department Groundwater Report No. 30.

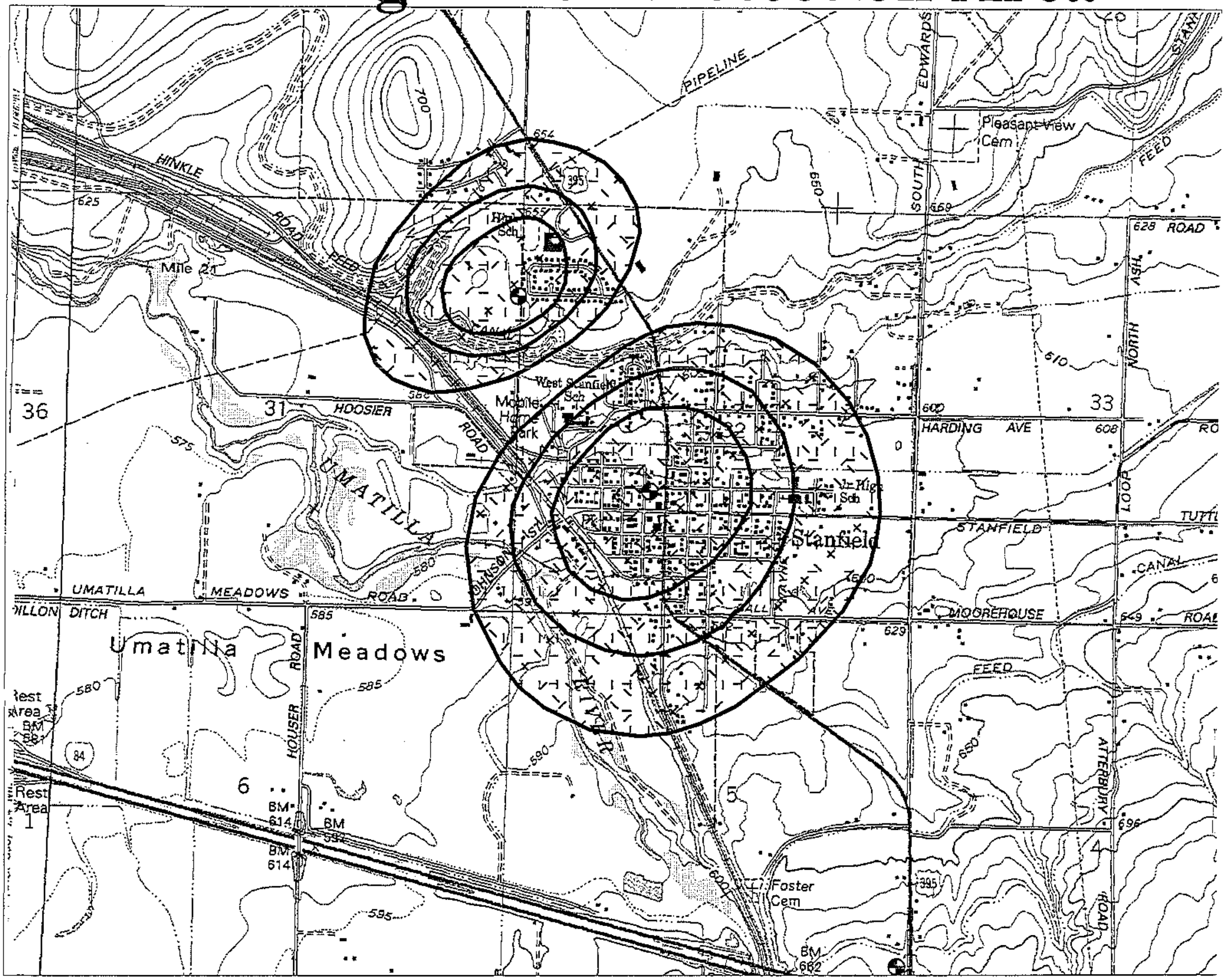
Davies-Smith, A., Bolke, E.L., and Collins, C.A., 1988. Geohydrology and digital simulation of the ground-water flow system in the Umatilla plateau and Horse Heaven Hills area, Oregon and Washington. U.S. Geological Survey Water-Resources Investigations Report 87-4268.

Stewart, S. and Nelson, D., 1996. Oregon Wellhead Protection Program Guidance Manual. Oregon Department of Environmental Quality (available at www.deq.or.state.us)

Appendix B: Figures

Figure 1

City of Stanfield
Drinking Water Protection Area



2000 0 2000 4000 6000 Feet

1:24,000

Drinking Water Protection Area (DWPA)
2, 5, and 10 Year Time of Travel (TOT)
Analytical Method

N

Model Parameters
Delineation Area (mi*mi): 1.09
Transmissivity (ft*ft/day): 2193
Production Interval (ft): 50
Effective Porosity: 0.25
Usage (gal/day): 675,894

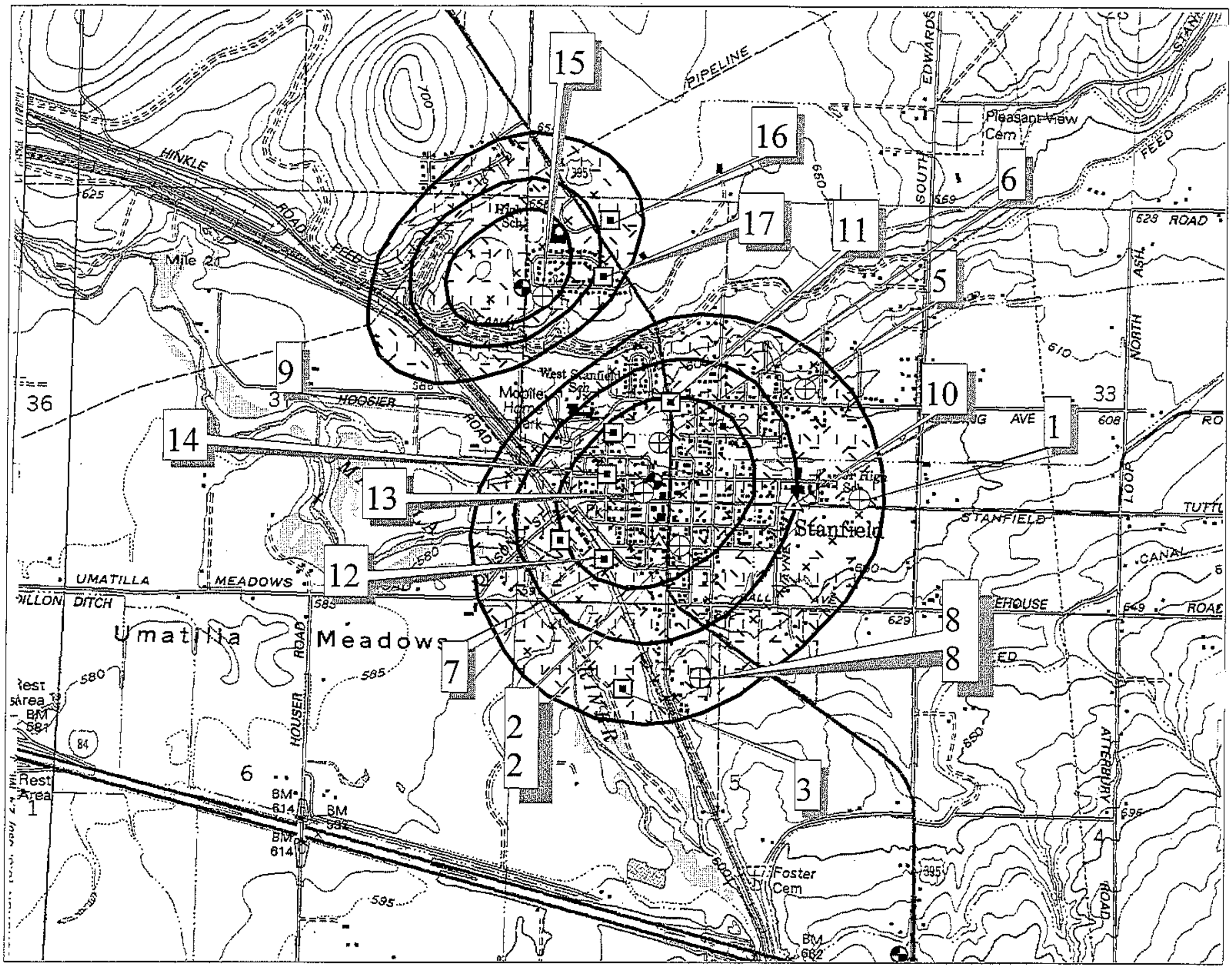
Well Location: Township 4N Range 29E Section 32
Umatilla County
Well #3 45°46'53.005"N 119°13'02.519"W
Well #4 45°47'17.421"N 119°13'28.206"W

Prepared by: JF
Project Manager: JF RG #1867
File # 4100842

USGS Echo, Stanfield, OR Quadrangle
(part section) 7.5' Series (Topographic)

