Wellhead Protection Report

City of Redmond
Department of Public Works

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WELLHEAD PROTECTION REPORT

Prepared for

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EXECUTIVE SUMMARY

The 1986 amendments to the federal Safe Drinking Water Act developed under the authority of the U.S. Environmental Protection Agency (USEPA) established a program to protect groundwaters that serve as drinking water sources for public water supply systems, referred to in the act as the "wellhead protection program." Each state was required by the USEPA to develop their own programs that incorporate the following minimum requirements:

- Delineation of areas that contribute flow to individual supply wells and springs
- Inventory of potential contamination sources within these contributing areas
- Development of plans to deal with hazardous material spills and contingent water supply sources
- Inclusion of public participation in the wellhead protection process

The Department of Health (DOH) in Washington State was designated by the Governor as the lead agency for wellhead protection program development and implementation. Wellhead protection requirements for public water systems in the state using wells or springs as their source of supply are specified in Chapter 246-290 of the Washington Administrative Code. DOH is responsible for monitoring compliance with the wellhead protection requirements and developing guidance documents to assist water purveyors in meeting the requirements.

The City of Redmond, Washington is involved in the wellhead protection process because the city obtains a portion of its water supply from five production wells completed in a shallow water-bearing formation (aquifer) that underlies the city. Redmond also has interties with City of Seattle pipelines that provide surface water from reservoirs in the Cascade Mountain foothills. The city initiated its wellhead protection effort in 1994 with authorization of a wellhead protection project funded partially through grant number G9400194 from the Department of Ecology under the Centennial Clean Water Fund.

This wellhead protection report represents the completion of Redmond's wellhead protection project and the initial step for the city in development of a local wellhead protection program. The report documents completion of the technical elements required by WAC 246-290 and provides recommendations regarding wellhead protection strategies and implementation approaches. It is designed to serve as a resource document for the city as it proceeds with the steps required to develop a wellhead protection program, including: determination of wellhead protection priorities, re-alignment of staff assignments, consideration and development of ordinances, confirmation of city council oversight and involvement, and ongoing solicitation of public input and guidance.

1. INTRODUCTION

1.1 WELLHEAD PROTECTION OBJECTIVES

The City of Redmond is developing a program to protect the quality of the portion of the drinking water supply that is obtained from city wells. The term "wellhead protection" was defined by the U.S. Environmental Protection Agency (USEPA) in the 1986 amendments to the Safe Drinking Water Act. "Wellhead" refers to a water supply well and the water that is produced by that well from the water-bearing strata (aquifer) in which the well is completed. Wellhead protection involves management of activities that have the potential to degrade the quality of groundwater produced by a supply well.

The requirements for municipal water purveyors in Washington State to develop wellhead protection plans are specified by the 1986 amendments to the Safe Drinking Water Act and state regulations promulgated to meet these federal requirements (WAC 246-290, Group A Public Water Systems). The regulatory framework for wellhead protection is addressed in more detail in Section 2 of this report.

The objectives of the city of Redmond with respect to wellhead protection are as follows:

- Preserve and protect the quality of groundwater in the aquifers that supply the city's drinking water.
- Meet the requirements of the state wellhead protection regulations and the Department of Ecology grant obtained by the City for development of a wellhead protection plan.
- Involve the public in the wellhead protection planning process.
- Develop a wellhead protection plan that can be directed and implemented by City staff, with focused assistance from outside resources.

1.2 IMPLEMENTATION OF THE CITY OF REDMOND WELLHEAD PROTECTION PROJECT

In 1994, the City of Redmond received a wellhead protection grant from the Department of Ecology (grant number G9400194) under the Centennial Clean water Fund. The grant partially funded the following subtasks:

- Establish a wellhead protection committee
- Define wellhead protection areas
- Complete a wellhead inventory (of potential contamination sources)
- Develop wellhead protection area management strategies

- Prepare contingency and spill response plans
- Prepare guidelines for a wellhead protection program
- Project management

All of the above have been performed with the exception of the establishment of a wellhead protection committee. Numerous meetings with the public were held; however, the city chose to develop staff awareness of the program elements prior to seeking public guidance for the program's adoption.

This wellhead protection report represents the initial step for the City of Redmond in development of a local wellhead protection program. It is designed to serve as a resource document for the city as elements of the wellhead protection program are conceived and implemented, including: determination of wellhead protection priorities, realignment of staff assignments, consideration and development of ordinances, confirmation of City Council oversight and involvement, and ongoing solicitation of public input and guidance.

1.3 REPORT OVERVIEW

This report documents the results of data compilation and analysis associated with completion of technical wellhead protection requirements, presents recommendations for wellhead protection program implementation by the City of Redmond, and describes the public involvement process employed during the project.

A brief description of the City of Redmond water supply system (Section 2) and previous groundwater quality protection efforts (Section 3) are followed by technical discussions of the Redmond aquifer hydrogeology and delineation of wellhead protection areas using an analytical element model (Sections 4 and 5, respectively), prepared by Pacific Groundwater Group. After wellhead protection areas were delineated, potential sources of groundwater contamination were inventoried and stored in a database created by Pacific Groundwater Group. The methods and findings of the contaminant inventory, along with a risk ranking developed by Pacific Groundwater Group and Parametrix, is presented in Section 6.

Section 7 describes the water supply contingency and spill response plan prepared by Parametrix in coordination with the City of Redmond. Public involvement activities led by Carolyn Browne Associates are summarized in Section 8. Wellhead protection strategies developed by Parametrix and Pacific Groundwater Group on the basis of the wellhead protection zone delineation and the contaminant inventory are presented in Section 9, and wellhead protection program implementation recommendations are provided in Section 10.

Figures and tables for each section are inserted at the end of that section. Section 11 lists reference documents used to complete this wellhead protection plan report. Appendices to this report follow Section 11.

2. REGULATORY AND POLICY FRAMEWORK FOR WELLHEAD PROTECTION

2.1 U.S. GOVERNMENT

The USEPA enforces regulations that address solid waste landfills; underground storage tanks; hazardous waste treatment, storage, and disposal facilities; hazardous waste site investigation and cleanup; pesticide and herbicide use; toxic substances use and disposal; and drinking water management. The EPA is the lead federal agency for wellhead protection, per requirements of the Safe Drinking Water Act (see Section 1.1 of this report). Development and enforcement of wellhead protection regulations is delegated by USEPA to state governments.

2.2 STATE OF WASHINGTON

The Department of Health (DOH) regulates large (Group A) public water systems such as Redmond's and large on-site sewage systems. The DOH regulations pertaining to Group A public water systems (WAC 246-290) specify requirements of the state wellhead protection program.

The Department of Ecology (Ecology) develops and enforces a multitude of regulations dealing with prevention and cleanup of groundwater contamination. These regulations apply to solid waste landfills; underground storage tanks; hazardous and dangerous wastes; hazardous waste site investigation and cleanup; implementation of the federal Resource Conservation and Recovery Act for hazardous waste treatment, storage, and disposal facilities in the state; permitting of discharges to groundwater and surface water; and well construction and decommissioning.

The state Growth Management Act (RCW 36.70A) requires that cities identify and protect critical areas, including aquifer recharge areas. In order to comply with the requirements of this act, the City of Redmond adopted regulations to govern sensitive areas in July 1992. These regulations are incorporated into the City of Redmond Community Development Guide (City of Redmond 1997b) and include definition and mapping of three Aquifer Recharge Area classifications: High, Medium, and Low Significance. Certain land uses are prohibited in High Significance Aquifer Recharge Areas, and implementation of mitigation standards are required in Medium and Low Significance Aquifer Recharge Areas.

2.3 KING COUNTY

Several divisions of the King County Department of Natural Resources are involved with groundwater quality regulations and programs, including Water and Land Resources, Water Pollution Control, and Solid Waste. The Department of Natural Resources is also the current lead agency for the Redmond-Bear Creek Valley Groundwater Management Plan (GWMP). The

County has direct jurisdiction over the unincorporated areas that bound the Redmond city limits on the north and east.

The Seattle-King County Department of Public Health (SKCDPH) served as lead agency for the Redmond-Bear Creek Valley GWMP from 1986 through 1995. This department regulates small water systems and septic systems, and is co-sponsor of the Local Hazardous Waste Management Program (with the King County Department of Natural Resources).

The King County Department of Development and Environmental Services regulates and enforces land development and zoning in unincorporated King County.

2.4 REDMOND-BEAR CREEK VALLEY GROUNDWATER MANAGEMENT PLAN

On April 17, 1986, King County petitioned Ecology to officially designate the Redmond-Bear Creek Valley Groundwater Management Area (GWMA), per the criteria established by WAC 173-100, Groundwater Management Areas and Programs. The GWMA covers an area of approximately 50 square miles bounded by the Snohomish County line on the north, the Bear Creek basin divide on the east, Lake Sammamish on the south, and the Sammamish River on the west. The aquifer from which Redmond draws water is located within the GWMA. Ecology designated the Redmond-Bear Creek Valley GWMA on October 7, 1986, with the Seattle-King County Department of Public Health as the lead agency.

The Redmond-Bear Creek Groundwater Advisory Committee (GWAC) was formed in 1988 to guide development of the Redmond-Bear Creek Valley GWMP according to state regulations, and to provide the perspective of the agencies represented on the committee.

Data collection and analysis was conducted between 1989 and 1992 by EMCON Northwest, Inc. and Adolfson Associates, Inc. The first draft of the GWMP (SKCDPH 1994) was completed in August 1994. A public hearing was held in February 1995 as part of the public comment period. An updated draft of the plan was submitted by the Redmond-Bear Creek Groundwater Management Committee (1996) in March 1996. The plan is currently in the process of adoption by affected agencies and Ecology.

This March 1996 draft GWMP recommends 16 specific goals intended to provide direction for programs that protect groundwater quality and quantity. Most of the recommended goals have direct connection or influence on the wellhead protection strategies developed for the City of Redmond in this report.

2.5 CITY OF REDMOND

The City of Redmond Comprehensive Plan (City of Redmond 1997a) supports wellhead protection. The policy statements in this plan that specifically apply to wellhead protection are summarized as follows:

NE-43. Recommends protection of the quality of groundwater used for public water supplies to insure adequate potable water sources. The level of protection shall correspond with the potential for contamination of the water supply, with the overall goal of non-degradation.

NE-44. Recommends that the city adopt and implement an aggressive program to protect the city's groundwater supply aquifer.

UT-23. Recommends that the city maintain a wellhead protection program as long as groundwater sources remain viable. This program shall guide land use decisions, development regulations, storm water facilities requirements, and other measures necessary to protect Redmond's well system.

The City of Redmond Community Development Guide (City of Redmond 1997b) describes regulations that apply to all aspects of project design, development, and operation, including groundwater quality protection. Sections 20B and 20C of the Community Development Guide contain city regulations that address groundwater quality protection through designation of Aquifer Recharge Areas and prohibition of specific land uses within High-Significance Recharge Areas. These regulations were enacted to meet requirements of the state Growth Management Act and to meet the needs of the Redmond community.

3. DESCRIPTION OF THE CITY OF REDMOND WATER SUPPLY SYSTEM

3.1 SYSTEM OVERVIEW

The City of Redmond obtains its water supply from two sources: city water supply wells and a City of Seattle surface water pipeline. The city is generally divided into two areas with respect to these water supply sources. The area east of the Sammamish River is served by city wells, and the area west of Lake Sammamish and the Sammamish River is supplied by water from the Tolt Eastside Supply Line. The locations of the city wells are shown on Figure 4.1 at the end of Section 4.

Even though there are two distinct areas within the Redmond system with respect to water supply services, water can be piped between these areas through two interties, with a combined capacity of about 2.2 to 2.9 million gallons per day (mgd). Other interties exist with the former Rose Hill Water District system, the City of Bellevue, the City of Seattle, and the Union Hill Water Association.

Projections for the year 2000 indicate a maximum daily demand of about 15.4 mgd and a total supply capacity of 26.4 mgd (City of Redmond 1992). This supply capacity assumes an addition of 1.1 mgd from replacement well 4 is added to the 3.7 mgd of wells 1, 2, 3, and 5, for a total groundwater supply component of 4.8 mgd.

3.2 SUMMARY OF WATER SUPPLY WELL INFORMATION

The groundwater component of the City of Redmond water supply consists of five wells, as summarized in Table 3.1. Well locations are shown on the maps following Section 4 of this report. Rated capacities of these wells range from 400 gallons per minute (gpm) to 1,000 gpm. All of the wells are completed in the same sand and gravel aquifer at depths ranging from 41 to 67 feet below ground surface. Wells 1, 2, 3, and 5 have treatment facilities that provide disinfection, fluoridation, and pH adjustment. Geologic logs of these wells are provided in Appendix A.

Replacement well 4 was drilled in 1996 as a substitute for original well 4, which was removed during construction of the Public Safety Building. When this well is brought on line, it will include equipment for disinfection, fluoridation, and pH adjustment.

Table 3.1. Inventory of existing City of Redmond water supply wells.

Well No. Year Drilled	Casing Diameter (inches)	Well Depth (feet bgs)	Depth to Static Water Level[1] (feet bgs)	Rated Capacity (gpm) @ Head[2]	Water Right (gpm)	1993 Production mg/Year	1993 Production gpm	1993 Production As % of Water Right
Well No. 1 1952; retrofitted 1972	12	56	15	750 1,000 @ 315 ft.	700	247	470	52%
Well No. 2 1959	12	68	19	450 500 @ 260 ft.	500	111	211	42%
Well No. 3 1969	12	46.5	20	350[1] 500 @ 315 ft.	480	127	242	50%
Well No. 4 1996	16"	57.5'	16'	--	800	NA	NA	NA
Well No. 5 1983	20	35	38	1,000 1,000 @ 360 ft.	1,000	312	594	59%
TOTAL				2,600 3,000	3,480	798	1,517	53%

Data sources: City of Redmond (1992); HDR Engineering (1994)

[1]Reported at time of well completion
[2]Operational capacity per Nelson Monroe, Redmond Water Maintenance Supervisor (1994)
NA = Not Applicable
bgs = below ground surface
gpm = gallons per minute
mg = million gallons

4. HYDROGEOLOGIC SETTING OF THE CITY OF REDMOND AQUIFER SYSTEM

4.1 OBJECTIVE

Characterizing the hydrogeology in the vicinity of the City of Redmond public water supply wells is a prerequisite to calculating the wellhead protection areas for the wells.

4.2 SUMMARY

This hydrogeologic characterization is primarily based on hydrogeologic work performed for the Redmond-Bear Creek GWMP. This work was completed by the SKCDPH (1994). A draft Hydrogeologic Characterization Report by EMCON Northwest (1992) was consulted as was a well database that was initiated during the GWMP project and is currently maintained by SKCDPH. Supporting documents include the Union Hill Water District's "Characterization and Protection of the Union Hill Aquifer System" by Carr/Associates (1993), the U.S. Geological Survey's draft report "Geohydrology and Quality of Groundwater in East King County, Washington" (Turney, Kahle, and Dion 1994), and two appendices to the Northridge UPD Draft EIS (Hydrologic Services" by GeoEngineers [1994] and "Hydrogeology of the Southern Union Hill Uplands" by Associated Earth Sciences [1995]).

This specific wellhead protection project focuses on the City of Redmond's municipal drinking water supply wells; therefore, the geographic scope of the wellhead protection project is smaller than the GWMP's study area. Geology and groundwater data were initially compiled for the Redmond City Impact and Planning Area (Figure 4.1). These data indicate that the five City of Redmond wells draw water from a highly permeable layer of sand and gravel (the "alluvial aquifer") in the lower portions of the Bear Creek Valley. This layer is about 30 ft thick and all of the wells are screened shallower than 70 ft below ground surface. The layer receives water from surrounding soil layers up Bear Creek Valley, Evans Creek Valley, and the uplands on the valley sides. Precipitation averages about 42 inches per year in the area, with 16 to 26 inches of those 42 inches expected to recharge groundwater. After recharging, groundwater moves within the soil layers toward Bear Creek, Evans Creek, Lake Sammamish, and the Sammamish River.

The city wells produce an average of 1,560 gallons per minute (gpm) and are permitted by water rights to pump as much as 3,480 gpm. Discharge data for city wells are summarized in Table 4.1.

4.3 GEOLOGY

SKCDPH (1994) identified the following seven geologic units underlying the project area:

- Alluvium

- Vashon Recessional Outwash
- Vashon Glacial Till
- Vashon Advance Outwash
- Transitional Beds
- Olympia Beds
- Older Undifferentiated Deposits

Brief descriptions of the six youngest units are provided here; the Older Undifferentiated Deposits do not appear to play a direct role in wellhead protection for the City of Redmond. Refer to SKCDPH (1994); Carr (1993); Turney, Kahle, and Dion (1993); and Minard and Booth (1988) for more detailed unit descriptions. Figure 4.2 is a geologic map of the study area, and Figure 4.3 presents two simplified geologic cross sections.

4.3.1 Alluvium and Vashon Recession Outwash

These two geologic deposits lie at ground surface in the floors of the Sammamish River, Bear Creek, and Evans Creek Valleys. They were deposited in valleys that remained after the Vashon glacier receded. The shallowest alluvium (included in geologic unit Qyal on Figure 4.2) consists of relatively fine-grained sand, silt, clay, and organic matter. The map by Minard and Booth (1988) indicates that Qyal does not occur in the upper reaches of Bear Creek.

Minard and Booth indicate that the young Vashon Recessional Outwash (Qvry) lies in the valley floors in the upper reaches of the Bear Creek drainage. The Qvry, or a related glacial outwash deposit, also appears to underlie the alluvium in the lower Bear Creek valley floor near downtown Redmond. There it yields water to the City of Redmond wells. It is possible that the city's water supply aquifer is actually within a lower portion of the Qyal deposit. Whether the city's water supply aquifer is alluvial or recessional is not important for the purposes of this project. The deposit is hereafter referred to as the "Qyal/Qvry" or "Alluvial Aquifer."

In the upper reaches of Bear Creek, well logs in areas mapped as Qvry indicate considerable fine-grained materials along with sand and gravel. In the downtown Redmond area, where penetrated by the City of Redmond supply wells, the deposit is clean sand and gravel.

The Qyal/Qvry bottom elevation occurs at approximately mean sea level near downtown Redmond (see Figure 4.3, Section A-A'). A similar bottom elevation is indicated for a related recessional deposit called the Redmond Delta or Qvrd, as indicated in the Redmond test well drilled for the GWMP project (see Figure 4.2). The Redmond Delta was deposited in glacial Lake Bretz at the current location of the Cadman gravel quarry east of downtown Redmond. The Qvrd has textural characteristics of an aquifer (sand and gravel) and is considered a part of the Qyal/Qvry aquifer.

Contrary to the general bottom elevation trend discussed above, a continuous aquifer is indicated from close to ground surface to 80 ft *below* mean sea level at the locations of the Marymoor and

Lower Evans Creek test wells drilled for the GWMP project (see Figure 4.2). At these two locations and other areas of lower Evans Creek and Lake Sammamish, the extra-thick upper aquifer may be explained by either of the following two possibilities:

- The extra-thick upper aquifer may be the combined sections of Qyal/Qvry and the Olympia Gravel (Qob) described below. Carr (1993) assigns the lower Evans Creek test well (therein called well EC-1) aquifer to the "primary aquifer" and, therefore, the Carr hydrostratigraphy is consistent with this first possible explanation (see Figure 5 in Carr 1993).

- The aquifer may be comprised of an extra-thick section of Qyal/Qvry if the erosional valley within which Qyal/Qvry was deposited had been eroded to about sea level in most areas but to 80 ft below sea level in lower Evans Creek and near Lake Sammamish. This possibility seems less likely than the first explanation.

The extra-thick aquifer penetrated in these two borings has not been noted or explained by previous authors.

4.3.2 Vashon Glacial Till

This glacial till (Qvt) makes up the shallowest geologic unit on the glacial uplands north, east, and west of Bear Creek Valley. Unless eroded away, the till tends to lay like a blanket over topography that existed just prior to till deposition. It appears to have been eroded away in much of the lower reaches of Bear Creek Valley (see Figure 4.3 - Section A-A'). However, the driller's log of Redmond well 3 suggests that till is present below the Qyal/Qvry. Work by Hart Crowser (1994a, 1994b) for the Woodinville Water District indicates that Qvt does underlie the Qvry in the upper reaches of the valley. The till is typically a very dense mixture of sand, silt, and gravel that does not transmit water readily.

4.3.3 Vashon Advance Outwash

Vashon Advance Outwash (Qva) underlies Qvt below the glacial uplands that surround Redmond and the Bear Creek Valley. Consisting of stratified clean sand and gravel with silt beds, Qva ranges in elevation from about 100 to 250 ft above sea level below Education Hill (north of downtown Redmond). Hart Crowser (1994a) places the Qva at an elevation of about 200 ft above sea level in the vicinity of Cottage Lake in the upper reaches of Bear Creek Valley. The Qva provides moderate quantities of water to wells drilled to depths of between 100 and 200 ft depth below the glacial uplands. The "Local Upland Aquifers" of EMCON (1992) and King County (1994), and the "Intermediate Aquifer" identified below Union Hill by Carr (1993), appear to be largely within the Qva.

4.3.4 Transitional Beds

Beneath the Qva is an extensive fine-grained deposit of laminated clayey silt to clay with minor lenses of sand, gravel, peat, and wood. This unit, referred to as the transitional beds (Qtb), was deposited in standing water ponded by the advancing Vashon glacier. The unit constitutes a major regional aquitard. The Qtb underlies the Qyal/Qvry Aquifer where the Qvt and Qva have been eroded away, such as in the Sammamish River and Bear Creek valleys within the project area.

Below the glacial uplands east and west of Bear Creek, as well as in the upper reaches of the Bear Creek Valley, the upper contact of the Qtb ranges in elevation from 100 ft to more than 300 ft above mean sea level. It was partially eroded in the Bear Creek Valley, where the upper contact of the Qtb is as low as a few feet below mean sea level near downtown Redmond (see Figure 4.3, Section B-B'). The Qtb may be completely eroded away at the locations of the Marymoor and lower Evans Creek GWMA test wells; if so, continuity between the Qyal/Qvry and Olympia Gravel Aquifer is locally established.

4.3.5 Olympia Beds

The Olympia Beds (Qob) consist of stratified sand with minor silt and clay beds deposited by streams. The lower section mapped by Minard and Booth (1988) along the east shore of Lake Sammamish consisted of coarse sand and gravel. Qob underlies the Qtb where the Qtb is present. Within the GWMA, the upper contact of the Qob ranges in elevation from 200 ft above mean sea level to 200 ft below mean sea level (EMCON 1992).

The lower coarse section of the Qob is equivalent to the Olympia Gravels and Sea Level Aquifer of SKCDPH (1984), a major regional aquifer capable of yielding large quantities of water to wells. The "Sea Level Aquifers" of SKCHD (1994) and the "Primary Aquifer" identified in the Union Hill area by Carr (1993) all appear to be within the lower coarse section of the Qob. Also, the Q(A)c of Turney, Kahle, and Dion (1994) correlates to the Qob.

4.4 AQUIFER IDENTIFICATION AND PROPERTIES

Three aquifers may be influenced by City of Redmond wellhead protection efforts. Using GWMP terminology, these aquifers include the Alluvial Aquifer, Local Upland Aquifers, and Sea Level Aquifers.

Redmond supply wells produce from the Alluvial Aquifer with screen bottom depths of 20 to 68 ft below ground surface. The well 3 log indicates possible till above the aquifer, which suggests that the production interval is not post-glacial alluvium. For the purpose of this project, the well 3 production interval is assumed to be in the same aquifer as the other city wells.

The Alluvial Aquifer is proximate to the Local Upland Aquifer and the Sea Level Aquifer to either side and underneath, respectively. However, aquitards generally separate the three aquifers. The aquitards Qvt and Qtb separate the Local Upland Aquifers from the Alluvial Aquifer; nevertheless, spring, interflow, and upward discharge from the Local Upland Aquifers are probably responsible for considerable but indirect "mountain-front recharge" to the Alluvial Aquifer. The Qtb separates the Sea Level Aquifer from the overlying Alluvial Aquifer (see Figure 4.3), except possibly in lower Evans Creek and near Lake Sammamish.

The Alluvial Aquifer properties are summarized in Table 4.2. The transmissivity (T) values derived from specific capacity data are less reliable than other values. No Alluvial Aquifer test data from upper Bear Creek Valley are known to exist. Well logs reviewed from the upper reaches of Bear Creek indicate more silt and clay than is present in the aquifer developed by the city wells; therefore, the hydraulic conductivity (K) of the Qal/Qvry is likely lower in the upper valley reaches than it is at the city wells.

The average aquifer thickness (b) of about 30 ft on Table 4.2 reflects the thicknesses of the high transmissivity portion of the Qyal/Qvry at the indicated wells. Overall thickness of the entire Qyal/Qvry deposit is typically about 70 ft, but only an average of 30 ft is highly transmissive. The issue of effective aquifer thickness is important because wellhead protection area delineation requires calculating groundwater travel times; it is therefore necessary to model groundwater movement by specifying hydraulic conductivity (K) and aquifer thickness (b), not just transmissivity.

Aquifer tests yield transmissivity data which are converted to aquifer hydraulic conductivity rates using the following equation:

$$T=Kb \quad \text{or} \quad K=T/b \qquad \text{Equation 1}$$

where K = hydraulic conductivity (ft per day)
T = transmissivity (ft^2 per day), and
b = aquifer thickness (ft).

For a given aquifer test, an appropriate aquifer thickness (b) must be interpreted from a well log to calculate the K. Likewise, an appropriate aquifer b and K must be specified if the entire aquifer is to be modeled. For a given T, a low b and high K will result in high groundwater flow velocities and long protection areas. For that same T, but modeled with a larger b and resulting smaller K, the groundwater velocities will be lower and the protection areas shorter.

Because a steady-state model is employed for this project, aquifer storage coefficients are not required.

Properties of the Local Upland and Sea Level Aquifers are less well known than the Alluvial Aquifer properties. Hart Crowser (1994b) reported a transmissivity range of 7,000 ft^2 per day

to 27,000 ft^2 per day for the Local Upland (Qva) Aquifer near Cottage Lake. Hart Crowser (1994a) also reports a transmissivity of 48,000 ft^2 per day for the Sea Level (Qob) aquifer near Cottage Lake. A transmissivity of about 7,000 ft^2 per day was used by Carr (1993) to model the Sea Level Aquifer below Union Hill. Associated Earth Sciences (1995) inferred that transmissivity of the Local Upland Aquifer ranges from 425 to 10,200 ft^2 per day.

4.5 PRECIPITATION RECHARGE

Turney, Kahle, and Dion (1994) estimate total groundwater recharge to be 31 inches per year in the East King County study area, east of this project study area. Within the GWMA, 26 inches of recharge per year are calculated for Qyal/Qvry areas using Turney, Kahle, and Dion's precipitation/recharge relationship and an average precipitation of 42 inches per year as reported for the GWMA (SKCDPH 1994). Using a similar modeling approach, 16 inches per year are expected to recharge in the glacial till uplands of the GWMA.

In layered systems, successively deeper aquifers receive only a fraction per unit area of the recharge that shallower aquifers receive. No quantification of recharge to the Upland or Sea Level Aquifers was made by SKCDPH (1994) or Turney, Kahle, and Dion (1994) based on this consideration, and such a calculation is beyond the scope of this project. Recharge in the uplands is distributed among several roughly horizontal layers, including the major aquifers described above, because shallower aquifers discharge water both horizontally and vertically downward to lower aquifers.

4.6 GROUNDWATER FLOW

This discussion of groundwater flow begins with the recharge areas in the glacial uplands and moves to local groundwater discharge areas. Potentiometric surface elevation is referenced to mean sea level (MSL). The terms groundwater potentiometric elevation and head are used interchangeably to describe the elevation of the groundwater level in a given aquifer.

Figure 4.4 presents a map of groundwater heads as presented in the GWMP (SKCDPH 1994). The map is based on data collected in April 1990 and by additional data collected by Hart Crowser (1994a, b) in the Woodinville area only. The King County GWMA database contains the data used by SKCDPH in the GWMP as well as data from numerous other water level measurement rounds. To assess the appropriateness of the groundwater flow direction map used in the GWMP for model calibration, Pacific Groundwater Group contoured the arithmetic means of all groundwater heads present in the King County groundwater database. The resulting potentiometric surface did not differ greatly from the GWMP map; however, the following qualifications on the Alluvial Aquifer map are important:

- Data point (well) density is insufficient to define the shape of contours in Bear Creek valley.

- The 60-ft contour has been drawn to "bend" from an east-west orientation in Bear Creek Valley to a north-south orientation in Evans Creek Valley without intersecting the aquifer boundary. The contour may in fact intersect the aquifer boundary in both valleys and, therefore, be in two segments.

- The orientation and position of the 20-ft contour is not well known. Based on the elevations of nearby surface waters, it is doubtful whether static groundwater heads less than 20 ft above MSL exist near Redmond.

4.6.1 Groundwater Flow in the Alluvial and Local Upland Aquifers

The map on the left side of Figure 4.4 presents heads and groundwater flow directions in the Alluvial and Local Upland Aquifers. Groundwater flow directions in the Local Upland Aquifers are parallel to topographic slopes and therefore radiate outward from the tops of the glacial uplands. Potentiometic surface elevations range from about 200 ft MSL along the upland margins to more than 300 ft MSL near the top of Education Hill north of downtown Redmond, and to between 400 and 500 ft MSL near the divide on top of Union Hill and Novelty Hill east of Bear Creek.

The positions of the groundwater divides atop Education, Union, and Novelty Hills are potentially important because they constitute the maximum potential extent of recharge to Redmond's wells. Figure 4.4 indicates the position of the divide on Union and Novelty hills as roughly indicated by Carr (1993) and Associated Earth Sciences (1995). The divide position inferred from Carr was drawn by Pacific Groundwater Group from a single data point on a cross section and extended north-south (the long axis of the upland). The divide position from Associated Earth Sciences was taken directly from Figure 6 of AES (1995); however, the interpretation of water level data upon which that divide was based is doubtful. In summary, the position of the divide on the Novelty and Union Hill Uplands is not well known. The position of the groundwater divide on Education Hill is assumed to coincide with the topographic divide.

The Upland Aquifer, as interpreted by the Qva geologic unit distribution (see Figure 4.2), underlies the Qvt and Alluvial Aquifer only in the upper reaches of Bear Creek (SKCDPH 1994; Hart Crowser 1994a, b). Recharge to the Upland Aquifers is from precipitation infiltration. Discharge is downward to the Sea Level Aquifer, laterally to springs and interflow along the upland margins, and upward to the Alluvial Aquifer where the two aquifers overlap in the upper reaches of Bear Creek Valley. Hart Crowser (1994a) indicates that heads in the Upland Aquifer are 20 ft higher than heads in the Alluvial Aquifer northwest of Cottage Lake; in such areas, upward discharge from the Upland Aquifer to the Alluvial Aquifer is likely significant.

The potentiometric surface in the Alluvial Aquifer falls from a high of about 120 ft MSL just above the confluence of Bear and Cottage Lake Creeks to 20 ft MSL near the Sammamish River. Heads near downtown Redmond range from about 40 ft MSL near Redmond well 5 to between 20 ft and 30 ft MSL at Redmond wells 1 and 2. Heads in the Evans Creek Alluvial Aquifer

likewise fall from 120 ft MSL on the east side of the project area to about 60 ft MSL where the Evans Creek Valley opens into the area of the Redmond Delta. Recharge to the Alluvial Aquifer is from precipitation infiltration and from discharge from the Upland Aquifers. Discharge from the Alluvial Aquifer is to Bear and Evans Creeks and the Sammamish River.

4.6.2 Groundwater Flow in the Sea Level Aquifer

The map on the right side of Figure 4.4 shows heads and groundwater flow directions in the Sea Level Aquifer. Potentiometric elevation ranges from 160 ft MSL on the east to 60 ft MSL on the west. Groundwater flows are generally westerly. These interpretations are, however, limited by a lack of data from the Bear Creek Valley, downtown Redmond, and below Education Hill. Recharge to the Sea Level Aquifer is from downward leakage from the Upland Aquifers of Union/Novelty hills and probably Education Hill. The percentage of precipitation recharge that reaches the Sea Level Aquifer, as opposed to that which discharges laterally in shallower aquifers, is not known. Discharge is laterally westward out of the project area and upward to the Alluvial Aquifer and surface water features.

Potentiometric elevations in the Sea Level Aquifer are equal to those in the Alluvial Aquifer near the confluence of Bear and Cottage Lake Creeks; everywhere downstream of that location the potentiometric elevations in the Sea Level Aquifer are greater than those in the Alluvial Aquifer, and the potential for upward flow of groundwater between the two aquifers exists. However, the Qtb aquitard restricts flow between the two aquifers. Head differences between the two aquifers may be as great as 40 ft near the Sammamish River. Flowing artesian conditions may exist for Sea Level Aquifer wells in this area. Upward discharge from the Sea Level Aquifer could be very significant where the Qtb aquitard may be missing (near the mouth of Evans Creek and near Lake Sammamish).

4.7 DISCHARGE OF CITY WELLS

Table 4.1 summarizes well discharge data for the city of Redmond. Total water consumption for the years 1989 through 1994 averaged about 2.25 million gallons per day (1,560 gallons per minute) and increased an average of nearly 4 percent per year over that period. Water right data and instantaneous pumping rates are also shown.

4.8 SURFACE WATER FEATURES

Key surface water features in the project area are:

- Cottage Lake Creek and Bear Creek
- Evans Creek
- Lake Sammamish
- Sammamish River

Cottage Lake Creek, Bear Creek, and their tributaries flow to the south from as far north as the King-Snohomish County line (see Figure 4.1). They combine to form lower Bear Creek about 2.5 miles north of downtown Redmond. Stream base flow data (Table 4.3) indicate that on the average, Bear Creek base flow increases over its entire reach near Redmond (gages are shown on Figure 4.2). The gain in base flow results from discharging groundwater.

Evans Creek drains a valley that defines the south edge of the eastern glacial upland in the project area. Evans Creek flows into Bear Creek in the Redmond Delta area. Bear Creek and Evans Creek are similar in size and character; that is, during base flow periods the main stems are relatively low energy, slow- to moderately fast-moving streams. They are not incised substantially into the Qyal and Qvry sediments.

Lake Sammamish defines the western edge of the Sammamish Plateau and the southern edge of the area potentially involved in wellhead protection for the city of Redmond. The mean water level elevation in the lake is about 25 ft above MSL.

The Sammamish River is a channelized river that drains Lake Sammamish to the northwest, through the city of Redmond. It is gaged at two locations in the project area (see Table 4.3 and Figure 4.2). Mean flow stage elevations on the river range from 25 ft at Lake Sammamish to an estimated 17 ft about 2 miles northwest of downtown Redmond (see Station 12125200, Figure 4.2). The water surface is about 10 ft below the surrounding floodplain. Water depth in the river has not been measured for this project. Assuming a water depth of 5 ft, the river bottom is approximately 12 ft above sea level at the downstream gage.

A well log (well 26N/05E-26N01) from the Sammamish River floodplain, near the downstream gage discussed in the preceding paragraph (12125200), indicates that the transmissive portion of the Qyal/Qvry aquifer occurs from 26 ft to 58 ft below ground surface (bgs); this corresponds to an elevation of 4 ft above MSL to 28 ft below MSL. Above that depth, soils consist of mixed clay, sand, and gravel. Thus, the top of the aquifer and the bottom of the river appear to be separated by a few feet of non-aquifer material at that location.

4.9 GROUNDWATER QUALITY

Water samples from city supply wells are routinely collected by the City of Redmond to comply with water quality regulations. These data indicate that the natural quality of groundwater in the alluvial aquifer is excellent. The water has a low dissolved solids load and a moderate amount of hardness. None of the monitoring constituents have exceeded Maximum Contamination Limits (MCLs), except for an occasional bacteriological exceedence.

Apart from the documented contamination events discussed in Section 6.12, the single parameter that has been found elevated above ambient groundwater concentrations is nitrate in well 3. The concentration exceeded 4 parts per million (ppm) in 1995, compared to an MCL of 10 ppm. Concentrations greater than 2 to 3 ppm are indicative of human activities, typically septic

discharges and fertilizer over-application. The state Department of Health requires quarterly monitoring for water sources that exceed 5 ppm nitrate.

A water quality database containing routine inorganic monitoring data supplied by the city covers sampling dates between 1984 and 1995. The database was created with a Microsoft Access application developed by Pacific Groundwater Group.

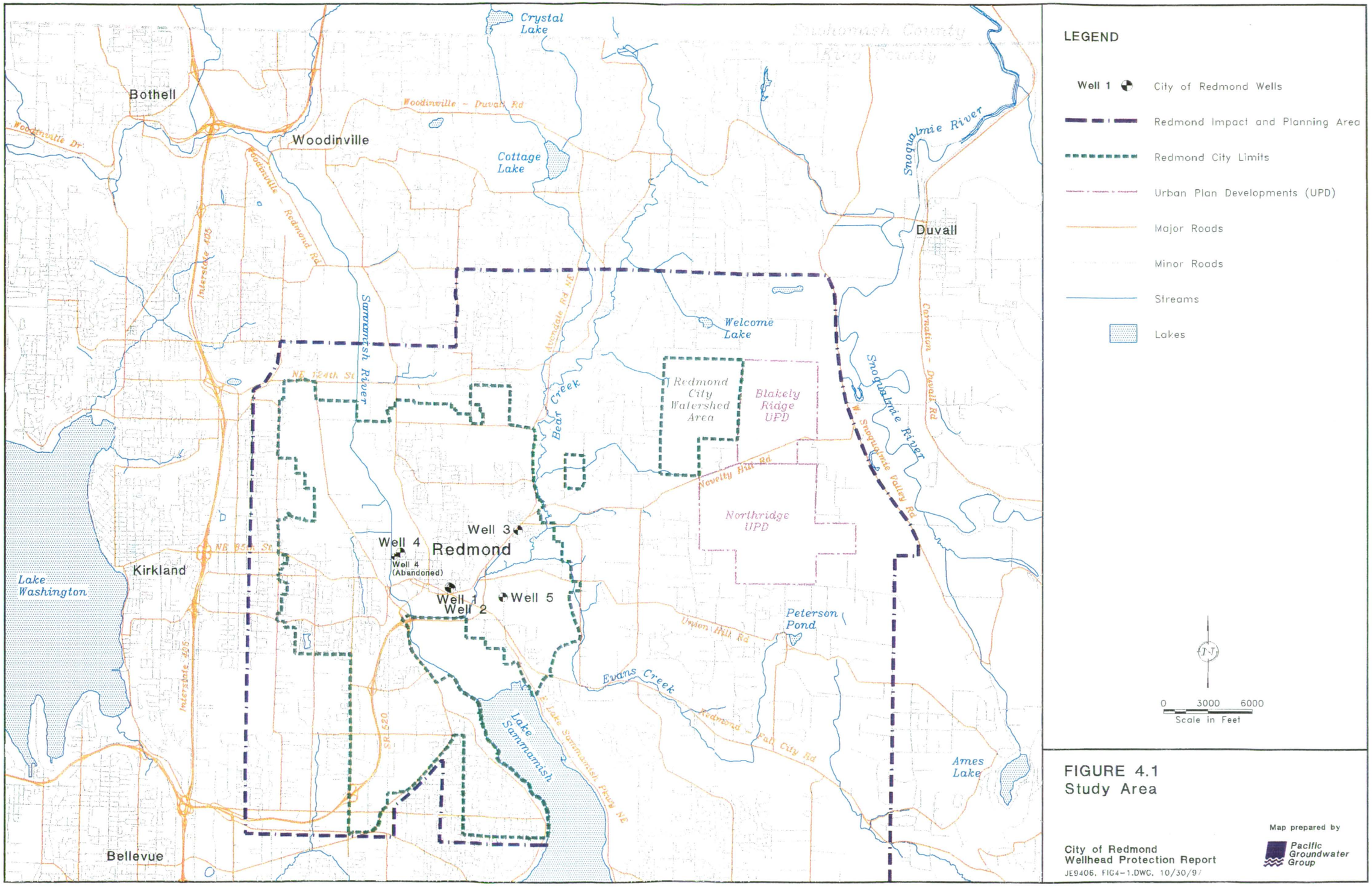
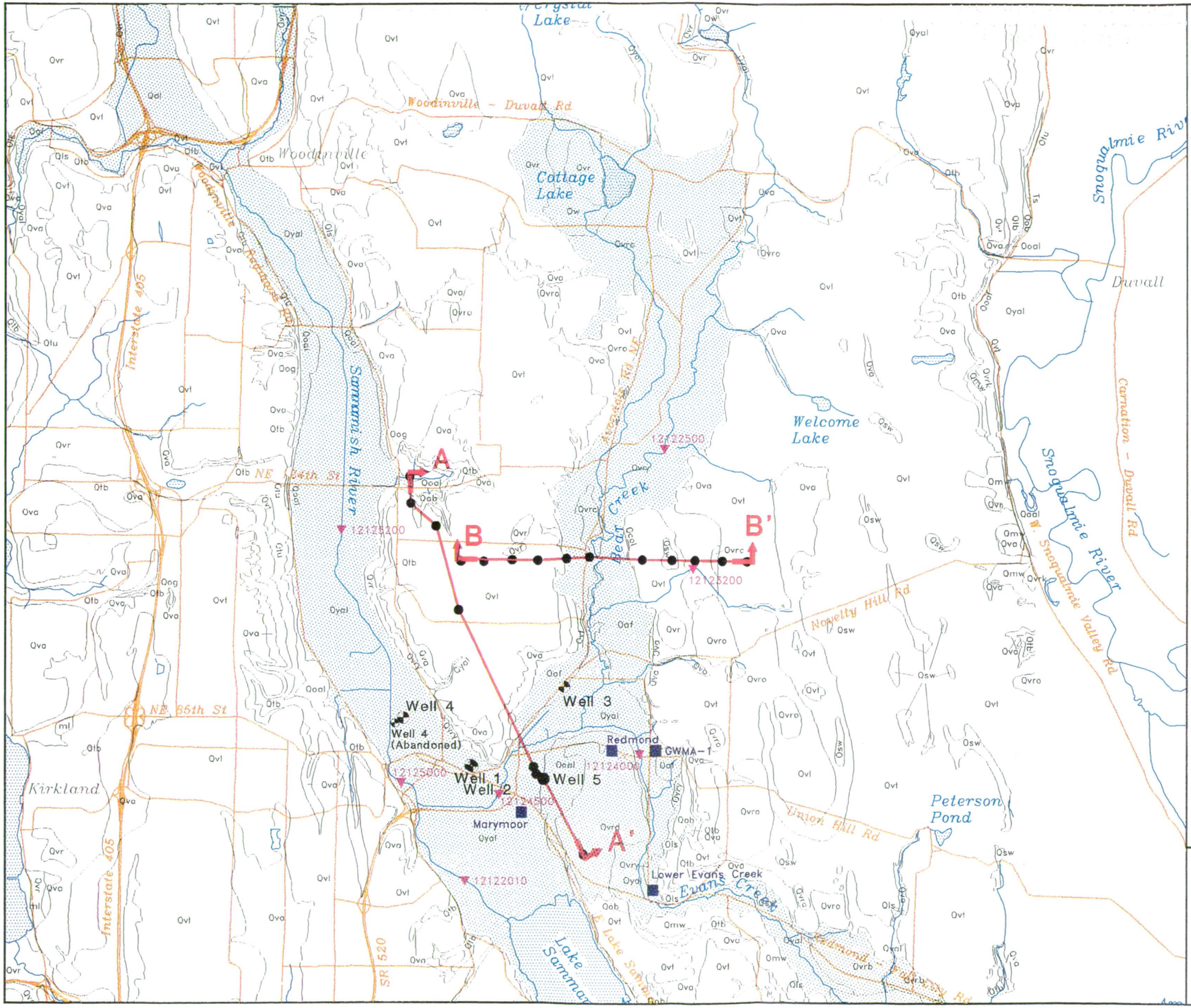


FIGURE 4.1
Study Area

City of Redmond
Wellhead Protection Report
JE9406, FIG4-1.DWG, 10/30/97

Map prepared by
Pacific Groundwater Group



LEGEND

Well #1 — City of Redmond Wells

A — A' — Cross-Section Locations

Location of Well Used for Geologic Cross-Section

GWMA-1 — GWMP Test Well Locations

12122500 — Stream Gaging Stations

Alluvial Aquifer Boundaries

Surficial Geology Descriptions

Qaf	Alluvial Fan Deposits
Qyal	Younger Alluvium
Qoal	Older Alluvium
Qsw	Swampy Deposits
Qc	Colluvium
Qls	Landslide Deposits
Qmw	Deposits of Mass Wasting
Qvr	Vashon Recessional Deposits
Qvry	Vashon Recessional – Younger
Qvrc	Vashon Recessional – Clay
Qvrb	Vashon Recessional – Lake Bretz
Qvrd	Vashon Recessional – Redmond Delta
Qvrk	Vashon Recessional – Kame Terrace
Qvro	Vashon Recessional – Older
Qvt	Vashon Till
Qva	Vashon Advance
Qtb	Transitional Beds
Qob	Olympia Beds
Ts	Sedimentary Rocks

Major Roads

Streams

Lakes

0 2500 5000
Scale in Feet

N

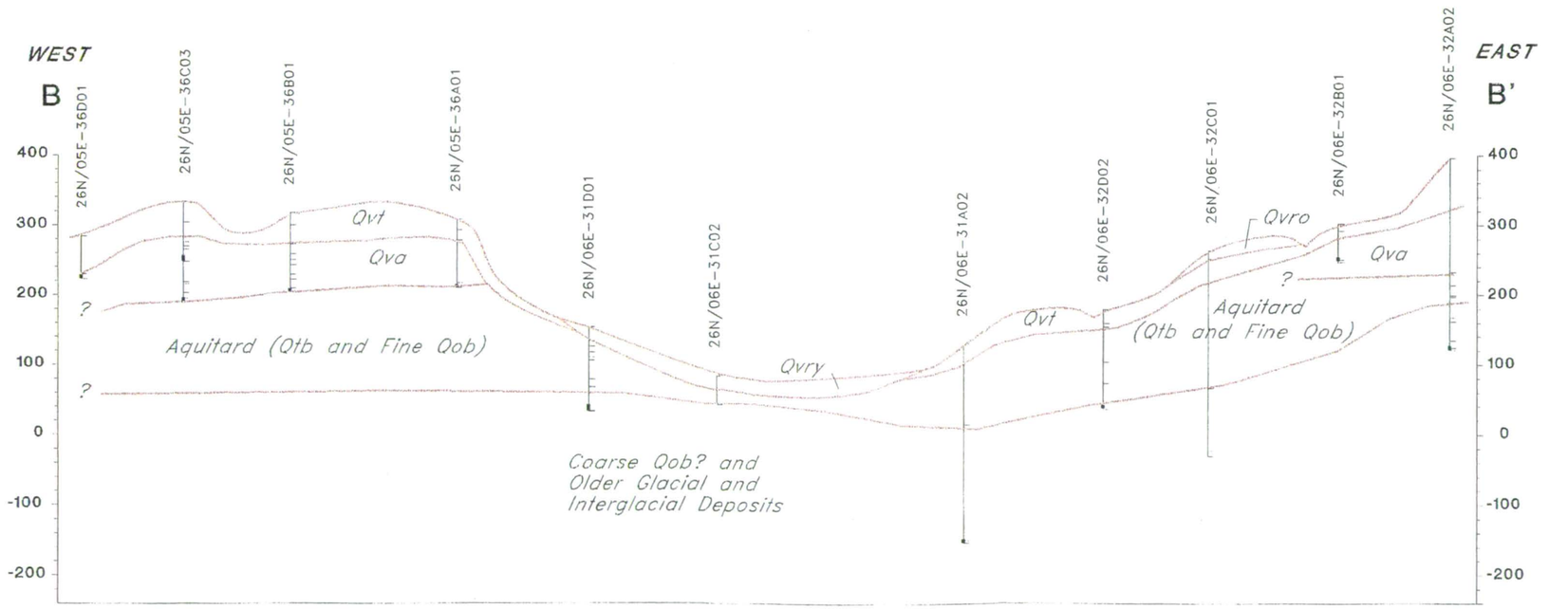
Geology from Minard and Booth, 1988

FIGURE 4.2
Geologic Map with Cross-Section and Key Well Locations

Map prepared by

Pacific Groundwater Group

City of Redmond
Wellhead Protection Report
JE9406, FIG4-2.DWG, 10/30/97



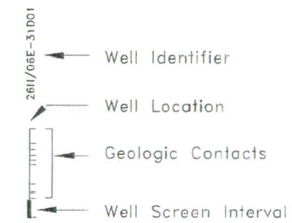
LEGEND

Geologic Contacts

Surficial Geology Descriptions

Qaf	Alluvial Fan Deposits
Qyal	Younger Alluvium
Qoal	Older Alluvium
Osw	Swampy Deposits
Qc	Colluvium
Qls	Landslide Deposits
Qmw	Deposits of Mass Wasting
Qvr	Vashon Recessional Deposits
Qvry	Vashon Recessional – Younger
Qvrc	Vashon Recessional – Clay
Qvrb	Vashon Recessional – Lake Bretz
Qvrd	Vashon Recessional – Redmond Delta
Qvrk	Vashon Recessional – Kame Terrace
Qvro	Vashon Recessional – Older
Qvt	Vashon Till
Qva	Vashon Advance
Qtb	Transitional Beds
Qob	Olympia Beds
Ts	Sedimentary Rocks

Well Descriptions



Horizontal Scale in Feet
0 1000 2000
Vertical Scale in Feet
0 100 200

FIGURE 4.3
Geologic Cross-Sections

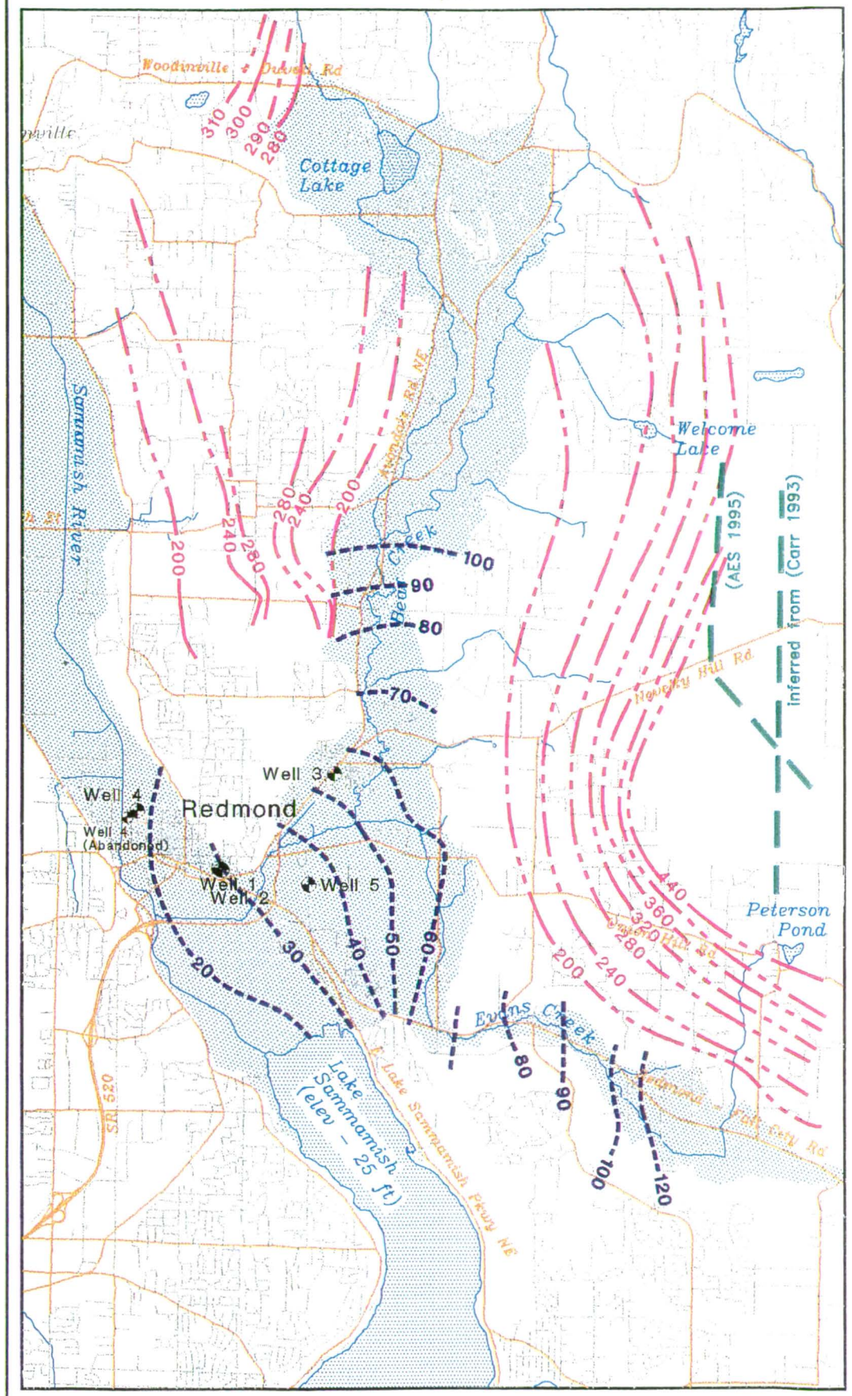
City of Redmond
Wellhead Protection Report

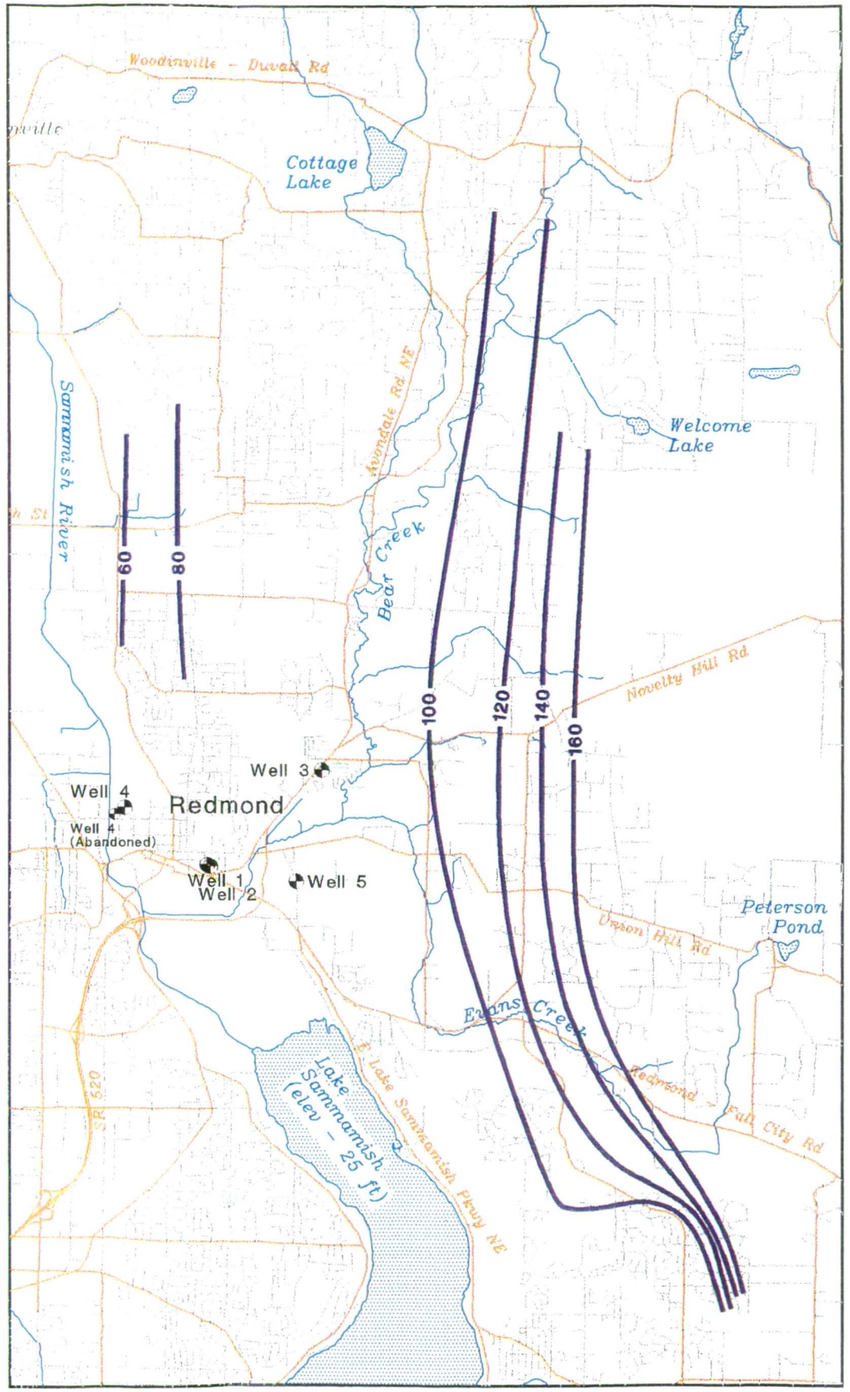
JE9406. FIG4-3.DWG, 10/30/97

Map prepared by
Pacific Groundwater Group

a. Alluvial and Upland Aquifers

b. Sea Level Aquifer





LEGEND

- Well 1 — City of Redmond Wells
- Potentiometric Surface Elevations
  - Alluvial Aquifer
  - Upland Aquifer
  - Sea Level Aquifer
  - all contours from SKCHD (1994)
- Groundwater Divide (see references on map)
- Alluvial Aquifer Boundaries
- Major Roads
- Minor Roads
- Streams
- Lakes

N

0 3000 6000
Scale in Feet

FIGURE 4.4
Groundwater Potentiometric Surface Elevations -
a. Alluvial and Upland Aquifers
b. Sea Level Aquifer

City of Redmond
Wellhead Protection Report
JL9406, FIG4-4.DWG, 10/30/97

Map prepared by
Pacific Groundwater Group

Table 4.1. Summary of Redmond city well discharge data.

Well No.	Approximate Instantaneous Discharge[1]	Average Annual Discharge[1]	Water Right[1]	Percent of Total City Pumpage
1	690 (133,000)	437 (84,000)	700 (134,759)	28 percent
2	380 (73,000)	281 (54,000)	500 (96,257)	18 percent
3	350 (67,000)	218 (42,000)	480 (92,406)	14 percent
4	0	0	800 (154,011)	0 percent
5	850 (164,000)	624 (120,000)	1,000 (192,513)	40 percent
Total	2,270 (437,000)	1,560 (300,000)		100 percent

Approximate instantaneous discharges reported by the City on August 23, 1995.

Average annual discharge based on data reported by the City for 1989-1994.

Water right discharge based on instantaneous rates quoted in Bishop (1995). Well 3 has a supplemental water right.

gpm = gallons per minute

ft^3/day - cubic feet per day

[1] gpm shown first; ft^3/day shown in ( )

Table 4.2. Alluvial aquifer properties.

Well No.	Transmissivity (ft^2/day)	Transmissivity Data Source	Alluvial Aquifer Thickness (ft) (see note)	Aquifer Thickness Data Source
1	27,000	Specific Capacity Calculation	NA	
2	5,300	Specific Capacity Calculation	NA	
3	11,000	Specific Capacity Calculation	31	Well log (25 to 56 ft bgs)
4 (old)	50,000	Shannon and Wilson (1975)	30	Shannon and Wilson (1975) Well log (10 to 40 ft bgs)
4 (new)	51,000 to 67,000	CH2M Hill (1996)	20	CH2M Hill Well log (28 to 48 ft bgs)
5	134,000	Specific Capacity Calculation	27	Shannon and Wilson (1983) Well log (14 to 41 ft bgs)
5	105,000	Shannon and Wilson (1983)		

The aquifer thickness is taken as the high transmissivity portion of the Qyal/Qvry as indicated by the well log.
NA = not available
bgs = below ground surface

Table 4.3. Stream base flow estimates.

Location	USGS Gaging Station Number	Median August Flow (cfs)	Average Annual Base Flow Estimate[a] (cfs)
Bear Creek near Redmond	12122500	7.28	11
Bear Creek Tributary near Redmond	12123200	0.4275	.5
Evans Creek near Redmond	12124000	7.475	11
Bear Creek at Redmond	12124500	21.68	32
Sammamish River near Redmond	12125000	74.85	110
Sammamish River above Bear Creek near Redmond	12122010	46.58	70

[a] 1.5 times median August flow
cfs = cubic ft per second
Reference: Hydrosphere Data Products, (1994).

5. DELINEATION OF WELL CAPTURE ZONES

5.1 OBJECTIVES

The objective of this section is to document the methods used to delineate capture zones around the City of Redmond water supply wells. Delineation of well capture zones consists of defining the area within which groundwater moves towards, and eventually reaches, a well. For this project, areas within which water may reach the wells in 6 months, 1 year, 5 years, and 10 years were delineated. Such delineation into areas, called time-of-travel (TOT) capture zones, is required by state and federal regulation.

State wellhead protection guidance (Washington State Department of Health 1995) recommends using advanced techniques, such as computer models, to delineate wellhead protection areas for water systems having greater than 1,000 service connections and using aquifers that are highly susceptible to contamination. Because these conditions apply to the Redmond water system, a computerized groundwater flow model was used for the delineation effort. The conceptual hydrogeologic model—the basis for model calculations and computerization of the groundwater flow regime—is outlined in Section 4.

5.2 SUMMARY

The conceptual model divided the area into the Alluvial Aquifer and Upland Aquifers. Redmond's city wells produce from the Alluvial Aquifer. The Analytic Element Model (AEM) used simulates Alluvial Aquifer flow acceptably near Redmond ("near field"). However, the model's "far field" simulation, which includes the Upland Aquifers and distal portions of the Alluvial Aquifer, is not acceptable. The AEM was used to delineate well capture zones for 6-month and 1-year TOT in the Alluvial Aquifer. The 5- and 10-year TOT capture zones extend beyond the near field. Because the model is not acceptably accurate outside the near field, hand calculations were performed to delineate the 5- and 10-year capture zones in the far field.

The Alluvial Aquifer model was calibrated to existing water level data by varying the aquifer, surface water body, and recharge parameters. Well discharges equal to water rights were used as a basis for well capture zone delineation to provide a conservative estimate of potential pumpage. After calibration, Alluvial Aquifer transmissivity and recharge were varied in an analysis of model sensitivity to variation in these parameters.

Figures 5.1 through 5.3 present coalesced capture zones that were drawn around the combined well capture zones resulting from the three model runs (a calibrated base capture zone and two sensitivity runs). The southern margin of the well 5 wellhead protection area was drawn perpendicular to field-measured groundwater heads and not along a model flowline; this was necessary because the modeled flowlines deviated about 15 degrees from flowlines that are based on the field data in that area.

Figures 5.1 through 5.3 show the 6-month, 1-year, 5-year, and 10-year capture zones. These well capture zones are recommended to serve as the basis for designation of wellhead protection area zones (see Section 9.4.1.2). Adjacent high vulnerability areas in the Alluvial Aquifer should also be considered for inclusion in the designation process.

The City has recently installed replacement well 4, which is considered in this delineation but was not included in the original model development. Results of testing at replacement well 4 indicate that aquifer properties are roughly similar to those at original well 4 (CH2M Hill 1996) which was considered in model development. Therefore, no modifications to the model were made as a result of testing replacement well 4.

It should be noted that the well capture zones on Figures 5.1 through 5.3 were produced assuming maximum pumping rates and also account for aquifer parameter uncertainty. It is not appropriate to assume that the zones represent actual sources of water to the wells under all pumping conditions. The zones will change with changing pumping conditions and are in all cases wider than the actual band of aquifer feeding a well at a given pumping rate. For example, with wells 1 and 2 pumping less than the assumed amount, the well 4 capture zone will extend closer to wells 1 and 2. Under those conditions a potential contamination source mapped within the well 1 and 2 capture zone in this report may actually be within the well 4 capture zone.

Mapping the well capture zones using the methods described above accounts for various pumping conditions and increases in pumping that are likely to occur as Redmond grows and water demand rises. Delineation of the zones was based on a reasonable amount of test results and the best available data. These delineated zones should guide regulation and programs designed to protect the city's drinking water.

5.3 DESCRIPTION OF THE TWODAN MODEL

5.3.1 Model Overview

The AEM for groundwater modeling uses geographical superposition of equations (solutions to Laplace's and/or Poisson's equations) that describe various elements of groundwater hydrology (Haitjema 1995). Such elements can include uniform groundwater flow, pumping or injecting wells, recharge, lakes, streams, and aquifer heterogeneities. Most elements have no geographic bounds (like a pumping well, they influence the simulated flow regime for an infinite distance but in varying strengths). A computer solves the matrix created by superposition of all the equations and thereby calculates the head distribution in the aquifer. The user specifies the area over which output is desired.

The AEM TwoDAN (Fitts 1994) was selected for this project. Information used to select TwoDAN was summarized in a memorandum from Pacific Groundwater Group to City of Redmond project leaders on August 8, 1994. TwoDAN is very easy to use and met the needs of the wellhead protection project. It will also serve as a quick tool for evaluating threats to the City's wells and for simulating storm water management practices. However, as discussed further

the section on Model Limitations, TwoDAN cannot simulate partially penetrating surface water features.

This section describes the AEM TwoDAN as developed for the Redmond water supply aquifer. A modeling memorandum submitted previously to the City (PGG 1997) contains a floppy disk with the files Red18-aa and Red18-wr, along with the base maps used for those model runs. Using those files and a licensed copy of TwoDAN, the city is able to run the model.

5.3.2 Far Field Features

The Redmond TwoDAN model contains of *far field* and *near field* features. Far field features are those that provide boundaries for the area of interest. Because an AEM is infinite in aerial extent, the model can provide a solution outside the far field; however, that part of the solution is neither of interest nor accurate. Within the far field, the solution is not required to be precise and dynamic. For instance, lakes, rivers, and stream elements in the far field may only approximate the complexity of the real features and are typically defined as lines of specified head. Figure 5.4 shows the Redmond model elements with the far field features labeled and highlighted. Table 5.1 summarizes the far field features.

5.3.3 Near Field Features

The near field is the area of interest for which the model is calibrated and dynamic. Figure 5.5 shows the model layout with near field features highlighted and labeled. Table 5.2 summarizes those near field features.

Well discharges are annual averages used for calibration. Well 4 was off line during calibration period data collection. Discharges equal to water rights were used for capture zone delineation.

Near field surface waters are limited to the upper reaches of the Sammamish River and the very lowest reaches of Bear Creek. This limited modeling of local surface water features is necessary because streamlines, and therefore capture zones, cannot cross surface water features as simulated in TwoDAN. The near field surface water features that are included are those that will not cause truncation of well capture zones from wells 1, 2, 3, or 5. The well 4 capture zone is influenced by the nearby Sammamish River. Some distortion of the flow field results from this approximation.

Upper Bear and Evans creeks are represented by constant head line sinks in the model (see Figure 5.4). Although they are called line *sinks*, these features supply water to the model. The heads specified for these features represent the groundwater heads observed at these locations.

5.4 MODEL CALIBRATION

The model was calibrated by visually comparing model head output to observed steady-state heads. Model well discharges were set equal to annual averages for the calibration process. The calibrated model heads and observed heads are shown in Figure 5.6. The near field and far field feature definitions presented in Tables 5.1 and 5.2 are those that resulted from model calibration. During calibration, aquifer properties, heterogeneity properties and shapes, surface water definitions, and line sink definitions were adjusted to improve the match between the modeled and observed groundwater heads. Calibration was terminated when heads and shapes of head contours in the Alluvial Aquifer were similar to the observed flow field and when additional efforts did not improve the match.

Heads ranged from near 100 ft above MSL to 50 ft above MSL over the same span of modeled Alluvial Aquifer as observed in the field; however, the gradient interpreted from field data is quite uniform, whereas the gradient in the model varies over a factor of about two (see Figure 5.6). Modeled heads between 50 ft and 30 ft above MSL are typically about 5 ft higher than observed heads at the same locations. This is probably the result of excluding most of lower Bear Creek as a surface water feature (line sink) in the model. Based on the elevations of the surface water features near Redmond (see Tables 5.1 and 5.2), it is very unlikely that groundwater heads are as low as 20 ft above MSL anywhere in the near field; therefore, the 20-ft contour included in the interpretation of the field data by SKCDPH (1994) was ignored in the calibration process.

The shapes of the contours, and therefore groundwater flow directions, are similar to the interpretation of the observed water level data; however, the modeled 50-ft contour is oriented about 15 degrees counter-clockwise from the observed 50-ft contour upgradient of Redmond well 5. This difference causes the modeled capture zone to occur about 15 degrees north of one that would be drawn based solely on the interpretation of measured water levels.

Water level data used to interpret groundwater flow directions and to calibrate the model are limited to locations where existing or new wells were surveyed and monitored during the Groundwater Management Project (SKCDPH 1994). The data set reliability is therefore limited in areas of low well density. Such areas include regions immediately upgradient of Redmond wells 1, 2, 3, and 5. These are areas where "early warning" water quality monitoring could also be achieved by monitoring well installations.

The model was calibrated to *groundwater flux* from the Upland Aquifers, but it was not calibrated to heads in the Upland Aquifers, as discussed below. Therefore, the model may be used to evaluate the impact of hydrologic stresses in the Uplands in the Alluvial Aquifer, but it cannot be used to track water movement (pathlines or capture zones) within the Upland Aquifers.

Based on the interpretations shown in Figure 4.3, the potentiometric surfaces in the Upland and Alluvial Aquifers do not appear to form a continuum. The aquifers are therefore adjacent, although they appear to be separated by seepage faces on cliffs or low-permeability layers such

as glacial till. Thus the heads in these two aquifers cannot be calibrated as two portions of one single layer aquifer using TwoDAN Version 3.0. (An updated version of TwoDAN allows for low-permeability walls that might allow better simulation of the two adjacent aquifers.) This explains why only the area within the Alluvial Aquifer is considered the near field, and the area outside the Alluvial Aquifer is considered the far field and is not calibrated to observed heads.

Still, it is important that the amount of water moving horizontally from the Upland Aquifers to the Alluvial Aquifer be reasonable. Since the amount of recharge applied in the model (see Table 5.2) and surface water elevations in the far field are based on a quantitative conceptual model for the site, reasonable flow between the two aquifers should result. A calculation using model output and Darcy's equation suggests a discharge of 15 ft^3 per day per ft width from the Upland Aquifer to the Alluvial Aquifer, compared to the similar value of 12 ft^3 per day per ft based on recharge calculations. This inter-aquifer flux may vary substantially over the model.

Modeled Lower Bear Creek and the Sammamish River gain water over their entire modeled reaches; this is consistent with base flow data from stream gages (Pacific Groundwater Group 1995). However, the modeled amount of water gain between the Sammamish River gages 12122010 and 12125000 (spanning the downtown Redmond area and the confluence of the Sammamish River with Bear Creek) is only about 40 percent of the estimated actual base flow increase. The model predicts a smaller increase in base flow than actually occurs because only the lowest reaches of Bear Creek are model surface water features; therefore, the contribution of Bear Creek to Sammamish River base flow is underestimated.

5.5 SENSITIVITY ANALYSIS

After calibration of the base case model, as defined by the parameter definitions in Tables 5.1 and 5.2, capture zones were generated for a base case and for two other cases developed to evaluate the potential variability of the modeled capture zones. All capture zone runs used water rights for well discharges; the two "sensitivity" runs also differed from the base case as explained in Table 5.3. The parameters that were varied were selected because they were deemed the most likely to cause significant changes in the model response. The degrees of modification were selected based on a general sense of uncertainty for specific parameters.

A sensitivity run using a transmissivity for heterogeneity "one" that was greater than the base case was not used in the well capture zone delineation because:

- The transmissivity for heterogeneity "one" in the base case is equal to that measured by a pumping test at well 4. It is the highest transmissivity value estimated for wells within heterogeneity "one"; therefore, the average transmissivity for heterogeneity one is probably less than the value used in the base case.

- The transmissivity of the Alluvial Aquifer is probably lower in upper Bear Creek Valley than near downtown. Since capture zones extend up the valley, the base case

transmissivity is probably greater than the actual transmissivity in the distal portions of the capture zones.

- High transmissivities create narrower capture zones than zones modeled using lower transmissivities; therefore, the high transmissivity capture zones are enveloped within the lower transmissivity capture zones near the wells.

5.6 WELL CAPTURE ZONE DELINEATION RESULTS

5.6.1 Six-Month Time of Travel

Figure 5.1 shows Redmond well capture zones for a 6-month TOT. The delineated area encompasses capture zones from the calibrated base case model run and the two sensitivity runs. In addition, the delineated areas encompass those small areas of the Alluvial Aquifer outside the modeled capture zones thought to be within the margin of uncertainty. The areas are completely contained within the Alluvial Aquifer, except for a small area north of Redmond wells 1 and 2.

5.6.2 One-Year Time of Travel

Figure 5.2 shows Redmond well capture zones for a 1-year TOT. The delineated areas encompass those small areas of the Alluvial Aquifer outside the modeled capture zones thought to be within the margin of uncertainty. The areas are completely contained within the Alluvial Aquifer, except for the small area of Upland near Redmond wells 1, 2, and 4 which is larger than the 6-month case. To simplify implementation it may be advisable to neglect the differences between the 6-month and 1-year capture zones near these wells.

The size and shape of the capture zone just north, south, and west of wells 1, 2, and 4 was controlled by a sensitivity run using a low hydraulic conductivity for the Alluvial Aquifer. That model run did not reproduce the observed groundwater flow field, and therefore is not likely representative of actual conditions. Nevertheless, the results of that sensitivity run were considered in the delineation to maintain a consistent approach that results in conservatively large protection areas.

The capture zone for well 4 terminates at the Sammamish River because the river is a fully penetrating surface water feature in the model. The combined effects of a low-transmissivity sensitivity run and a fully penetrating surface water feature create an exaggerated surface water influence on the capture zone. Testing data for well 4 indicate that the nearby river does not noticeably affect drawdowns near the well (CH2M Hill 1996). The well 4 testing work did not evaluate possible drawdown on the west side of the river. A refined capture zone evaluation for well 4 should be considered, including whether drawdown and the capture zone could extend west of the river.

5.6.3 Five-Year Time of Travel

Figure 5.3 shows Redmond well capture zones for a 5-year TOT. The capture zone for the 5-year TOT of wells 1, 2, 3, and 4 are coalesced into a single area. The area extends from the eastern-most pathline in the Alluvial Aquifer to a line connecting the capture zone from well 4 and the topographic divide on top of Education Hill. All water entering these wells is predicted to be less than 5 years old; therefore, no 10-year TOT capture zone exists for wells 1, 2, 3, and 4.

The eastern pathline from Redmond well 3 came very close to the northern limit of the modeled Alluvial Aquifer and the line sink (recharge boundary) representing aquifer flow in the upper reaches of Bear Creek Valley. The heads in this region of the model are not calibrated and dynamic because the line sink fixes the heads; therefore, the model did not determine reliably the location where the eastern pathline from well 3 intersects the aquifer boundary. To select a location for that intercept, the recharge area required to supply the water right of wells 1, 2, 3, and 4 was calculated.