Figure 2

City of Stanfield Drinking Water Protection Area
Potential Contaminant Sources



2000 0 2000 4000 6000 Feet

1:24,000

USGS Echo, Stanfield, OR Quadrangle (part section) 7.5' Series (Topographic)

Drinking Water Protection Area (DWPA)
2, 5, and 10 Year Time of Travel (TOT)
Analytical Method

Prepared by: JF 01/31/03
Project Manager: JF RG#1867
File # 4100842

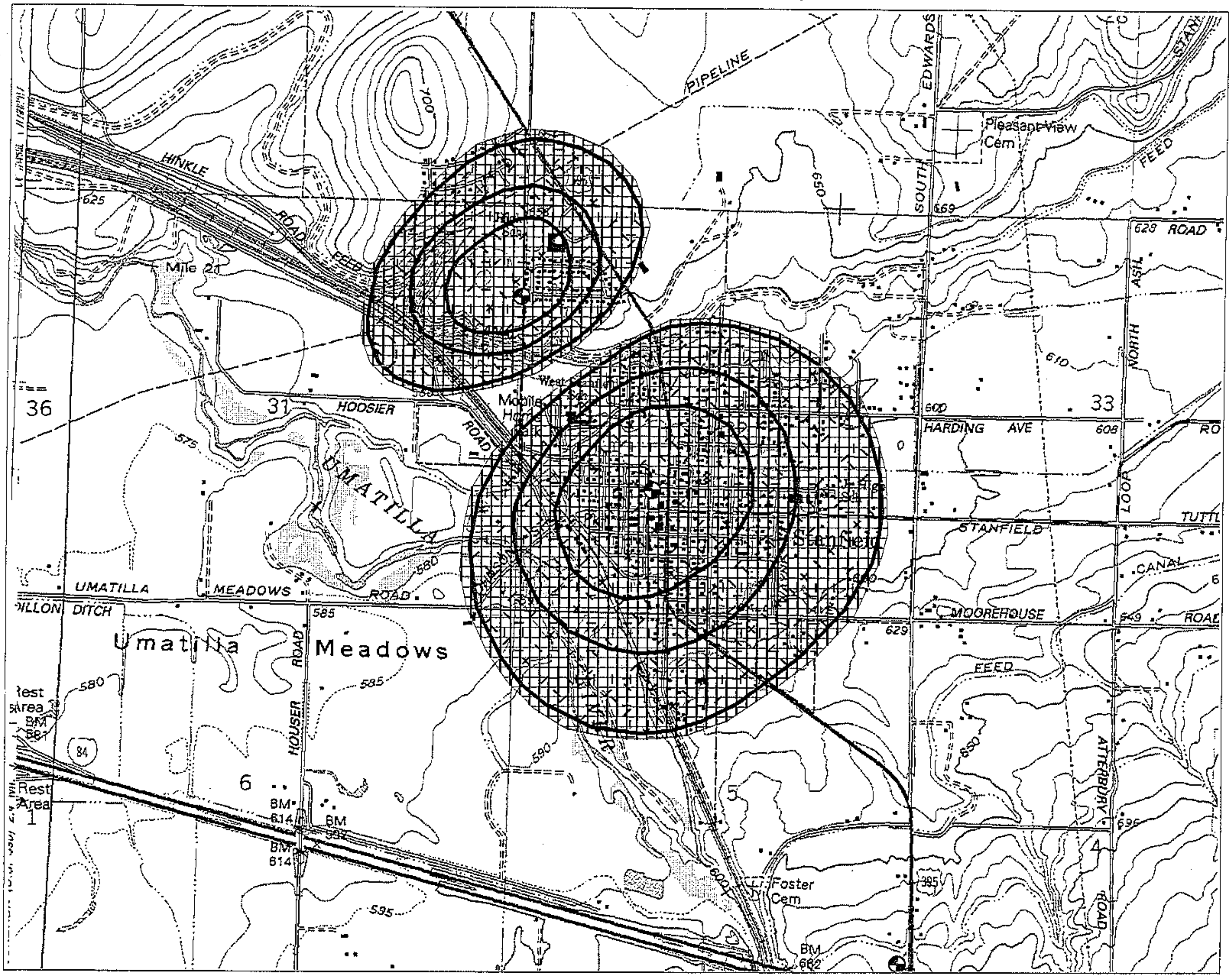
N

Potential Contaminant Sources
- ⊕ **Higher Relative Risk**
- ▣ **Moderate Relative Risk**
- △ **Low Relative Risk**

Well Location: Township 4N Range 29E Section 32
Umatilla County
Well #3 45°46'53.005"N 119°13'02.519"W
Well #4 45°47'17.421"N 119°13'28.206"W

Note: Sites and areas noted in this figure are potential sources of contamination to the drinking water as identified by Oregon Drinking Water Protection Staff. Environmental contamination is not likely to occur when chemicals are used and managed properly. Numbers indicate potential contaminant sources indexed to Appendic C, Table 2.

City of Stanfield Drinking Water Protection Area
Soil Sensitivity Analysis



2000 0 2000 4000 6000 Feet

1:24,000

USGS Echo, Stanfield, OR Quadrangle (part section) 7.5' Series (Topographic)

Drinking Water Protection Area (DWPA)
2, 5, and 10 Year Time of Travel (TOT)
Analytical Method

N

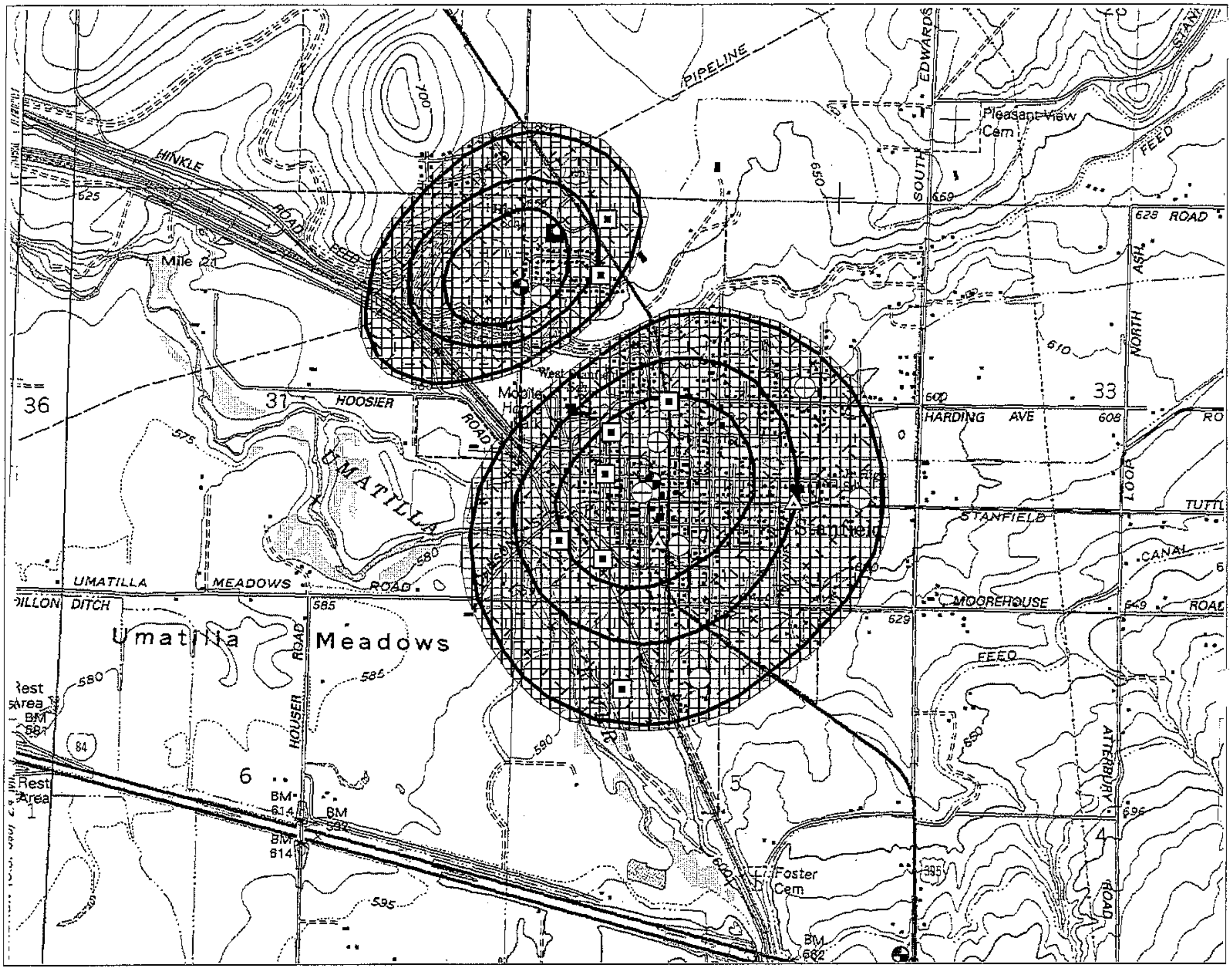
Prepared by: JF 01/31/03
Project Manager: JF RG#1867
File # 4100842

Sensitivity Analysis
- **High Soil Sensitivity**
- **Medium Soil Sensitivity**
- **Low Soil Sensitivity**

Well Location: Township 4N Range 29E Section 32
Umatilla County
Well #3 45°46'53.005"N 119°13'02.519"W
Well #4 45°47'17.421"N 119°13'28.206"W

Note: Sites and areas noted in this figure are potential sources of contamination to the drinking water as identified by Oregon Drinking Water Protection Staff. Environmental contamination is not likely to occur when chemicals are used and managed properly. Numbers indicate potential contaminant sources indexed to Appendic C, Table 2.