The recharge area was calculated to be about 4 square miles, which agrees well with the size of the area between the divide on Education Hill and the eastern side of the capture zones as shown on Figure 5.3. Therefore, without further northward extension of the eastern pathline, the capture zone was sufficiently large to supply the water pumped from the wells, and the eastern pathline was not projected further up the valley in the Alluvial Aquifer. The capture zones were then projected into the Upland Aquifer parallel to the topographic gradient. Although the northern limit of the well 3 capture zone appears reasonable, its location is not well known.

A groundwater flow velocity of 5 ft per day within the Upland Aquifers was used in hand calculations to locate the isochrons on both Education Hill and Union Hill (outside the near field). The change in capture zone shape as pathlines move from the Alluvial Aquifer to the Upland Aquifer is most dramatic in the case of well 5. The northern- and southern-most pathlines leading from well 5 refract to the east at the Alluvial Aquifer/Upland Aquifer boundary and then follow the generalized topographic gradient to the east.

5.6.4 Ten-Year Time of Travel

Figure 5.3 shows the 10-year TOT capture zone for Redmond well 5. It was placed upgradient of the 5-year isochron based on a groundwater flow velocity of 5 ft per day (9,125 ft over 5-years). The north and south limits of the zone follow the generalized topographic gradient. The zone terminates at the position of a groundwater divide as inferred from Carr (1993). The position of that divide is not well known.

5.7 MODEL LIMITATIONS

The Redmond TwoDAN model is a quick and flexible groundwater model that has allowed the delineation of well capture zones at water right discharge rates. Other discharge rates and other variations on the base case can be evaluated efficiently with the model. In addition, the model can be used for other groundwater management purposes.

Limitations of this model include those resulting from the nature of the TwoDAN code and its specific application to the Redmond area. Many of the limitations cannot be surmounted by further calibration or modification; therefore, it is not recommended that the City extensively refine this model. A more comprehensive model may be required in the future to meet certain city needs. It is recommended that City personnel contact the model developer for this project (Pacific Groundwater Group) or other qualified groundwater professionals prior to city application of the model. The purpose of the discussion should be to evaluate appropriateness for the intended use of the model.

Major limitations resulting from specific application of TwoDAN to the Redmond area have been discussed in previous sections. They are listed again in Table 5.4 along with examples of appropriate and inappropriate uses.

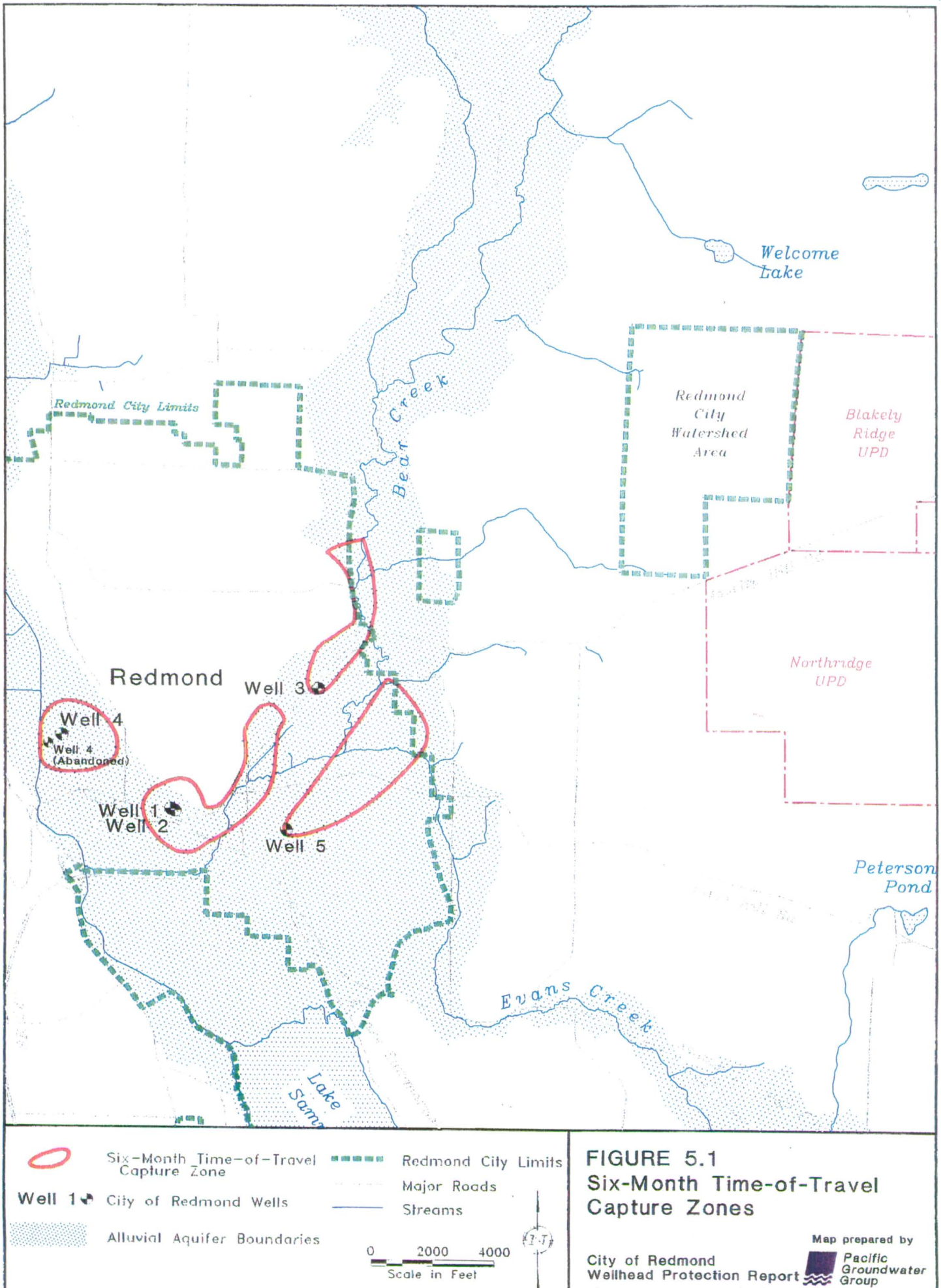


FIGURE 5.1
Six-Month Time-of-Travel Capture Zones

City of Redmond
Wellhead Protection Report

Map prepared by
Pacific Groundwater Group

JE9-106, FIG5-1.DWG, 10/30/97

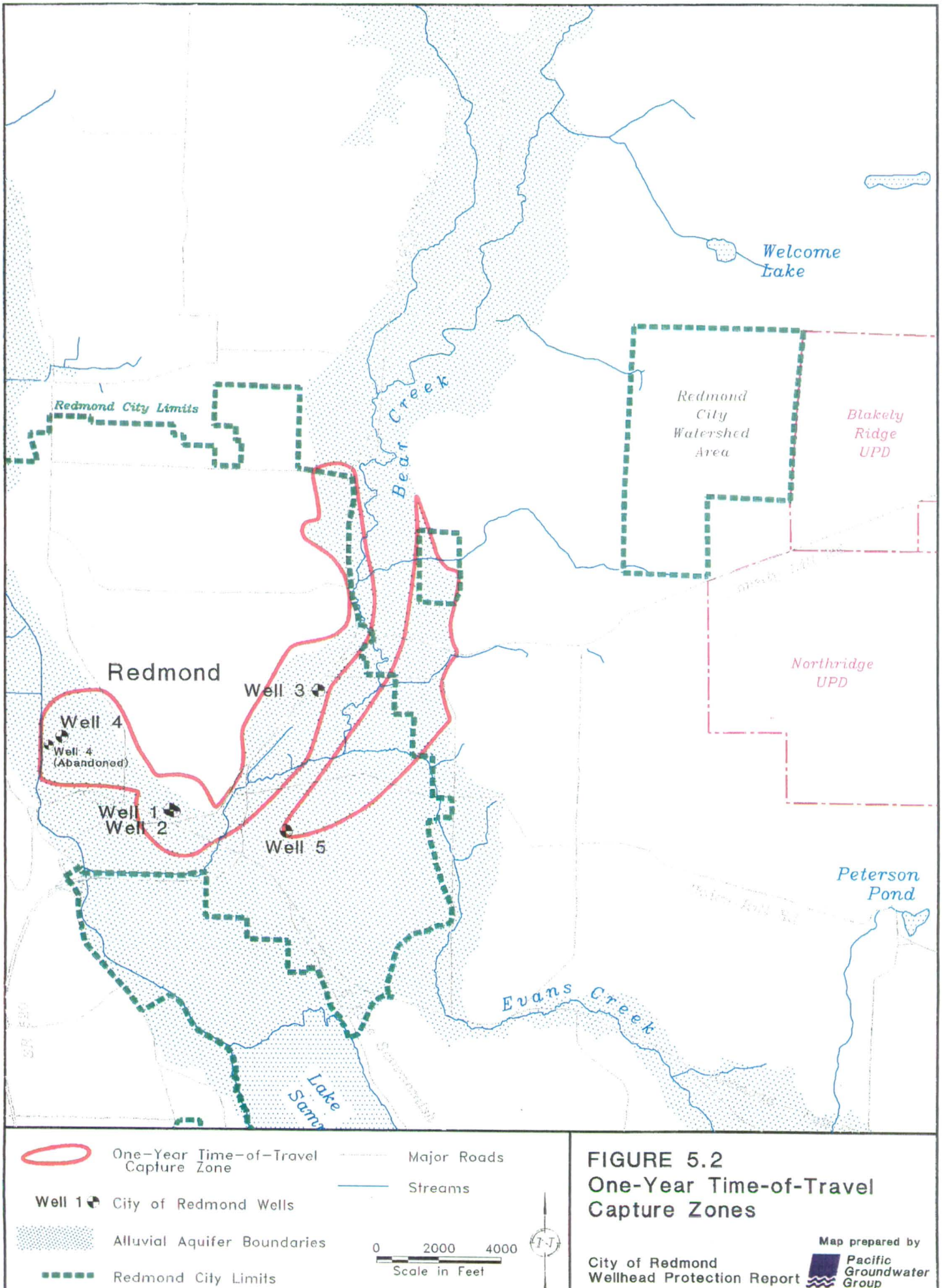


FIGURE 5.2
One-Year Time-of-Travel Capture Zones

City of Redmond
Wellhead Protection Report

Map prepared by
Pacific Groundwater Group

JE9406, FIG5-2.DWG, 10/30/97

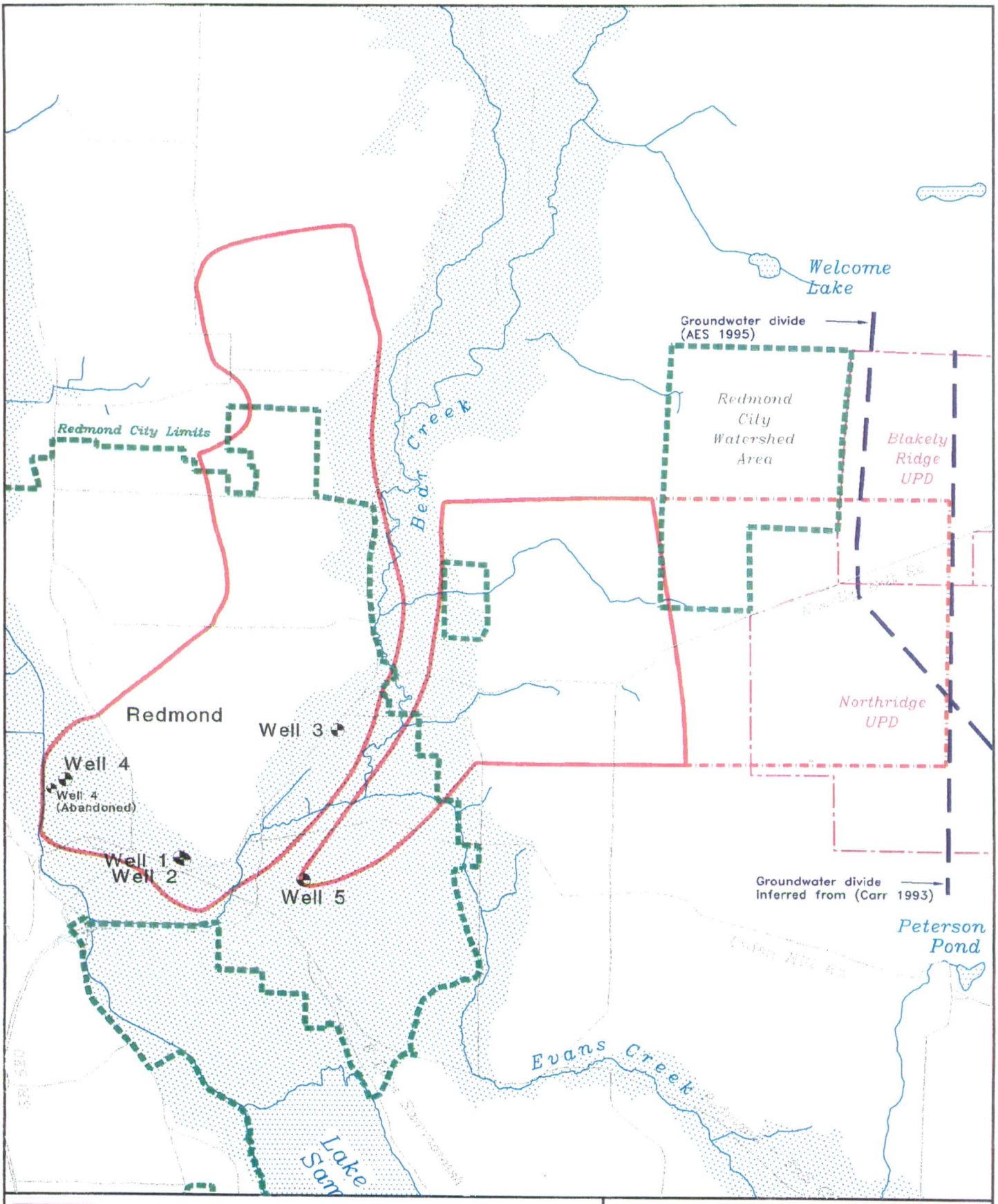
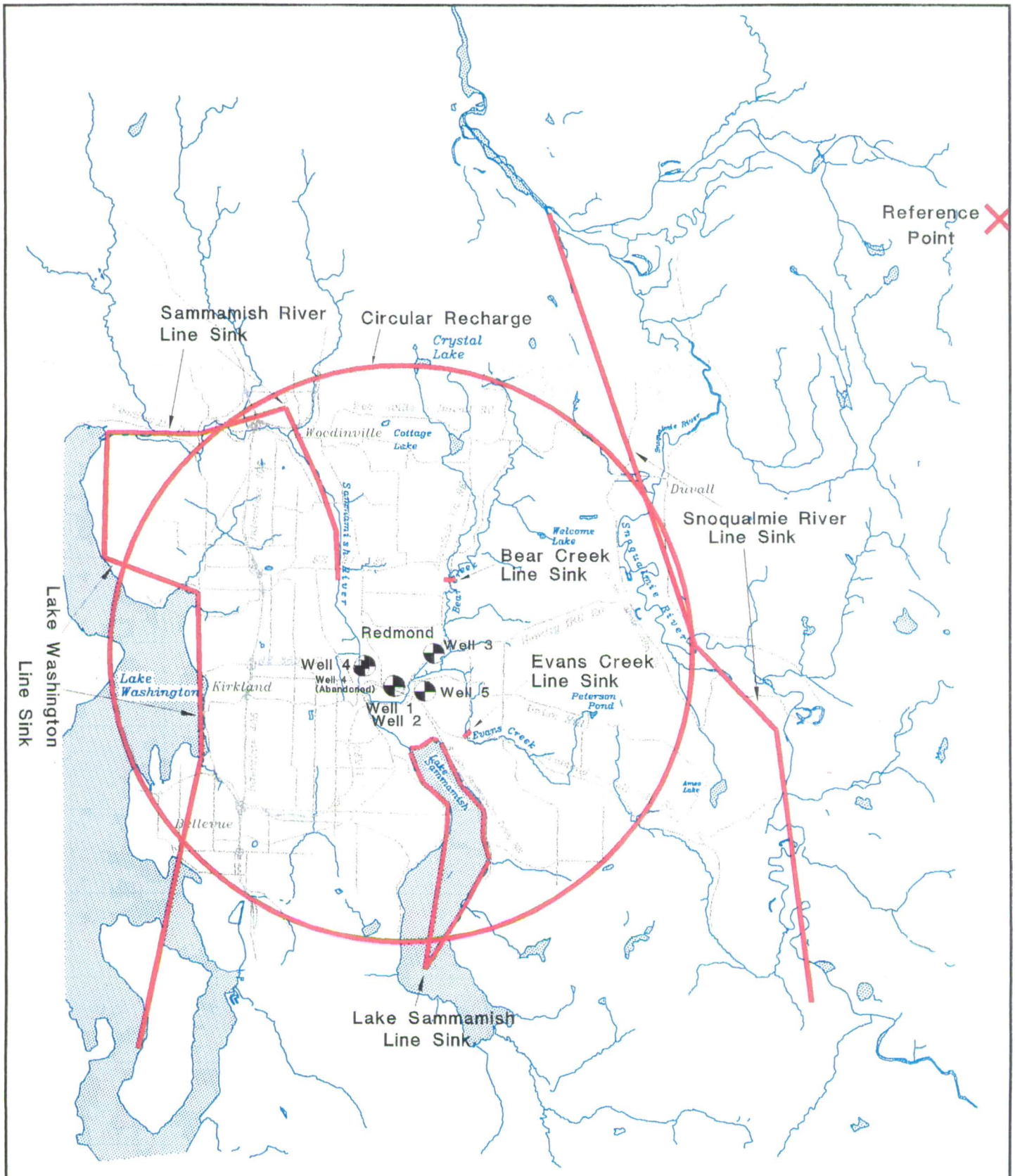


FIGURE 5.3
Five- & Ten-Year Time-of-Travel Capture Zones

City of Redmond
Wellhead Protection Report

Map prepared by
Pacific Groundwater Group

JE9406. FIG5-3.DWG. 10/30/97



Far Field Features

Well 1 City of Redmond Wells

Major Roads

Streams

0 8000 16000

Scale in Feet

FIGURE 5.4
Model Layout - Far Field Features

City of Redmond
Wellhead Protection Report

Map prepared by
Pacific Groundwater Group

JE9406. FIG5-4.DWG. 10/30/97

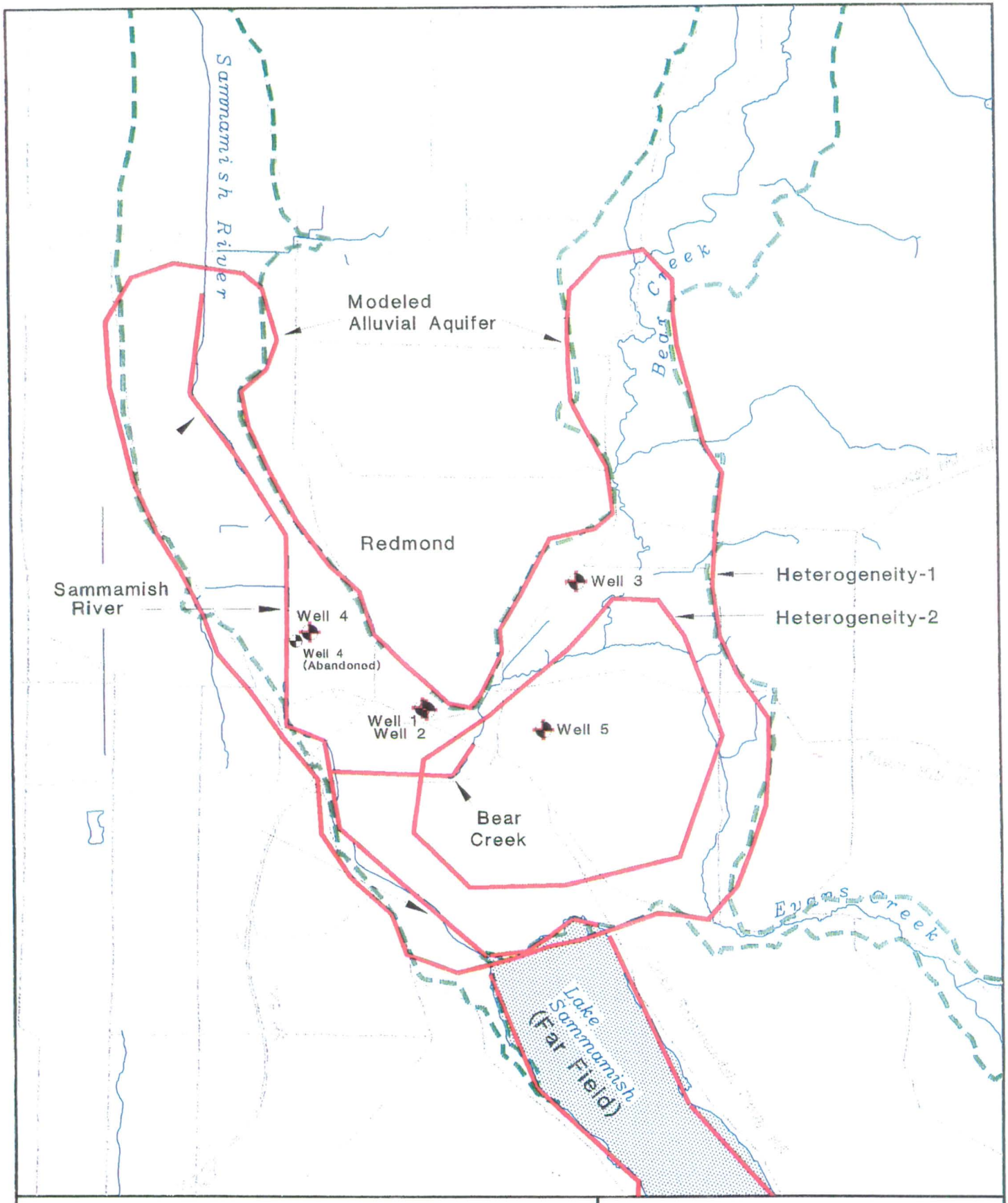


FIGURE 5.5
Model Layout - Near Field Features

Map prepared by
Pacific Groundwater Group

City of Redmond
Wellhead Protection Report

JE9406. FIG5-5.DWG, 10/30/97

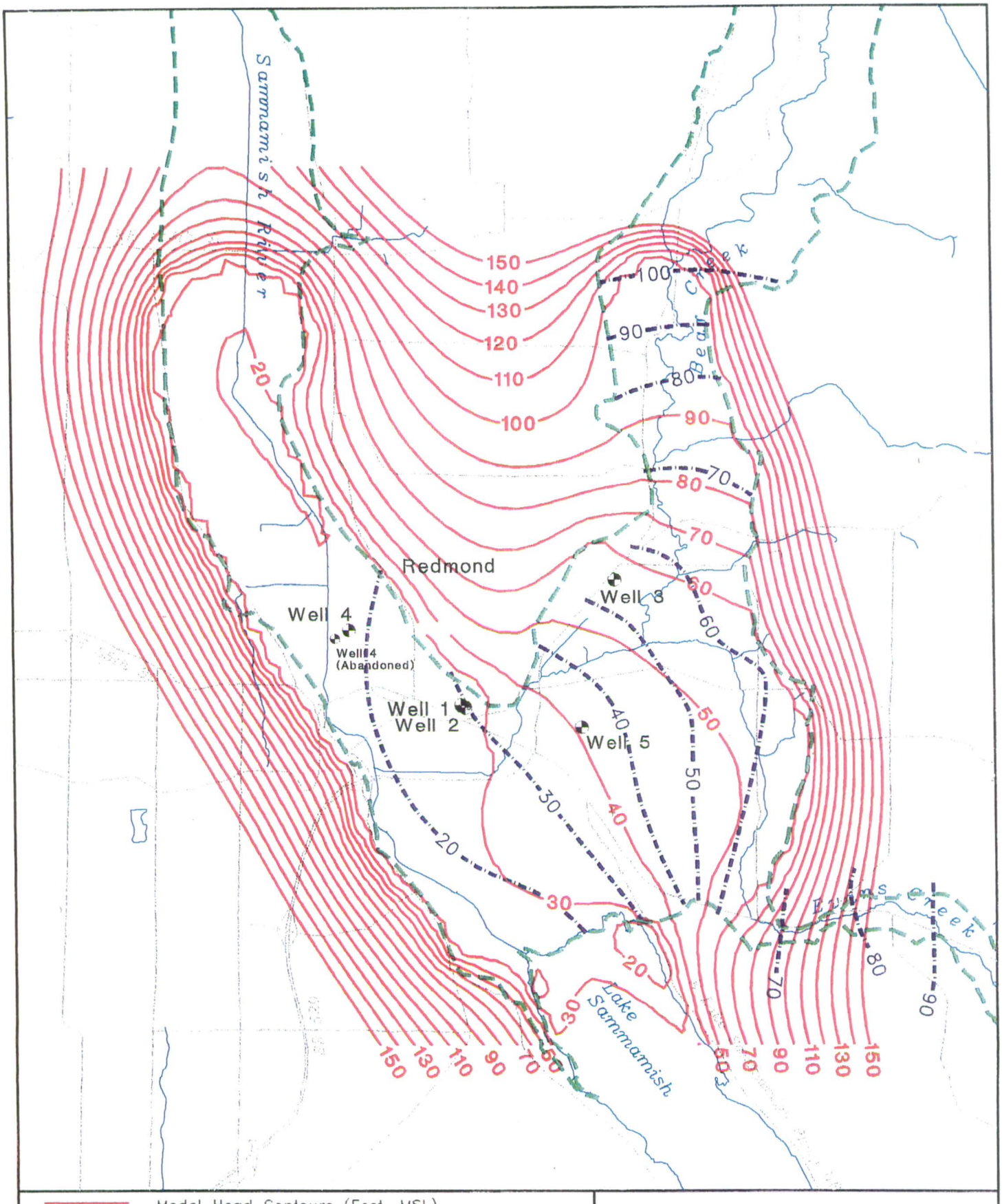


FIGURE 5.6
Results of Model Calibration

City of Redmond
Wellhead Protection Report

Map prepared by
Pacific Groundwater Group

JE9406, FIG5-6.DWG, 10/30/97

Table 5.1. Definition of far field features.

Far Field Feature (element)	Key Parameter
Regional aquifer	K=20 ft/day, b=75 ft
Snoqualmie River	head=30 ft
Lake Sammamish	head=25 ft
Lake Washington	head=15 ft
Sammamish River (lower reach)	head=15 ft
Evans Creek Valley head	head=60 ft
Upper Bear Creek Valley head	head=93 ft
Aerial recharge	17.5 in/yr
Reference point	head=250 ft

where K=hydraulic conductivity
b=thickness

Table 5.2. Definition of near field features (base case).

Near Field Feature (element)	Key Parameter
Alluvial aquifer (heterogeneities one and two)	heterogeneity one: K=1,600 ft/day, b=30 ft heterogeneity two: K=2,500 ft/day, b=30 ft
Bear Creek (lower reach)	head=25 to 30 ft
Sammamish River (upper reach)	head=17 to 25 ft
Redmond well 1	discharge=84,000 ft^3/day
Redmond well 2	discharge=54,000 ft^3/day
Redmond well 3	discharge=42,000 ft^3/day
Redmond well 4	discharge=0
Redmond well 5	discharge=120,000 ft^3/day

where K=hydraulic conductivity
b=thickness
Well discharges are annual averages used for calibration. Well 4 was off-line during calibration period data collection. Discharges equal to water rights were used for capture zone delineation.

Table 5.3. Definition of sensitivity model runs.

Model Sensitivity Run	Parameter Change	Resulting Change in Calibration
Low hydraulic conductivity (Alluvial Aquifer - heterogeneity one)	Heterogeneity one K=533 ft/day (a decrease by a factor of 3 compared to base case), otherwise the same as the base case.	Head distribution dissimilar to base case and observed data.
High recharge	R=0.006 ft/day (an increase by a factor of 1.5 over base case), otherwise the same as the base case.	Head distribution similar to base case.

Table 5.4. Model limitations.

Major Limitation	Examples of Resulting Appropriate and Inappropriate uses
Geographic: The model may only be used to evaluate flow directions and water levels in the calibrated near field.	Appropriate: 1. Evaluate well capture zones up to a time of travel of 1 year. 2. Evaluate discharge location of infiltrated storm water. 3. Manage a plume of contaminated water in downtown Redmond. Inappropriate: 1. Evaluate long-term (> 1 year) well capture zones. 2. Evaluate groundwater flow directions or heads in Upland Aquifers.
Surface Water: Model surface water features are fully penetrating, whereas real features are not. Model aquifer responses near the features may not simulate reality. Also, Bear and Evans creeks are not included; therefore, model water levels are too high near downtown Redmond, and surface water discharges are underestimated.	Appropriate: 1. Delineate conservatively long well capture zones. 2. Evaluate aquifer responses under relatively low aquifer stress. Inappropriate: 1. Evaluate groundwater/surface water interactions in a realistic manner. 2. Evaluate aquifer responses under high aquifer stress. 3. Absolute interpretation of groundwater elevations near downtown (as opposed to relative elevations or changes in elevations).

6. CONTAMINANT SOURCE INVENTORY AND ASSESSMENT

6.1 OBJECTIVES

This wellhead protection element was undertaken to inventory potential groundwater contamination sources and prioritize contaminant risks to groundwater in the well capture zones delineated in Section 5 of this report. The information in the following subsections presents an inventory of risks and then a prioritization of those risks. The contaminant source inventory and assessment was conducted using techniques consistent with guidance provided by the Department of Health (1993).

6.2 SUMMARY

A geographical information system (GIS) base map and a relational database were established to support inventory and mapping of potential groundwater contamination sources within the TOT zones mapped for city wells in Section 5. Regulatory databases and field observations were used to compile the inventory. The results of the contaminant source inventory and assessment indicate that the highest priority risks to groundwater quality in the City of Redmond well capture zones are as follows:

- Point sources of hazardous materials and spills to storm water systems in the 6-month TOT zone of wells 1, 2, 3, 4, and 5
- Major sanitary sewer pipes within the 6-month TOT zone of wells 1, 2, 3, 4, and 5
- Nitrate impacts from residences within the 6-month, 1-year, and 5-year TOT zones of well 3
- Releases from unsewered commercial and industrial zones, mostly in well 5 TOT zones
- Transportation spill risks to wells 3 and 5
- Surface mining within the 6-month and 1-year TOT zones of well 5

6.3 COMPILATION OF GIS COVERAGES AND POTENTIAL CONTAMINANT SOURCE DATA

Mapping data compiled to support an assessment of risks to City of Redmond wells include the hydrogeologic data described in Sections 4 and 5 and information on potential point and non-point contamination sources. The project base map facilitated geographic analysis of all data types and provided specific information on non-point source risks. The project base map consists

of GIS coverages provided by the City of Redmond, King County, and PGG. Key coverages used in assessing water quality risks to wells include:

- Potential point source contaminant data
- Sewered areas
- Sewer pipes
- Surficial geology
- City of Redmond well capture zones
- Aquifer boundaries
- Parcel boundaries
- Zoning codes
- Political boundaries
- Roads
- Streams

6.4 INTERPRETATION OF LAND USE ZONING CODE DATA

Land use zoning codes were evaluated within the City of Redmond well capture zones to indicate the predominant types of risks to groundwater quality. Figure 6.1 shows land use types interpreted from City of Redmond and King County data. The land use designations on Figure 6.1 are city planning objectives and differ from current land use in cases of non-conforming uses. Recognized non-conforming uses are not a significant source of contaminants and were therefore not considered.

The data indicate that land use within the 0.5-year TOT zone for City of Redmond wells 1 and 2 is predominantly commercial near the wells, with smaller sections of business park and residential zoning in upgradient locations. The 1- and 5-year TOT zones of wells 1 and 2 are similarly composed, with additional areas of low-, medium-, and high-density residential zones in upgradient locations. The urban land uses that predominate near the wells are associated with relatively high risks to shallow groundwater quality, particularly from point sources. Several potential point sources of contamination exist in close proximity to the wells. Land use within the well 4 capture zone is very similar to that of wells 1 and 2.

Land use within the 0.5-year TOT zone for City of Redmond well 3 is primarily residential. The 1- and 5-year TOT zones for well 3 are dominated by low- to moderate-density residential zoning and a small commercial development. The land uses in the well 3 capture zone are less likely to be associated with groundwater quality problems from point sources than the urban land uses near wells 1, 2, 4, and 5. Non-point source contamination problems, including septic discharges, are more likely to degrade water quality in areas zoned residential and semi-rural residential, such as near well 3.

The 0.5-year TOT zone for City of Redmond well 5 is zoned for business park, industrial use and semi-rural residential use. The 1- and 5-year TOT zones are composed almost entirely of semi-

rural residential use and park uses. The business uses currently include several potential point sources of contamination in close proximity to the well. The semi-rural uses may include raising livestock but not large-scale agricultural cropping. The rural land use may subject groundwater to degradation as a result of non-point source contaminants; however, septic impacts are not likely because of large lot size and low septic drainfield densities.

Two large planned developments ("Blakely Ridge UPD" and "Northridge UPD") are proposed on top of Union Hill within portions of the 10-year TOT zone of well 5. If constructed, these developments will change the current rural land use to residential with various business and commercial uses. It is unlikely that the change in land use will materially affect the total amount of groundwater recharge, although the locations of the recharge will be centralized in infiltration basins after construction, as opposed to the current naturally diffuse recharge. Shallow groundwater quality will likely degrade in the vicinity of the major storm water infiltration facilities, but groundwater quality at Redmond city well 5 is not likely to materially degrade solely as a result of these developments because of the distances involved. The proponents of the projects do not predict exceedence of drinking water Maximum Contamination Limits (MCLs) in aquifers immediately downgradient of the proposed storm water infiltration facilities. Groundwater monitoring programs have been proposed to track groundwater quantity and quality in nearby aquifers.

6.5 POINT-SOURCE CONTAMINANT DATABASE

Data sources used to compile a database of potential groundwater contamination point sources located within or near the City of Redmond water supply well capture zones are listed in Table 6.1. The potential point source data were compiled into three databases as follows:

Vista Information Systems, Inc. Report
All information sources in Table 6.1, except the Superfund Authorization and Reauthorization Act (SARA) Title III, business Standard Industrial Classification (SIC) codes, and field reconnaissance data, were contained in a Vista Information Systems, Inc. report which is attached as Appendix B.

King County SARA Title III (Hazmat) Data
King County compiles data on businesses that use and store large volumes of hazardous materials (not hazardous waste). Appendix B presents King County's SARA Title III (Hazmat) database for all sites with addresses listed as "Redmond."

City of Redmond Business License Application Database
Appendix B contains a copy of the City of Redmond Business License database that has been screened to include only businesses with SIC codes listed in guidance prepared by the Department of Health (1993). Fourteen percent (790) of the 5,724 entries in this database have SIC codes warranting inclusion in a wellhead protection database. Only 43% of the addresses in this database could be located automatically using GIS address matching software. No tabulation of

businesses in that database within the well capture zones was compiled, however because it would be incomplete and misleading. It is recommended that the City standardize its business license database so that automatic address matching using GIS software can be used to locate new and existing businesses within the well capture zones.

For Vista and Hazmat sites within the well capture zones, database fields defining the downgradient well and the TOT zone were added based on modeling results.

6.6 INTERPRETATION OF POINT-SOURCE CONTAMINANT DATA

Tables 6.2 and 6.3 present a list of businesses that are located within and near the City of Redmond well capture zones and were identified in the Vista and Hazmat databases, respectively. Figure 6.2 shows the location of the sites in the Vista and Hazmat databases.

The numerous businesses located at Vista map sites 8 and 12 (see Figure 6.2) were included based on their proximity to the well capture zones, large parcel sizes, and uncertainty with regard to the location of potential contamination sources within the parcels. The full contents of the databases are presented in Appendix B.

A field reconnaissance was performed of the sites on Table 6.2, as indicated in the column on the right of that table. The status of many State Priority List (SPL) and Leaking Underground Storage Tank (LUST) sites, based on field reconnaissance, differs from that recorded in the State databases. It is likely that the databases are not current and that remediation is further along than indicated in the databases. In some cases land use has also changed.

Tables 6.2 and 6.3 indicate that within the 6-month TOT zones of the Redmond city wells, about 40 sites are present that are either contaminated, have USTs, and/or manage substantial quantities of hazardous materials. Of those sites within the 6-month TOT zones, 18 are registered USTs and 21 are Resource Conservation and Recovery Act (RCRA) sites (some are both). Well 5 has the highest number of sites (23) within the 6-month TOT zone, and most of them are USTs (11) and/or RCRA sites (11). The well 1+2 6-month TOT zone contains 14 sites in all; 6 are USTs, and 8 are RCRA sites (some are both). The well 4 6-month TOT zone contains two sites; one is a UST and one is an RCRA site. The well 3 6-month TOT zone contains no identified potential point sources.

The identified USTs are typically located at gas stations, maintenance operations, and truck fleet facilities. Because the databases only include registered USTs, the list probably represents only a fraction of USTs located in the well capture zones. Many unregistered commercial USTs are likely to exist and an even greater number of unidentified residential heating oil tanks are also likely found within the well capture zones.

USTs typically contain hydrocarbon fuels and waste oils. If leaked, the fuels may migrate as a separate phase or dissolve in the groundwater. Fuels in a separate phase form (floating on

groundwater) are less mobile in the subsurface then fuel constituents dissolved in groundwater, and typically do not migrate very far from source areas.