City of Stanfield Drinking Water Protection Area
Potential Contaminant Sources and Soil Sensitivity Analysis



2000	0	2000	4000	6000 Feet

1:24,000

USGS Echo, Stanfield, OR Quadrangle (part section) 7.5' Series (Topographic)

Drinking Water Protection Area (DWPA)
2, 5, and 10 Year Time of Travel (TOT)
Analytical Method

Potential Contaminant Sources
- ⊕ **Higher Relative Risk**
- ▣ **Moderate Relative Risk**
- △ **Low Relative Risk**

Sensitivity Analysis
- **High Soil Sensitivity**
- **Medium Soil Sensitivity**
- **Low Soil Sensitivity**

Prepared by: JF 01/31/03
Project Manager: JF RG#1867
File # 4100842

Well Location: Township 4N Range 29E Section 32
Umatilla County
Well #3 45°46'53.005"N 119°13'02.519"W
Well #4 45°47'17.421"N 119°13'28.206"W

N

Note: Sites and areas noted in this figure are potential sources of contamination to the drinking water as identified by Oregon Drinking Water Protection Staff. Environmental contamination is not likely to occur when chemicals are used and managed properly. Numbers indicate potential contaminant sources indexed to Appendic C, Table 2.

Appendix C: Inventory of Potential Contaminant Sources

APPENDIX C - INVENTORY OF POTENTIAL CONTAMINANT SOURCES
CITY OF STANFIELD - PWS # 4100842
OREGON SOURCE WATER ASSESSMENT

Notes and Acronyms for Table 1 and Table 2

Sites and areas identified in these Tables are only potential sources of contamination to the drinking water. Environmental contamination is not likely to occur when contaminants are used and managed properly.

Total number of sources listed in Table 1 in the DWPA may not add up to the total number of potential contaminants sources in Table 2 because more than one type of potential contaminant source may be present at any given facility.

Data collected by DLC of Oregon Department of Environmental Quality on September 22, 1999.

Acronyms:

AST - Aboveground Storage Tank
DEQ - Oregon Department of Environmental Quality
DRYCLEANER - DEQ's Drycleaner database
DWPA - Drinking Water Protection Area
ECSI - DEQ's Environmental Cleanup Site Information database
HWIMSY - DEQ's Hazardous Waste Information Management System database
LUST - DEQ's Leaking Underground Storage Tank database
NPDES - National Pollution Discharge Elimination System
PCS - Potential Contaminant Source
PWS - Public Water System
SFM - State Fire Marshall's database of hazardous materials
SIS - DEQ's Source Information System database which includes WPCF and NPDES permits
SWMS - DEQ's Solid Waste Management System database
UST - DEQ's Underground Storage Tank database
UST - Underground Storage Tank
WPCF - Water Pollution Control Facility
WRD -Oregon Water Resources Division database for water rights information system

TABLE 1. SUMMARY OF POTENTIAL CONTAMINANT SOURCES BY LAND USE; CITY OF STANFIELD; PWS# 4100842

COMMERCIAL/INDUSTRIAL SOURCES		Relative Risk Ranking	Total in DWPA	RESIDENTIAL/MUNICIPAL SOURCES	Relative Risk Ranking	Total in DWPA
AUTOMOBILES	BODY SHOPS	HIGHER	0	AIRPORT - MAINTENANCE/FUELING AREA	HIGHER	0
	CAR WASHES	MODERATE	0	APARTMENTS AND CONDOMINIUMS	LOWER	0
	GAS STATIONS	HIGHER	0	CAMPGROUNDS/RV PARKS [1]	LOWER	1
	REPAIR SHOPS	HIGHER	0	CEMETERIES - PRE-1945	MODERATE	0
BOAT SERVICES/REPAIR/REFINISHING		HIGHER	0	DRINKING WATER TREATMENT PLANTS	MODERATE	0
CEMENT/CONCRETE PLANTS		MODERATE	0	FIRE STATION	LOWER	1
CHEMICAL/PETROLEUM PROCESSING/STORAGE		HIGHER	0	FIRE TRAINING FACILITIES	MODERATE	0
DRY CLEANERS		HIGHER	0	GOLF COURSES	MODERATE	0
ELECTRICAL/ELECTRONIC MANUFACTURING		HIGHER	0	HOUSING - HIGH DENSITY - > 1 HOUSE/0.5 ACRES	MODERATE	2
FLEET/TRUCKING/BUS TERMINALS		HIGHER	0	LANDFILL/DUMPS [1]	HIGHER	0
FOOD PROCESSING		MODERATE	0	LAWN CARE - HIGHLY MAINTAINED AREAS	MODERATE	0
FURNITURE/LUMBER/PARTS STORES		MODERATE	0	MOTOR POOLS	MODERATE	0
HOME MANUFACTURING		HIGHER	0	PARKS	MODERATE	0
JUNK/SCRAP/SALVAGE YARDS		HIGHER	0	RAILROAD YARDS/MAINTENANCE/FUELING AREAS	HIGHER	0
MACHINE SHOPS		HIGHER	0	SCHOOLS	LOWER	0
MEDICAL/VET OFFICES [1]		MODERATE	0	SEPTIC SYSTEMS - HIGH DENSITY - > 1/ACRE [1]	HIGHER	0
METAL PLATING/FINISHING/FABRICATION		HIGHER	0	SEWER LINES - CLOSE PROXIMITY TO PWS [1]	HIGHER	1
MINES/GRAVEL PITS		HIGHER	0	UTILITY STATIONS - MAINTENANCE TRANSFORMER STORAGE	HIGHER	0
OFFICE BUILDINGS/COMPLEXES		LOWER	0	WASTE TRANSFER/RECYCLING STATIONS [1]	MODERATE	0
PARKING LOTS/MALLS - > 50 SPACES		HIGHER	0	WASTEWATER TREATMENT PLANTS/COLLECTION STATIONS [1]	MODERATE	1
PHOTO PROCESSING/PRINTING		HIGHER	0	OTHERS (LIST)		
PLASTIC/SYNTHETICS PRODUCER		HIGHER	0			
RESEARCH LABORATORIES		HIGHER	0			
RV/MINI STORAGE		LOWER	0			
WOOD PRESERVING/TREATING		HIGHER	0			
WOOD/PULP/PAPER PROCESSING AND MILLS		HIGHER	0			
OTHERS (LIST)						
MAINTENANCE SHOP		MODERATE	1			

(Continued on p.2)

NOTES/KEY:

Sites and areas identified in this Table are only potential sources of contamination to the drinking water. Environmental contamination is not likely to occur when contaminants are used and managed properly.

(1) - Potential Source of Microbial Contamination

(2) - Drip irrigated crops, such as vineyards and some vegetables, are considered lower risk than spray irrigation

(3) - Septic Systems located within the 2-year time-of-travel (TOT) for wells are considered moderate risks.

TABLE 1. SUMMARY OF POTENTIAL CONTAMINANT SOURCES BY LAND USE; CITY OF STANFIELD; PWS# 4100842

AGRICULTURAL/FOREST SOURCES		Relative Risk Ranking	Total in DWPA
AUCTION LOTS[1]		HIGHER	0
BOARDING STABLES [1]		MODERATE	0
CONFINED ANIMAL FEEDING OPERATIONS (CAFOS) [1]		HIGHER	0
CROPS - IRRIGATED - BERRIES, HOPS, MINT, ORCHARDS, VINEYARDS/NURSERIES, GREEN HOUSES, VEGETABLES, ETC.		MODERATE[2]	1
CROPS - NONIRRIGATED - CHRISTMAS TREES, GRAINS, GRASS SEEDS, HAY, PASTURE		LOWER	0
FARM MACHINERY REPAIR		HIGHER	0
GRAZING ANIMALS - > 5 LARGE ANIMALS OR EQUIVALENT/ACRE [1]		MODERATE	0
LAGOONS/LIQUID WASTES [1]		HIGHER	0
LAND APPLICATION SITES [1]		MODERATE	2
MANAGED FOREST LANDS	BROADCAST FERTILIZED AREAS	LOWER	0
	CLEARCUT HARVESTED - < 35 YRS.	MODERATE	0
	PARTIAL HARVESTED - <10 YRS.	MODERATE	0
	ROAD DENSITY - > 2 MI./SQ. MI.	MODERATE	0
PESTICIDE/FERTILIZER/PETROLEUM STORAGE, HANDLING, MIXING, & CLEANING AREAS		HIGHER	1
RECENT BURN AREAS - < 10 YRS.		LOWER	0
OTHERS (LIST)			0

MISCELLANEOUS SOURCES		Relative Risk Ranking	Total in DWPA
ABOVE GROUND STORAGE TANKS		MODERATE	0
CHANNEL ALTERATIONS - HEAVY		LOWER	0
COMBINED SEWER OUTFALLS [1]		LOWER	0
STORMWATER OUTFALLS [1]		LOWER	0
COMPOSTING FACILITIES [1]		MODERATE	0
HISTORIC GAS STATIONS		HIGHER	1
HISTORIC WASTE DUMPS/LANDFILLS [1]		HIGHER	0
HOMESTEADS - RURAL	MACHINE SHOPS	HIGHER	0
	SEPTIC SYSTEMS < 1/ACRE [1]	LOWER(3)	0
INJECTION WELLS/DRYWELLS/SUMPS - CLASS V UICS [1]		HIGHER	2
KENNELS - > 20 PENS [1]		LOWER	0
MILITARY INSTALLATIONS		HIGHER	0
RANDOM DUMPSITES		MODERATE	0
RIVER RECREATION - HEAVY USE [1]		LOWER	0
SLUDGE DISPOSAL AREAS [1]		MODERATE	0
STORMWATER RETENTION BASINS [1]		MODERATE	0
TRANSMISSION LINES - RIGHT-OF-WAYS		LOWER	0
TRANSPORTATION CORRIDORS	FREEWAYS/STATE HIGHWAYS	MODERATE	1
	RAILROADS	MODERATE	1
	HERBICIDE USE AREAS	MODERATE	0
	RIVER TRAFFIC - HEAVY	LOWER	0
	STREAM CROSSING - PERENNIAL	LOWER	0
UNDERGROUND STORAGE TANKS	CONFIRMED LEAKING TANKS - DEQ LIST	HIGHER	1
	DECOMMISSIONED - INACTIVE	LOWER	0
	NON-REGULATED TANKS - < 1,100 GALS	HIGHER	0
	NOT YET UPGRADED OR REGISTERED TANKS	HIGHER	0
	UPGRADED AND/OR REGISTERED - ACTIVE	LOWER	0
	STATUS UNKNOWN	HIGHER	0
UPSTREAM RESERVOIRS		LOWER	0
WELLS/ABANDONED WELLS		HIGHER	2
LARGE CAPACITY SEPTIC SYSTEMS -CLASS V UIC (SERVES >20 PEOPLE) [1]		HIGHER	0
OTHERS (LIST)			0

NOTES/KEY:

Sites and areas identified in this Table are only potential sources of contamination to the drinking water. Environmental contamination is not likely to occur when contaminants are used and managed properly.

(1) - Potential Source of Microbial Contamination

(2) - Drip irrigated crops, such as vineyards and some vegetables, are considered lower risk than spray irrigation

(3) - Septic Systems located within the 2-year time-of-travel (TOT) for wells are considered moderate risks.

TABLE 2. INVENTORY RESULTS - LIST OF POTENTIAL CONTAMINANT SOURCES; CITY OF STANFIELD; PWS# 4100842

REFERENCE NO. (SEE FIGURE 2)	PCS TYPE(S)	PCS NAME	APPROXIMATE LOCATION	CITY	TIME OF TRAVEL ZONE	RELATIVE RISK RANKING	METHOD FOR LISTING
1	DRYWELLS-CLASS V UIC'S	DRYWELLS USED FOR CITY STORM WATER	SOUTH OF HIGH SCHOOL	STANFIELD	BETWEEN 5-YR AND 10-YR	HIGHER	FIELD OBSERVATION INTERVIEW
2	HISTORIC GAS STATION / CONFIRMED LEAKING UST - DEQ LIST	BONOCO GAS STATION	TAFT & HIGHWAY 395	STANFIELD	WITHIN 2-YR	HIGHER	DATABASE FIELD OBSERVATION INTERVIEW
3	LAND APPLICATION SITE	IRRIGATION SITE FOR EFFLUENT	SOUTH OF TOWN	STANFIELD	BETWEEN 5-YR AND 10-YR	MODERATE	FIELD OBSERVATION INTERVIEW
4	SEWAGE TREATMENT PLANT	SEWAGE TREATMENT PLANT	N. SHERMAN & HINKLE RD	STANFIELD	BETWEEN 2-YR AND 5-YR	MODERATE	DATABASE FIELD OBSERVATION INTERVIEW
5	PRIVATE DRINKING WATER WELLS	RESIDENCES ON NE SIDE OF TOWN	RESIDENCES ON NE SIDE OF TOWN	STANFIELD	BETWEEN 5-YR AND 10-YR	HIGHER	FIELD OBSERVATION INTERVIEW
6	ABANDONED WELL	ABANDONED WELL	NORTH OF DRINKING WATER WELL #3	STANFIELD	WITHIN 2-YR	HIGHER	FIELD OBSERVATION INTERVIEW
7	RV PARK	RV PARK	MAIN ST ACROSS FROM BONOCO STATION	STANFIELD	WITHIN 2-YR	LOWER	FIELD OBSERVATION INTERVIEW
8	LAND APPLICATION SITES / PESTICIDES	AE STALEY MANUFACTURING	SOUTH SIDE OF TOWN	STANFIELD	BETWEEN 5-YR AND 10-YR	HIGHER	DATABASE FIELD OBSERVATION INTERVIEW
9	MAINTENANCE SHOP	CITY SHOP	105 W WOOD ST	STANFIELD	BETWEEN 2-YR AND 5-YR	MODERATE	DATABASE INTERVIEW
10	FIRE STATION	STANFIELD FIRE STATION	280 W COE ST	STANFIELD	BETWEEN 2-YR AND 5-YR	LOWER	DATABASE FIELD OBSERVATION INTERVIEW
11	TRANSPORTATION CORRIDOR-STATE HIGHWAY	HIGHWAY 395	RUNS THROUGH DWPA	STANFIELD	WITHIN 2-YR	MODERATE	FIELD OBSERVATION INTERVIEW
12	TRANSPORTATION CORRIDOR-RAILROAD	RAILROAD	RUNS THROUGH DWPA	STANFIELD	WITHIN 2-YR	MODERATE	FIELD OBSERVATION INTERVIEW
13	SEWER LINES-CLOSE PROXIMITY TO PWS	CITY SEWER LINES	CLOSE PROXIMITY TO PWS	STANFIELD	WITHIN 2-YR	HIGHER	FIELD OBSERVATION INTERVIEW
14	HIGH DENSITY HOUSING	HIGH DENSITY HOUSING	CLOSE PROXIMITY TO PWS	STANFIELD	WITHIN 2-YR	MODERATE	FIELD OBSERVATION INTERVIEW
15	DRYWELL	DRYWELL USED FOR CITY STORM WATER	SOUTH OF HIGH SCHOOL AT WELL 4	STANFIELD	BETWEEN 2-YR AND 5-YR	HIGHER	FIELD OBSERVATION INTERVIEW
16	IRRIGATED CROPS	IRRIGATED CROPS	EAST OF HIGH SCHOOL AT WELL 4	STANFIELD	BETWEEN 5-YR AND 10-YR	MODERATE	FIELD OBSERVATION INTERVIEW
17	HOUSING-HIGH DENSITY	RESIDENCES	EAST OF WELL	STANFIELD	BETWEEN 2-YR AND 5-YR	MODERATE	FIELD OBSERVATION INTERVIEW

Note: Sites and areas identified in this Table are only potential sources of contamination to the drinking water. Environmental contamination is not likely to occur when contaminants are used and managed properly.