The fuel constituents most likely to dissolve out of fuel into water at concentrations problematic for drinking water are light aromatic hydrocarbons (benzene, toluene, xylene, and ethylbenzene) and total petroleum hydrocarbons (TPH). The aromatic constituents comprise typically less than 30% of the total fuel mass. These components, when they are dissolved in groundwater, have the following subsurface migration characteristics:

- They move in the same direction as groundwater.
- They move marginally slower than groundwater.
- They are consumed over time by microbes in the ground (i.e., they biodegrade).

Based on a survey of California sites, Lawrence Livermore National Laboratory (1995) recently found that detections of hydrocarbons were very rate in groundwater more than 200 feet from leaking underground fuel tanks, largely as a result of natural biodegradation.

Waste oils will have highly variable composition. Of greatest concern from a groundwater protection standpoint are chlorinated solvents that may be mixed with the oils as a result of their use in cleaning auto parts. The chlorinated solvents are more soluble, move more rapidly in the subsurface, are generally more toxic than the fuel components, and do not degrade at appreciable rates. These chemicals pose a greater risk to drinking water.

In addition to waste oil tanks potentially containing chlorinated solvent mixtures, dry cleaners routinely use chlorinated solvents for cleaning clothes. Six dry cleaners are identified as RCRA small quantity generators in the Vista report and two are reported to have two USTs. Two of the five dry cleaners are located within the 6-month TOT zone for wells 1+2. The chlorinated solvents are sufficiently problematic that careful management of the source solvent, waste solvent, contact water, vapor, and storm water is warranted.

The number of potential point sources of contamination (over 40) within the 6-month TOT zones of the Redmond wells is relatively high. The predominance of USTs and RCRA sites in the well capture zones indicates that hazardous materials *management* is more important than clean-up of currently contaminated sites. The likelihood that existing chlorinated solvent contamination of wells 1, 2, and 4 is derived from an existing RCRA permit holder (see Section 6.12) is further evidence that City of Redmond involvement in hazardous materials management within the well capture zones is warranted.

As stated in Section 5, it should be noted that the "capture zones" on Figures 5.1 through 5.3 were produced assuming maximum pumping rates, and they also account for aquifer parameter uncertainty. They are appropriate as wellhead protection areas, but it is not appropriate to assume that the zones represent actual sources of water to the wells under all pumping conditions. The zones will change with changing pumping conditions and are in all cases wider than the actual

band of aquifer feeding a well at a given pumping rate. For example, with wells 1 and 2 pumping less than the assumed amount, the well 4 capture zone will extend closer to wells 1 and 2. Under those conditions a potential contamination source mapped within the well 1 and 2 capture zone in this report may actually be within the well 4 capture zone.

6.7 STORM WATER IMPACT ASSESSMENT

6.7.1 Description of Storm Water Runoff Characteristics

Storm water (i.e., urban runoff) is produced when rainfall or other precipitation accumulates faster than it can evaporate, be used by plants, or infiltrate to the ground. Urban areas produce more runoff than rural areas because they have more hard surfaces, such as rooftops, driveways, streets, and highways. These surfaces not only promote runoff but they also reduce the infiltration that recharges groundwater supplies. Even grass lawns produce more runoff than forests and pastures.

Storm water flow typically contains pollutants, such as sediment, nutrients, bacteria, oils and grease, metals, and other toxicants. Many of these contaminants come from air pollution, motor vehicles, application of pesticides and fertilizers, soil erosion, and pet feces. Roofing materials have also been identified as a diffuse source of metals in runoff, particularly zinc (Good 1993). In general, contaminant concentrations in storm water are similar for all land uses, with slightly higher nitrate concentrations in residential areas, and higher zinc concentrations in commercial areas. Concentrated sources of storm water contamination may also occur if undiluted pollutants (e.g., fertilizer, gasoline) are accidently or intentionally spilled and enter storm drains.

Storm water contamination has primarily been a concern for surface water pollution because most urban runoff is directed to streams, lakes, and other water bodies with fish and other aquatic life that are highly sensitive to common storm water contaminants. However, where storm water is discharged to infiltration areas, there is also a potential for groundwater contamination.

6.7.2 Evaluation of Storm Water Quality Data

Using existing storm water quality sample data and available literature sources, infiltration of storm water (i.e., precipitation runoff) was assessed as a potential contamination source to the Redmond aquifer. For this assessment, contamination is defined as water sample concentrations of primary and secondary contaminants exceeding criteria established to protect drinking water, as defined by *Water Quality Standards for Groundwaters of the State of Washington, Chapter 173-200 WAC* (Ecology 1995). Primary contaminants include those chemical substances that may be harmful to human health, while secondary contaminants are those that impart a taste, odor, or other undesirable characteristic to drinking water supplies.

An initial assessment of potential storm water contamination of the Redmond aquifer involved review of the limited storm water analytical results from samples collected within the well capture

zones of the city wells. Storm water was sampled in the early 1990s by the City of Redmond Public Works Department at locations where contamination was suspected; thus, the sample results are not likely to be representative of chemical concentrations typically found in the city (City of Redmond 1997e).

Included in the City of Redmond data are two samples from catch basins in commercial areas. These catch basins are located within the 6-month TOT capture zone for Redmond well 4. Of the primary and secondary contaminants, the samples were analyzed only for total copper. Total copper concentrations in these samples (0.0021 to 0.0032 mg/L) were well below the drinking water criterion for total copper (1.0 mg/L), and below the existing concentrations in Redmond wells (<0.020 mg/L).

Additional runoff samples were collected from a drainage ditch in a residential area within the 5-year TOT zone of wells 1, 2, and 4. Samples from this location were analyzed for three primary drinking water contaminants and five secondary contaminants. Except for iron, storm water sample contaminant concentrations were well below primary and secondary drinking water criteria (Table 6.4). Samplers noted an orange-colored material in the ditch where the sample was collected. Naturally occurring iron deposits in the soil or rusting iron debris likely caused the orange staining and high iron concentrations in storm water at this location. Of the eight contaminants analyzed in both storm water and well water samples, only iron had higher concentrations in storm water.

The above comparisons between storm water quality and drinking water criteria were based on very limited analytical results. In order to conduct a broader assessment of the potential for storm water infiltration to contaminate the Redmond aquifer, a much larger database of storm water sample concentrations from numerous sites in the United States was used. Table 6.4 lists averages of storm event mean concentrations for samples collected in residential areas as part of the Nationwide Urban Runoff Program (NURP; USEPA 1983). Table 6.4 also indicates that except for lead, concentrations of storm water pollutants were generally well below drinking water criteria.

Reduced lead usage in gasoline over the 15 years since NURP sample collection has likely reduced typical lead concentrations in storm water. Further, because lead is relatively immobile in soil, lead in infiltrated storm water would not be expected to move downward through the soil and reach the aquifer at concentrations exceeding the drinking water criterion.

Although these comparisons indicate that storm water infiltration is not likely to increase contaminant concentrations in groundwater to levels that exceed drinking water criteria, any groundwater quality degradation is undesirable. State groundwater quality standards prohibit discharge of contaminants that will degrade existing groundwater quality, except where an overriding public interest will be served and all contaminants are provided with all known, available, and reasonable methods of prevention, control, and treatment prior to entry (Ecology 1995). Comparisons between storm water sample concentrations and Redmond well water quality

(see Table 6.4) indicate that nitrate and fluoride concentrations were lower in storm water than groundwater, and concentrations of most other contaminants in storm water were less than detection limits for Redmond well samples. These data suggest that where metals concentrations are reduced during infiltration, the potential for groundwater degradation from storm water is minimal.

6.7.3 Discussion of Potential Groundwater Contamination from Storm Water

Concern over potential groundwater contamination from storm water has been recognized by several governmental agencies in western Washington. King County's *Surface Water Design Manual* (King County 1994) requires liners for wetponds, water quality swales, and other storm water quality treatment facilities located over rapidly draining soils. Washington Department of Ecology's *Storm Water Management Manual for the Puget Sound Basin* requires storm water treatment prior to infiltration to protect groundwater quality (Ecology 1992). The City of Renton's aquifer protection ordinance prohibits storm water infiltration within Zone 1 of the city's wellhead protection areas and requires lining of biofiltration facilities in the remaining aquifer protection areas (City of Renton 1992).

While it may be prudent to minimize the possibility of groundwater contamination from storm water infiltration, research has shown that most pollutants of importance in urban runoff are intercepted during the infiltration process, and they are effectively prevented from reaching underlying aquifers (USEPA 1983). NURP studies in Long Island, New York and Fresno, California found that heavy metals, organic priority pollutants, pesticides, and coliform bacteria accumulate in the upper soil layers of recharge basins, and effective retention of pollutants takes place with all soil types tested, ranging from clays to sands (USEPA 1983).

Some of the basins studied had been in operation for more than 20 years. Of the pollutants examined, only chlorides were not attenuated by soils. The Fresno study concluded that urban runoff recharge resulted in no apparent adverse impacts on the groundwater underlying five recharge basins (Salo et al. 1982). Comparing storm water concentrations to groundwater concentrations, Miller (1987) found that grassed infiltration swales in the gravelly glacial outwash soils of Spokane County, Washington were successful in achieving very high levels of contaminant removal (e.g., 94.5% for copper, 75.4% for lead, and 92.7% for zinc) within 6 inches of the surface.

Gaus (1993) examined the concentrations and forms of trace metals in eight storm water infiltration basins in the Puget Sound region. Each infiltration basin studied had infiltration rates well above Ecology's 2.41 inch/hr maximum recommended for water quality treatment. The water soluble forms of copper, lead, and zinc were at trace levels or were below detection limits in all basin soils; they comprised less than 1 percent of the total concentrations of these metals. The absence of soluble metals was attributed to most metals in storm water being adsorbed to particles, and the remaining soluble fraction being converted into less reactive chemical forms

gravity sewers are less likely to leak outward than are force mains; therefore, risks from the numerous small-diameter gravity sewers greater than 500 ft from the wells are considered to be negligible. Well 5 was contaminated in 1986 by bacteria from a break in a former sanitary sewer force main located within 100 ft of the well (City of Redmond water utility files).

6.9 SEPTIC SYSTEM IMPACT ASSESSMENT

6.9.1 Description of Potential Contaminant Sources

Risks from on-site waste water disposal systems were grouped into two categories:

- Inadvertent or intentional discharge of toxic chemicals is most commonly a problem in commercial or industrial settings with on-site septic systems. A smaller risk exists from septic tank cleaners and other chemicals that could be discharged by home owners.

- Discharge of organic wastes occurs wherever septic systems are used. Organic wastes include naturally occurring chemicals that can degrade water quality when they are discharged in sufficient quantities.

Figure 6.3 shows major sanitary sewer lines and land parcels within the well capture zones that will not be served by sewer systems in the near future. Parcels mapped as unsewered are either not within 200 feet of an existing or planned sewer pipe, or are within unsewered county areas indicated by the King County/Metro GIS in late 1995. Figure 6.4 shows allowable residential unit density based on zoning codes.

Data on Figure 6.3 indicate that all parcels zoned for industrial, commercial, or business use have access to sewerage service within the 1-year well capture zones for city wells, according to the criteria used in this analysis. However, city staff reports there is one commercial establishment (Shultz Distributing Co.) that is currently using a drainfield for sanitary wastewater within a 6-month travel time of well 5; others may also exist.

6.9.2 Evaluation of Nitrogen Impacts From Drainfields

To estimate the potential for City of Redmond wells to be contaminated with nitrogen from septic drainfields, a GIS-based nitrogen loading analysis was performed. First, all parcels that are within the 5-year capture zones of city wells were identified. Those parcels in this group that are not within the areas served by sewers were identified and were assumed to be using septic systems for on-site wastewater disposal.

The unsewered parcels fall into the following two geographic groups (Figure 6.3):

- Unsewered areas within the capture zones of well 3 begin about 2,000 ft northeast of well 3 and extend discontinuously through the 1-year TOT zone. A high percentage of the 5-year TOT zone is unsewered.

- The unsewered area within the capture zone of well 5 begins about 5,000 ft northeast of well 5 and includes all of the 1-year and 5-year TOT zones.

Of these unsewered parcels, some were within City of Redmond limits, and others were outside the city limits. City land use codes, in addition to city and county rules governing maximum septic drainfield densities, were used to calculate anticipated drainfield densities. City code limits septic drainfields to parcels of 1-acre size or greater. Minimum lot size for drainfield use in the county is dependent on soil type.

An average value two lots per acre on septic was assumed for county parcels. Parcels zoned with industrial or commercial (or other non-residential) code were assumed to have zero residential units. The maximum allowable drainfield density was multiplied by the area for each parcel, giving the maximum number of residential units that is expected to be built on each parcel.

It was assumed that each equivalent residential unit (ERU) discharges 150 gallons of wastewater per day, and that the wastewater has a total nitrogen load of 30 mg-N/L. These numbers are estimates that are representative of typical conditions (Hantzche and Finnemore 1992; Frimpter and others 1990). Based on these assumptions, the total wastewater nitrogen load and the total nitrogen load per acre for each zoning district under maximum build-out was calculated. The calculations were then summed to yield the total load and average load per acre under maximum build-out within the two areas described above.

The results of the calculations are summarized in Table 6.5A. The far right column of Table 6.5A presents an index of nitrate concentration increase at city wells 3 and 5, resulting from wastewater discharge within each well capture zone. The indices were calculated by dividing the maximum build-out loading rates by the maximum well discharge. The capture zones for wells 1+2 and 4 contained no unsewered parcels by the method used.

The calculations indicate that the threats to wells 3 and 5 from nitrogen discharged from on-site wastewater disposal systems is low. However, recent nitrate concentrations in well 3 have varied between about 1.5 and 4 mg/L, which is nearing the State Department of Health threshold of 5 mg/L where quarterly nitrate sampling is required (Chapter 246-290-025 WAC). An additional 1 to 2 mg/L nitrate resulting from additional unsewered development could trigger the additional monitoring requirements.

6.10 LAWN AND AGRICULTURAL CHEMICAL IMPACT ASSESSMENT

Fertilizers, pesticides, and herbicides are applied to residential lawns, commercial landscaping, agricultural lands, and vegetated areas adjacent to roads. If optimally applied, these chemicals pose little threat to groundwater. However, applications are commonly not made correctly and groundwater contamination can result. The most common form of groundwater contamination from these sources is nitrate contamination, which can result from the excessive use of fertilizer.

Risks to wells from nitrate fertilizer applications occur in addition to concentrations supplied by septic discharge (Section 6.9). Frimpter and others (1990) estimated that an average of 9 pounds of nitrate (as N) leached annually to groundwater from each 5,000-square-foot lawn. Assuming that larger lawns (common within the Redmond well capture zones) are probably less intensely managed than the typical 5,000-square-foot lawn, the 9 pounds per year loading rate is probably a reasonable average per residential unit.

Table 6-5B summarizes the results of the fertilizer nitrate loading calculations. The fertilizer loadings are all greater than those for septic discharges. Furthermore, the values of 4 mg/L and 11 mg/L for the capture zones of wells 1+2+4 and well 3, respectively, are high relative to the 10 mg/L maximum contamination limit (MCLs) for nitrate and the 5 mg/L monitoring requirement threshold. The indices are directly proportional to the number of residential parcels in the well capture zones, and, like the septic calculations, do not include attenuation of nitrate.

Most modern pesticides have low solubility in water and break down in the environment; they are therefore seldom found in groundwater except in areas of intense agricultural development. Sampling for the Redmond-Bear Creek Valley GWMA (SKCDPH 1994) found no chlorinated pesticides in groundwater samples. Risks to city wells from routine application of pesticides are considered negligible.

No data regarding detection of herbicides in area groundwater were available. Over-application of water-soluble herbicides presents risks to groundwater quality. In recognition of this potential risk, the city prohibited a contractor from using the herbicide Monobor Chlorate prior to asphalting on the basis of risks to nearby well 5 (City of Redmond 1992d).

Lawn-derived nitrogen leaching can be minimized by the appropriate use of slow release fertilizers. Over-application of pesticides and herbicides can be avoided by matching the proper chemical to the problem pest or plant and strictly following manufacturer's instructions for application. Public education can be effective in controlling these problems. Recommendations are included in Section 9 to reduce risk to city wells from routine and non-routine applications.

6.11 TRANSPORTATION SPILL IMPACT ASSESSMENT

Potential groundwater contamination associated with transportation in Redmond is dominated by the vehicular transport of hazardous substances that could spill and infiltrate if an accident occurred. All of the city wells are in proximity to arterial routes used by trucks carrying hazardous materials. Wells 1, 2, and 4 are in areas of slow-moving city traffic. Although accidents may occur in these locations, spills caused by traffic accidents are less likely than in areas of higher traffic speeds. Avondale Road, which runs just west of well 3, is a major arterial with high volumes of moderate-speed truck traffic and accidents involving hazardous materials (SKCDPH 1994). The proximity of well 3 to Avondale Road places that well at particular risk from contamination resulting from accidents. Well 5 is located about 2,000 ft downgradient of Union Hill Road, another major arterial with moderate-speed truck traffic. The 2,000-ft travel distance provides sufficient time for emergency response actions to protect well 5 from impacts from Union Hill Road accidents. 180th Ave NE is a smaller arterial running immediately upgradient of well 5. Traffic volume increase is expected to be at least 10% per year to the year 2005, with a commensurate increase in the risk of hazardous materials accidents (SKCDPH 1994).

6.12 SUMMARY OF DOCUMENTED CONTAMINANT IMPACTS TO GROUNDWATER

The quality of Redmond's drinking water has historically been excellent. Five contamination events are documented in Table 6.6 (data from City of Redmond water utility files); however three of these events may not represent actual groundwater contamination (1987, 1991, 1993).

Well 5 was contaminated in 1986 by fecal bacteria from a broken sewer line running along the west side of 180th Ave NE. The sewer line was broken by a construction contractor, and although the line was repaired, the well was pumped to waste for 6 months and the water system was chlorinated (City of Redmond water utility files).

Perchloroethene (PCE) was detected in Wells 1, 2, and 4 in 1996 below the drinking water MCL of 5 parts per billion (ppb). Monitoring data available through mid-1997 indicates detectable concentrations of PCE in all three wells. PCE is a dense, volatile organic liquid. Although not highly soluble, its solubility is high relative to its MCL. Wells 1 and 2 continue to be used for water supply. Well 4 is not on line, pending completion of pump installation.

Review of potential PCE sources indicates that a possible source of the contaminant is the dry cleaning establishment located at number 34 of the Vista potential contamination sites (see Figure 6.2). The establishment is a RCRA small quantity generator of hazardous waste. Dry cleaners commonly use PCE as a dry cleaning solvent. The Redmond City Public Works Department is currently working with the establishment to further evaluate this potential PCE source.

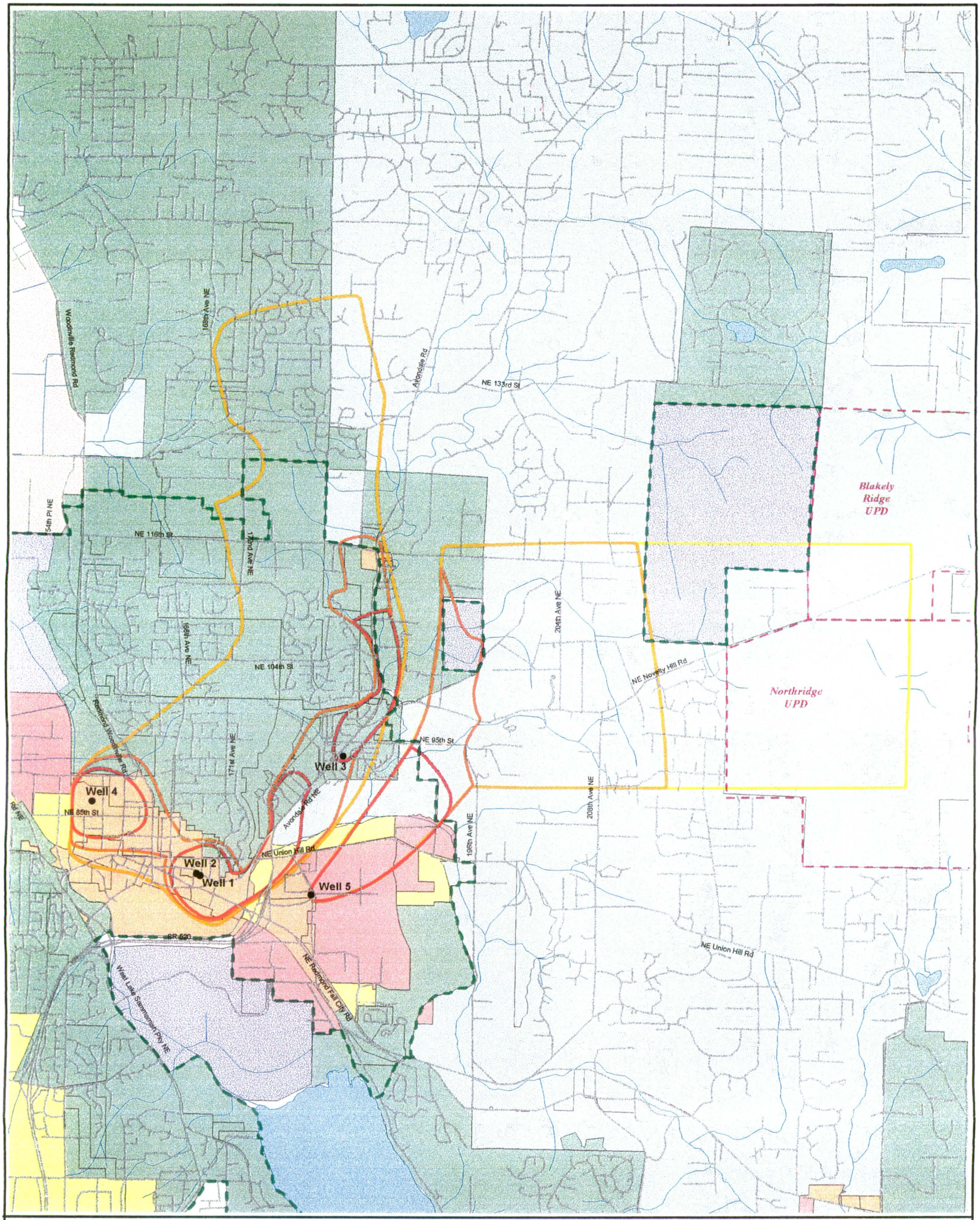
6.13 CONTAMINANT SOURCE RISK RANKING

Sites and non-point sources posing relatively high risks to city wells are identified in Table 6.7. The purpose of the ranking is to allow prioritization of the risk mitigation efforts presented in Section 9.

The method of assignment included consideration of the following variables:

- release likelihood
- volume of contaminant
- toxicity of contaminant
- stability and mobility of contaminant
- proximity of possible release to well

Considerable uncertainty is inherent in any ranking of this sort and only that level of effort and precision necessary to allow prioritization of preventative measures is warranted. Therefore, relative threats were assigned as either *Relatively High* or *Medium to Low.*



- City of Redmond Wells

Well Capture Zones
- 6-Month Time of Travel
- 1-Year Time of Travel
- 5-Year Time of Travel
- 10-Year Time of Travel

- Streets
- Streams & Lakes
- Redmond City Limits
- Urban Planned Development

Land Use Type
- Commercial
- Business Park
- Industrial
- Residential
- Semi-Rural Residential
- Open Space/Recreation
- Agricultural

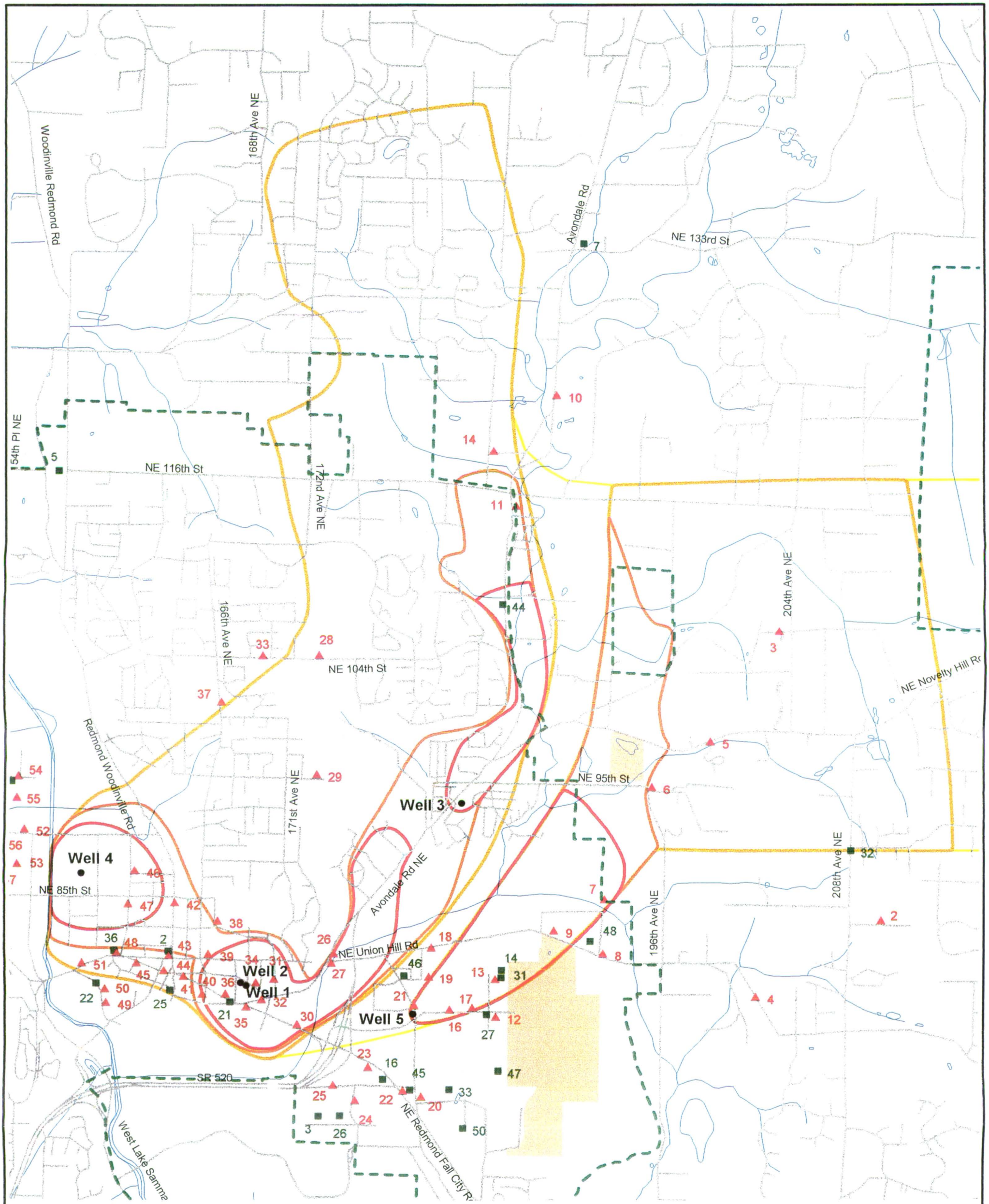
(note: City of Redmond land use type based on City of Redmond Zoning Code)
(note: King County land use type based on King County Zoning Code)

2000 0 2000 Feet

FIGURE 6.1
Land Use in Capture Zones

City of Redmond
Wellhead Protection Report
JE9406, redmond.apr, 10/30/97

Pacific Groundwater Group



- City of Redmond Wells

Well Capture Zones
- 6-Month Time of Travel
- 1-Year Time of Travel
- 5-Year Time of Travel
- 10-Year Time of Travel

50 ▲ Contaminated, RCRA, LUST, or UST Sites (VISTA Report) with Map ID Number

26 ■ Hazardous Materials (SARA Title III) Sites with King County ID Number

- Gravel Pits
- Borrow Pits
- Streets
- Streams & Lakes
- Redmond City Limits

1000 0 1000 Feet

FIGURE 6.2
Location of Potential Point Sources of Contamination

City of Redmond
Wellhead Protection Report
JE9406, redmond.apr, 10/30/97

Pacific Groundwater Group

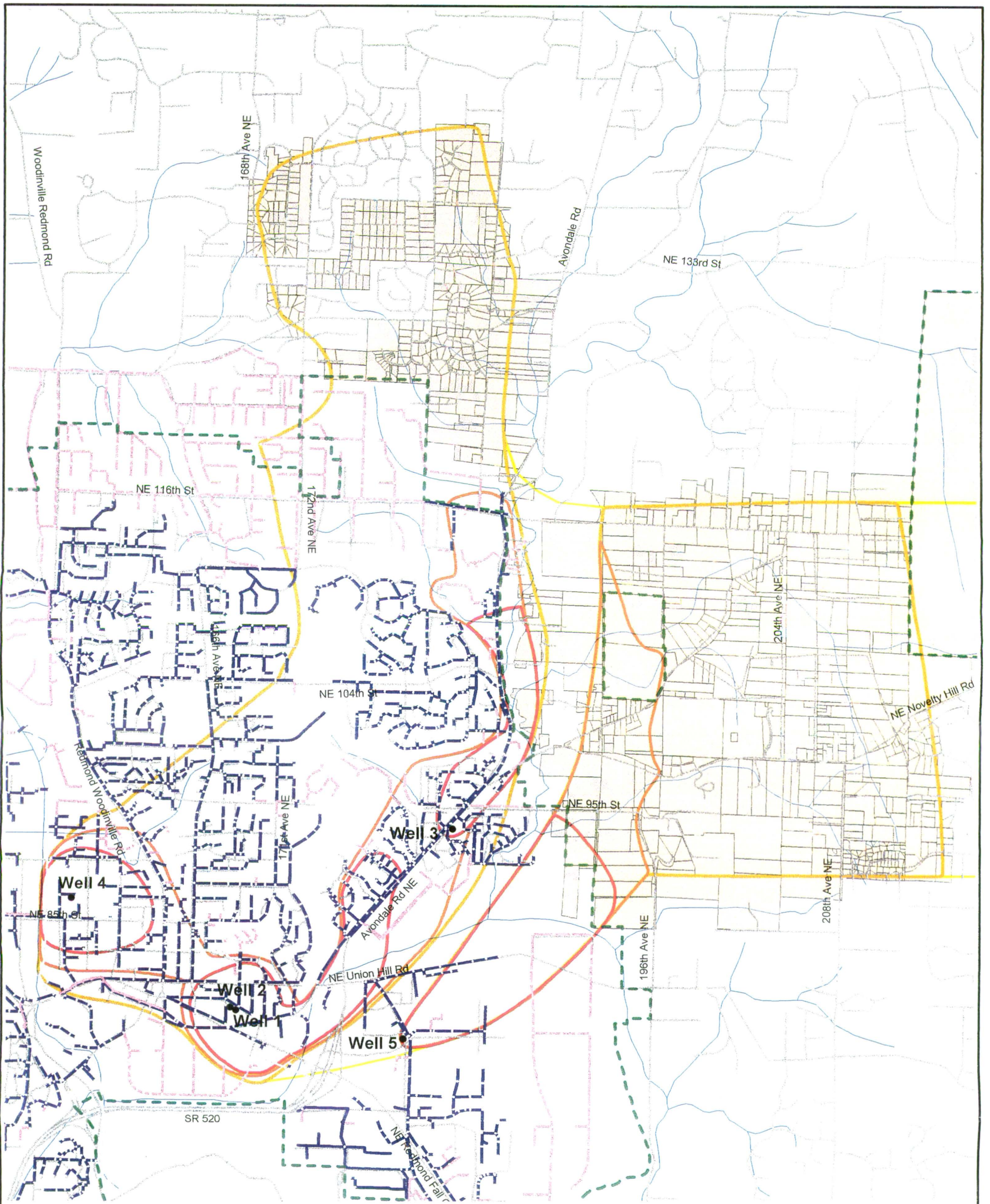
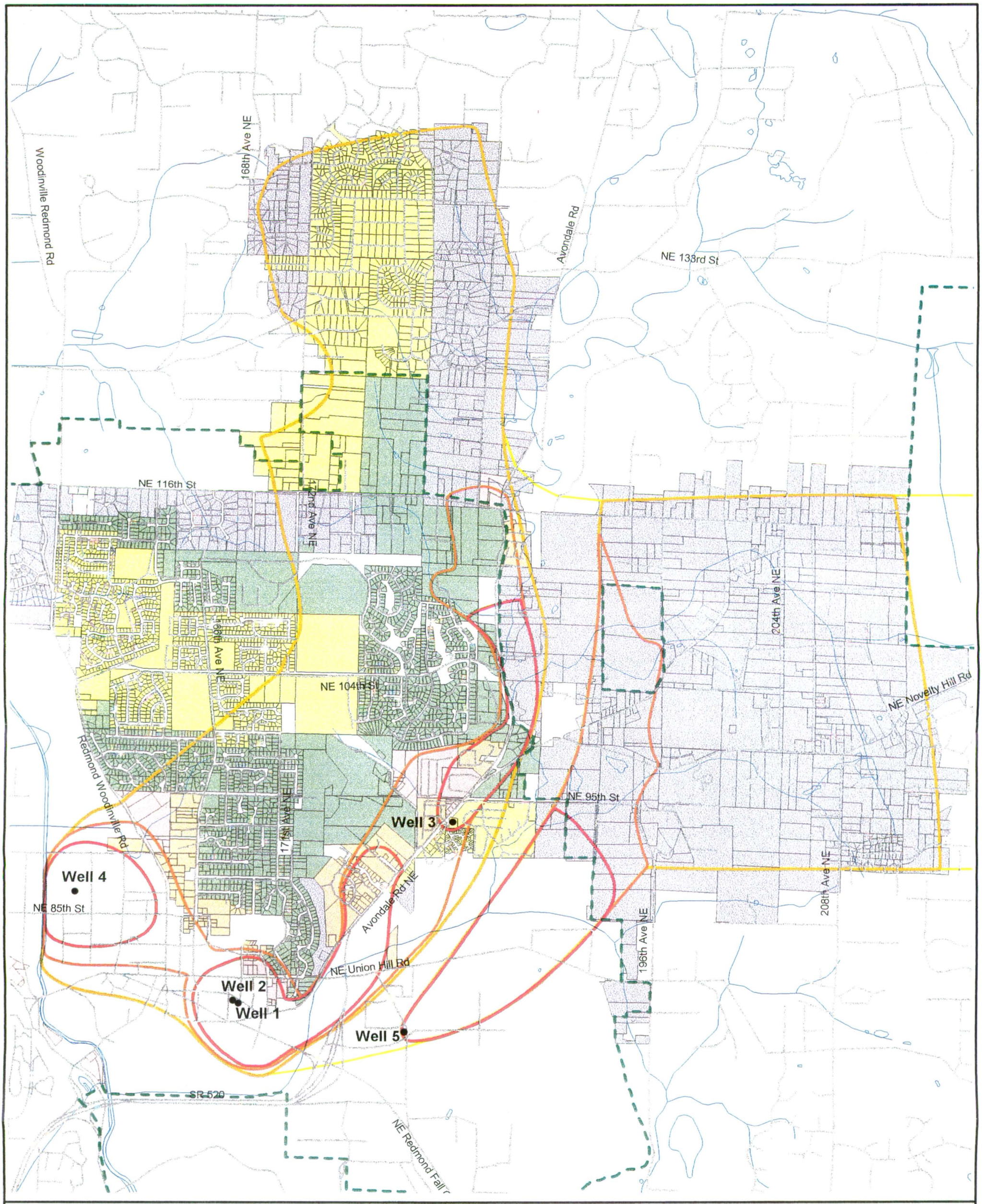


FIGURE 6.3
Major Sanitary Sewer Lines and Unsewered Areas Within Well Capture Zones

City of Redmond
Wellhead Protection Report
JE9406, redmond.apr, 10/30/97

Pacific Groundwater Group



- City of Redmond Wells

Well Capture Zones
- 6-Month Time of Travel
- 1-Year Time of Travel
- 5-Year Time of Travel
- 10-Year Time of Travel

- Streets
- Streams & Lakes
- Redmond City Limits

Allowable Residential Unit Density (ERU/Acre)
- = 0.0
- 0.1 - 1.0
- 1.1 - 5.0
- 5.1 - 10.0
- 10.1 - 20.0
- > 20.0

Note: Residential Densities for non-residential zoned properties not shown

Note: Residential Unit Densities outside Wellhead Protection Areas are not shown

1000 0 1000 Feet

FIGURE 6.4
Allowable Residential Unit Density

City of Redmond
Wellhead Protection Report
JE9406, redmond.apr, 10/30/97

Pacific Groundwater Group

Table 6.1 Potential point source contaminant data sources.