TABLE 2. INVENTORY RESULTS - LIST OF POTENTIAL CONTAMINANT SOURCES; CITY OF STANFIELD; PWS# 4100842

REFERENCE NO. (SEE FIGURE 2)	POTENTIAL IMPACTS	DATABASE LISTINGS	COMMENTS
1	SHALLOW INJECTION WELLS MAY TRANSPORT UNTREATED WASTEWATER (PROCESS OR STORM WATER) DIRECTLY INTO GROUNDWATER AND IMPACT DRINKING WATER.	NONE	WELLS ARE REPORTEDLY CASED AND SEALED TO 1200 FEET
2	HISTORIC SPILLS, LEAKS, OR IMPROPER HANDLING OF SOLVENTS AND PETROLEUM PRODUCTS MAY IMPACT THE DRINKING WATER SUPPLY. ABANDONED UNDERGROUND STORAGE TANKS MAY BE PRESENT. EXISTING CONTAMINATION FROM SPILLS, LEAKS, OR IMPROPER HANDLING OF STORED MATERIALS MAY IMPACT THE DRINKING WATER SUPPLY.	LUST LIST WITH AN UNKNOWN STATUS. SFM LIST WITH THE FOLLOWING MATERIALS REPORTED ON-SITE: GASOLINE (UST).	TANKS HAVE BEEN REMOVED HOWEVER SOIL REMAINS
3	IMPROPER MANAGEMENT OF SLUDGE AND WASTEWATER MAY IMPACT DRINKING WATER SUPPLY.	NONE	NONE
4	IMPROPER MANAGEMENT OF WASTEWATER, TREATMENT CHEMICALS, OR EQUIPMENT MAINTENANCE MATERIALS MAY IMPACT DRINKING WATER SUPPLY.	SIS LIST WITH A NPDES PERMIT FOR DOMESTIC WASTEWATER TREATMENT.	NONE
5	IMPROPERLY INSTALLED OR MAINTAINED WELLS AND ABANDONED WELLS MAY PROVIDE A DIRECT CONDUIT FOR CONTAMINATION TO GROUNDWATER AND DRINKING WATER SOURCE.	NONE	NONE
6	IMPROPERLY INSTALLED OR MAINTAINED WELLS AND ABANDONED WELLS MAY PROVIDE A DIRECT CONDUIT FOR CONTAMINATION TO GROUNDWATER AND DRINKING WATER SOURCE.	NONE	NONE
7	LEAKS OR SPILLS OF AUTOMOTIVE FLUIDS OR IMPROPERLY MANAGED SEPTIC SYSTEMS AND WASTEWATER DISPOSAL MAY IMPACT DRINKING WATER SUPPLY. HEAVY USAGE ALONG EDGE OF WATERBODY MAY CONTRIBUTE TO EROSION, CAUSING TURBIDITY.	NONE	NONE
8	IMPROPER MANAGEMENT OF SLUDGE AND WASTEWATER MAY IMPACT DRINKING WATER SUPPLY. LEAKS, SPILLS AND IMPROPER HANDLING OF PESTICIDES, FERTILIZERS AND PETROLEUM PRODUCTS MAY IMPACT DRINKING WATER SOURCE.	HWIMSY LIST WITH UNKNOWN GENERATOR STATUS. SIS LIST WITH A INDIVIDUAL WPCF PERMIT.	NONE
9	SPILLS, LEAKS, OR IMPROPER HANDLING OF CHEMICALS AND OTHER MATERIALS DURING TRANSPORTATION, USE, STORAGE, AND DISPOSAL MAY IMPACT THE DRINKING WATER SUPPLY.	SFM LIST WITH THE FOLLOWING MATERIALS REPORTED ON-SITE: DEGREASER; GASOLINE; HERBICIDES; MOTOR OIL; AND PAINT.	NONE
10	SPILLS, LEAKS, OR IMPROPER HANDLING OF CHEMICALS AND OTHER MATERIALS DURING TRANSPORTATION, USE, STORAGE AND DISPOSAL MAY IMPACT THE DRINKING WATER SUPPLY.	SFM LIST WITH THE FOLLOWING MATERIALS REPORTED ON-SITE: FC-600 LIGHT WATER BRAND ATC/AFFF AND SILVEX.	NONE
11	VEHICLE USAGE INCREASES THE RISKS FOR LEAKS OR SPILLS OF FUELS AND OTHER HAZARDOUS MATERIALS THAT MAY IMPACT DRINKING WATER. ROAD BUILDING, MAINTENANCE, AND USAGE MAY CONTRIBUTE TO INCREASED EROSION AND SLOPE FAILURE CAUSING TURBIDITY IN SURFACE WATER DRINKING WATER SOURCES. OVER-APPLICATION OR IMPROPER HANDLING OF PESTICIDES OR FERTILIZERS MAY IMPACT THE DRINKING WATER SUPPLY.	NONE	NONE
12	RAIL TRANSPORT INCREASES THE RISKS FOR LEAKS OR SPILLS OF FUELS AND OTHER HAZARDOUS MATERIALS THAT MAY IMPACT DRINKING WATER. INSTALLATION AND MAINTENANCE OF TRACKS MAY CONTRIBUTE TO INCREASED EROSION AND SLOPE FAILURE CAUSING TURBIDITY IN SURFACE WATER DRINKING WATER SOURCES. OVER-APPLICATION OR IMPROPER HANDLING OF PESTICIDES ADJACENT TO TRACKS MAY IMPACT THE DRINKING WATER SUPPLY.	NONE	NONE
13	IF NOT PROPERLY DESIGNED, INSTALLED, AND MAINTAINED, SEWER LINES CAN IMPACT DRINKING WATER, ESPECIALLY ADJACENT TO A WATERBODY OR WITHIN THE 2-YEAR TIME-OF-TRAVEL ZONE FOR DRINKING WATER WELLS.	NONE	NONE
14	IMPROPER USE, STORAGE, AND DISPOSAL OF HOUSEHOLD CHEMICALS INCLUDING CLEANERS, VEHICLE MAINTENANCE PRODUCTS, POOL CHEMICALS, PESTICIDES AND FERTILIZERS MAY IMPACT THE DRINKING WATER SUPPLY. STORMWATER RUN-OFF OR INFILTRATION MAY CARRY CONTAMINANTS TO DRINKING WATER SUPPLY.	NONE	NONE
15	SHALLOW INJECTION WELLS MAY TRANSPORT UNTREATED WASTEWATER (PROCESS OR STORM WATER) DIRECTLY INTO GROUNDWATER AND IMPACT DRINKING WATER.	NONE	WELLS ARE CASED AND SEALED TO 1200 FEET
16	OVER-APPLICATION OR IMPROPER HANDLING OF PESTICIDES OR FERTILIZERS MAY IMPACT DRINKING WATER. EXCESSIVE IRRIGATION MAY CAUSE TRANSPORT OF CONTAMINANTS OR SEDIMENTS TO GROUNDWATER/SURFACE WATER THROUGH RUNOFF. NOTE: *DRIP-IRRIGATED CROPS SUCH AS VINEYARDS AND SOME VEGETABLES, ARE CONSIDERED TO BE A LOW RISK.	NONE	NONE
17	IMPROPER USE, STORAGE, AND DISPOSAL OF HOUSEHOLD CHEMICALS INCLUDING CLEANERS, VEHICLE MAINTENANCE PRODUCTS, POOL CHEMICALS, PESTICIDES AND FERTILIZERS MAY IMPACT THE DRINKING WATER SUPPLY. STORMWATER RUN-OFF OR INFILTRATION MAY CARRY CONTAMINANTS TO DRINKING WATER SUPPLY.	NONE	NONE

Note: Sites and areas identified in this Table are only potential sources of contamination to the drinking water. Environmental contamination is not likely to occur when contaminants are used and managed properly.

Appendix D: Well Reports

WELL LOG FOR WELL 3

SUPPLY NAME : STANFIELD, CITY OF
ID NUMBER : 4100842

NOTICE TO WATER WELL CONTRACTOR
The original and first copy of this report are to be filed with the
STATE ENGINEER, SALEM, OREGON 97310
within 30 days from the date of well completion.

WATER WELL REPORT

STATE OF OREGON
(Please type or print)
(Do not write above this line)

State Well No. 4N/29-32cbc
State Permit No.

(1) OWNER:
Name City of Stanfield
Address Stanfield, Oregon

(2) TYPE OF WORK (check):
New Well ☒ Deepening ☐ Reconditioning ☐ Abandon ☐
If abandonment, describe material and procedure in Item 12.

(3) TYPE OF WELL:
Rotary ☐ Driven ☐
Cable ☒ Jetted ☐
Dug ☐ Bored ☐

(4) PROPOSED USE (check):
Domestic ☐ Industrial ☐ Municipal ☒
Irrigation ☐ Test Well ☐ Other ☐

(5) CASING INSTALLED:
Threaded ☐ Welded ☐
16" Diam. from 0 ft. to 53 ft. Gage
12" Diam. from 0 ft. to 70 ft. Gage
" Diam. from ft. to ft. Gage

(6) PERFORATIONS:
Perforated? ☐ Yes ☒ No.
Type of perforator used
Size of perforations in. by in.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

(7) SCREENS:
Well screen installed? ☐ Yes ☐ No
Manufacturer's Name
Type Model No.
Diam. Slot size Set from ft. to ft.
Diam. Slot size Set from ft. to ft.

(8) WATER LEVEL: Completed well.
Static level 20 ft. below land surface Date 7/9/59
Artesian pressure lbs. per square inch Date

(9) WELL TESTS:
Drawdown is amount water level is lowered below static level
Was a pump test made? ☐ Yes ☐ No If yes, by whom?
Yield: 115 gal./min. with 230 ft. drawdown after 3 hrs.

Bailer test gal./min. with ft. drawdown after hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? ☐ Yes ☐ No

(10) CONSTRUCTION:
Well seal—Material used
Depth of seal ft.
Diameter of well bore to bottom of seal in.
Were any loose strata cemented off? ☐ Yes ☐ No Depth
Was a drive shoe used? ☐ Yes ☐ No
Did any strata contain unusable water? ☐ Yes ☐ No
Type of water? depth of strata
Method of sealing strata off
Was well gravel packed? ☐ Yes ☐ No Size of gravel:
Gravel placed from ft. to ft.

(11) LOCATION OF WELL:
County Umatilla Driller's well number City Well #3
NW¼ ¼ SW ¼ Section 32 T. 4N R. 29E W.M.
Bearing and distance from section or subdivision corner

(12) WELL LOG:
Diameter of well below casing 12-inch
Depth drilled 300 ft. Depth of completed well 300 ft.

Formation: Describe color, texture, grain size and structure of materials; and show thickness and nature of each stratum and aquifer penetrated, with at least one entry for each change of formation. Report each change in position of Static Water Level as drilling proceeds. Note drilling rates.

MATERIAL	From	To	SWL
Soil	0	2	
Clay	2	23	
Gravel	23	47	
Shaley rock	47	53	
Gray rock hard	53	87	
Rock brown soft (water)	87	90	
Sand brown	90	95	
Boulders green hard	95	126	
Gray rock	126	144	
Boulders	144	150	
Gray rock	150	205	
Black rock	205	215	
Boulders	215	237	
Red rock	237	245	
Boulders	245	267	
Black rock medium	267	275	
Gray Boulders hard	275	300	

Work started 5/21/59 19 Completed 7/9/59 19
Date well drilling machine moved off of well 19

Drilling Machine Operator's Certification:
This well was constructed under my direct supervision. Materials used and information reported above are true to my best knowledge and belief.
[Signed] (Drilling Machine Operator) Date 19
Drilling Machine Operator's License No.

Water Well Contractor's Certification:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.
NAME Ben Dreyer Drilling Contractor (Person, firm or corporation) (Type or print)
Address Rt. 2 Box 73BB Pendleton, Oregon
[Signed] (Water Well Contractor)
Contractor's License No. 12 Date 7/10/59 19

ATTACHMENT

WELL LOG FOR WELL #3

SUPPLY NAME STANFIELD, CITY OF
ID NUMBER : 4100842

NOTICE TO WATER WELL CONTRACTOR
The original and first copy of this report are to be filed with the
STATE ENGINEER, SALEM, OREGON 97310
within 30 days from the date of well completion.

WATER WELL REPORT
STATE OF OREGON
(Please type or print)
(Do not write above this line)

State Well No. 4N/29-32 cbc
State Permit No.

(1) OWNER:
Name City of Stanfield
Address Stanfield, Oregon

(2) TYPE OF WORK (check):
New Well ☐ Deepening ☒ Reconditioning ☐ Abandon ☐
If abandonment, describe material and procedure in Item 12.

(3) TYPE OF WELL:
Rotary ☐ Driven ☐
Cable ☒ Jetted ☐
Dug ☐ Bored ☐

(4) PROPOSED USE (check):
Domestic ☐ Industrial ☐ Municipal ☒
Irrigation ☐ Test Well ☐ Other ☐

CASING INSTALLED:
Threaded ☐ Welded ☐
" Diam. from ft. to ft. Gage
" Diam. from ft. to ft. Gage
" Diam. from ft. to ft. Gage

PERFORATIONS:
Perforated? ☐ Yes ☐ No.
Type of perforator used
Size of perforations in. by in.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

(7) SCREENS:
Well screen installed? ☐ Yes ☐ No
Manufacturer's Name
Type Model No.
Diam. Slot size Set from ft. to ft.
Diam. Slot size Set from ft. to ft.

(8) WATER LEVEL: Completed well.
Static level 20 ft. below land surface Date
Artesian pressure lbs. per square inch Date

(9) WELL TESTS:
Drawdown is amount water level is lowered below static level
Was a pump test made? ☐ Yes ☐ No If yes, by whom?
Yield: 200 gal./min. with 185 ft. drawdown after 3 hrs.
Bailer test gal./min. with ft. drawdown after hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? ☐ Yes ☐ No

(10) CONSTRUCTION:
Well seal—Material used
Depth of seal ft.
Diameter of well bore to bottom of seal in.
Were any loose strata cemented off? ☐ Yes ☐ No Depth
Was a drive shoe used? ☐ Yes ☐ No
Did any strata contain unusable water? ☒ Yes ☐ No
Type of water? depth of strata 210
Method of sealing strata off
Was well gravel packed? ☐ Yes ☐ No Size of gravel:
Gravel placed from ft. to ft.

(11) LOCATION OF WELL:
County Umatilla Driller's well number City Well #3
NW ¼ SW ¼ Section 32 T. 4N R. 29E W.M.
Bearing and distance from section or subdivision corner

(12) WELL LOG:
Diameter of well below casing 12-inch
Depth drilled 401 ft. Depth of completed well 701 ft.

Formation: Describe color, texture, grain size and structure of materials; and show thickness and nature of each stratum and aquifer penetrated, with at least one entry for each change of formation. Report each change in position of Static Water Level as drilling proceeds. Note drilling rates.

MATERIAL	From	To	SWL
Gray rock medium	300	366	
Black rock soft	366	401	
Black rock medium	401	440	
Gray rock hard	440	465	
Black rock soft	465	488	
Gary rock hard	488	504	
Black rock medium	504	518	
Black rock hard	518	538	
Gary rock medium	538	687	
Black rock soft	687	699	
Gray rock hard	699	701	

Work started 8/8/62 19 Completed 10/6/62 19
Date well drilling machine moved off of well 19

Drilling Machine Operator's Certification:
This well was constructed under my direct supervision. Materials used and information reported above are true to my best knowledge and belief.
[Signed] (Drilling Machine Operator) Date 19
Drilling Machine Operator's License No.

Water Well Contractor's Certification:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.
NAME Ben Dreyer Drilling Cortractor (Person, firm or corporation) (Type or print)
Address Rt. 1 Box 225 Hermiston, Oregon
[Signed] (Water Well Contractor)
Contractor's License No. 12 Date 10/8/62 19

ATTACHMENT

WELL LOG FOR WELL #3

SUPPLY NAME : STANFIELD, CITY OF
ID NUMBER : 4100842

NOTICE TO WATER WELL CONTRACTOR
The original and first copy of this report are to be filed with the STATE ENGINEER, SALEM, OREGON 97310 within 30 days from the date of well completion.

WATER WELL REPORT
STATE OF OREGON
(Please type or print)
(Do not write above this line)

UMAT 2972

State Well No. 4N/29-32cbc
State Permit No.

(1) OWNER:
Name City of Stanfield
Address Stanfield, Oregon

(2) TYPE OF WORK (check):
New Well ☐ Deepening ☒ Reconditioning ☐ Abandon ☐
If abandonment, describe material and procedure in Item 12.

(3) TYPE OF WELL:
Rotary ☐ Driven ☐
Cable ☐ Jetted ☐
Dug ☐ Bored ☐

(4) PROPOSED USE (check):
Domestic ☐ Industrial ☐ Municipal ☒
Irrigation ☐ Test Well ☐ Other ☐

CASING INSTALLED: Threaded ☐ Welded ☐
8" Diam. from 676 ft. to 714 ft. Gage .330
" Diam. from ft. to ft. Gage
" Diam. from ft. to ft. Gage

PERFORATIONS: Perforated? ☐ Yes ☐ No.
Type of perforator used
Size of perforations in. by in.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

(7) SCREENS: Well screen installed? ☐ Yes ☐ No
Manufacturer's Name
Type Model No.
Diam. Slot size Set from ft. to ft.
Diam. Slot size Set from ft. to ft.

(8) WATER LEVEL: Completed well.
Static level 162 ft. below land surface Date 7/15/64
Artesian pressure lbs. per square inch Date

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? ☐ Yes ☐ No If yes, by whom?
Yield: 660 gal./min. with 20 ft. drawdown after 3 hrs.
540 " 12 " 3 "
" " "
Bailer test gal./min. with ft. drawdown after hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? ☐ Yes ☐ No

(10) CONSTRUCTION:
Well seal—Material used
Depth of seal ft.
Diameter of well bore to bottom of seal in.
Were any loose strata cemented off? ☐ Yes ☐ No Depth
Was a drive shoe used? ☐ Yes ☐ No
Did any strata contain unusable water? ☐ Yes ☐ No
Type of water? depth of strata
Method of sealing strata off
Was well gravel packed? ☐ Yes ☐ No Size of gravel:
Gravel placed from ft. to ft.

(11) LOCATION OF WELL:
County Umatilla Driller's well number City Well 3#
NW ¼ SW ¼ Section 32 T. 4N R. 29E W.M.
Bearing and distance from section or subdivision corner

(12) WELL LOG: Diameter of well below casing 12-inch
Depth drilled 78 ft. Depth of completed well 778 ft.
Formation: Describe color, texture, grain size and structure of materials; and show thickness and nature of each stratum and aquifer penetrated, with at least one entry for each change of formation. Report each change in position of Static Water Level as drilling proceeds. Note drilling rates.