Data Origins	Name	Description of Site Type	Date of Data
U.S. EPA	Superfund Sites	Contaminated Sites identified by EPA	May 1995
U.S. EPA	Potential Superfund Sites	Potentially contaminated sites identified by EPA	September 1995
U.S. EPA	RCRA Large Quantity Generators	Businesses that generate more than 1000 Kg of hazardous waste per month	June 1995
U.S. EPA	RCRA Small and Very Small Quantity Generators	Businesses that generate between 100 Kg and 1000 Kg of hazardous waste per month	June 1995
U.S. EPA	RCRA Treatment, Storage, and/or Disposal Sites	Business that treat, store, or dispose of hazardous waste	June 1995
U.S. EPA	RCRA Transporters	Businesses that transport hazardous waste	June 1995
Washington State Department of Ecology	Confirmed Contaminated Sites Report	Contaminated sites identified by Washington State	May 1995
Washington State Department of Ecology	Suspected Contaminated Sites Report	Potentially contaminated sites identified by Washington State	May 1995
Washington State Department of Ecology (NWRO)	Leaking Underground Storage Tanks	Leaking USTs identified by Ecology Northwest Regional Office	July 1995
Washington State Department of Ecology (Toxics Cleanup)	Leaking Underground Storage Tanks	Leaking USTs identified by Ecology headquarters	July 1995
Washington State Department of Ecology	Municipal Solid Waste Facilities	Municipal solid waste landfills	September 1994
Washington State Department of Ecology	Underground Storage Tanks	registered USTs	July 1995
King County Health Department	SARA Title III (Hazardous Materials) Data	Businesses that handle large quantities of hazardous materials	March 1997
City of Redmond	Business SIC Codes	Standard Industrial Classification codes for businesses in Redmond	March 1997
Parametrix, Inc.	Field Reconnaissance Notes		March 1997

SIC = Standard Industrial Codes

Table 6.2 List of sites from Vista database within well capture zones - sorted by map ID number

Map ID No.	Site Name	List (see definitions and note 3)						City Well Capture Zone	TOT Zone (year)	Comments from Field Reconnaissance
		SPL	LUST	UST	LQG	SQG	TRANS			
1	KEEP IT CLEAN RECYCLING & EQUIP						X	5	10	Inaccessible, may no longer exist.
3	THE OVERLAKE SCHOOL			X				5	5	No obvious environmental concerns
4	TRUSS SPAN	X						5	0.5	Outside of protection area
5	MCEACHERN PROPERTY		X					5	5	Unable to gain visual access to site. It is located well off of Union Hill Road on private property.
6	LAKE WASHINGTON SCHOOL DISTRICT			X				5	1	No obvious environmental concerns
7	ALL SEASONS CONSTRUCTION	X						5	0.5	Area is very industrial. Poor housekeeping.
8	OLYMPIAN PRECAST INC	1					X	5	**	Outside of protection area.
8	GOLDEN RULE & B&J ROOFING			X				5	**	Outside of protection area.
8	SCHROEDER & SONS			X				5	**	Outside of protection area.
8	CADMAN/CLOSED			note 2				5	**	Outside of protection area.
8	OLYMPIAN STONE COMPANY INC.			X				5	**	Outside of protection area.
9	WDOT 18816 NE 80TH REDMOND					X		5	0.5	No obvious environmental concerns.
11	TEXACO STATION		X	X		X		3	1	Cleanup appears to be complete.
12	GENETIC SYSTEMS CORP					X		5	**	Outside of protection area.
12	TRIGON PACKAGING CORP					X		5	**	Outside of protection area.
12	SUPER RENT INC NE 76TH ST			note 1		X		5	**	Outside of protection area.
12	CAREMARK INC					X		5	**	Outside of protection area.
13	DENNIS R CRAIG CONSTRUCTION INC.			X		X		5	0.5	Property behind #13 appears to be a landfill of construction materials.
13	MIRMAR CONSTRUCTION CO INC			X				5	0.5	Now called Mutual Materials Co.
14	CORY DE JONG & SON INC			X				3	5	Piles of saw dust for retail sale.
16	GENIE INDUSTRIES			X	X			5	0.5	Very good housekeeping.
17	CITY SHOPS			X				5	0.5	No obvious environmental concerns.
17	HOS BROS. CONSTRUCTION INC			X				5	0.5	Unable to locate. May have been located in a now vacant building
17	BELL INDUSTRIES ILLUMINATED DISPLAYS				X			5	0.5	Now called IDD Aerospace Corp. No obvious evidence of environmental concerns.
17	SAJASA CONSTRUCTION INC.					X		5	0.5	Unable to locate. May have been located in a now vacant building
17	WEYERCO LEASING INC					X		5	0.5	Unable to locate. May have been located in a now vacant building
17	REDMOND CITY OF MAINT OPER CTR					X		5	0.5	No obvious environmental concerns.
18	UNITED PARCEL SERVICE-REDMOND		X	X		X		1,2	**	Cleanup appears to be complete.
19	SHULTZ DISTRIBUTING INC		X	X				5	**	
21	GENETIC SYS CORP WHSE					X		5	0.5	No obvious environmental concerns.
26	A&A FOREIGN AUTO REPAIR	X	X	X				1,2	0.5	No obvious environmental concerns. A creek is immediately adjacent to the site.
26	QUINNS AUTO REPAIR					X		1,2	0.5	No obvious environmental concerns. A creek is immediately adjacent to the site.
27	HEART TECHNOLOGY INC					X		1,2	0.5	No obvious environmental concerns.
28	LAKE WASHINGTON SD REDMOND HIGH SCHOOL				X			4	5	No obvious environmental concerns.
29	ORGANIZATIONAL MAINTENANCE SHOP #10			X				4	5	No obvious environmental concerns. Military institution? Construction of housing development immediately North.
29	WA STATE MILITARY ARMY NAT'L GUARD		C					1,2 (or 4)	5	No obvious environmental concerns. Appears to be a military institution. Construction of housing in progress to the North.
30	KITS CAMERAS 12					X		1,2	0.5	No obvious environmental concerns.
30	PAYLESS 2562					X		1,2	0.5	No obvious environmental concerns.
31	ASKEW AUTO REPAIR					X		1,2	0.5	Unable to locate.
32	MINIT-LUBE #1109			X				1,2	0.5	No obvious environmental concerns. Now called Q-Lube.
34	OVERLAKE CLEANERS					X		1,2	0.5	No obvious environmental concerns.
35	REDMOND BP (was Unocal 4870)			X				1,2	0.5	Cleanup appears to be complete.
36	WAYNE AND GARYS CHEVRON SERVICE		X	X		X		1,2	0.5	Now a Boston Market Restaurant.
36	MAX D NICHOLLS			X				1,2	0.5	At this address, a U-DO-IT Pest Control Products and office space for lease.
36	JACKPOT STATION 305			X				1,2	0.5	Now called Redmond Gas Mart. The asphalt around the pump island has been patched.
36	KIMS TAILOR & DRY CLEANING					X		1,2	0.5	No obvious environmental concerns.
38	LWSD TRANSPORTATION FACILITY			X				1,2	5	This is a vacant lot. No obvious environmental concerns.
39	REDMOND ELEMENTARY SCHOOL			X				1,2	1	No obvious environmental concerns.
40	UNOCAL REDMOND BULK PLANT	1						1,2	0.5	Not visited.
41	KELLY REALTY (see note - now Daniel's Dry Cleaner)		C	X		?		4	5	Now a Daniels Dry Cleaners. Some patched asphalt in front of store and around back in the alley.
41	PHILLIPS 66 COMPANY SS#071842			X				4	5	Now a Key Bank. No obvious environmental concerns.
42	HALLMARK CUSTOM CLEANERS					X		4	1	No obvious environmental concerns.
43	ARCO #6067		X	X				4	1	No obvious environmental concerns.
43	REDMOND CLEANERS INCORPORATED			X		X		4	1	No obvious environmental concerns.
44	PREMIUM TUNE N LUBE REDMOND					X		4	5	No obvious environmental concerns.
45	EASTSIDE IMPORT AUTO REBUILD LTD					X		4	5	5-55 gallon drums and a pile of car parts located behind garage.
46	GOODYEAR AUTO SVC CTR					X		4	0.5	No obvious environmental concerns.
47	CITY OF REDMOND FIRE DEPARTMENT			X				4	0.5	No obvious environmental concerns.
48	CHEVRON 98795			X		X		4	5	No obvious environmental concerns.
51	CLEANING CENTER OF REDMOND THE					X		4	5	No obvious environmental concerns.

SPL=State Priority List (contaminated site)
LUST=leaking underground storage tank
UST=underground storage tank
LQG=RCRA large quantity generator
SQG=RCRA small quantity generator
TRANS=RCRA transporter
C=remediation completed
I=Independent Cleanup Report Submitted

Notes
1: GWMP lists USTs at this site, the Vista report did not.
2: GWMP lists many more USTs than the Vista report.
3: Status of site in database often different than status based on field recon.
4: The complete database is tabulated in Appendix B
5: See text for cautionary note regarding association of a source and a well.
6: ** refers to sites outside the capture zones but within the WHPA zones.

Table 6.2 List of sites from Vista database within well capture zones - sorted by well and time-of-travel zone

Map ID No.	Site Name	List (see definitions and note 3)						City Well	TOT Zone	Comments from Field Reconnaissance
		SPL	LUST	UST	LQG	SQG	TRANS	Capture Zone	(year)	
26	A&A FOREIGN AUTO REPAIR	X	X	X				1.2	0.5	No obvious environmental concerns. A creek is immediately adjacent to the site.
40	UNOCAL REDMOND BULK PLANT	I						1.2	0.5	Not visited.
36	WAYNE AND GARYS CHEVRON SERVICE		X	X		X		1.2	0.5	Now a Boston Market Restaurant.
35	REDMOND BP (was Unocal 4870)			X				1.2	0.5	Cleanup appears to be complete.
36	MAX D NICHOLLS			X				1.2	0.5	At this address, a U-DO-IT Pest Control Products and office space for lease.
36	JACKPOT STATION 305			X				1.2	0.5	Now called Redmond Gas Mart. The asphalt around the pump island has been patched.
32	MINIT-LUBE #1109			X				1.2	0.5	No obvious environmental concerns. Now called Q-Lube.
26	QUINNS AUTO REPAIR					X		1.2	0.5	No obvious environmental concerns. A creek is immediately adjacent to the site.
27	HEART TECHNOLOGY INC					X		1.2	0.5	No obvious environmental concerns.
30	KITS CAMERAS 12					X		1.2	0.5	No obvious environmental concerns.
30	PAYLESS 2562					X		1.2	0.5	No obvious environmental concerns.
31	ASKEW AUTO REPAIR					X		1.2	0.5	Unable to locate.
34	OVERLAKE CLEANERS					X		1.2	0.5	No obvious environmental concerns.
36	KIMS TAILOR & DRY CLEANING					X		1.2	0.5	No obvious environmental concerns.
39	REDMOND ELEMENTARY SCHOOL			X				1.2	1	No obvious environmental concerns.
29	WA STATE MILITARY ARMY NAT'L GUARD		C					1.2 (or 4)	5	No obvious environmental concerns. Appears to be a military institution. Construction of housing in progress to the North.
38	LWSD TRANSPORTATION FACILITY			X				1.2	5	This is a vacant lot. No obvious environmental concerns.
18	UNITED PARCEL SERVICE-REDMOND		X	X		X		1.2	**	Cleanup appears to be complete.
11	TEXACO STATION		X	X		X		3	1	Cleanup appears to be complete.
14	CORY DE JONG & SON INC			X				3	5	Piles of saw dust for retail sale.
47	CITY OF REDMOND FIRE DEPARTMENT			X				4	0.5	No obvious environmental concerns.
46	GOODYEAR AUTO SVC CTR					X		4	0.5	No obvious environmental concerns.
43	ARCO #6067		X	X				4	1	No obvious environmental concerns.
43	REDMOND CLEANERS INCORPORATED			X		X		4	1	No obvious environmental concerns.
42	HALLMARK CUSTOM CLEANERS					X		4	1	No obvious environmental concerns.
41	KELLY REALTY (see note - now Daniel's Dry Cleaner)		C	X		?		4	5	Now a Daniel's Dry Cleaners. Some patched asphalt in fort of store and around back in the alley.
48	CHEVRON 98795			X		X		4	5	No obvious environmental concerns.
29	ORGANIZATIONAL MAINTENANCE SHOP #10			X				4	5	No obvious environmental concerns. Military institution? Construction of housing development immediately North.
41	PHILLIPS 66 COMPANY SS#071842			X				4	5	Now a Key Bank. No obvious environmental concerns.
28	LAKE WASHINGTON SD REDMOND HIGH SCHOOL				X			4	5	No obvious environmental concerns.
44	PREMIUM TUNE N LUBE REDMOND					X		4	5	No obvious environmental concerns.
45	EASTSIDE IMPORT AUTO REBUILD LTD					X		4	5	5-55 gallon drums and a pile of car parts located behind garage.
51	CLEANING CENTER OF REDMOND THE					X		4	5	No obvious environmental concerns.
7	ALL SEASONS CONSTRUCTION	X						5	0.5	Area is very industrial. Poor housekeeping.
4	TRUSS SPAN	X						5	0.5	Outside of protection area
16	GENIE INDUSTRIES			X	X			5	0.5	Very good housekeeping.
13	DENNIS R CRAIG CONSTRUCTION INC.			X		X		5	0.5	Property behind #13 appears to be a landfill of construction materials.
13	MIRMAR CONSTRUCTION CO INC			X				5	0.5	Now called Mutual Materials Co.
17	CITY SHOPS			X				5	0.5	No obvious environmental concerns.
17	HOS BROS. CONSTRUCTION INC.			X				5	0.5	Unable to locate. May have been located in a now vacant building
17	BELL INDUSTRIES ILLUMINATED DISPLAYS				X			5	0.5	Now called IDD Aerospace Corp. No obvious evidence of environmental concerns.
17	SAJASA CONSTRUCTION INC.					X		5	0.5	Unable to locate. May have been located in a now vacant building
9	WDOT 18816 NE 80TH REDMOND					X		5	0.5	No obvious environmental concerns.
17	WEYERCO LEASING INC					X		5	0.5	Unable to locate. May have been located in a now vacant building
17	REDMOND CITY OF MAINT OPER CTR					X		5	0.5	No obvious environmental concerns.
21	GENETIC SYS CORP WHSE					X		5	0.5	No obvious environmental concerns.
6	LAKE WASHINGTON SCHOOL DISTRICT			X				5	1	No obvious environmental concerns
5	MCEACHERN PROPERTY		X					5	5	Unable to gain visual access to site. It is located well off of Union Hill Road on private property.
3	THE OVERLAKE SCHOOL			X				5	5	No obvious environmental concerns
1	KEEP IT CLEAN RECYCLING & EQUIP						X	5	10	Inaccessible, may no longer exist.
8	OLYMPIAN PRECAST INC	I					X	5	**	Outside of protection area.
19	SHULTZ DISTRIBUTING INC		X	X				5	**	
8	GOLDEN RULE & B&J ROOFING			X				5	**	Outside of protection area.
8	SCHROEDER & SONS			X				5	**	Outside of protection area.
8	CADMAN/CLOSED			note 2				5	**	Outside of protection area.
8	OLYMPIAN STONE COMPANY INC.			X				5	**	Outside of protection area.
12	GENETIC SYSTEMS CORP					X		5	**	Outside of protection area.
12	TRIGON PACKAGING CORP					X		5	**	Outside of protection area.
12	SUPER RENT INC NE 76TH ST			note 1		X		5	**	Outside of protection area.
12	CAREMARK INC					X		5	**	Outside of protection area.

SPL=State Priority List (contaminated site)
LUST=leaking underground storage tank
UST=underground storage tank
LQG=RCRA large quantity generator
SQG=RCRA small quantity generator
TRANS=RCRA transporter
C=remediation completed
I=Independent Cleanup Report Submitted

Notes
1: GWMP lists USTs at this site, the Vista report did not.
2: GWMP lists many more USTs than the Vista report.
3: Status of site in database often different than status based on field recon.
4: The complete database is tabulated in Appendix B
5: See text for cautionary note regarding association of a source and a well.
6: ** refers to sites outside the capture zones but within the WHPA zones.

Table 6.3. List of sites from King County hazmat database within well capture zones.

Site ID No.	Facility Name	Chemicals	City Well	TOT Zone (year)	Vista Map ID No.
2	ARCO	GASOLINE	4	1	43
14	MUTUAL MATERIALS	LIME, PORTLAND CEMENT	5	0.5	13
21	TIME OIL	GASOLINE, DIESEL	1,2	0.5	36
25	T D FEEDS	SODIUM SELENITE,2-OH-4-METHIO BUT ACID	4	5	
31	MK BATTERY, REDMOND	LEAD, SULFURIC ACID	5	0.5	
32	GTE, UNION HILL	SULFURIC ACID	5	5	
36	BOB'S CHEVRON SERVICE	GASOLINE	4	5	48
44	TEXACO	GASOLINE, DIESEL	3	0.5	
46	SHULTZ DISTRIBUTING	DIESEL, OILS, GASOLINE	99	99	19
48	OLYMPIAN PRECAST	MURIATIC ACID, DIESEL, CEMENT	99	99	8

Notes: 1: The complete database is tabulated in Appendix B
2: See text for cautionary note regarding association of a source and a well.
3: Well "99" and TOT zone "99" do not exist. These symbols are assigned to sites outside of but adjacent to the well capture zones.

Table 6.4. Residential storm water sample concentrations compared to drinking water criteria and City of Redmond well water samples.

Contaminant	City of Redmond[1] Storm Water Sample Concentration (mg/L)	Average NURP[2] Storm Water Sample Concentration (mg/L)	Contaminant Group	Drinking Water Criterion (mg/L)	Range of Redmond[1] Well Water Sample Concentrations (mg/L)
Nitrate	0.141	0.736	Primary	10	0.94 to 2.0
Lead	0.0017	0.144	Primary	0.05	<0.002
Flouride	0.05	NR	Primary	4	0.8 to 1.2
Copper	0.0013	0.033	Secondary	1	<0.020
Iron	199	NR	Secondary	0.3	<0.05
Zinc	0.003	0.135	Secondary	250	<20
Chloride	3.73	NR	Secondary	250	<20
Sulfate	7.92	NR	Secondary	250	<10 to 18

[1] City of Redmond 1997e
[2] USEPA 1983

Table 6.5. Analysis of nitrogen loading by residences within the 5-year capture zones.

A. Septic Drainfield Loadings

5-Year Capture Zones	Geographic Input Data: Number of Residential Units	Number of Parcels	Number of Acres	Units per Acre based on zoning	Calculations: Total N load (Kg/yr)	Total N load per acre (Kg/yr-ac)	Index of Concentration increase at well (mg/L)
Well 3 Totals	**258**	**380**	**526**		**1,606**	**3**	**2**
	51	131	253	0.2	315	1	0.33
	44	86	109	0.4	271	2	0.28
	38	42	38	1	238	6	0.25
	123	119	123	6 (see Note 1)	766	6	0.80
	3	2	3	8 (see note 1)	16	6	0.02
Well 5 Totals	**349**	**507**	**1539**		**2,169**	**1**	**1**
	266.82	446	1334	0.2	1,659	1	0.83
	82.02	61	205	0.4	510	2	0.26

Notes for A.

1. The zoning code density is greater than the 1 unit per acre on septic allowable by City code.
   The "number of ERUs" and all nitrate impacts were calculated at the maximum allowable septic density of 1 unit per acre.

B. Lawn Fertilizer Loading

5-Year Capture Zones	Number of Residential Parcels	Total N load for all Parcels (Kg/yr)	Average Parcel Size (acres)	Index of Concentration increase at well (mg/L)
Wells 1+2 and 4	1,680	15,120	0.5	4
Well 3	1,144	10,296	1	11
Well 5	521	4,689	5	2

Other necessary Data

Gallons of wastewater per day per ERU:		150 gallons
Total N content of wastewater at water table:		30 mg-N/L (incorporates 25% denitrification)
Water Rights of Wells	Wells 1plus 2	1199 gpm
	Well 3	480 gpm
	Well 4	800 gpm
	Well 5	1000 gpm

Assumptions necessary for calculation of increase at well:

Entire N load enters well with well pumping at water right.
Steady state loading and pumping.
No denitrification or utilization along flow path to well.

Table 6.6. Summary of Redmond drinking water well contamination events.

Date	Location	Contaminant	History
1986	Well 5	coliform from sewer line break	flushed by pumping Well 5 to waste for 6 months
1987	Well 5	1,1,1 trichloroethane of less than 1 ppb	showed up in August and was not detected again
1991	Well 1	perchloroethene at 0.7 ppb	showed up in June and was not detected in subsequent samples
1993	Well 1	perchloroethene at 0.5 ppb	showed up in June and was not detected in subsequent samples
1996	Wells 1, 2 and 4	perchloroethene at ranges of 1.0 to 5.0 ppb	first detected in August 1996; contamination continues to be found in all three wells

Data from City of Redmond water utility files.

Table 6.7. Summary of relative risks from contamination sources.

	Potential Contaminant Source	<0.5-year TOT	0.5- to 1-year TOT	1- to 5-year TOT	5- to 10-year TOT
Wells 1 and 2	point-source use of halogenated solvents				N.A.
	other point sources				N.A.
	spills to stormwater system				N.A.
	residential nitrate				N.A.
	major sewer pipes				N.A.
	transportation				N.A.
	commercial/industrial septic systems	N.A.	N.A.	N.A.	N.A.
	surface mining	N.A.	N.A.		N.A.
Well 3	point-source use of halogenated solvents				N.A.
	other point sources				N.A.
	spills to stormwater system				N.A.
	residential nitrate				N.A.
	major sewer pipes				N.A.
	transportation				N.A.
	commercial/industrial septic systems				N.A.
	surface mining	N.A.	N.A.		N.A.
Well 4	point-source use of halogenated solvents				N.A.
	other point sources				N.A.
	spills to stormwater system				N.A.
	residential nitrate				N.A.
	major sewer pipes				N.A.
	transportation				N.A.
	commercial/industrial septic systems	N.A.	N.A.		N.A.
	surface mining	N.A.	N.A.		N.A.
Well 5	point-source use of halogenated solvents				
	other point sources				
	spills to stormwater system				
	residential nitrate				
	major sewer pipes				
	transportation				
	commercial/industrial septic systems				
	surface mining				

Low to medium relative risk

High relative risk

N.A. = Not Applicable

7. WATER SUPPLY CONTINGENCY AND SPILL RESPONSE PLAN

7.1 OBJECTIVES

This component of the wellhead protection process is intended to meet state wellhead protection requirement by providing the following:

- A contingency plan to ensure that customers have an adequate supply of potable water in the event that contamination results in the temporary or permanent loss of the principal source of supply.

- Documentation of coordination with local emergency spill responders (including police, fire, and health departments).

7.2 PLAN DESCRIPTION

The City of Redmond Water Supply Contingency Plan and Spill Response Plan (last updated April 11, 1997) was developed by the project consultant team in consultation with the City of Redmond. This plan provides a central reference for procedures from the other City emergency manuals that deal with the city's groundwater supply, including providing a contingent water supply in the event of impairment or failure of the city wells. The Water Supply Contingency and Spill Response Plan is intended to be consistent and coordinated with the following emergency planning documents:

All Hazards Comprehensive Emergency Management Plan and Implementing Procedures (revised January 17, 1996). A thorough document that addresses planning and response to any emergency or disaster.

Eastside Hazardous Materials Team, Standard Operating Procedures. Formed by the cities of Redmond, Bellevue, Bothell, Issaquah, Kirkland, and Woodinville. Provides procedures for coordinated responses to hazardous materials incidents.

Standby Manual. Used by the Public Works Department and Parks Department to facilitate responses to emergency situations at facilities under the jurisdiction of these departments, including the city water supply system.

The table of contents of the Water Supply Contingency and Spill Response Plan is provided in Appendix C of this report.

8. PUBLIC INVOLVEMENT

8.1 OBJECTIVES

Involvement of the public, including business owners as well as residents, in the wellhead protection process is recommended by guidance prepared by the Department of Health (April 1995). The objectives of this element of the City of Redmond wellhead protection project were to solicit ideas from city staff regarding wellhead protection issues and their impacts on the public, initiate assessment of public awareness of groundwater protection issues, and coordinate wellhead protection efforts with city staff and existing city programs that deal with groundwater quality.

8.2 SUMMARY

The public involvement activities conducted during the City of Redmond wellhead protection project consisted of planning workshops with city staff, focus groups discussions with citizens and business representatives, public workshops with citizens and stakeholders, and coordination with existing city programs. Documentation of the public involvement activities is included in Appendix D.

8.3 PLANNING WORKSHOPS

Workshops with staff from the City of Redmond Public Works and Planning Departments were facilitated by Carolyn Browne Associates on March 26, 1996, and July 10, 1997. These workshops confirmed that the City of Redmond has a history of positive citizen response to water issues; however, there are several areas where greater public education is likely to be needed. The following subjects were identified for future public education about groundwater issues:

- Different areas of the city supplied by groundwater and surface water.
- Importance of groundwater as a component of the city water supply.
- Locations and susceptibility of the city wells with respect to potential groundwater contamination sources.
- Existing city, county, and state regulations that address groundwater quality and mandate wellhead protection.
- The role of existing city programs in wellhead and groundwater protection.

- Means by which the public can get involved and stay informed (such as newsletters, speakers, displays, and presentations).

8.4 FOCUS GROUP DISCUSSIONS

Carolyn Browne Associates designed and facilitated focus group discussions with Redmond business owners (July 18, 1996) and Redmond residents (July 23, 1996). Themes common to both groups included the following:

- Surface water pollution is a major environmental concern, but there is little awareness about the potential for groundwater pollution.

- There is little awareness of the sources of the city's drinking water supply. Some have heard the word "aquifer," but few are able to provide a definition.

- Although they sense that the cost for Redmond water is less than in other places, Redmond businesses and residents have little understanding of whether this is true and what determines the rate they pay.

- People sense that there is not an ample supply of water to handle the future growth in the area.

- There is little knowledge of how toxic chemicals used by businesses and residents can degrade the city water supply, but people are eager to learn and to change their habit patterns so that the water supply will not be contaminated.

- Few people have any awareness of state and federal mandates for water protection.

- No one in either group had heard the word "recharge" or had any understanding of what a recharge zone is in relation to an aquifer.

- Business owners and residents strongly support city efforts to educate the public about water quality issues.

8.5 PUBLIC WORKSHOPS

Interactive public workshops were held on July 30 and 31, 1997, from 7:00 to 9:00 p.m. at Anderson Park in Redmond to present information about groundwater and wellhead protection to Redmond businesses and residents and to obtain responses to the concerns that were discussed.

There was extensive publicity to promote attendance at these meetings through newspaper advertisements, flyers sent to homes and businesses in the well capture zones, and

announcements on cable access television. However, only 31 people attended one of these two workshops.

The major themes expressed by the workshop participants, based upon responses from completed individual questionnaires, included:

- Most learned about the workshops from the flyers received in the mail. The ads in the newspapers generated little response.
- Most people came to the workshop because they were interested in learning about Redmond's drinking water supply.
- Nearly all who attended rated the workshop a valuable experience.
- Participants strongly support greater education for businesses and residents as the most important means of enlisting public support for groundwater protection.
- Most prefer a range of methods for funding aquifer protection, including special permits and user fees in wellhead protection zones, seeking outside grants and loans, and raising development and hookup fees.

8.6 COORDINATION WITH CITY STAFF AND EXISTING PROGRAMS

Carolyn Browne Associates and Redmond City Public Works staff held several meetings to coordinate existing water-related educational activities with the wellhead protection planning process. Ongoing city efforts were discussed, including school curricula and classroom presentations, well house tours for teachers and students, community water forums, and participation in city festivals and other public education processes.

9. WELLHEAD PROTECTION PROGRAM RECOMMENDATIONS

9.1 OBJECTIVE

The objective of the recommendations presented in this section is to provide the City of Redmond with a starting point from which to develop a wellhead protection program. These recommendations are based on the information developed during the wellhead protection project (described in Sections 1 through 8 of this report), and the wellhead and groundwater protection framework provided by existing regulations and policies.

9.2 SUMMARY

These wellhead protection program recommendations are designed to complement and enhance existing ordinances and programs that address various aspects of groundwater protection. Wellhead protection is a subcategory of groundwater or aquifer protection, in that the capture zones of individual water supply wells fall within the aquifer from which those wells draw water. By integrating references to the existing regulatory framework, the wellhead protection program recommendations are intended to build upon these existing regulations and policies and thus avoid duplicated efforts.

The wellhead protection program recommendations can be grouped into the following actions:

- Defining wellhead protection zones that provide for graduated levels of protection from contamination.
- Managing documented or potential contaminant sources and land use activities that have the potential to degrade groundwater quality, including: hazardous materials and hazardous waste; storm water; sanitary waste water, pesticides and fertilizers; surface mining; and construction/decommissioning of water wells.
- Integrating contaminant source management into land use and zoning regulations.
- Designing, reviewing, permitting, and monitoring of facilities that have the potential to degrade groundwater quality.
- Managing data collected for the program.
- Promoting public involvement and education.

The detailed recommendations developed for each of these categories are presented in the following sections of this report.

9.3 APPLICABLE REGULATIONS AND POLICIES

As discussed in Section 2 of this report, numerous environmental regulations and policies at the local, state, and federal level in some way address groundwater protection. Agencies and governments that enforce regulations or run programs that will influence the development and implementation of the City of Redmond wellhead protection program include:

City of Redmond: all departments

King County: Department of Natural Resources; Seattle-King County Department of Public Health; Department of Development and Environmental Services; Fire Marshal

State of Washington: Department of Ecology; Department of Health; Department of Natural Resources; Department of Agriculture; State Conservation Commission

Federal Government: U.S. Environmental Protection Agency; U.S. Geological Survey; U.S. Department of Agriculture

The recommended wellhead protection strategies discussed below in Section 9.4 cite only principal regulations and policies associated with each strategy, with emphasis on those in effect in the city of Redmond. A more thorough discussion of local, state, and federal regulations applicable to these wellhead protection strategies is provided in the supplement to the Redmond-Bear Creek Valley GWMP (Redmond-Bear Creek Groundwater Management Committee 1996).

9.4 RECOMMENDED WELLHEAD PROTECTION STRATEGIES

The following discussion of wellhead protection strategies is grouped into subsections by key issues and completed wellhead protection plan components discussed in Sections 1 through 8 of this report. The specific sections of the City of Redmond documents—and the Redmond-Bear Creek Valley GWMP (Redmond-Bear Creek Groundwater Management Committee 1996) that form the framework for wellhead protection in Redmond—are cited within each applicable discussion of strategies and program elements.

It should be noted that the management strategies presented by the Redmond-Bear Creek GWAC (1996) represent an extensive and comprehensive set of options for addressing potential threats to groundwater quality in and around the City of Redmond. Cross-referencing of these strategies to those developed in this wellhead protection report therefore provides a critical linkage to prior local groundwater protection work. As of the date of this report, the Redmond-Bear Creek GWAC recommendations are under review by the King County Council and none have been implemented as ordinances.

9.4.1 Designation of Wellhead Protection Zones

9.4.1.1 Relationship to Principal Existing Regulations and Policies

City of Redmond

No existing City of Redmond regulations specifically address wellhead protection zone designation, although the City of Redmond Comprehensive Plan contains provisions for including wellhead protection policies and regulations into the City Code and Community Development Guide.

Redmond-Bear Creek Valley GWMP

The recommended management strategies from the GWMP that relate to designating wellhead protection areas are summarized as follows, with joint implementation by King County and the City of Redmond (unless otherwise noted):

SA-2. Facilitate development of wellhead protection programs by public water system purveyors.

Washington State Department of Health

Requirements and technical methodology for determination of wellhead protection areas are described in Section 4 of the wellhead protection guidance document (Washington State Department of Health 1995).

9.4.1.2 Recommended Strategies Regarding Designation of Wellhead Protection Zones

WHPZ-1. Using the time-of-travel (TOT) capture zones delineated in Section 5 of this report (see Figure 5.2), designate the following wellhead protection zones (Figure 9.1):

WHP Zone 1: The 6-month TOT capture zone around city wells 1+2, 3, 4, and 5.

WHP Zone 2: The 1-year TOT capture zone around city wells 1+2, 3, 4, and 5, combined with the narrow area between the 1-year TOT zones of well 5 and the other wells.

WHP Zone 3: The 5-year and 10-year TOT capture zones around city wells 1+2, 3, 4, and 5, combined with the narrow area between the 5-year and 10-year TOT zones of well 5 and the other wells.

WHPZ-2. Develop a legal description and map of WHP Zones 1, 2, and 3 boundaries that incorporate lot lines and city boundaries, to help implement the protective measures ultimately developed for the WHP zones.

WHPZ-3. Identify and superimpose other wellhead, aquifer, and groundwater protection designations on the WHP zone map, including:

- Wellhead or aquifer protection areas designated by adjacent water purveyors (Woodinville Water District; Union Hill Water District; Northeast Sammamish Sewer and Water District).

- Aquifer Recharge Areas designated pursuant to the requirements of the Growth Management Act (Chapter 36.70A RCW) and described in Sections 20B and 20C of the City of Redmond Community Development Guide.

- Groundwater Susceptibility Areas mapped by the King County Department of Natural Resources, as described by management strategy SA-1E of the Redmond-Bear Creek Valley GWMP.

WHPZ-4. If well 4 is used extensively, evaluate whether the capture zone of this well extends west of the Sammamish River. Evaluate the existing well test data to identify any influences of the Sammamish River during that test. Consider an additional aquifer test after installing a piezometer west of the river. Recalculate the capture zone if the Sammamish River is NOT influential. If additional analysis indicates that the capture zone of city well 4 extends westward under the Sammamish River, then revise the definition of WHP zones accordingly and update the contaminant source assessment and inventory to address potential risks to the well west of the river.

WHPZ-5. Develop a numerical, three-dimensional, groundwater flow model when water supply or groundwater management tasks would benefit from its use. At that time wellhead protection zone delineations should be modelled and compared to the zones recommended in this report.

WHPZ-6. Consider incorporation of strategy SA-2 of the Redmond-Bear Creek Valley GWMP into development of the city's wellhead protection program.

9.4.1.3 Rationale

Establishing WHP zones provides a starting point for graduated protective measures and management of risks posed by potential sources of groundwater contamination. Any implementation of wellhead protection strategies, recommended below in Sections 9.4.2 through 9.4.16 of this report, depends upon definition of the WHP zones.

9.4.2 Land Use and Zoning Regulations

9.4.2.1 Relationship to Principal Existing Regulations and Policies

City of Redmond

Compatibility of land uses involving hazardous materials is addressed by the following policy from the Comprehensive Plan:

> LU-72. The City's wellhead protection program should include an evaluation of the compatibility of existing heavy industrial uses and chemical storage (including hazardous materials and petroleum products) on high- and moderate-potential aquifer recharge areas.

In following the requirements of the Growth Management Act (Chapter 36.70A RCW), the City of Redmond adopted regulations governing aquifer recharge areas. These regulations are contained in the following sections of the Community Development Guide:

Section 20B.10.010. Contains a Sensitive Areas Map that delineates generalized boundaries of three types of Aquifer Recharge Areas: High, Medium, and Low Significance. The actual type, extent, and boundaries of Aquifer Recharge Areas is determined in the field by a qualified consultant according to the procedures, definitions, and criteria established by Section 20C of the Community Development Guide.

Section 20C.40.020(15). Defines the three classifications of Aquifer Recharge Areas: low significance/low susceptibility; medium significance/moderate susceptibility; and high significance/high susceptibility.

Section 20C.40.060. States that the regulations pertaining to Sensitive Areas (including Aquifer Recharge Areas) apply as an overlay to zoning, land use, and other regulations established by the City of Redmond.

Section 20C.40.100(15)(e)(1). Prohibits the following land uses in High Significance Aquifer Recharge Areas:

> Land uses and activities that involve the use, storage, transport, or disposal of significant quantities of chemicals, substances, or materials that are toxic, dangerous, or hazardous, as defined by state and federal regulations
>
> On-site community sewage disposal systems
>
> Underground chemical storage
>
> Petroleum pipelines

Solid waste landfills

Based on work performed for this wellhead protection project, these uses currently exist at numerous locations within the High Significance Aquifer Recharge Area in Redmond.

Section 20C.40.100(15)(e)(2). Requires that mitigation standards in Sections 20C.40.110 be implemented and that Section 20C.40.120 be implemented in Medium Significance and Low Significance Aquifer Recharge Areas.

Redmond-Bear Creek Valley GWMP

The recommended management strategies from the GWMP that relate to land use planning and zoning are summarized as follows, with joint implementation by King County and the City of Redmond (unless otherwise noted):

SA-1A. Determine whether categorical exemptions to SEPA should be eliminated in the physically susceptible areas mapped in the GWMP.

SA-1B. If eliminating the categorical exemptions to SEPA is justified, designate the physically susceptible areas mapped in the GWMP as an Environmentally Sensitive Area to facilitate the elimination.

SA-1C. Adopt the specified general aquifer protection policies, to coordinate with wellhead protection programs that would focus intense aquifer protection efforts in areas where the existing built environment presents significant risks to public drinking water systems.

SA-1D. Develop guidance to help environmental reviewers identify proposed developments that may degrade groundwater quality, require adequate information to address such impacts, and propose effective mitigation.

SA-1E. Define and map aquifer recharge areas and areas that are physically susceptible to groundwater contamination.

SA-2. Facilitate development of wellhead protection programs by public water system purveyors.

9.4.2.2 Recommended Strategies Regarding Land Use and Zoning Regulations

LUZ-1. Develop graduated levels of protection for WHP Zones 1, 2, and 3. Consider prohibited land uses in WHP Zones 1 and 2, and describe conditional land uses with acceptable mitigation in WHP Zone 3. These land use regulations should incorporate the protective measures developed following the recommendations described in Sections 9.4.3 through 9.4.13 of this report. Existing Aquifer Recharge Area

regulations specified in the Community Development Guide should be revised and integrated with WHP zone regulations.

LUZ-2. Consider incorporation of strategies SA-1 (A through E) and SA-2 of the Redmond-Bear Creek Valley GWMP into development of the city's wellhead protection program.

9.4.2.3 Rationale

Updating land use regulations to incorporate wellhead protection measures is the fundamental means of implementing wellhead protection. Complete descriptions of prohibited and conditional uses specified in land use regulations, with cross references to associated regulations and guidance (including permit requirements, design standards, best management practice (BMP) descriptions, and compliance monitoring requirements) are the core tool of an effective wellhead protection program. Land use regulations that incorporate wellhead protection also support managing the environmental consequences of growth. The regulations are a method to screen out future incompatible land uses that could adversely impact the quality of Redmond's groundwater supply.