MATERIAL	From	To	SWL
Boulders hard gray	700	726	
Sand clay black	726	733	
Rock gray medium	733	750	
Boulders gray hard	750	759	
Rock black soft	759	774	
Rock black medium	774	778	

Work started 6/22/64 19 Completed 7/14/64 19
Date well drilling machine moved off of well 19

Drilling Machine Operator's Certification:
This well was constructed under my direct supervision. Materials used and information reported above are true to my best knowledge and belief.
[Signed] (Drilling Machine Operator) Date 19
Drilling Machine Operator's License No.

Water Well Contractor's Certification:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.
NAME Ben Dreyer Drilling Contractor (Person, firm or corporation) (Type or print)
Address
[Signed] (Water Well Contractor)
Contractor's License No. 12 Date ~~10/~~ 7/15/ 19 64

ATTACHMENT

WELL LOG FOR WELL 3

SUPPLY NAME: STANFIELD, CITY OF
ID NUMBER : 4100842

WATER WELL REPORT
STATE OF OREGON

RECEIVED JUL 6 1982
WATER RESOURCES DEPT
SALEM, OREGON

State Well No. 4N/29E-32cb
State Permit No.
Recondition

(1) OWNER:
Name City of Stanfield
Address
City Stanfield State ORE

(2) TYPE OF WORK (check):
New Well ☐ Deepening ☐ Reconditioning ☒ Abandon ☐
If abandonment, describe material and procedure in Item 12.

(3) TYPE OF WELL:
Rotary Air ☐ Driven ☐ Rotary Mud ☐ Dug ☐ Cable ☒ Bored ☐

(4) PROPOSED USE (check):
Domestic ☐ Industrial ☐ Municipal ☒ Irrigation ☐ Test Well ☐ Other ☐ Thermal: Withdrawal ☐ Reinjection ☐

(5) CASING INSTALLED: Steel ☐ Plastic ☐ Threaded ☐ Welded ☐
NONE
" Diam. from ft. to ft. Gauge
" Diam. from ft. to ft. Gauge

LINER INSTALLED:
" Diam. from ft. to ft. Gauge

(6) PERFORATIONS: Perforated? ☒ Yes ☐ No
Type of perforator used Mill Knife
Size of perforations 3 in. by 1/4 in.
6 Perf Perfoot perforations from 123 ft. to 118 ft.
perforations from ft. to ft.
perforations from ft. to ft.

(7) SCREENS: Well screen installed? ☐ Yes ☒ No
Manufacturer's Name
Type Model No.
Diam. Slot Size Set from ft. to ft.
Diam. Slot Size Set from ft. to ft.

(8) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? ☒ Yes ☐ No If yes, by whom? LANE Pump
Yield: gal./min. with ft. drawdown after hrs.
Air test gal./min. with drill stem at ft. hrs.
Bailer test gal./min. with ft. drawdown after hrs.
Artesian flow g.p.m.
Temperature of water Depth artesian flow encountered ft.

(9) CONSTRUCTION: Special standards: Yes ☐ No ☒
Well seal—Material used
Well sealed from land surface to ft.
Diameter of well bore to bottom of seal in.
Diameter of well bore below seal in.
Number of sacks of cement used in well seal sacks
How was cement grout placed?

Was pump installed? Type HP Depth ft.
Was a drive shoe used? ☐ Yes ☒ No Plugs Size: location ft.
Did any strata contain unusable water? ☒ Yes ☐ No
Type of Water? depth of strata
Method of sealing strata off
Was well gravel packed? ☐ Yes ☒ No Size of gravel:
Gravel placed from ft. to ft.

(10) LOCATION OF WELL: City Well #3
County Umatilla Driller's well number 221
NW ¼ SW ¼ Section 32 T. 4N R. 29E W.M.
Tax Lot # Lot Blk Subdivision
Address at well location:

(11) WATER LEVEL: Completed well.
Depth at which water was first found ft.
Static level 264 ft. below land surface. Date 6-24-82
Artesian pressure lbs. per square inch. Date

(12) WELL LOG: Diameter of well below casing 12
Depth drilled ft. Depth of completed well 776 ft.
Formation: Describe color, texture, grain size and structure of materials; and show thickness and nature of each stratum and aquifer penetrated, with at least one entry for each change of formation. Report each change in position of Static Water Level and indicate principal water-bearing strata.

MATERIAL	From	To	SWL
Moved on well to cement out cascading surface water. Perforated casing. Set cement plug and Tremmied cement to top of plug. Applied pressure with packers and drill stem. Let cement set for 3 days. Drilled out cement & plug. Cleaned out well to 776.			
Note: Believe there is a screen off pump bowls still in bottom of well.			

Work started May 24 1982 Completed June 24 1982
Date well drilling machine moved off of well June 24 1982

Drilling Machine Operator's Certification:
This well was constructed under my direct supervision. Materials used and information reported above are true to my best knowledge and belief.
[Signed] [signature] (Drilling Machine Operator) Date June 1982
Drilling Machine Operator's License No. 1153

Water Well Contractor's Certification:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.
Name Brown & Brown Drilling Co. (Person, firm or corporation) (Type or print)
Address P.O. Box 124, Hermiston
[Signed] [signature] (Water Well Contractor)
Contractor's License No. 728 Date June 25 1982

NOTICE TO WATER WELL CONTRACTOR
The original and first copy of this report are to be filed with the WATER RESOURCES DEPARTMENT, SALEM, OREGON 97310, within 30 days from the date of well completion.

SP*12658-690

ATTACHMENT

WELL LOG FOR WELL 4

SUPPLY NAME: STANFIELD, CITY OF
ID NUMBER : 4100842

NOTICE TO WATER WELL CONTRACTOR
The original and first copy of this report are to be filed with the
WATER RESOURCES DEPARTMENT, SALEM, OREGON 97310
within 30 days from the date of well completion.

WATER WELL REPORT
STATE OF OREGON
(Please type or print)
(Do not write above this line)

UMAT 2962

State Well No. ____
State Permit No. ____

(1) OWNER:
Name: CITY OF STANFIELD
Address: STANFIELD OREGON

(2) TYPE OF WORK (check):
New Well ☑ Deepening ☐ Reconditioning ☐ Abandon ☐
If abandonment, describe material and procedure in Item 12.

(3) TYPE OF WELL:
Rotary ☑ Driven ☐
Cable ☐ Jetted ☐
Dug ☐ Bored ☐

(4) PROPOSED USE (check):
Domestic ☐ Industrial ☐ Municipal ☑
Irrigation ☐ Test Well ☐ Other ☐

CASING INSTALLED: Threaded ☐ Welded ☑
12" Diam. from +1 ft. to -156 ft. Gage .250
" Diam. from ____ ft. to ____ ft. Gage ____
" Diam. from ____ ft. to ____ ft. Gage ____

PERFORATIONS: Perforated? ☐ Yes ☑ No
Type of perforator used ____
Size of perforations ____ in. by ____ in.
____ perforations from ____ ft. to ____ ft.
____ perforations from ____ ft. to ____ ft.
____ perforations from ____ ft. to ____ ft.

(7) SCREENS: Well screen installed? ☐ Yes ☑ No
Manufacturer's Name ____
Type ____ Model No. ____
Diam. ____ Slot size ____ Set from ____ ft. to ____ ft.
Diam. ____ Slot size ____ Set from ____ ft. to ____ ft.

(8) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? ☑ Yes ☐ No If yes, by whom? LARMORE Pump Co.
Yield: 1227 gal./min. with 185 ft. drawdown after 4 hrs.
1000 " ____ " ____
" ____ " ____
Bailer test ____ gal./min. with ____ ft. drawdown after ____ hrs.
Artesian flow ____ g.p.m.
Temperature of water 69° Depth artesian flow encountered ____ ft.

(9) CONSTRUCTION:
Well seal—Material used NEAT - CEMENT
Well sealed from land surface to 157 ft.
Diameter of well bore to bottom of seal 16 in.
Diameter of well bore below seal 12 in.
Number of sacks of cement used in well seal 80 sacks
How was cement grout placed? ONE CONTINUOUS POUR W/PROFESSIONAL GROUT PUMP

Was a drive shoe used? ☐ Yes ☑ No Plugs ____ Size: location ____ ft.
Did any strata contain unusable water? ☐ Yes ☑ No
Type of water? ____ depth of strata ____
Method of sealing strata off ____
Was well gravel packed? ☐ Yes ☑ No Size of gravel: ____
Gravel placed from ____ ft. to ____ ft.

(10) LOCATION OF WELL:
County UMATILLA Driller's well number 070-77
NW ¼ NW ¼ Section 32 T. 4N. R. 29 E. W.M.
Bearing and distance from section or subdivision corner ____

(11) WATER LEVEL: Completed well.
Depth at which water was first found 290
Static level 290 ft. below land surface. Date 1-11-78
Artesian pressure NONE lbs. per square inch. Date ____

(12) WELL LOG: Diameter of well below casing 12" TO 725 FT. 8" [illegible]
Depth drilled 1161 ft. Depth of completed well 1161 ft.

Formation: Describe color, texture, grain size and structure of materials; and show thickness and nature of each stratum and aquifer penetrated, with at least one entry for each change of formation. Report each change in position of Static Water Level and indicate principal water-bearing strata.

MATERIAL	From	To	SWL
SAND	0	30	
GRAVEL	30	46	
BROKEN BRN. BASALT	46	145	
HARD GREY "	145	217	
BROKEN BRN. "	217	226	[illegible]
MED. GREY "	226	290	
SOFT RED "	290	345	[illegible]
HARD GREY "	345	475	
MED. HARD GREY "	475	612	
SOFT GREY "	612	[illegible]	
MED GREY "	[illegible]	[illegible]	
SOFT GREY "	917	91[illegible]	[illegible]
MED. GREY "	917	[illegible]	
SOFT GREY "	93[illegible]	[illegible]	
MED. HARD GREY "	95[illegible]	991	
VERY HARD " "	991	1012	
SOFT BROKEN GREY "	1012	[illegible]	
MED HARD "	[illegible]	[illegible]	
SOFT RED	[illegible]	[illegible]	
HARD GREY	1132	1133	

Work started 12-9 1977 Completed 12-27 1977
Date well drilling machine moved off of well 1-2 1978

Drilling Machine Operator's Certification:
This well was constructed under my direct supervision. Materials used and information reported above are true to my best knowledge and belief.
[Signed] [signature] (Drilling Machine Operator) Date 1-16 1978
Drilling Machine Operator's License No. 886

Water Well Contractor's Certification:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.
Name WALLACE WELL Drlg Co. (Person, firm or corporation) (Type or print)
Address PENDLETON, OREGON
[Signed] [signature] (Water Well Contractor)
Contractor's License No. ____ Date ____ 19__

(USE ADDITIONAL SHEETS IF NECESSARY)

SP*45656-119

ATTACHMENT

Appendix E: Parameters Used in Delineation Model

Delineation Method: ☐ Calculated Fixed Radius ☐ Enhanced CFR ☒ Analytical
☐ Numerical ☐ Hydrogeologic Mapping

Pump Rate (Q in ft³/day): **Primary Well: 63,635 Emergency Well: 23,863**
Source: ☐ System ☐ Water Resources Dept ☒ Estimated from Population
☐ Comparable Community ☐ Pump Capacity ☐ 90% of Safe Yield

Nature of the Aquifer:
☐ Unknown
☐ Unconfined
☐ Semiconfined
☒ Confined
Nature of confining unit: *basalt and claystone*
Depth to 1st confining unit: *45* feet
Thickness of confining unit: 245 feet
Depth to 2nd confining unit:
Thickness of confining unit:
☐ Depth to Willamette A: feet; Willamette B: feet

Aquifer Characteristics:
Lithology: ☐ Cobbles/Gravel ☐ Sand ☐ Gravel ☐ Sand and Gravel ☐ Sandy Silt ☒ Layered Volcanic Rocks
☐ Fractured Volcanic Bedrock ☐ Fractured Sedimentary Bedrock
☐ Other: __________ ☐ Unknown
Thickness (b): 51 feet
Effective Porosity (n): 0.25
Hydraulic Conductivity (Permeability): 2193 ft²/day ☐ NA
☐ Estimated from lithology
☐ Specific Capacity (Well Report)
☐ Published Report
☒ Aquifer Test
Hydraulic Gradient: *0.001* Flow Direction: 180 ☐ NA
☒ Published Report
☒ Graphical Solution
☐ Field Measurements
☐ Model Results
Irrigation Wells Accounted for:

Aquifer Name: *Columbia River Basalt (CRB)*

Appendix F: Sensitivity Summary: City of Stanfield Primary Well

Highly Sensitive Source: ☒ Yes ☐ No

Yes	No	
☐	☒	Unconfined Aquifer: Shallow (< 100 Ft), No significant clay layers
☐	☒	Unconfined Aquifer: Cobbles/gravel
☐	☒	Unconfined Aquifer: Fractured bedrock
☐	☒	Fractured Confined Aquifer <50 feet Below the Surface
☐	☒	Other Aquifer description: ....
☐	☒	Organic Chemical Detection: ....
☐	☒	Inorganic Chemical Detection (>50% MCL) ....
☐	☒	Source-related Coliform: total .... fecal .... Date ....
☒	☐	Nitrate-N≥ 5mg/L: Concentration .... **6 mg/L** Date **12/7/00**
☐	☒	Well Construction/Setback or Monitoring Deficiencies from Site Visit: ....
☐	☒	Well Report Missing/Unavailable
☒	☐	Casing Seal Missing/Unknown
☐	☒	Inappropriate Casing Seal Depth (depth recommendation: ....)
☐	☒	Inappropriate Casing Seal Material:
☐	☒	Casing Seal Not Constructed Properly:..........................
☐	☒	Traverse Potential >5 (Not performed on TNCWS)
☐	☒	Infiltration Potential >7 (Not performed on TNCWS)

Moderately Sensitive Source: ☒ Yes ☐ No

Yes	No	
☐	☒	Shallow (<50 feet) Confined Alluvial Aquifer and Thin (<15ft) Confining Unit
☐	☒	Deep Unconfined Aquifer
☐	☒	Fractured Bedrock at Surface
☐	☒	Aquifer Character Unknown
☐	☒	Commingling of Aquifers Suspected
☐	☒	Nitrate-N 1-4.9 mg/L: Concentration .... Date ....
☐	☒	Inorganic Chemical Detection (<50% of MCL):
☐	☒	Well Construction Deficiencies from Site Visit................
☒	☐	Well constructed prior to 1979
☐	☒	Other Wells Score ≥ 400
☒	☐	Soil with TOT <65 hours or lack of soil information in DWPA
☐	☒	Infiltration Potential 4 to ≤ 7 (Not performed on TNCWS)
☐	☒	Surface water within 500 feet

1. Note that it is possible for a single system to have criteria from both the high and moderately sensitive lists. Having a criterion checked "yes" indicates that this characteristic contributes to the sensitivity at the indicated level.

Additional Comments ....
....

Sensitivity Analysis Completed by: Jeffrey J Frederick .... **Date:** 01/14/03 ....

Appendix F: Sensitivity Summary: City of Stanfield Emergency Well

Highly Sensitive Source: ☒ Yes ☐ No

Yes	No	
☐	☒	Unconfined Aquifer: Shallow (< 100 Ft), No significant clay layers
☐	☒	Unconfined Aquifer: Cobbles/gravel
☐	☒	Unconfined Aquifer: Fractured bedrock
☐	☒	Fractured Confined Aquifer <50 feet Below the Surface
☐	☒	Other Aquifer description: ....
☐	☒	Organic Chemical Detection ....
☐	☒	Inorganic Chemical Detection (>50% MCL) ....
☐	☒	Source-related Coliform: total ..... fecal .... Date ....
☒	☐	Nitrate-N≥ 5mg/L: Concentration .... **6 mg/L** Date **12/7/00**
☐	☒	Well Construction/Setback or Monitoring Deficiencies from Site Visit: ....
☐	☒	Well Report Missing/Unavailable
☐	☒	Casing Seal Missing/Unknown
☐	☒	Inappropriate Casing Seal Depth (depth recommendation: ....)
☐	☒	Inappropriate Casing Seal Material
☐	☒	Casing Seal Not Constructed Properly:. ....
☐	☒	Traverse Potential >5 (Not performed on TNCWS)
☐	☒	Infiltration Potential >7 (Not performed on TNCWS)

Moderately Sensitive Source: ☒ Yes ☐ No

Yes	No	
☐	☒	Shallow (<50 feet) Confined Alluvial Aquifer and Thin (<15ft) Confining Unit
☐	☒	Deep Unconfined Aquifer
☐	☒	Fractured Bedrock at Surface
☐	☒	Aquifer Character unknown
☐	☒	Commingling of Aquifers Suspected
☐	☒	Nitrate-N 1-4.9 mg/L: Concentration .... Date ....
☐	☒	Inorganic Chemical Detection (<50% of MCL) ....
☐	☒	Well Construction Deficiencies from Site Visit. ....
☒	☐	Well constructed prior to 1979
☐	☒	Other Wells Score ≥ 400
☒	☐	Soil with TOT <65 hours or lack of soil information in DWPA
☐	☒	Infiltration Potential 4 to ≤ 7 (Not performed on TNCWS)
☐	☒	Surface water within 500 feet

1. Note that it is possible for a single system to have criteria from both the high and moderately sensitive lists. Having a criterion checked "yes" indicates that this characteristic contributes to the sensitivity at the indicated level.

Additional Comments ....

Sensitivity Analysis Completed by: Jeffrey J. Frederick .... **Date:** 01/14/03

Appendix G: Groundwater Fact Sheet