9.4.3 Hazardous Materials and Hazardous Waste Management

9.4.3.1 Relationship to Principal Existing Regulations and Policies

City of Redmond

The following sections of the city's Comprehensive Plan address the issue of hazardous materials and hazardous waste management:

NE-47. Encourages hazardous waste cleanups by not duplicating state and federal regulations and by ensuring that city regulations and standards are flexible.

NE-48. Recommends cleanup of contaminated sites that may affect the city groundwater supply to a standard that will not present risk to this resource.

UT-70 and UT-XX (as amended by Ordinance No. 1929, March 27, 1997). Requires the city to develop and implement regulations on the storage and use of hazardous materials.

Section 20C.80.755, Hazardous Waste Treatment and Storage Facilities, of the city's Community Development Guide (as amended by Ordinance 1930, March 27, 1997) defines and classifies hazardous waste treatment and storage facilities. This regulation also specifies minimum development standards, including the requirement to prevent release of materials including those resulting from a "worst-case" accident. Incidental storage of hazardous materials is limited to those amounts necessary for the proper function of the business, not to exceed quantities allowed by the Redmond Fire Department and the Uniform Fire Code.

Redmond-Bear Creek Valley GWMP

The recommended management strategies from the GWMP that relate to hazardous materials and hazardous waste management are summarized as follows, with joint implementation by King County and the City of Redmond (unless otherwise noted):

HM-1. The Redmond-Bear Creek Valley GWAC supports the findings and recommendations of the Washington State Hazardous Waste Plan.

HM-2. Designate zones for hazardous waste storage and treatment. (King County)

HM-3. Commit staff and funding to comprehensive implementation of Article 80 of the Uniform Fire Code, including ordinance development and public education. (King County Fire Marshal; City of Redmond Fire Marshal; King County Department of Natural Resources)

HM-4. Incorporate groundwater protection in the Local Emergency Management Plan.

HM-5A. Assess the risk of transportation-related hazardous materials spills when developing wellhead protection programs. Develop and implement risk reduction strategies as needed. (City of Redmond)

UST-1A. Petition the Department of Ecology to designate the Redmond-Bear Creek Valley GWMA as an Environmentally Sensitive Area under Chapter 90.76 RCW, the state Underground Storage Management Act.

UST-1B. Prepare a program and related ordinances to augment the state underground storage tank regulations, WAC 173-360. (King County Department of Natural Resources; concurrence by the City of Redmond is pending)

UST-1C. Prepare an ordinance requiring disclosure of underground storage tanks at the time of sale of any real property in King County. (King County Department of Natural Resources)

UST-2A. Prepare an ordinance requiring secondary containment of underground chemical storage tanks, as defined in WAC 173-360-120, and for certain underground tanks exempt or deferred from WAC 173-360. (King County Department of Natural Resources)

UST-2B. Prepare an ordinance requiring that all underground chemical storage tanks without secondary containment, currently in use and exempt from WAC 173-360, must be tested and tagged at regular intervals. (King County Department of Natural Resources)

UST-3A. Prepare an ordinance to addresses identification and abandonment of home underground heating oil tanks. (King County Department of Natural Resources)

UST-3B. Develop a database describing and locating underground heating oil tanks.

UST-3C. As a component of the GWMP education program, educate homeowners and owners of exempt underground storage tanks about underground tank abandonment requirements specified by the Uniform Fire Code, .

King County

The King County Department of Natural Resources, Water Pollution Control and Solid Waste divisions, and the Seattle-King County Department of Public Health are sponsors of the Local Hazardous Waste Management Program. This program assists small businesses and households with hazardous waste identification, management, and disposal.

9.4.3.2 Recommended Strategies Regarding Hazardous Materials and Hazardous Waste Management

HW-1. Develop definitions for substances of concern that have the potential to contaminate the city's groundwater supply. Consider establishing threshold quantities for these substances of concern. Provide compatibility and cross references with existing state and federal regulations.

HW-2. Develop an inventory and reporting requirements for substances of concern, incorporating existing regulatory requirements to minimize duplicated efforts and unnecessary expense to regulated businesses (see permitting recommendations in Section 9.4.11 of this report).

HW-3. Offer technical assistance to regulated businesses about BMPs. Use existing programs operated by the City of Redmond, King County, and the Department of Ecology to the maximum extent possible (see public education recommendations in Section 9.4.16 of this report).

HW-4. Require project applicants to inform the city about documented or potential groundwater contamination that is known by the applicant, or is revealed during any environmental site assessment conducted on the project property or properties in the vicinity of the project property.

HW-5. Require businesses and property owners within the WHP zones to give the city information and data about contaminant releases and cleanups, including independent remedial actions conducted according to WAC 173-340, the Model Toxics Control Act Cleanup Regulation.

HW-6. Using the contaminant database described in this wellhead protection report as the starting point, update and maintain an inventory of potential groundwater

contamination sources and groundwater quality information (see data management recommendations in Section 9.4.15 of this report).

HW-7. Consider developing regulations that are more stringent than existing local, state, and federal regulations governing the storage, use, transportation, and disposal of chemicals. The most stringent requirements should apply to WHP Zone 1 (6-month TOT) and Zone 2 (1-year TOT).

HW-8. Consider incorporation of strategies HM-1 through HM-5 and UST-1 through UST-3 of the Redmond-Bear Creek Valley GWMP into the city's wellhead protection program.

9.4.3.3 Rationale

Regulating point sources of hazardous substances and hazardous wastes in WHP Zone 1 (6-month groundwater TOT zone) is critical, due to the high risk posed to the city supply wells (see Section 6.13 and Table 6.7). Tracking chemical use, requiring application of containment and BMPs, and providing technical assistance to businesses will serve to decrease this risk.

9.4.4 Surface Mining Management

9.4.4.1 Relationship to Principal Existing Regulations and Policies

City of Redmond

The City of Redmond Comprehensive Plan refers to potential environmental impacts from surface mining in the following policies:

LU-76. Adequate precautions must be taken by mining operators to protect groundwater resources. This included maintaining adequate separation between the base of excavation and groundwater.

LU-77. Grading and fill plans proposed as part of the mine reclamation plans required by the state Department of Natural Resources must be protective of groundwater resources.

Redmond-Bear Creek Valley GWMP

The recommended management strategies from the GWMP that relate to surface mining management are summarized as follows, with joint implementation by King County and the City of Redmond (unless otherwise noted):

SG-1. Develop best management practices (BMPs) in grading permits issued to gravel pit operations. BMPs should support compliance with the National Pollutant Discharge Elimination System (NPDES) and Ecology's "General Permit" requirements.

SG-2A. Propose that the King County Comprehensive Plan be recommended to include a policy stipulating careful land evaluation uses at reclaimed sand and gravel mine sites, because of the increased susceptibility of groundwater contamination due to removal of overlying protective geologic materials during past mining operations. (King County Department of Natural Resources)

SG-2B. Propose an ordinance that requires testing of any fill to be used for reclamation at sites located in physically susceptible areas and in recharge areas. (King County Department of Natural Resources).

SG-2C. Prepare an ordinance that requires reclamation plans for mineral extraction sites include measures to protect groundwater quality and quantity.

King County

Conditional and unclassified use permits are required for surface mining operations. These permits, plus the reclamation plan required by the state Department of Natural Resources (discussed below), must meet the requirements of King County Code Chapter 21.42, Quarrying and Mining Classifications. King County also requires a grading permit for excavations exceeding 500 cubic yards.

State of Washington

Surface mining operations are currently regulated by the Washington State Department of Ecology (discharge permit and storm water pollution prevention plan) and the Department of Natural Resources (mining reclamation plan).

9.4.4.2 Recommended Strategies Regarding Surface Mining Management

SM-1. Require surface mining operations within the WHP zones to provide the city with copies of all permits and plans required for operation and closure.

SM-2. Subject surface mining operations to the project review and permitting process (see Section 9.4.11 of this report).

SM-3. If management of hazardous materials, storm water runoff, and other potential groundwater contamination sources is not adequately addressed in the permit and plan data submitted to the Department of Ecology (Ecology) for a mining operation, require

collection and submittal of supplemental data and implementation of supplemental mitigation measures, as appropriate.

SM-4. Consider incorporation of strategies SG-1 through SG-2 of the Redmond-Bear Creek Valley GWMP into development of the city's wellhead protection program.

9.4.4.3 Rationale

Sand and gravel mining operations were identified in the well 5 WHP zones (see Figure 6.1). Surface mining operations provide potential pathways for contaminants to enter groundwater because the excavation of earth materials lowers the natural ground surface and reduces the depth to groundwater. Potential sources of groundwater contamination associated with surface mining operations include chemicals and fuels used at the site, turbid wash water, and fill material placed in the mine pits (legally and illegally). A comprehensive wellhead protection program must incorporate existing surface mining regulations and provide for enhancement of these requirements, as necessary.

9.4.5 Storm Water Management

9.4.5.1 Relationship to Principal Existing Regulations and Policies

City of Redmond

The following policy of the Comprehensive Plan addresses potential storm water impacts to groundwater:

NE-43. Potentially contaminated storm water should not be discharged to groundwater.

The 1996 Comprehensive Stormwater Plan (as amended by Ordinance No. 1929, March 27, 1997), states the following:

Page 27. Storm water infiltration should be emphasized as a preferred method of storm water management in locations where groundwater contamination is not a concern.

Modifications to Ecology's Stormwater Management Manual for the Puget Sound Basin (1992), incorporated in the Clearing, Grading, and Stormwater Management, Redmond Technical Notebook (effective April 22, 1996), include the following:

Section III, 3 - 4. Infiltration shall only be used for (a) water quality enhancement as a last resort; and (b) 1.0 inch/hour minimum and 3 inches/hour maximum design infiltration rates. A minimum setback of 200 ft from a public well is required.

Infiltration design requirements are specified in the Infiltration Checklist (Appendix A, page A-11 of Technical Notebook).

Redmond-Bear Creek Valley GWMP

The recommended management strategies from the GWMP plan that relate to storm water management are summarized as follows, with joint implementation by King County and the City of Redmond (unless otherwise noted):

ST-1A. Amend/adopt surface water design manual updates that promote storm water infiltration in high- and moderately physically susceptible areas where site conditions are such that groundwater contamination can be prevented by pollution source controls and storm water pretreatment.

ST-2A. Require that storm water management facilities be designed to protect groundwater quality.

ST-2B. Study the effectiveness of best available technologies applied to storm water treatment systems. This study should monitor discharges from actual facilities.

ST-3. Include storm water management in the groundwater education program described by recommendations ED-1 and ED-2.

ST-4A. Provide coordination between Department of Ecology groundwater and surface water planning efforts (Department of Ecology).

ST-4B. Revise the Puget Sound Water Quality Management Plan to address groundwater quality issues (Puget Sound Water Quality Authority).

ST-4C. Provide coordination among King County water resource planning efforts (King County Department of Natural Resources).

ST-5. Provide high priority to areas requiring groundwater protection when identifying and correcting water quality problems associated with existing roadways. Develop a program to retrofit existing storm water structures (as required by the NPDES). Require storm water quality and quantity controls comparable to new regulations when conducting major renovation or widening of roads.

ST-6. Evaluate the groundwater quantity and quality benefits of soil amendment. Implement soil amendment requirements if this evaluation proves to be a practical method of improving water quality, increasing infiltration, and reducing storm water runoff (in progress by City of Redmond).

9.4.5.2 Recommended Strategies Regarding Storm Water Management

SW-1. Consider regulating storm water infiltration in WHP Zone 1 and in High-Significance Recharge Areas of Redmond's aquifer (designated in Sections 20B and 29C of the Community Development Guide) that are heavily developed and support use and storage of hazardous materials. This step relates to the greater potential for hazardous material spills to be transported to groundwater, rather than the lower potential for groundwater quality impacts from typical runoff. This evaluation should include a detailed examination of each affected storm water basin to system hydraulics and pretreatment options.

SW-2. Assess the potential for groundwater impacts from hazardous material spills that could be intercepted by storm water systems, eventually reaching soils and groundwater by leakage or infiltration. Evaluate options for isolation of spills by incorporating containment features in facility design and by effective spill response (see Section 9.4.13 of this report). Coordinate with the development of requirements for hazardous materials management (see Section 9.4.3 of this report).

SW-3. Consider modifying or enhancing existing design standards for storm water conveyance, treatment, and disposal facilities located within WHP zones to minimize leakage and to prevent groundwater contamination (see Section 9.4.10 of this report).

SW-4. Build upon existing programs that provide technical assistance to businesses and residential property owners about BMPs for management of discharges to the city storm water system.

SW-5. Consider incorporation of strategies ST-1 through ST-6 of the Redmond-Bear Creek Valley GWMP when developing the city's wellhead protection program.

9.4.5.3 Rationale

Section 6.13 identified transport of hazardous material spills from storm water infiltration systems to groundwater as a high relative risk to groundwater quality in the 6-month TOT zone to all of the city supply wells (see Table 6.7), especially because of the shallow depth to water (generally 15 ft below ground surface). Data and technical references reviewed in the storm water assessment (Section 6.7) indicate that metals in typical urban runoff are attenuated by adsorption to soils during infiltration; however, the attenuation potential for organic chemicals (such as petroleum products and solvents) is much less than for metals.

Normal contaminant concentrations in storm water are minor compared to concentrations resulting from hazardous material spills; therefore, prevention and mitigation of such spills are required to protect groundwater supplies from contaminant releases via the storm water pathway.

9.4.6 Sanitary Sewage Management

9.4.6.1 Relationship to Principal Existing Regulations and Policies

City of Redmond

Sanitary sewage management to prevent groundwater impacts is addressed by the following policy of the Comprehensive Plan:

NE-43. Waste water should not be discharged to groundwater.

Redmond-Bear Creek Valley GWMP

The recommended management strategies from the GWMP that relate to sanitary sewage management are summarized as follows, with joint implementation by King County and the City of Redmond (unless otherwise noted):

SP-1A. Review and analyze existing studies and ongoing pilot programs to determine whether infiltration and exfiltration are problems in the Redmond-Bear Creek Valley GWMA. Determine appropriate follow-up actions.

SP-1B. Encourage the King County Water Pollution Control Division and the City of Redmond to continue existing or implement new regularly scheduled leak detection and repair programs, to protect aquifers in the Redmond-Bear Creek Valley GWMA.

SP-1C. Encourage King County to amend the Comprehensive Land Use Plan and King County Code Chapter 13.24 to require use of leakproof piping in physically susceptible areas and recharge areas.

King County

Discharge of hazardous constituents to sanitary sewer systems that are part of the former METRO system in King County is regulated by the Department of Natural Resources, Water Pollution Control Division.

9.4.6.2 Recommended Strategies Regarding Sanitary Sewage Management

SSM-1. Consider modification or enhancement of existing design standards for waste water conveyance, treatment, and disposal facilities located within WHP zones to minimize leakage and prevent groundwater contamination (see Section 9.4.10 of this report).

SSM-2. Enhance existing programs that give technical assistance to businesses and residential property owners regarding BMPs for managing discharges to the city waste water system.

SSM-3. Consider incorporation of strategies SP-1A through SP-1C of the Redmond-Bear Creek Valley GWMP into development of the city's wellhead protection program.

9.4.6.3 Rationale

Leakage from sanitary sewer facilities (including side sewers, sewer mains, and pump stations) presents a high relative risk within the 6-month TOT zone of city supply wells, as discussed in Section 6.8 of this report (see Table 6.7). As noted in Section 6.12 of this report, Redmond supply well 5 was temporarily contaminated in 1986 by fecal bacteria from a broken sewer line. Sanitary sewer conveyance systems (especially force mains) that serve businesses and industries can release chemical and bacteriological contaminants into the ground in proximity to groundwater, in situations where pipe inverts are near the water table. Proper construction, monitoring, and maintenance of sanitary sewer facilities in WHP zones are, therefore, important components of a wellhead protection program.

9.4.7 Septic System Management

9.4.7.1 Relationship to Principal Existing Regulations and Policies

City of Redmond

The following policies in the Comprehensive Plan address potential impacts of septic systems on groundwater quality:

UT-46 and UT-59. Connection to the city waste water collection system is required for all new development, unless the zoned density is less than one unit per acre. On-site sewage disposal systems are allowed only if soil conditions are suitable and groundwater would not be negatively impacted.

UT-57. Existing development is required to connect to the city waste water collection system when on-site systems fail and city sewer facilities are available.

UT-58. Conversion of on-site waste water treatment and disposal systems to the city sewer system should be required as connections become available.

Redmond-Bear Creek Valley GWMP

The recommended management strategies from the GWMP that relate to septic system management are summarized as follows, with joint implementation by King County and the City of Redmond (unless otherwise noted):

OS-1. Consider requiring a nitrate loading analysis in wellhead protection programs for systems with over 1,000 connections. (Management Committee)

OS-2A. Inventory the commercial, industrial, and institutional facilities served by on-site sewage systems. Monitor those facilities that present a significant risk to groundwater quality. Educate facility operators in hazardous materials management. (Seattle-King County Department of Public Health)

OS-2B. Amend Title 13 of the Code of the King County Board of Health to expressly prohibit on-site sewage disposal systems for any materials other than domestic sewage. (Seattle-King County Department of Public Health).

OS-3A. In the public information distributed by the Local Hazardous Waste Management Program, address risks posed by disposal of household hazardous wastes to septic systems. (Seattle-King County Department of Public Health).

OS-3B. Develop and implement a public education program to increase the awareness of proper septic system operation and maintenance. (Seattle-King County Department of Public Health).

OS-4. Prepare amendments to Title 13 of the Code of the King County Board of Health to require that the as-built drawing of any on-site sewage treatment and disposal system be recorded with the property deed. (Seattle-King County Department of Public Health).

OS-4B. Evaluate the feasibility of a county-wide on-site sewage system management program and determine its potential effectiveness in protecting groundwater.

King County

Through Title 13 of the Code of the King County Board of Health, SKCDPH regulates design and installation of small septic systems (less than 3,500 gallons per day) in King County. SKCDPH also provides public information and assistance with design, installation, and operation of these systems.

State of Washington

The siting, design, construction, repair, and replacement of septic systems are addressed in the state on-site sewage regulations (WAC 248-96) and the state groundwater standard regulations (WAC 173-200). Disposal of sanitary waste and other discharges in large on-site septic systems (14,500 gallons per day or more) is generally regulated by Ecology. The state Department of Health regulates systems with flows between 3,500 and 14,500 gallons per day.

9.4.7.2 Recommended Strategies Regarding Septic System Management

SPT-1. Prohibit new septic systems and other types of on-site waste water treatment/disposal systems within WHP Zones 1 and 2. Require that existing septic systems within all WHP zones connect to the city sanitary sewer as it becomes available.

SPT-2. Modify existing city regulations governing septic systems and sanitary sewer connection requirements to reflect new wellhead protection requirements.

SPT-3. Consider modification or enhancement of existing design standards for septic systems located within WHP zones, to minimize leakage and prevent groundwater contamination (see Section 9.4.10 of this report). For the well 3 WHP zones, specify designs to promote denitrification.

SPT-4. Continue to enhance public information efforts regarding design and maintenance of septic systems, and use of alternate (non-hazardous) household chemicals (see Section 9.4.16 of this report).

SPT-5. Consider incorporation of strategies OS-1 through OS-4 of the Redmond-Bear Creek Valley GWMP in developing the city's wellhead protection program.

9.4.7.3 Rationale

The septic system impact assessment and the contaminant source risk ranking (presented in Sections 6.9 and 6.13 of this report, respectively) indicate a high relative risk of commercial/industrial septic system impacts in the 6-month TOT zone for well 5, and a high relative risk of nitrate impacts from domestic septic systems within the 10-year TOT zone of well 3. Implementing and enhancing current regulations governing septic systems, using a graduated approach to wellhead protection (based on well distances and groundwater travel times), will reduce the risks to the city's wells posed by these systems.

9.4.8 Pesticide, Herbicide, and Fertilizer Management

9.4.8.1 Relationship to Principal Existing Regulations and Policies

Redmond-Bear Creek Valley GWMP

The recommended management strategies from this plan that relate to pesticide and fertilizer management are summarized as follows, with joint implementation by King County and the City of Redmond (unless otherwise noted):

PF-1A. Develop farm plans for agricultural users of pesticides and fertilizer in physically susceptible and recharge areas.

PF-1B. Evaluate the Cooperative Extension Pesticide Reduction Program for its effectiveness in protecting groundwater and its applicability to Groundwater Management Areas.

PF-1C. Evaluate, develop, and implement methods of pesticide and fertilizer use, on city and county property and rights-of-way, that are protective of groundwater quality.

9.4.8.2 Recommended Strategies Regarding Pesticide, Herbicide, and Fertilizer Management

PHFM-1. Consider regulating pesticide, herbicide, fertilizer, and other agricultural chemical application within the 6-month TOT zones within WHP Zone 1.

PHFM-2. In public education programs on the use of pesticides, herbicides, and fertilizers and potential impacts to groundwater quality, support and enhance existing public education efforts by the city and King County.

PHFM-3. Consider incorporation of strategies PF-1A through PF-1C of the Redmond-Bear Creek Valley GWMP as the city's wellhead protection program is being developed.

9.4.8.3 Rationale

As noted in Section 6.10 of this report (Lawn and Agricultural Chemical Impact Assessment), optimal application of agricultural chemicals following the manufacturer's instructions poses little threat to groundwater. Over-application results in the potential for migration of these chemicals into the groundwater system. This is more likely to occur with residential users rather than commercial applicators. The potential nitrate loading from fertilizer use in the WHP zones of well 3 is high due to the residential and rural land uses in that area.

9.4.9 Well Construction and Decommissioning

9.4.9.1 Relationship to Principal Existing Regulations and Policies

City of Redmond

Water well decommissioning is addressed by the following policy of the Comprehensive Plan:

> UT-37. Encourage the connection to city water for those properties on existing private well systems.

Redmond-Bear Creek Valley GWMP

The recommended management strategies from the GWMP that pertain to water well construction and decommissioning are summarized as follows, with joint implementation by King County and the City of Redmond (unless otherwise noted):

> WC-1A. Support legislation that provides funding for the state well construction and decommissioning program (with Ecology).
>
> WC-1B. Develop a local health department program to implement the delegation portion of WC-1a (King County and Ecology).
>
> WC-2. Develop an ordinance that requires sellers to disclose to buyers the presence of used or unused wells on their property (King County).
>
> WC-2B. Develop an ordinance that requires identification of wells on property that is the subject of SEPA review, rezone applications, and/or land use permit applications (King County).
>
> WC3A. Explore the possibility of creating a funding mechanism for well decommissioning (King County).
>
> WC3B. Consider alternatives to well decommissioning procedures as part of WAC 173-160 revisions (Ecology).

State of Washington

Ecology enforces WAC 173-160, Minimum Standards for Construction and Maintenance of Wells. These regulations specify procedures for drilling, sealing, completion, and decommissioning of most types of wells.

9.4.9.2 Recommended Strategies Regarding Well Construction and Decommissioning

WCD-1. Require project proponents to conduct a site reconnaissance and a search of Ecology well log files to identify any wells (including water supply wells and water quality monitoring wells) that are present on the project site. Include requirements to properly decommission identified wells that are improperly constructed or no longer in use, following WAC 173-160, Minimum Standards for Construction and Maintenance of Wells. Apply this requirement to wells that are discovered during construction work, so that such wells will not be partially destroyed or buried.

WCD-2. Require city review of wells to be drilled in the WHP zones that are exempt from WAC 173-160, including anode or cathode wells, soil gas extraction wells, and mineral exploration wells. Develop minimum sealing requirements for such wells.

WCD-3. Consider incorporation of strategies PF-1A through PF-1C of the Redmond-Bear Creek Valley GWMP into development of the city's wellhead protection program.

9.4.9.3 Rationale

Improperly constructed wells or any wells not correctly decommissioned can be conduits for any contaminants in the vicinity of the well. These contaminants can migrate directly to groundwater along the inside and/or outside of the well casing. This phenomenon can occur in municipal water supply wells, domestic water wells, monitoring or observation wells, soil gas extraction wells, test borings, and anode or cathode protection wells. Although WAC 173-160 requires that such wells be decommissioned by removal or sealing in place, many such wells are not properly decommissioned. The best opportunity for discovery and proper decommissioning of wells is during review of projects that involve redevelopment or new development.

9.4.10 Engineering and Design Standards

9.4.10.1 Relationship to Principal Existing Regulations and Policies

City of Redmond

The city's Community Development Guide includes ordinances that specify engineering and design standards for all types of facilities. These are cross referenced to other city, county, state, and federal documents that contain detailed engineering and design information and guidance. The wellhead protection strategies and elements described in other subsections of Section 9 include references to the Community Development Guide, as appropriate.

9.4.10.2 Recommended Strategies Regarding Engineering and Design Standards

EDS-1. Incorporate recommended wellhead protection strategies described above in Sections 9.4.1 through 9.4.9 of this report into appropriate sections of the Community Development Guide that address engineering and design standards.

EDS-2. Identify all other design standards and regulations in the Community Development Guide (in addition to those noted in strategy EDS-1) that have an effect on, or relate directly to, wellhead or groundwater protection. Incorporate wellhead protection cross references and requirements into these sections of the Community Development Guide, as appropriate.

9.4.10.3 Rationale

Engineering and design standards need to incorporate wellhead protection requirements to provide constructed projects and facilities with features that protect groundwater quality.

9.4.11 Project Review and Permitting

9.4.11.1 Relationship to Principal Existing Regulations and Policies

City of Redmond

Section 20C.40.030(10) of the Community Development Guide states that the Aquifer Recharge Area requirements, established pursuant to the Growth Management Act (Chapter 36.70A RCW), must be subject to and coordinated with the following: clearing and grading; site plan review; general development permit; special development permit; subdivision or short subdivision; building permit; shoreline substantial development; variance; master plan approval; other permits leading to the development or alteration of land; and rezones (if not combined with another development permit).

Section 20C.40.070 of the Community Development Guide describes the permit process and application requirements that pertain to Sensitive Areas established pursuant to the Growth Management Act (Chapter 36.70A RCW). This includes Aquifer Recharge Areas. This section also states that the City of Redmond will consolidate and integrate the review and processing of the Sensitive Areas aspects of proposals with other land use and environmental considerations and approvals.

9.4.11.2 Recommended Strategies Regarding Project Review and Permitting

PRP-1. Incorporate wellhead protection requirements (established to address recommendations described in Sections 9.4.1 through 9.4.10 of this report) into the project review and permit process, consistent with procedures described in the Community Development Guide.

PRP-2. Consider creating a permit system to control and monitor land uses in those WHP zones that have the potential to degrade groundwater quality. Determine which potential groundwater contamination sources described in Sections 9.4.3 through 9.4.9 of this report require permitting.

PRP-3. Clearly define coordination and responsibilities of city groups that have roles in developing and implementing the wellhead protection permit system.

9.4.11.3 Rationale

The project review and permit process is the "front line" of wellhead protection. Identification and mitigation of potential threats to groundwater within WHP zones is most effectively addressed at the review and permit stage of a project. Incorporating wellhead protection provisions into existing project review and permit structure is desirable, to minimize unnecessary expenditures and inconvenience to project applicants and city reviewers.

A permit system to specifically control and monitor projects and facilities during construction operation, and closure would focus specifically on land uses that have the potential to degrade groundwater quality. Conceptualization, development, and implementation of such a system requires a thorough evaluation of: existing city permit systems and controls; the roles and responsibilities of city departments and divisions (such as the Public Works Department and the Fire Department); and existing non-city regulations applicable to permit holders that overlap with wellhead protection requirements.

9.4.12 Compliance Monitoring

9.4.12.1 Relationship to Principal Existing Regulations and Policies

Compliance monitoring of permit conditions is addressed by regulations and policies discussed in Sections 9.4.1 through 9.4.13 of this report.

9.4.12.2 Recommended Strategies Regarding Compliance Monitoring

CM-1. Incorporate monitoring provisions specific to permit conditions that address wellhead protection, by modifying existing regulations or developing new regulations. Clearly specify information to be provided, the format, and due dates of submittals.

CM-2. Provide procedures and staffing for review of compliance monitoring data, on-site inspections, and follow-up to non-compliance incidents.

CM-3. Avoid duplication of effort by permit holders by incorporating information required by other regulatory programs into the wellhead protection compliance monitoring requirements.

CM-4. Determine and specify other regulatory programs that require permit compliance on issues related to wellhead protection and groundwater quality. Require permit holders to furnish evidence to the city of non-compliance with any of these related regulatory programs.

9.4.12.3 Rationale

Land use regulation activities implemented to protect the city's groundwater supply will not be effective unless compliance with those regulations is regularly monitored. Incorporating new wellhead protection compliance monitoring requirements with those of other regulatory programs will minimize expense and inconvenience to permit holders.

9.4.13 Water Supply Contingency and Spill Response Planning

9.4.13.1 Relationship to Principal Existing Regulations and Policies

City of Redmond

The following policy of the Comprehensive Plan (as amended by Ordinance No. 1929, March 27, 1997) addresses water supply contingency and spill response planning:

> UT-70; UT-XX. Redmond shall adopt and implement an emergency response plan to address surface water and groundwater contamination emergencies, with close cooperation among staff from City departments and divisions. The plan shall meet Puget Sound Water Quality Authority plan requirements.

The following emergency response plans apply to the City of Redmond:

All Hazards Comprehensive Emergency Management Plan and Implementing Procedures, revised January 17, 1996. A thorough document that addresses planning and response to any emergency or disaster.

Eastside Hazardous Materials Team, Standard Operating Procedures. Formed by the cities of Redmond, Bellevue, Bothell, Issaquah, Kirkland, and Woodinville. Provide procedures for coordinated responses to hazardous materials incidents.

Standby Manual. Used by the Public Works Department and Parks Department to facilitate responses to emergency situations at facilities under the jurisdiction of these departments, including the city water supply system.

City of Redmond Water Supply Contingency Plan and Spill Response Plan. Updated April 11, 1997. Provides a central reference for procedures from the other city emergency manuals that deal with the city's groundwater supply, including providing a contingent water supply in case of impairment or failure of the city wells. Meets state Department of Health

requirements for water system contingency and spill response. Development of this plan was part of the wellhead protection project. The table of contents of this plan is included in Appendix C of this report.

Redmond-Bear Creek Valley GWMP

The recommended management strategies from this plan that relate to water supply contingency and spill response planning are described as follows, with joint implementation by King County and the City of Redmond (unless otherwise noted):

HM-3. Commit staff and funding to comprehensive implementation of Article 80 of the Uniform Fire Code, including ordinance development and public education. (King County Fire Marshall; King County Department of Natural Resources)

HM-4. Incorporate groundwater protection in the Local Emergency Management Plan.

HM-5A. Assess the risk of transportation-related hazardous materials spills when developing wellhead protection programs. Develop and implement risk reduction strategies as needed. (City of Redmond)

State Department of Health

WAC 236-290, Group A Public Water Systems, requires systems with over 1,000 connections that use groundwater to develop a water supply contingency and spill response plan. Details of the plan content and information to assist in developing such a plan are provided in "Wellhead Protection Program Guidance Document, Washington State Department of Health, April 1995."

9.4.13.2 Recommended Strategies Regarding Water Supply Contingency and Spill Response Planning

CSP-1. Incorporate the current version of the "Water Supply and Contingency Response Plan" in the upcoming emergency drills.

CSP-2. Maintain and update the "Water Supply and Contingency Response Plan" to be consistent with the other emergency planning programs and procedures in effect in the City of Redmond.

CSP-3. Incorporate strategies HM-3, HM-4, and HM-5A of the Redmond-Bear Creek GWMP into development of the city's wellhead protection program. These strategies were also referenced in Section 9.4.3 of this report.

9.4.13.3 Rationale

In addition to satisfying Department of Health regulations, the implementation and maintenance of the "Water Supply and Contingency Response Plan" and integration of this plan with other Redmond and Eastside emergency response programs is a logical means of incorporating groundwater and wellhead protection into the emergency response process. Providing first responders with the proper knowledge, information, and procedures with respect to wellhead protection and water supply contingency will reduce risks of groundwater contamination from hazardous material spills and other catastrophic incidents.

9.4.14 Groundwater Monitoring

9.4.14.1 Relationship to Principal Existing Regulations and Policies

Redmond-Bear Creek Valley GWMP

The recommended management strategy from the GWMP that relates to groundwater monitoring is described as follows, with joint implementation by King County and the City of Redmond (unless otherwise noted):

> DCM-1A, Task 2. This task of the recommended data collection, management, and analysis program includes collection of water level data and groundwater quality data from wells monitored during the study.

9.4.14.2 Recommended Strategies Regarding Groundwater Monitoring

GM-1. Determine whether existing monitoring wells, observation wells, or former domestic water wells located on land not owned by the city are suitable for inclusion in the city groundwater monitoring network.

GM-2. Select locations for city groundwater monitoring wells, prioritized on the basis of data needs. High priority should be given to monitoring wells as follows:

- Consider installing two monitoring wells located within approximately 2,000 ft of each of the well 1+2 and well 4 locations. The purpose of these monitoring wells is to check for the presence of previously detected groundwater contaminants, at locations upgradient of the supply wells. Spacing between the supply wells and the monitoring wells should be based upon flow paths predicted by the analytical element model (Section 5 of this report) and locations of potential contamination sources in the vicinity of the wells (Section 6 of this report).

- Consider installing one upgradient monitoring well near the upgradient boundary of the 6-month TOT zone for the well 1+2 site, well 3, well 4, and well 5. These

monitoring wells will serve as the initial points of an early warning data collection system to assess the quality of groundwater before it is captured by the wells.

- Plan siting and installation of additional wells, as appropriate.

GM-3. Develop a sampling and analysis plan and a quality assurance plan to document sampling and laboratory analysis. Measure water levels and collect groundwater samples from these monitoring wells at least semiannually. Test the samples for conventional geochemical parameters, volatile organic compounds, and other chemicals of concern, depending on prior sample results. Coordinate with ongoing King County groundwater monitoring efforts. Include groundwater monitoring data in the data management system (see Section 9.4.15).

GM-4. Incorporate in the wellhead protection permit process (see Section 9.4.11 of this report) the option to require permit holders to install, maintain, and sample monitoring wells for land uses that involve significant quantities of hazardous substances or other significant risks to groundwater.

GM-5. Review the groundwater monitoring well network (comprised of monitoring wells installed by the city and by permit holders) annually with respect to data needs, budget parameters, and other factors that influence the implementation and maintenance of the groundwater monitoring program.

GM-6. Consider incorporation of strategy DCM-1A, Task 2 of the Redmond-Bear Creek GWMP into development of the city's wellhead protection program.

9.4.14.3 Rationale

A monitoring well network is critical to a wellhead protection program because it can provide both hydrogeologic and groundwater quality data at points other than the water supply wells. Hydrogeologic data (geology of strata penetrated during drilling, field hydraulic conductivity test results, and water level data) allow assessment of changes in aquifer character over distance and support refinement of the conceptual and analytical models. Water quality sample results from monitoring wells provide indications of potential sources, types, and distribution of contaminants over time. An effective monitoring well network is particularly important to the City of Redmond wellhead protection effort, given the proximity the city wells to a variety of contamination sources (Figure 6.2) and based on known or suspected contamination events that have occurred in the city wells (see Table 6.6).

9.4.15 Data Management

9.4.15.1 Relationship to Principal Existing Regulations and Policies

Redmond-Bear Creek Valley GWMP

The recommended management strategies from the GWMP that relate to data management are described as follows, with joint implementation by King County and the City of Redmond (unless otherwise noted):

DCM-1A. Develop and implement a data collection, management, and analysis program that includes: tagging of existing and new wells; monitoring of water quality, water level, precipitation, and stream discharge parameters (King County Department of Natural Resources); entry of data into the existing regional database (King County Department of Natural Resources); and development of a numerical or computerized groundwater hydrology model (King County Department of Natural Resources).

DCM-1B. Input local groundwater management area data from the King County database into the Ecology groundwater database (Department of Ecology).

9.4.15.2 Recommended Strategies Regarding Data Management

The following steps are recommended:

DM-1. Develop recommendations on updates to the contaminant database presented in Section 6 of this report. Specify elements requiring updating, include: hazardous materials storage and use (from Fire Department records and business license applications); sites on the Ecology underground storage tank, leaking underground storage tank, and confirmed/suspected contaminated sites lists; cleanup status of contaminated sites (from focused reviews of Ecology files); and city storm water facility data.

DM-2. Evaluate database needs. Consider database applications, requirements, and compatibility among the City of Redmond Public Works, Planning, and Fire Departments. Assess options regarding graphical representation and interface, database functionality, support, and software and hardware.

DM-3. Generate tables for storage and inter-relation of information that include supply well locations, well capture zone data and capture zone parcels, water levels, water quality, hazardous materials storage and use, contaminated sites, chemical storage tanks, mining operations, and storm water infiltration facilities. Load initial data.

DM-4. Program the database with functions that allow the city to maintain and operate the database, including methods to generate lists, map files, and summary tables. Consider city users and capabilities, software compatibility, and flexibility.

DM-5. Prepare database documentation. Produce documents including data dictionaries, import file structures, data acquisition program recommendations (such as chemical laboratory digital submittals), and design considerations.

DM-6. Provide short-term and long-term training and support, as required by the city.

DM-7. Add biological and organic parameters to the water quality database created during the wellhead protection project. Maintain the database.

DM-8. Consider incorporation of strategies DCM-1A and DCM-1B of the Redmond-Bear Creek Valley GWMP into development of the city's wellhead protection program.

9.4.15.3 Rationale

Maintaining a relational database of groundwater contaminant sources and groundwater quality will allow the city to monitor changes in distribution of contaminants that are stored or have been released to the ground. The ability to retrieve this information in a variety of formats (including tabular and graphical) will facilitate ongoing evaluation of contaminant risk to the aquifer and to Redmond's wells and adjustment of the wellhead protection program, as appropriate.

9.4.16 Public Involvement and Education

9.4.16.1 Relationship to Existing Principal Regulations and Policies

City of Redmond

The following policies in the Comprehensive Plan address public involvement and education regarding groundwater quality:

NE63: Support public education to protect and improve surface water and groundwater resources by:

Providing an awareness of potential impacts on water quality.

Encouraging proper use of fertilizers and chemicals.

Encouraging proper disposal of waste materials.

Educating businesses regarding implementation of BMPs, in cooperation with other agencies and organizations.

Educating the public and businesses on the substitution of chemicals and materials with low-risk contamination properties for those that present a high environmental risk.

The City of Redmond Department of Public Works, Natural Resources Division is involved in an ongoing water conservation and public involvement program that includes groundwater protection. The public involvement task of this wellhead protection project (see Section 8 of this report) was coordinated with these ongoing city efforts and used citizen and business focus groups to assess the degree of public groundwater awareness.

Redmond-Bear Creek Valley GWMP

The recommended management strategies from the GWMP that relate to public involvement and education are summarized as follows, with joint implementation by King County and the City of Redmond (unless otherwise noted):

ED-1. Review applicable educational efforts in progress to determine whether the protection of groundwater is emphasized. Seek the cooperation of applicable parties to include groundwater information and concerns in their educational programs.

ED-2. Develop and implement new educational programs that address groundwater issues that are not included in existing education programs.

King County

The King County Department of Natural Resources, Water Pollution Control Division and Solid Waste Division, and the Seattle-King County Department of Public Health are sponsors of the Local Hazardous Waste Management Program. This program provides assistance to small businesses and households regarding hazardous waste identification, management, and disposal.

9.4.16.2 Recommended Strategies Regarding Public Involvement and Education

PIE-1. Use the results of the focus group discussions (Appendix D of this report) to design and conduct separate baseline random-sample surveys of residents and businesses in Redmond. Evaluate results.

PIE-2. Use results of the random-sample surveys to update existing water education programs by incorporating wellhead and groundwater protection concepts. Use the messages and media indicated by the surveys to assure the best opportunity for success.

PIE-3. Consider incorporation of strategies ED-1 and ED-2 of the Redmond-Bear Creek Valley GWMP into development of the city's wellhead protection program.

PIE-4. Develop and implement an ongoing public participation plan as a component of the wellhead protection program. Use tools such as committees, workshops, forums, open houses, and festivals or other special events to implement the program.

9.4.16.3 Rationale

Baseline random-sample surveys have been shown to provide invaluable information on which to base wellhead and groundwater protection educational programs. Once baseline surveys have been completed, follow-up surveys can quantitatively gauge the performance of the educational programs and support development of program enhancements.

Maximizing existing water education programs when developing enhanced or new groundwater education programs is important to avoid duplication of effort and undesirable schedule impacts.

Development and implementation of a public participation plan is critical for a wellhead protection program. The consistent mechanism for distributing information and receiving feedback provided by a public participation plan will greatly expedite the wellhead protection program, especially during controversial phases of implementation, such land use ordinance development.

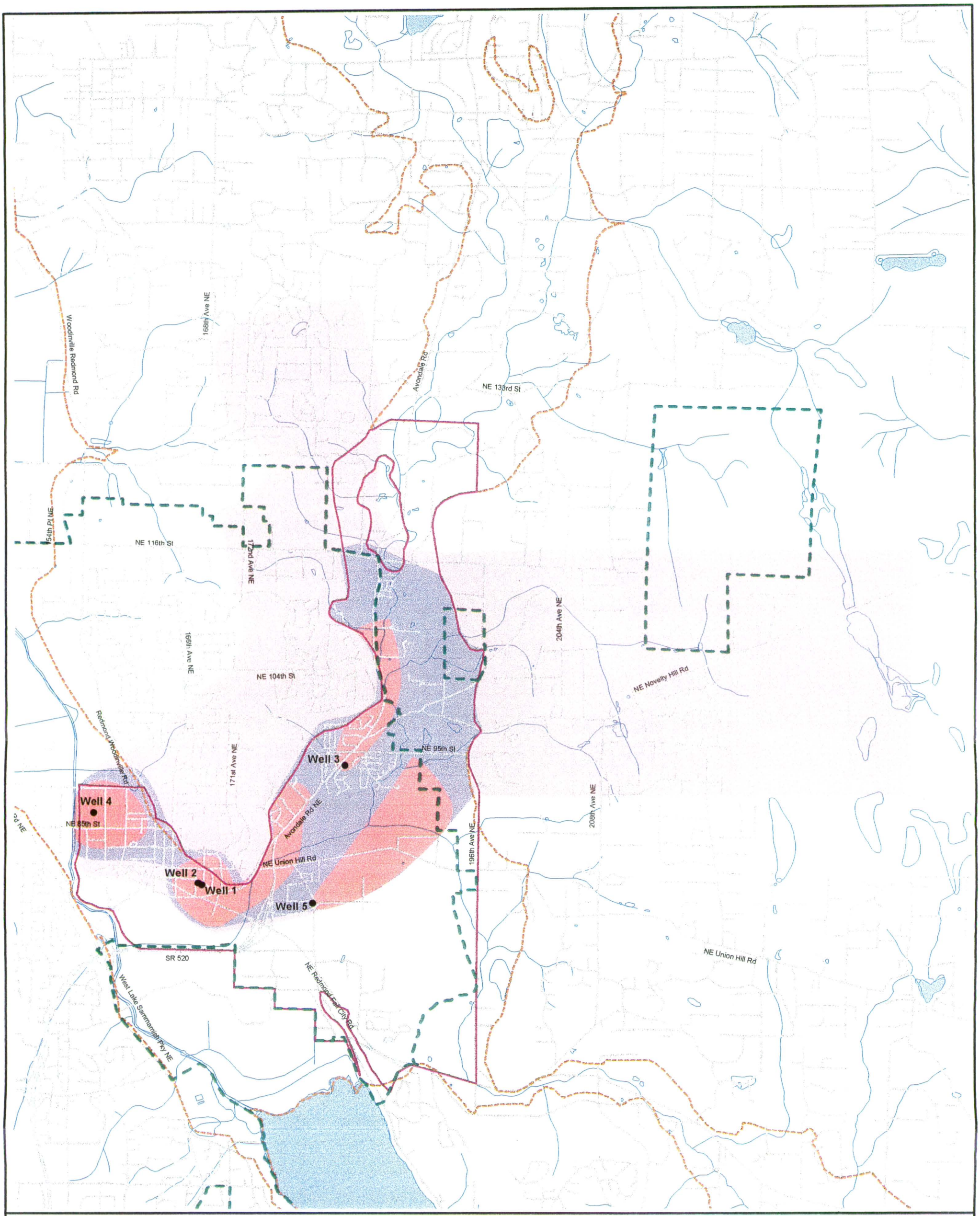


FIGURE 9.1
Recommended Wellhead Protection Zones

City of Redmond
Wellhead Protection Report
JE9406, redmond.apr, 10/30/97

Pacific Groundwater Group

10. WELLHEAD PROTECTION PROGRAM IMPLEMENTATION RECOMMENDATIONS

10.1 PRIORITIZATION OF RECOMMENDED WELLHEAD PROTECTION STRATEGIES

The recommended wellhead protection strategies discussed in Section 10 of this report were evaluated with respect to ability to implement, relative cost, and priority. The evaluation summarized in Table 10.1 provides the City of Redmond with a starting point to initiate a more detailed prioritization process.

10.2 PRELIMINARY DESCRIPTION OF WELLHEAD PROTECTION PROGRAM RESPONSIBILITIES

Implementation of a wellhead protection program by the City of Redmond will require the participation and coordination of a number of city departments and divisions. A preliminary description of responsibilities for implementation of wellhead protection program functions and activities is provided in Table 10.2. As the elements of the wellhead protection program are refined, more detailed matrices of responsibility can be established.

10.3 INTERJURISDICTIONAL COORDINATION

Although the WHP Zone 1 and the majority of Zone 2 fall largely within the city boundaries (see Figure 9.1), portions of Zones 2 and 3 extend into unincorporated King County north and east of the city. In addition, the wellhead protection strategies described in Section 9 of this report include a number of groundwater protection strategies recommended by the Redmond-Bear Creek Valley GWMP. Close coordination with King County will therefore be required to implement the city wellhead protection program. The city should also coordinate with adjacent water purveyors (Woodinville Water District, Union Hill Water District, Northeast Sammamish Sewer and Water District) regarding the proximity of their wellhead or aquifer protection areas to the WHP zones designated by the City of Redmond.

10.4 ORDINANCE DEVELOPMENT

10.4.1 Existing City of Redmond Ordinances and Regulations

As described in Section 2.5 of this report, the City of Redmond Community Development Guide (amended March 27, 1997) describes regulations that apply to all aspects of project design, construction, and operation, including regulations that relate to groundwater quality protection.

Sections 20B and 20C of the Community Development Guide contain city regulations that address groundwater quality protection through designation of Aquifer Recharge Areas and

prohibition of specific land uses within High-Significance Recharge Areas (see Section 9.4.2 of this report). These regulations were enacted to meet requirements of the state Growth Management Act.

10.4.2 Overview of Selected Wellhead Protection Regulations and Ordinances

The wellhead protection literature documents local groundwater protection regulations from as early as the 1970s, enacted to prevent contamination of surface water and groundwater from garbage dumps, feedlots, and septic systems (USEPA 1989). With the advent of federal and state hazardous waste regulations and drinking water protection programs, development of groundwater protection regulations at the state and local level evolved from the early 1980s through the present.

State implementation of wellhead protection mandates specified by the 1986 amendments to the Safe Drinking Water Act resulted in passage of wellhead and groundwater protection ordinances in a number of states including Washington state. Consideration of features from such existing ordinances can guide a municipality in modification of existing regulations and development of new regulations regarding wellhead and groundwater protection.

Table 10.3 provides an overview of selected wellhead and groundwater protection regulations from Washington state and other states, with respect to issues that are included in the recommended wellhead protection strategies presented in this report.

10.4.3 Preliminary Wellhead Protection Ordinance Outline

The information from Section 10.4.2 was evaluated in conjunction with the recommended wellhead protection strategies presented in this report to develop a preliminary outline of a wellhead protection ordinance for the City of Redmond. This outline (Figure 10.1) is intended to illustrate the types of issues that could be addressed in such an ordinance, while recognizing that implementation of the recommended wellhead protection strategies will likely require a series of modifications to existing ordinances as well as new ordinances. In addition, cross references to and integration with King County regulations will be required, especially those regulations that may eventually be developed in response to the groundwater protection strategies recommended by the Redmond-Bear Creek Valley GWMP.

10.5 AGENCY AND CITIZEN NOTIFICATION

The wellhead protection requirements of WAC 246-290, Group A Public Water Systems, specify the following written notifications associated with implementation of a wellhead protection program:

- Owners/ operators of actual and potential sources of groundwater contamination within the WHP zone boundaries.

- Regulatory agencies and local governments within the boundaries of the WHP zones, including the findings of the WHP contaminant inventory.

Example notification letters are included in Appendix E of this report.

10.6 PUBLIC INVOLVEMENT AND STAKEHOLDER PARTICIPATION

Involvement of the public and stakeholders in the development and implementation of a wellhead protection program by the City of Redmond was initiated with the public involvement activities described in Section 8 of this report. Recommended wellhead protection strategies regarding public involvement and education (see Section 9.4.16, strategies PIE-1 through PIE-4) provide the basis for an ongoing participation by the public and stakeholders as the city's wellhead protection program proceeds. This participation critical to promote understanding, awareness, and consensus of the citizens and business owners that will benefit from and be affected by the wellhead protection program.

I. Title

II. Purpose and Intent

III. Definitions

IV. Applicability

V. Wellhead Protection Areas and Zones

VI. Regulated Quantities of Hazardous Substances

VII. Land Use Regulations in Wellhead Protection Areas
- A. Proposed Land Uses
- B. Existing Land Uses

VIII. Engineering and Design Standards
- A. Hazardous Substance Containers
- B. Sewer Pipes and Associated Structures
- C. Hazardous Substance Pipelines

IX. Project Review and Permitting

X. Wellhead Protection Permit Requirements
- A. Operating Permits
- B. Closure Permits
- C. Special Permits

XI. Release Reporting, Investigation, and Remediation

XII. Facility Inspection and Compliance Monitoring
- A. Facility Access
- B. Data Submittal and Management Requirements
- C. Monitoring Well Requirements

XIII. Enforcement and Penalties

XIV. Appeals and Variance Procedures

Figure 10.1 Preliminary Wellhead Protection Ordinance Outline

Table 10.1 Summary of recommended wellhead protection strategies and priorities.

Wellhead Protection Recommendations By Category	Ability to be Implemented	Relative Cost	Priority
Wellhead Protection Zones			
WHPZ-1. Designate WHP Zones	H	L	H
WHPZ-2. Legal Description of WHP Zones	H	L	H
WHPZ-3. Map Other Protection Areas	H	L	M
WHPZ-4. Update Well 4 WHP Zones	H	M	M
WHPZ-5. Develop 3-Dimensional Flow Model	L	H	M
WHPZ-6. Consider GWMP strategy SA-2	M	M	M
Land Use and Zoning			
LUZ-1. Develop Land Use Regulations for WHP Zones	M	M	H
LUZ-2. Consider GWMP strategy SA-1	M	M	M
Hazardous Materials/Hazardous Waste Management			
HW-1. Define Hazardous Substances and Threshold Quantities	H	L	H
HW-2. Develop Inventory and Reporting Requirements (Coordinate with Project Review and Permitting)	M	M-H	M
HW-3. Provided Technical Assistance to Regulated Businesses	M	M-H	M
HW-4. Require Submittal of Site Contamination Information	H	L	H
HW-5. Require Submittal of Site Cleanup Information	H	L	H
HW-6. Update and Maintain a Contaminant Inventory Database (Coordinate with Data Management)	M	H	M
HW-7. Consider Development of More Stringent Regulations	M	M	M
HW-8. Consider GWMP strategies HM-1 through HM-5 and UST-1 through UST-3	M	M	M
Surface Mining Management			
SM-1. Require Copies of Operational and Closure Permits	H	L	H
SM-2. Include in Project Review and Permitting Process	M	M	M
(Coordinate with Project Review and Permitting)			
SM-3. Require Supplement Data Collection and Reporting	M	M	M
SM-4. Consider GWMP strategies SG-1 and SG-2	M	M	M

Note: H = High; M = Medium; L = Low

Table 10.1 Summary of recommended wellhead protection strategies and priorities (continued).

Wellhead Protection Recommendations By Category	Ability to be Implemented	Relative Cost	Priority
Storm Water Management			
SW-1. Consider Elimination of Infiltration in WHP Zone 1	L-M	H	M
SW-2. Assess Potential Impacts and Mitigation of Spills	M	M	H
SW-3. Consider Modification of Existing Storm Water Standards (Coordinate with Hazardous Materials Management and Design Standards)	M	M-H	M
SW-4. Enhance Existing Technical Assistance Programs (Coordinate with Public Involvement and Education)	M	M	M
SW-5. Consider GWMP strategies ST-1 through ST-6	M	M	M
Sanitary Sewage Management			
SS-1. Modify Design Standards to Minimize Leakage (Coordinate with Engineer and Design Standards)	M-H	M-H	M-H
SS-2. Enhance Existing Technical Assistance Programs (Coordinate with Public Involvement and Education)	M	M	M
SS-3. Consider GWMP strategy SP-1	M	M	M
Septic System Management			
SPT-1. Prohibit New Systems in WHP Zones 1 and 2	M-H	M	H
SPT-2. Modify Existing Sewer Connection Requirements	M	M	M
SPT-3. Modify Design Standards to Minimize Impacts	M	M	M
SPT-4. Enhance Existing Technical Assistance Programs (Coordinate with Public Involvement and Education)	M	M	M
SPT-5. Consider GWMP strategies OS-1 through OS-4	M	M	M
Pesticide, Herbicide, and Fertilizer Management			
PHFM-1. Regulate Use of Agricultural Chemicals in WHP Zone 1	M	M	M
PHFM-2. Enhance Existing Public Education Programs (Coordinate with Public Involvement and Education)	M	M	M
PHFM-3. Consider GWMP strategy PF-1	M	M	M

Note: H = High; M = Medium; L = Low

Table 10.1 Summary of recommended wellhead protection strategies and priorities (continued).

Wellhead Protection Recommendations By Category	Ability to be Implemented	Relative Cost	Priority
Well Construction and Decommissioning			
WCD-1. Require Well Searches for New Projects	H	L	M
WCD-2. Require City Review of Wells Exempt from WAC 173-160	H	M	H
WCD-3. Consider GWMP strategy WC-1 through WC-3	M	M	M
Engineering and Design Standards			
EDS-1. Add WHP Design Standards to Community Development Guide	M-H	M-H	M
EDS-2. Revise Other Community Guide Sections to Address WHP	M	M-H	M
Project Review and Permitting			
PRP-1. Incorporate WHP Requirements into Review and Permit Process	M-H	M-H	H
PRP-2. Develop a WHP Permit System	M	H	M
PRP-3. Define and Coordinate WHP Responsibilities of City Departments	M-H	M	H
Compliance Monitoring			
CM-1. Attach Appropriate Monitoring Provisions to Permit Requirements (Coordinate with Project Review and Permitting	M	M-H	M
CM-2. Provide Procedures and Staffing for Monitoring Data Review	M	H	M
CM-3. Avoid Overlap with Existing Environmental Regulations	M	L	H
CM-4. Require Notification to City of Non-Compliance with Other Environmental Regulations Pertinent to Wellhead Protection	H	L	H
Water Supply Contingency and Spill Response Planning			
CSP-1. Use Water Supply and Contingency Response Plan in Drills	H	L	H
CSP-2. Maintain and Update Water Supply and Contingency Response Plan	M	M	H
CSP-3. Consider GWMP strategies HM-3, HM-4, and HM-5A	M	M	M

Note: H = High; M = Medium; L = Low

Table 10.1 Summary of recommended wellhead protection strategies and priorities (continued).

Wellhead Protection Recommendations By Category	Ability to be Implemented	Relative Cost	Priority
Groundwater Monitoring			
GM-1. Identify Existing Non-City Wells for Possible Monitoring	M	M	H
GM-2. Install Monitoring Wells at Priority Locations	M	H	H
GM-3. Collect and Analyze Groundwater Samples	M	H	H
GM-4. Reserve Option to Require Monitoring Wells in Project Permits (Coordinate with Project Review and Permitting)	M	M-H	M
GM-5. Review the Groundwater Monitoring Program Annually	M	H	M
GM-6. Consider GWMP strategy DCM-1A	M	M	M
Data Management			
DM-1. Develop a Process for Updating the Contaminant Database	M	H	M
DM-2. Complete an Evaluation of Database Needs	M	H	M
DM-3. Generate Database Tables and Load Initial Data	M	H	M
DM-4. Program the Database with User-Friendly Functions	M	H	M
DM-5. Prepare Database Documentation	M	H	M
DM-6. Obtain Short- and Long-Term Training Support for City Staff	M	H	M
DM-7. Consider GWMP strategies DCM-1 and DCM-1B	M	M	M
Public Involvement and Education			
PIE-1. Conduct Random-Sample Surveys of Residents and Businesses	M	M	M
PIE-2. Use Survey Results to Update Water Education Programs	M	M	M
PIE-3. Develop and Implement an Ongoing Public Participation Program	M	M-H	M
PIE-4. Consider GWMP strategies ED-1 and ED-2	M	M	M

Note: H = High; M = Medium; L = Low

Table 10-2 Preliminary description of wellhead protection program responsibilities

Function/Activity	Public Works Department						Other City Departments/Entities							
	Natural Resources Div.	Engineering Div.	Construction Div.	Operations Div.	Admin. Services Div.	Transportation Div.	Planning Department	Fire Department	Parks Deptartment	City Attorney	Executive Office	City Council	Planning Commission	Outside Assistance
Designation/Mapping of WHP Zones	X						X					X	X	
Land Use Regulations	X	X		X	X	X	X	X	X	X	X	X	X	
Hazardous Materials Management	X		X	X			X	X						
Surface Mining Management	X	X	X				X							
Storm Water Management	X		X	X										
Sanitary Sewage Management	X		X	X										
Septic System Management	X			X										
Pesticide and Fertilizer Management	X			X		X	X		X					
Well Construction and Decommissioning	X			X										X
Engineering and Design Standards	X	X	X				X					X	X	
Project Review and Permitting	X	X	X				X			X			X	
Compliance Monitoring/Ground Water Monitoring	X		X	X			X	X						X
Water Supply Contingency and Spill Response Planning	X	X	X	X				X						
Data Management	X				X		X							X
Public Involvement and Education	X				X									
Ordinance Development	X	X	X	X	X	X	X	X	X	X	X	X	X	X

Table 10.3 Summary of Selected Wellhead and Groundwater Protection Ordinances.

Ordinance Provisions	Renton, Washington	Tacoma, Washington	Spokane CO, Washington	Dayton, Ohio	Palm Beach CO, Florida
Protection zones	Zone 1 (1-yr TOT); Zone 2 (other)	Groundwater Protection District	Aquifer Sensitive Area	Wellfield Protection Area (1-yr TOT)	Zone 1 (30-day TOT) through Zone 4 (500-day TOT)
Hazardous substance definition	Uniform Fire Code	WAC 173-303; supplemental list	WAC 173-303	OSHA	CERCLA
Minimum quantity of hazardous substance that triggers regulations	5 gallons or 25 pounds	220 pounds	Based on risk	20 gallons or 160 pounds	5 gallons or 25 pounds
Examples of ordinance exemptions	Residences; existing heating oil systems	Small USTs; product pipelines; permitted landfills	None	Residences; transportation; 1-yr supply of agricultural chemicals	Transportation; emergency services; offices and sales
Prohibition of specific new land uses	Yes	Yes	Yes	Yes	Yes
Business relocation	Yes; with graduated compensation	No	No	Yes; city land purchase	Yes; compensate actual costs
Permits	Yes; coordination with fire dept.	Yes	Yes	Yes; coordination with fire dept.	Yes

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APPENDIX A

WELL LOGS AND CONSTRUCTION DATA FOR CITY OF REDMOND WATER SUPPLY WELLS

25/5-12C
WELL #1

STATE OF WASHINGTON
DEPARTMENT OF CONSERVATION
AND DEVELOPMENT

WELL LOG

No. Appl. #2043
Cert. #1313

Date Nov. 5, 19 51

Record by Harold O. Meyer

Source Driller's Record

Location: State of WASHINGTON

County King

Area

Map

Lot 4, Blk. 1, Sikes 3rd Add. to Redmond
sec 12 T 25N. R 5 E.

DIAGRAM OF SECTION

Drilling Co. Harold O. Meyer

Address

Method of Drilling Drilled/ (dug to 18'40" diam. Date 19

Owner City of Redmond

Address Redmond, Wash.

Land surface, datum ft. above / below

CORRELATION	MATERIAL	THICKNESS (feet)	DEPTH (feet)
	Loose gravel & top soil	0	1.5
	Very coarse gravel with little sod	15.5	17
	Loose gravel & sand, water	1.5	18.5
	Hardpan soaked with water drilled open	5.5	24
	Gravel, sand & water	1	25
	Hardpan, water coming in at all times	6	31
	Coarse gravel, sand & water	1	32
	Hard pan	4	36
	Clean gravel, sand & water Drove casing without drilling	4	40
	Hardpan	1	41
	Gravel & sand in med. cr.	5	46

(Transcribe driller's terminology literally but paraphrase as necessary, in parentheses. If material water-bearing, so state and record static level if reported. Give depths in feet below land-surface datum unless otherwise indicated. Correlate with stratigraphic column, if feasible. Following log of materials, list all casings, perforations, screens, etc.)

Turn up material

Sheet of sheets

WELL LOG.—Continued No. Appli. #2043 Cert. #1313-A

CORRELATION	MATERIAL	THICKNESS (feet)	DEPTH (feet)
	Depth forward	———	
	Very coarse gravel & sand. Some of the gravel up to 4" in diam.	10	56
	From 41' to 56' the casing was driven without drilling except to break up s of the larger rocks that would catch under the shoe. All material waterbe ing.		
	Pump Test:		
	Dim.: 56' deep, 18" diam.		
	SWL: 15 - 17 ft.		
	DD: 2'		
	Yield: 200 g.p.m.		
	Casing: 36" (dug hole) from 0 to 18'; 18" diam. drilled from 18' to 46'; 18" casing goes from 18" above grou 46 ft.; 10" casing from 18" above ground to 50'; 5' of screen and 1' of fittings attached to bottom of 10" pipe.		
	Perfs.: 10" screen with 60 thousands opening from 51' to 56'		

S.F. 7449-46 REMINGTO... INC - 20 20 745-2...

WELL #1
25/5 - 12C

WELL #2
25/5-12C
68' deep

STATE OF WASHINGTON
DEPARTMENT OF CONSERVATION
AND DEVELOPMENT

WELL LOG

No. Appli. 4934
Cert. 3420-A

Date 9-8, 1959

Record by well driller

Source driller's source

Location: State of WASHINGTON

County King

Area Lot 6, Blk. 1 of

Map Sykes 3d Add.

¼ ¼ sec. 12 T. 25 N., R. 5 E. W.

Diagram of Section

Drilling Co. H.O. Meyer Drilling Co.

Address Kirkland, Wash.

Method of Drilling dug Date 9-28, 1958

Owner Town of Redmond

Address

Land surface, datum ft above / below

CORRELATION	MATERIAL	THICKNESS (feet)	DEPTH (feet)
	Cobble stones, coarse gravel & coarse sand	19	19
	Gravel & sand	8	27
	Layer of hardpan	2	29
	Coarse gravel & sand 2" minus	14	43
	Smaller gravel	2	45
	Small gravel & sand w/b	4	49
	Light brown sand & gravel	6	56
	Dark brown sand & gravel coarse	3	59
	Blue sand & gravel w/b	9	68
	Hard pan & some clay	4	72
	PUMP TEST:		
	Dim. 36"x19' dug & 12"x68' drilled		
	SWL: 19 ft.		
	DD: 39 ft.		
	Yield: 420 g.p.m.		
	Water Temp. 48°		

(Transcribe driller's terminology literally but paraphrase as necessary, in parentheses. If material water-bearing, so state and record static level if reported. Give depths in feet below land-surface datum unless otherwise indicated. Correlate with stratigraphic column, if feasible. Following log of materials, list all casings, perforations, screens, etc.)

Turn up (over)

Sheet ____ of ____ sheets

WELL #2
25/5-12C
68' deep

WELL LOG.—Continued No...../.....-.....

CORRELATION	MATERIAL	THICKNESS (feet)	DEPTH (feet)
	Depth forward	———	
	Type & size of pump: vertical turbine - 500 g.p.m. capacity		
	Type & size of motor; 40 h.p. elec.		
	CASING:		
	36" diam. pouredconcrete from 0 to 19		
	12" diam. steel casing plus 2 to 53 ft.		
	~~12" nominal Cook well screen from 53 to 68'.~~		
	PERFORATIONS:		
	5 ft. of #40 slot Cook screen from 53 to 58 ft.		
	10 ft. of #30 slot Cook screen from 58 to 68 ft.		
	Screen is wire wound		

S. F. No. 7449—12-54—3M. 40108.

25/6-6E

Well #3

Appl. 9901
Per. 9325

STATE OF WASHINGTON
DEPARTMENT OF CONSERVATION
DIVISION OF WATER RESOURCES

WELL LOG

Record by Driller
Source Driller's record

Location: State of WASHINGTON
County King
Area
Map
SW ¼ NW ¼ sec. 6 T. 25 N., R. 6 E.E. W.

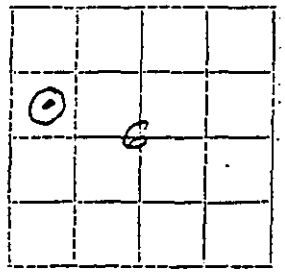


Diagram of Section

Drilling Co. H. O. Meyer Drilling Co.
Address 6424 Kaje Washington Blvd. Kirkland, Wash
Method of Drilling cable Date Nove. 5, 19 69
Owner City of Redmond
Address City Hall, Redmond, Washington
Land surface, datum ft. above / below
SWL: 20 Date May 1968, 19 Dims.:

Correlation	Material	From (feet)	To (feet)
	(Transcribe driller's terminology literally but paraphrase as necessary, in parentheses. If material water-bearing, so state and record static level if reported. Give depths in feet below land-surface datum unless otherwise indicated. Correlate with stratigraphic column, if feasible. Following log of materials, list all casings, perforations, screens, etc.)		
	Municipal supply		
	sand gravel, some clay	0	12
	sand, gravel, clay-hardpacked	12	14
	sand, gravel, clay	14	25
	sand, gravel, water	25	27
	sand, gravel, layers of clay		
	cement	27	36½
	sand, coarse, & gravel water	36½	40
	clay bound sand and gravel	40	42
	sand, coarse, some gravel		
	water bearing	42	46
	gravelly, till	46	56
	blue sticky clay	56	63
	sand, coarse some pebbles & wood & volumes of water but full of sulphur	63	73

Turn up

Sheet ____ of ____ sheets

WELL LOG.—Continued No...../.....-.....

CORRELATION	MATERIAL	From (feet)	To (feet)
	Depth forward	———	
	Casing: welded 16" from 0 to 20'		
	12' from 0 to 46'		
	Screen: Cook Mfr. stainless steel slots		
	10 3/8 SS .020 from 36.5' to 37/5'		
	10 3/8 SS .060 from 37.5' to 40.5;		
	.035 from 40.5' to 46.5.		
	Gravel Packed: pea gravel from 46.5' to 73'		
	Surface seal: 16" surface casing to 20'		
	Pump test: 513 gpm with 12.4 DD.		
	Pump: Bryon Jackson Pump, vertical turbine		
	40 hp		

S. F. No. 7449—OS—12-65.

CH2M HILL

PROJECT NUMBER	BORING NUMBER	
106914.A2.ZZ	MW-4	SHEET 1 OF 2

SOIL BORING LOG

PROJECT Redmond Well No. 4 LOCATION Redmond, WA

ELEVATION N/A DRILLING CONTRACTOR Hokkiado Drilling & Developing, Graham, WA

DRILLING METHOD AND EQUIPMENT Cable Tool

WATER LEVELS START 9/17/96 FINISH 9/17/96 LOGGER T. O'Connor

DEPTH BELOW SURFACE (FT)	SAMPLE: INTERVAL	SAMPLE: NUMBER AND TYPE	SAMPLE: RECOVERY	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
	5				FILL: SILTY SAND WITH GRAVEL (SM), brown, moist, firm, gravel up to 1-inch diameter	
5.0	7		1.5	17-41-39-40		
	10					
10.0	12		1.5	27-33-50-3"		
	15				PEAT brown, moist, firm	
15.0	17		1.8	4/3/3/10	Increase sand and gravel	
	20				POORLY-GRADED SAND (SP), tan-brown, wet, firm, large grained sand, trace gravel up to 2-inch diameter	
20.0	22		1.3	5/18/10/32		
	26				POORLY-GRADED SAND WITH GRAVEL (SP), tan-brown, firm, wet, trace silt, gravel up to 2-inch diameter	
25.0	28			39-50-32		

FIGURE 3
City of Redmond Production Well No. 4 Geologic Log

CH2M HILL

PROJECT NUMBER	BORING NUMBER	
106914.A2.ZZ	MW-4	SHEET 2 OF 2

SOIL BORING LOG

PROJECT Redmond Well No. 4 LOCATION Redmond, WA

ELEVATION N/A DRILLING CONTRACTOR Hokkiado Drilling & Developing, Graham, WA

DRILLING METHOD AND EQUIPMENT Cable Tool

WATER LEVELS START 9/17/96 FINISH 9/17/96 LOGGER T. O'Connor

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL	SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION	COMMENTS
	30	BAILER			SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
	33					
		BAILER			POORLY-GRADED GRAVEL WITH SAND (GP), olive, wet, gravel up to 3-inch diameter	
	35					
35.0		BAILER	0	50-6"		
	37					
		BAILER			WELL-GRADED GRAVEL WITH SAND (GW), dark grayish brown, wet, firm, gravel up to 3-inch diameter	
	40					
40.0		BAILER				
	43					
			1.0	6/9/12	POORLY-GRADED GRAVEL WITH SAND (GP), gray-brown, firm, wet	
	45					
45.0					POORYL-GRADED SAND WITH GRAVEL (SP), olive, wet, firm	
	48					
		BAILER			POORLY-GRADED SAND (SP), gray-brown, wet, firm	
	50					
50.0		BAILER				
	53					
		BAILER				
	55					
55.0		BAILER				
	57.5					
		BAILER			POORLY-GRADED SAND WITH SILT (SP-SM), dark gray-brown, wet, firm	
	60.0					

FIGURE 3 (continued)
City of Redmond Production Well No. 4 Geologic Log

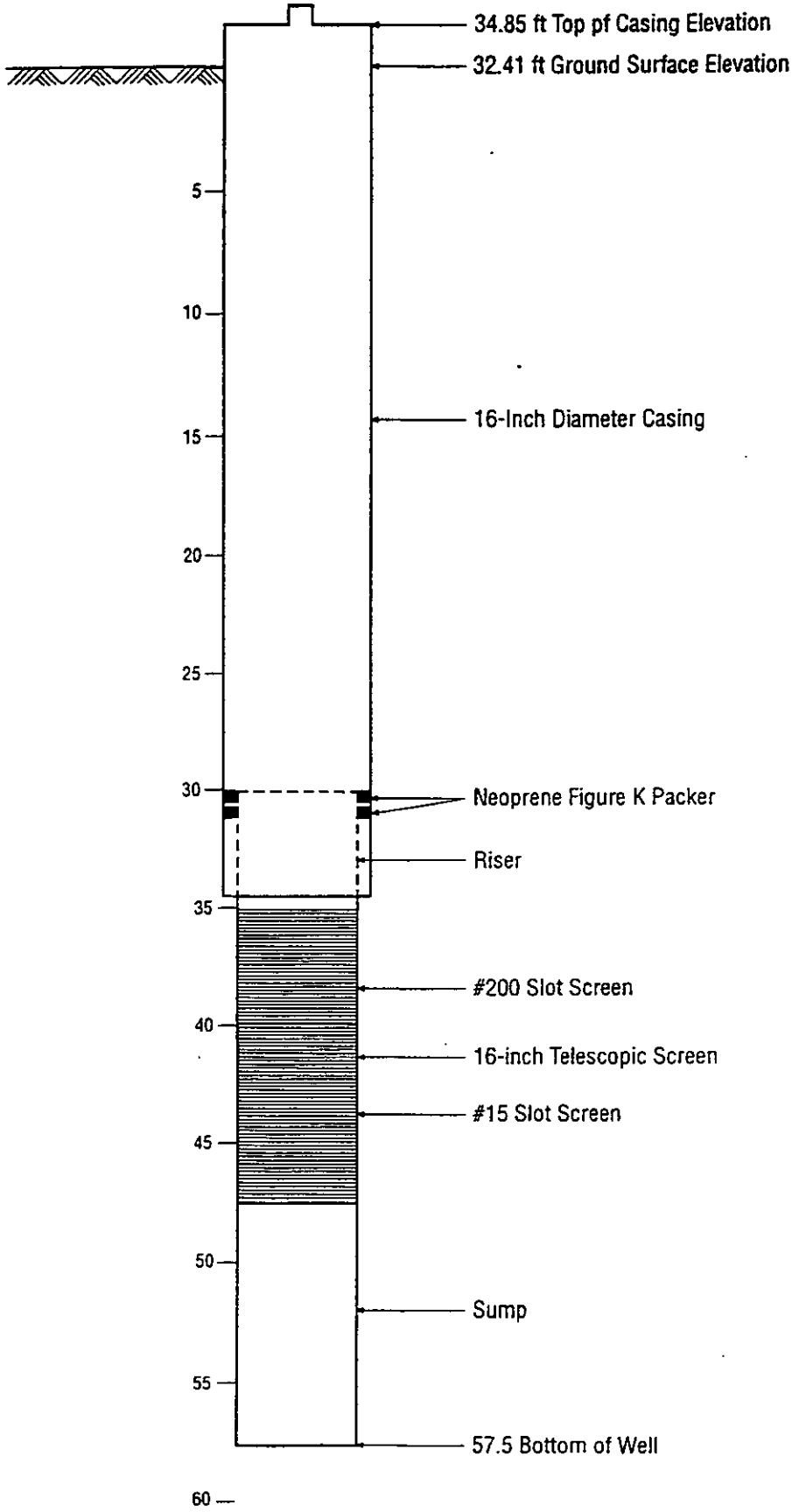


FIGURE 4

Redmond Well No. 4
Production Well

25/5—12/W

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT

STATE OF WASHINGTON

Application No. G1-24[illegible]

Permit No. .....

(1) OWNER: Name City of Redmond Address 15670 NE 85th St. Redmond WA 98[illegible]

(2) LOCATION OF WELL: County King — NE ¼ NE ¼ Sec. 12 T. 25 N., R. 5 W.M.

Bearing and distance from section or subdivision corner

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

(4) TYPE OF WORK: Owner's number of well (if more than one) #5
New well ☒ Method: Dug ☐ Bored ☐
Deepened ☐ Cable ☒ Driven ☐
Reconditioned ☐ Rotary ☐ Jetted ☐

(5) DIMENSIONS: Diameter of well 20 inches.
Drilled 41 ft. Depth of completed well 41 ft.

(6) CONSTRUCTION DETAILS:
Casing installed: 20 " Diam. from +1'6" ft. to 21'-6" ft.
Threaded ☐ ..... " Diam. from ..... ft. to ..... ft.
Welded ☒ ..... " Diam. from ..... ft. to ..... ft.

Perforations: 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.

Screens: Yes ☒ No ☐
Manufacturer's Name UOP Johnson
Type Stainless Model No. 304
Diam. 18" Slot size 250 from 20 ft. to 35 ft.
Diam. ..... Slot size ..... from ..... ft. to ..... ft.

Gravel packed: Yes ☐ No ☒ Size of gravel: .....
Gravel placed from ..... ft. to ..... ft.

Surface seal: Yes ☒ No ☐ To what depth? 18 ft.
Material used in seal Cement Grout
Did any strata contain unusable water? Yes ☐ No ☒
Type of water? ..... Depth of strata .....
Method of sealing strata off .....

(7) PUMP: Manufacturer's Name .....
Type: ..... H.P. .....

(8) WATER LEVELS: Land-surface elevation above mean sea level.... ..... ft.
Static level 7'-4" ft. below top of well Date 2-23-83
Artesian pressure ..... lbs. per square inch Date .....
Artesian water is controlled by ..... (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☒ No ☐ If yes, by whom? driller
Yield 1530 gal./min. with 2.7 ft. drawdown after 24 hrs.
" " " "
" " " "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test 2-23-83
Baller 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) WELL LOG:

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation

MATERIAL	FROM	TO
Black topsoil Sand - Gravel	0	3
Brown sand - Gravel dry	3	10
Brown sand - gravel silty	10	13
Sand - gravel water bearing	13	29
Brown sand - gravel small brown silt layers	29	41

Work started 2-7 19 83 Completed 2-25 19 8[illegible]

WELL DRILLER'S STATEMENT:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME Armstrong Drilling, Inc.
(Person, firm, or corporation) (Type or print)

Address 10715 - 66th Ave. E. Puy. WA 983[illegible]

[Signed] John E. Armst[illegible]
(Well Driller)

License No. 0012 Date 3-7 19 8[illegible]

(USE ADDITIONAL SHEETS IF NECESSARY)

APPENDIX B

POTENTIAL POINT-SOURCE CONTAMINANT INVENTORY DATA

VISTA
INFORMATION SOLUTIONS, INC.

Data Disk for Report 086240-001 /sp616

RISKPNTS.DXF

This is an AutoCad file containing one point object for each MapIdNo in the RISKRECS.DBF file. Each of the 61 points has a MapIdNo attached to it as an attribute. The points are plotted in the following coordinate system:

Washington State Plane Coordinates, Northern Zone (NAD-83), with units changed to US Survey Feet

Projection	= Lambert Conformal Conic
Datum	= NAD 83
Units	= US Survey Feet (Standard units would be Meters)
Origin	= 47°0'0"N 120°50'0"W
Std. Parallel 1	= 47°30'0"N
Std. Parallel 2	= 48°44'0"N
False Easting	= 1,640,416.7 Ft. (500,000 Meters)
False Northing	= 0.0 Ft.

RISKRECS.DBF

This is a dBase III file containing the site information and description for each risk record in the report. Its fields are as follows:

MapIdNo	Point number shown on map, in the text of the report and in RISKPNTS.DXF
VistaID	Vista's record identification number
SiteName	Name of facility
Street	Address of facility
City	"
Zip	"
County	"
State	"
List	Name of database record is from
EPAId	EPA id number (if appropriate)
AgSit_Rn	Agency Site Record number
DescSort	Sort order for description
Description	Text description of risks or events at site

PRINTEXP.G Print export file of Federal and State summary pages.

PRINTEXP.L Print export file of plotted risk sites.

PRINTEXP.D Print export file of unmappable sites description.

PRINTEXP.U Print export file of unmappable risk sites.

PRINTEXP.H Print export file of databases searched description.

* Print export files are formated for HP LaserJet printers.

VISTA
SPECIAL REPORT

VISTA Report #: 6/086240-001 Date of Report: 10/11/95

Ref/Loan #: IRREGULAR POLYGON
Client: RANDY EDWARDS, PACIFIC GROUNDWATER GROUP
2377 EASTLAKE AVE E, SEATTLE, WA 98102

Subject
Property: IRREGULAR POLYGON
REDMOND, WA 98052

SUMMARY OF FEDERAL RECORDS FOUND

Database & Date	Agency and Type of Records	0 to 1/8 mi	1/8 to 1/4 mi	1/4 to 1/2 mi	1/2 to 1 mi	TOTAL
NPL 05/95	US EPA Superfund Sites	0	0	0	0	0
CERCLIS 09/95	US EPA Potential Superfund Sites	0	0	0	--	0
RCRA-LgGen 06/95	US EPA RCRA Large Quantity Generators	5	5	--	--	10
RCRA-SmGen 06/95	US EPA RCRA Small and Very Small Quantity Generators	32	7	--	--	39
RCRA-TSD 06/95	US EPA RCRA Treatment,Storage,and/or Disposal Sites	0	0	0	0	0
RCRA-Transp 06/95	US EPA RCRA Transporters	2	4	--	--	6
ERNS 03/95	US EPA	2	--	--	--	2
	FEDERAL RECORDS Sub-total:	41	16	0	0	57

Note: 1) A dash (--) indicates the list is not searched at that distance.
2) Sites often have a record in more than one database.

 For more information call: (619) 450-6100

VISTA
SPECIAL REPORT

VISTA Report #: 6/086240-001 Date of Report: 10/11/95

Ref/Loan #: IRREGULAR POLYGON
Client: RANDY EDWARDS, PACIFIC GROUNDWATER GROUP
2377 EASTLAKE AVE E, SEATTLE, WA 98102
Subject Property: IRREGULAR POLYGON
REDMOND, WA 98052

SUMMARY OF STATE RECORDS FOUND

Database & Date	Agency and Type of Records	0 to 1/8 mi	1/8 to 1/4 mi	1/4 to 1/2 mi	1/2 to 1 mi	TOTAL
SPL 05/95	Department of Ecology, Toxics Cleanup Program Confirmed Contaminated Sites Report	0	0	0	0	0
SPL 05/95	Department of Ecology, Toxics Cleanup Program Suspected Contaminated Sites Report	4	0	0	1	5
LUST 01/95	Department of Ecology, Southwest Regional Office Southwest Region Leaking Underground Storage Tank Site List	0	0	0	--	0
LUST 07/95	Department of Ecology, Central Regional Office Central Region Leaking Underground Storage Tank Site List	0	0	0	--	0
LUST 07/95	Department of Ecology, Northwest Regional Office Northwest Region Leaking Underground Storage Tank Site List	11	2	5	--	18
LUST 07/95	Department of Ecology, Toxics Cleanup Program Leaking Underground Storage Tank List	11	1	4	--	16
SWLF 09/94	Department of Ecology, Solid Waste Services Program Municipal Solid Waste Facilities	0	0	0	--	0
UST's 07/95	Department of Ecology, Solid & Hazardous Waste Program Underground Storage Tank Database	33	8	--	--	41
	STATE RECORDS Sub-total:	59	11	9	1	80
	TOTAL:	100	27	9	1	137

Note: 1) A dash (--) indicates the list is not searched at that distance.
2) Sites often have a record in more than one database.

 For more information call: (619) 450-6100

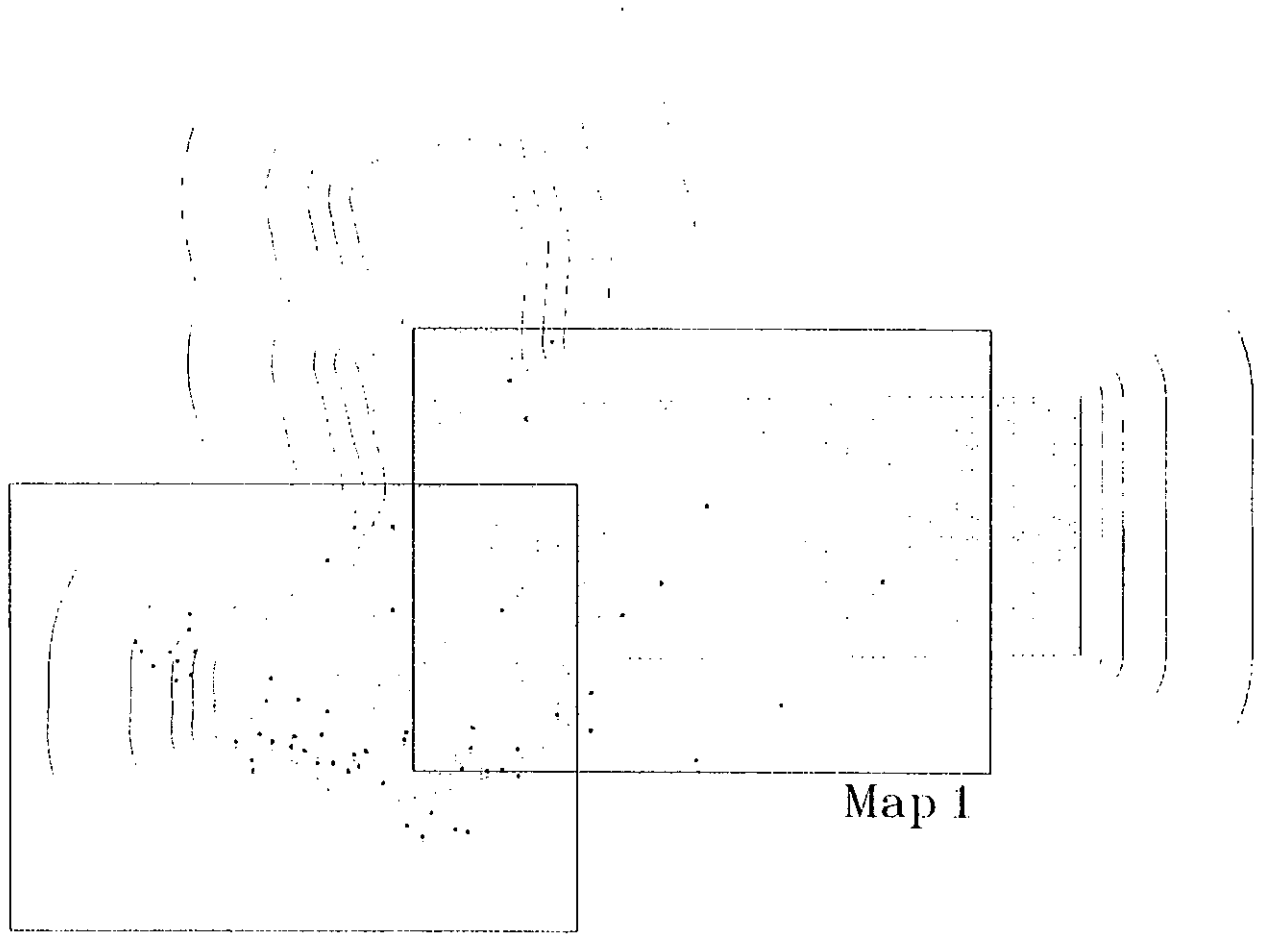
Government Records Report

Government Listed Sites

Subject

Search Area

N

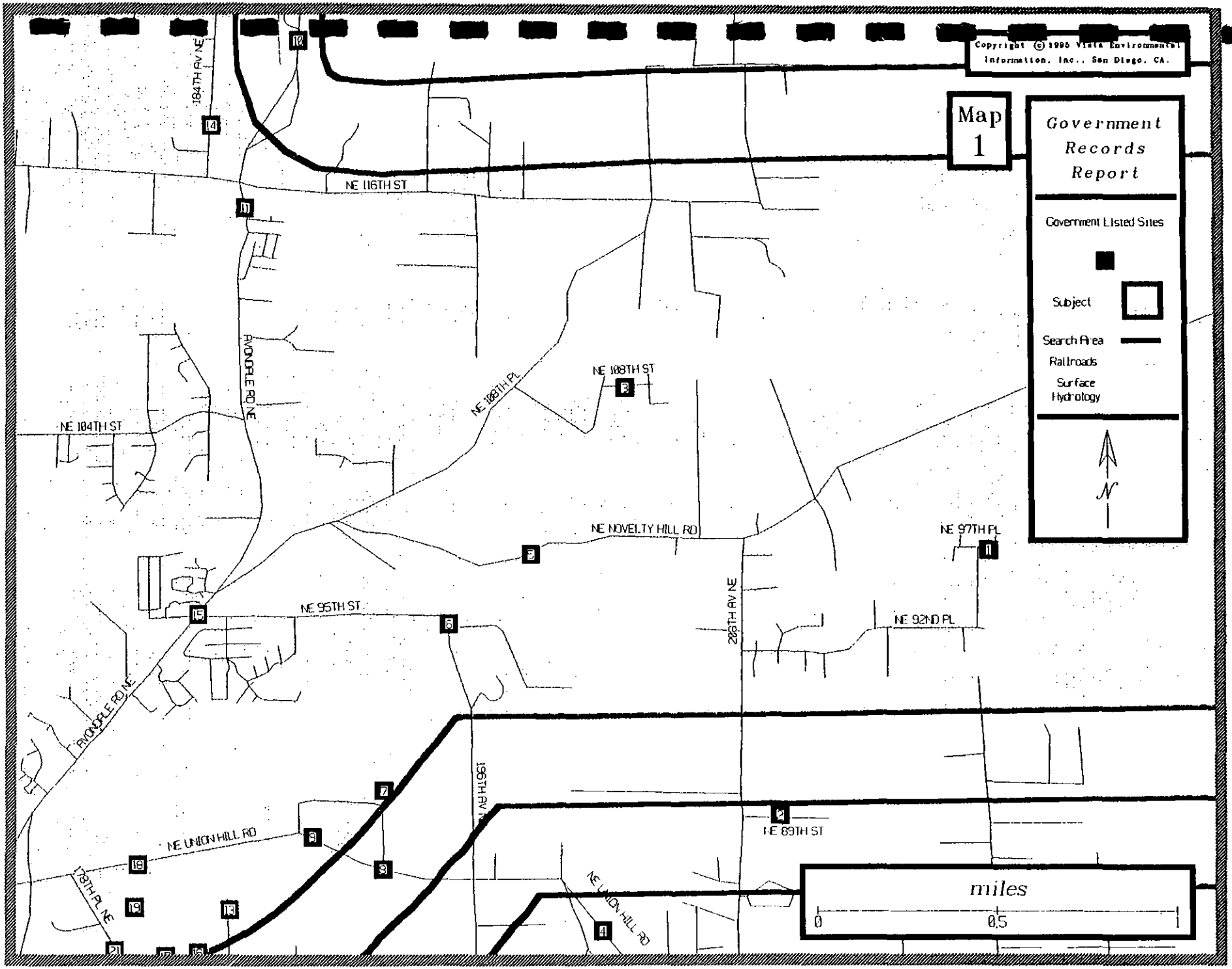


Map 1

Map 2

miles

0 1 2 3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Map 1
Government Records Report
Government Listed Sites
Subject
Search Area
Railroads
Surface Hydrology
N
miles
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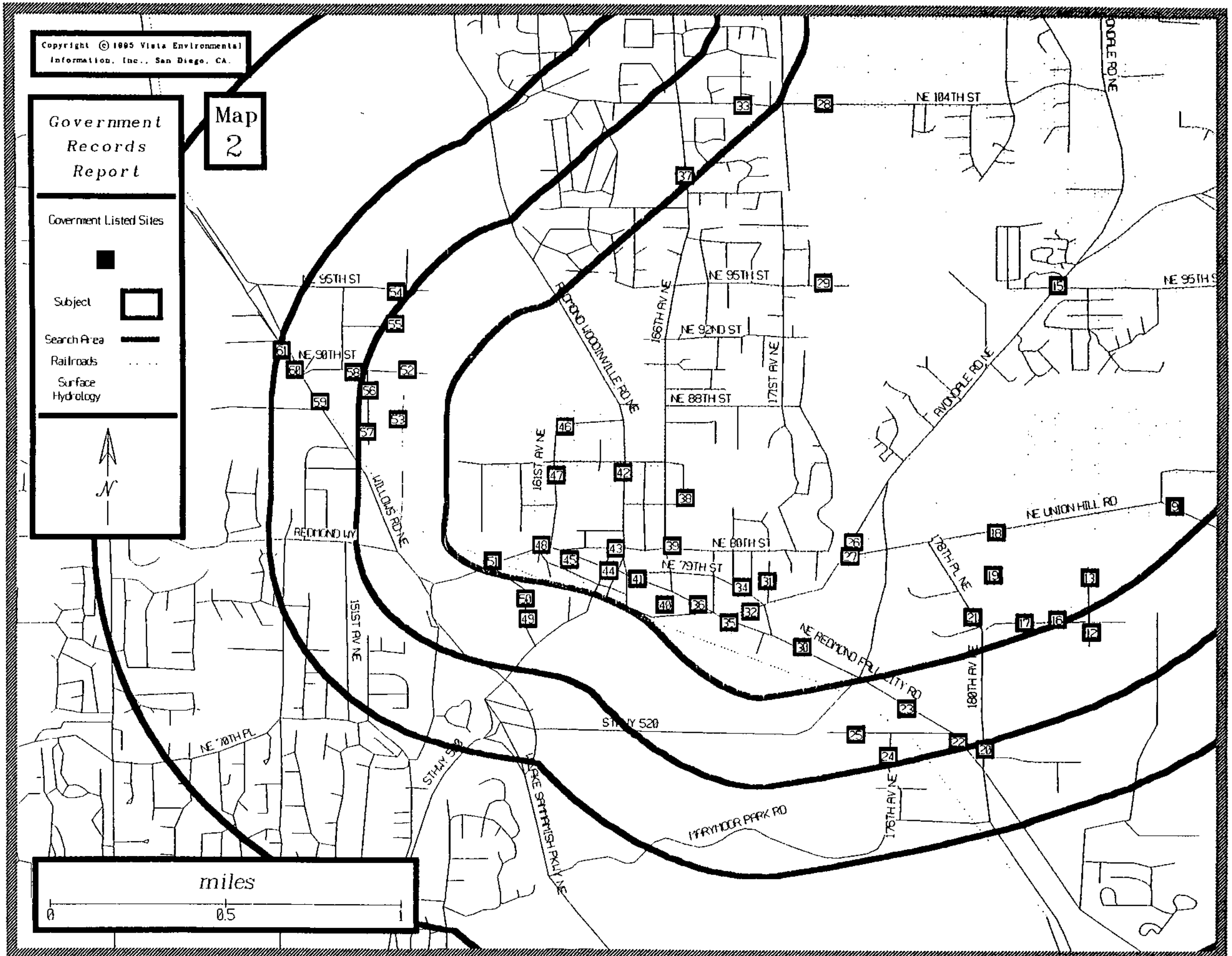
0.5
NE 116TH ST
NE 108TH ST
NE 104TH ST
NE 95TH ST
NE NOVELTY HILL RD
NE 97TH PL
NE 92ND PL
NE 89TH ST
NE UNION HILL RD
184TH AV NE
AVONDALE RD NE
188TH PL NE
196TH AV NE
206TH AV NE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Government Records Report
Map 2
Government Listed Sites
Subject
Search Area
Railroads
Surface Hydrology
N
miles
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1
NE 104TH ST
NE 95TH ST
NE 95TH ST
NE 95TH S
NE 92ND ST
NE 90TH ST
NE 88TH ST
NE 80TH ST
NE 79TH ST
NE 70TH PL
NE UNION HILL RD
NE REDMOND FALL CITY RD
REDMOND WY
REDMOND WOODINVILLE RD NE
AVONDALE RD NE
WILLOWS RD NE
151ST AV NE
161ST AV NE
166TH AV NE
171ST AV NE
176TH AV NE
178TH PL NE
180TH AV NE
ST HWY 520
ST HWY 520
LAKE SAMMAMISH PKWY NE
MARYMOOR PARK RD
9 12 13 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61

VISTA SPECIAL REPORT

10/11/95

VISTA Report #: 6/086240-001

RCRA-LgGen

MAP REF #	EPA ID / AGENCY ID	SITE NAME AND ADDRESS	
		WITHIN 1/8 MILE	
12		GENETIC SYSTEMS CORP 185TH AVE NE 6565 185TH AVE NE	REDMOND 98052
			Vista ID: 1853003
	WAD988479663	Generator Class	:Generators who generate at least 1000 kg./month of non-acutely hazardous waste (or 1 kg./month of acutely hazardous waste).
16		GENIE IND 18340 NE 76TH ST	REDMOND 98052
			Vista ID: 4942510
	WAD980738041	Generator Class	:Generators who generate at least 1000 kg./month of non-acutely hazardous waste (or 1 kg./month of acutely hazardous waste).
17		BELL INDUSTRIES ILLUMINATED DISPLAYS 18225 NE 76TH ST	REDMOND 98052
			Vista ID: 43295
	WAD097820732	Generator Class	:Generators who generate at least 1000 kg./month of non-acutely hazardous waste (or 1 kg./month of acutely hazardous waste).
28		LAKE WASHINGTON SD REDMOND HIGH SCHO 17272 NE 104TH	REDMOND 98052
			Vista ID: 247625
	WAD100868488	Generator Class	:Generators who generate at least 1000 kg./month of non-acutely hazardous waste (or 1 kg./month of acutely hazardous waste).
37		LAKE WASHINGTON SD REDMOND JR HIGH S 10055 166TH AVE NE	REDMOND 98052
			Vista ID: 247624
	WAD100868496	Generator Class	:Generators who generate at least 1000 kg./month of non-acutely hazardous waste (or 1 kg./month of acutely hazardous waste).

RCRA-LgGen

MAP REF #	EPA ID / AGENCY ID	SITE NAME AND ADDRESS

WITHIN 1/8 TO 1/4 MILE

25 DUNKIN & BUSH INC — REDMOND
17301 NE 70TH ST — 98052
Vista ID: 3270618
WAD051239226 Generator Class :Generators who generate at least 1000 kg./month of non-acutely hazardous waste (or 1 kg./month of acutely hazardous waste).

---

25 SIGN PROS — REDMOND
17425 NE 70TH — 98052
Vista ID: 3270619
WAD988497780 Generator Class :Generators who generate at least 1000 kg./month of non-acutely hazardous waste (or 1 kg./month of acutely hazardous waste).

---

52 SUNRISE DESIGN — REDMOND
15500 NE 90TH ST — 98052
Vista ID: 412328
WAD981763980 Generator Class :Generators who generate at least 1000 kg./month of non-acutely hazardous waste (or 1 kg./month of acutely hazardous waste).

---

53 PROCYTE CORP — REDMOND
8511 154TH AVE NE — 98052
Vista ID: 4864475
WA0000100545 Generator Class :Generators who generate at least 1000 kg./month of non-acutely hazardous waste (or 1 kg./month of acutely hazardous waste).

---

57 QUANTIM GRAPHICS INC — REDMOND
8541 152ND AVE NE — 98052
Vista ID: 344257
WAD055661995 Generator Class :Generators who generate at least 1000 kg./month of non-acutely hazardous waste (or 1 kg./month of acutely hazardous waste).

 For more information call: (619) 450-6100

RCRA-SmGen

MAP REF #	EPA ID / AGENCY ID	SITE NAME AND ADDRESS

WITHIN 1/8 MILE

9 WDOT 18816 NE 80TH REDMOND
18816 NE 80TH
REDMOND
98052
Vista ID: 462216
WAD982653545 Generator Class :Generators who generate 100 kg./month but less than 1000 kg./month of non-acutely hazardous waste

---

11 TEXACO STATION
11520 AVONDALE RD
REDMOND
98052
Vista ID: 2883370
WAD988503728 Generator Class :Generators who generate 100 kg./month but less than 1000 kg./month of non-acutely hazardous waste

---

12 TRIGON PACKAGING CORP
6812 185TH AVE NE
REDMOND
98052
Vista ID: 430666
WAD982656506 Generator Class :Generators who generate less than 100 kg./month of non-acutely hazardous waste.

---

12 SUPER RENT INC NE 76TH ST
18455 NE 76TH ST
REDMOND
98052
Vista ID: 3270646
WAD988490546 Generator Class :Generators who generate less than 100 kg./month of non-acutely hazardous waste.

---

12 CAREMARK INC
6645 185TH AVE NE STE 151
REDMOND
98052
Vista ID: 4071767
WAD988516399 Generator Class :Generators who generate 100 kg./month but less than 1000 kg./month of non-acutely hazardous waste

---

13 DENNIS R CRAIG CONSTRUCTION CO
7710 185TH NE
REDMOND
98052
Vista ID: 1840590
WAD071844922 Generator Class :Generators who generate less than 100 kg./month of non-acutely hazardous waste.

RCRA-SmGen

MAP REF #	EPA ID / AGENCY ID	SITE NAME AND ADDRESS

WITHIN 1/8 MILE

17 WEYERCO LEASING INC REDMOND
18122 NE 76TH 98052
Vista ID: 200284
WAD002836013 Generator Class :Generators who generate less than 100 kg./month of non-acutely hazardous waste.

---

17 REDMOND CY OF MAINT OPER CTR REDMOND
18080 NE 76TH MAINT OPER CTR 98052
Vista ID: 349312
WAD982653453 Generator Class :Generators who generate 100 kg./month but less than 1000 kg./month of non-acutely hazardous waste

---

17 SAJASA CONSTRUCTION INC REDMOND
18124 NE 76TH ST 98052
Vista ID: 1847056
WAD988506226 Generator Class :Generators who generate 100 kg./month but less than 1000 kg./month of non-acutely hazardous waste

---

18 UNITED PARCEL SERVICE REDMOND
18001 NE UNION HILL RD 98052
Vista ID: 1850837
WAD988486932 Generator Class :Generators who generate 100 kg./month but less than 1000 kg./month of non-acutely hazardous waste

---

21 GENETIC SYS CORP WHSE REDMOND
7735 178TH PL NE 98052
Vista ID: 4864492
WA0000062745 Generator Class :Generators who generate 100 kg./month but less than 1000 kg./month of non-acutely hazardous waste

---

23 GUARANTEED AUTO REBUILD REDMOND
17657 1/2 REDMOND FALL CITY RD 98052
Vista ID: 182619
WAD091742783 Generator Class :Generators who generate 100 kg./month but less than 1000 kg./month of non-acutely hazardous waste

---

RCRA-SmGen

MAP REF #	EPA ID / AGENCY ID	SITE NAME AND ADDRESS

WITHIN 1/8 MILE

26 QUINNS AUTO REPAIR REDMOND
8040 AVONDALE RD NE 98052
Vista ID: 5189208
WAD980981468 Generator Class :Generators who generate 100 kg./month but less than 1000 kg./month of non-acutely hazardous waste

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27 HEART TECHNOLOGY INC REDMOND
17425 NE UNION HILL RD 98052
Vista ID: 5189367
WA0000313007 Generator Class :Generators who generate 100 kg./month but less than 1000 kg./month of non-acutely hazardous waste

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30 KITS CAMERAS 12 REDMOND
17166 REDMOND WAY 98052
Vista ID: 5377899
WA0000902346 Generator Class :Generators who generate 100 kg./month but less than 1000 kg./month of non-acutely hazardous waste

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30 PAYLESS 2562 REDMOND
17220 REDMOND WAY NE 98052
Vista ID: 5510661
WA0001013358 Generator Class :Generators who generate 100 kg./month but less than 1000 kg./month of non-acutely hazardous waste

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31 ASKEW AUTO REPAIR REDMOND
7903 170TH PL NE 98052
Vista ID: 4071763
WAD988514048 Generator Class :Generators who generate 100 kg./month but less than 1000 kg./month of non-acutely hazardous waste

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34 OVERLAKE CLEANERS REDMOND
16940 NE 79TH ST 98052
Vista ID: 3270653
WAD988487989 Generator Class :Generators who generate less than 100 kg./month of non-acutely hazardous waste.

RCRA-SmGen

MAP REF #	EPA ID / AGENCY ID	SITE NAME AND ADDRESS

WITHIN 1/8 MILE

35 REDMOND BP REDMOND
16909 REDMOND WAY 98052
Vista ID: 5283664
WAD988492518 Generator Class :Generators who generate 100 kg./month but less than 1000 kg./month of non-acutely hazardous waste

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36 KIMS TAILOR & DRY CLEANING REDMOND
16720 REDMOND WAY 98052
Vista ID: 1856313
WAD988483020 Generator Class :Generators who generate less than 100 kg./month of non-acutely hazardous waste.

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36 WAYNE AND GARYS CHEVRON SERVIC REDMOND
16760 REDMOND WY 98052
Vista ID: 1856314
WAD988470837 Generator Class :Generators who generate less than 100 kg./month of non-acutely hazardous waste.

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42 HALLMARK CUSTOM CLEANERS REDMOND
8469 164TH AVE NE 98052
Vista ID: 185252
WAD981771041 Generator Class :Generators who generate less than 100 kg./month of non-acutely hazardous waste.

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43 REDMOND CLEANERS INCORPORATED REDMOND
7981 LEARY WAY N.E. 98052
Vista ID: 1845825
WAD988521514 Generator Class :Generators who generate 100 kg./month but less than 1000 kg./month of non-acutely hazardous waste

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44 PREMIUM TUNE N LUBE REDMOND REDMOND
16311 REDMOND WAY 98052
Vista ID: 5189326
WA0000230524 Generator Class :Generators who generate less than 100 kg./month of non-acutely hazardous waste.

RCRA-SmGen

MAP REF #	EPA ID / AGENCY ID	SITE NAME AND ADDRESS

WITHIN 1/8 MILE

45 EASTSIDE IMPORT AUTO REBUILD LTD REDMOND
7927 159TH PL NE 98052
Vista ID: 133071
WAD087595708 Generator Class :Generators who generate 100 kg./month but less than 1000 kg./month of non-acutely hazardous waste

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46 GOODYEAR AUTO SVC CTR REDMOND
16101 NE 87TH ST STE B 98052
Vista ID: 4864681
WA0000026674 Generator Class :Generators who generate less than 100 kg./month of non-acutely hazardous waste.

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48 CHEVRON 98795 REDMOND
16000 REDMOND WY 98052
Vista ID: 2884319
WAD988485710 Generator Class :Generators who generate 100 kg./month but less than 1000 kg./month of non-acutely hazardous waste

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49 QUEEN CITY AUTO REBUILD INC REDMOND
7502 159TH PL NE 98052
Vista ID: 344402
WAD982659591 Generator Class :Generators who generate 100 kg./month but less than 1000 kg./month of non-acutely hazardous waste

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49 R P AUTO SVC REDMOND
7430 159TH PL NE 98052
Vista ID: 3755593
WAD980982656 Generator Class :Generators who generate 100 kg./month but less than 1000 kg./month of non-acutely hazardous waste

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49 STERLING AUTO BODY & PAINT REDMOND
7520 159TH PL NE 98052
Vista ID: 4864477
WAD020236238 Generator Class :Generators who generate less than 100 kg./month of non-acutely hazardous waste.

RCRA-SmGen

MAP REF #	EPA ID / AGENCY ID	SITE NAME AND ADDRESS

WITHIN 1/8 MILE

50 ACCURATE AUTO BODY INC REDMOND
7662 159TH PL NE 98052
Vista ID: 5510323
WAD981768260 Generator Class :Generators who generate less than 100 kg./month of non-acutely hazardous waste.

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51 CLEANING CENTER OF REDMOND THE REDMOND
15796 REDMOND WAY 98052
Vista ID: 1856311
WAD988475745 Generator Class :Generators who generate less than 100 kg./month of non-acutely hazardous waste.

WITHIN 1/8 TO 1/4 MILE

22 BROWN BEAR CAR WASH REDMOND REDMOND
17809 REDMOND FALL CITY RD 98052
Vista ID: 4072389
WAD988516282 Generator Class :Generators who generate less than 100 kg./month of non-acutely hazardous waste.

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25 FINAL PHASE FINISHING INC REDMOND
17445 NE 70TH ST 98052
Vista ID: 5510415
WAR000000232 Generator Class :Generators who generate 100 kg./month but less than 1000 kg./month of non-acutely hazardous waste

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52 MACRO TECHNOLOGIES INC REDMOND
15500 NE 90TH ST 98052
Vista ID: 254000
WAD095711701 Generator Class :Generators who generate 100 kg./month but less than 1000 kg./month of non-acutely hazardous waste

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RCRA-SmGen

MAP REF #	EPA ID / AGENCY ID	SITE NAME AND ADDRESS

WITHIN 1/8 TO 1/4 MILE

53 KOLL REAL SVC CO REDMOND
8449 154TH AVE NE 98052
Vista ID: 5377761

WA0000998559 Generator Class :Generators who generate less than 100 kg./month of non-acutely hazardous waste.

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57 STERLING COMMERCIAL AWNING REDMOND
8503 152ND AVE NE 98052
Vista ID: 1852866

WAD988480992 Generator Class :Generators who generate 100 kg./month but less than 1000 kg./month of non-acutely hazardous waste

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57 WHOLESALE AUTO REPAIR REDMOND
8509 152ND AVE NE 98052
Vista ID: 3270000

WAD988499430 Generator Class :Generators who generate 100 kg./month but less than 1000 kg./month of non-acutely hazardous waste

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58 NORTHWEST AUTO TECH CTR REDMOND
15143 NE 90TH 98052
Vista ID: 3270709

WAD988486858 Generator Class :Generators who generate 100 kg./month but less than 1000 kg./month of non-acutely hazardous waste

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RCRA-Transp

MAP REF #	EPA ID / AGENCY ID	SITE NAME AND ADDRESS	
		WITHIN 1/8 MILE	
1		KEEP IT CLEAN RECYCLING & EQUIP 21851 NE 97TH PL	REDMOND 98053
			Vista ID: 3755863
	WAD083732537	Transporter Status :Engaged in the off-site transportation of hazardous waste	
8		OLYMPIAN PRECAST INC 19150 UNION HILL RD	REDMOND 98053
			Vista ID: 1850839
	WAD988481511	Transporter Status :Engaged in the off-site transportation of hazardous waste	
		WITHIN 1/8 TO 1/4 MILE	
24		ALL GREEN CORP 6855 176TH AVE NE STE 200	REDMOND 98052
			Vista ID: 5510329
	WAR000000406	Transporter Status :Engaged in the off-site transportation of hazardous waste	
25		DUNKIN & BUSH INC 17301 NE 70TH ST	REDMOND 98052
			Vista ID: 3270618
	WAD051239226	Transporter Status :Engaged in the off-site transportation of hazardous waste	
53		KOLL REAL SVC CO 8449 154TH AVE NE	REDMOND 98052
			Vista ID: 5377761
	WA0000998559	Transporter Status :Engaged in the off-site transportation of hazardous waste	
57		ARGENT CHEMICAL LABS INC 8515 152ND AVE NE	REDMOND 98052
			Vista ID: 25989
	WAD988468211	Transporter Status :Engaged in the off-site transportation of hazardous waste	

ERNS

MAP REF # | EPA ID / AGENCY ID | SITE NAME AND ADDRESS

WITHIN 1/8 MILE

15 EVERGREEN SANITATION REDMOND
AVONDALE RD. AT 95TH
Vista ID: 200231064

91284
Spill Date: 04/10/1993
Case Number:91284
Spill Location:AVONDALE RD. AT 95TH
Spill City:REDMOND
Spill State:WA
Spill Zip:
Spill County:KING
Source/Agency:
Material Spilled:SEPTIC TANK MATERIAL , 00000000.00 , UNK
Medium Affected:
Waterway Affected:N/A

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15 EVERGREEN SANITATION REDMOND
AVONDALE RD. AT 95TH
Vista ID: 200255096

91284
Spill Date: 04/10/1993
Case Number:91284
Spill Location:AVONDALE RD. AT 95TH
Spill City:REDMOND
Spill State:WA
Spill Zip:
Spill County:KING
Source/Agency:
Material Spilled:SEPTIC TANK MATERIAL , 00000000.00 , UNK
Medium Affected:
Waterway Affected:N/A

SPL

MAP REF #	EPA ID / AGENCY ID	SITE NAME AND ADDRESS

WITHIN 1/8 MILE

7 ALL SEASONS CONSTRUCTION — REDMOND
8504 192ND AVE. N.E. — 98053
Vista ID: 4929993

NPL Status :
State Status : AWAITING SITE HAZARD ASSESSMEN
Waste # 0 : HLG ORGNC CMPD,PETRO PROD
Waste # 1 :
Waste # 2 :

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8 OLYMPIAN PRECAST INC — REDMOND
19150 UNION HILL RD — 98053
Vista ID: 1850839

NPL Status :
State Status : INDEPENDENT REMEDIAL ACTION,IN
Waste # 0 : PETROLEUM
Waste # 1 :
Waste # 2 :

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26 A&A FOREIGN AUTO REPAIR — REDMOND
8004 AVONDALE RD NE — 98052
Vista ID: 1842481

NPL Status :
State Status : AWAITING SITE HAZARD ASSESSMEN
Waste # 0 : EPA PRIORITY POLLUTANTS-METALS
Waste # 1 :
Waste # 2 :

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40 UNOCAL REDMOND BULK PLANT — REDMOND
16631 CLEVELAND ST. — 98052
Vista ID: 1854367

NPL Status :
State Status : INDEPENDENT REMEDIAL ACTION,IN
Waste # 0 : PETRO PROD,NON-HALOG SLV
Waste # 1 :
Waste # 2 :

SPL

MAP REF #	EPA ID / AGENCY ID	SITE NAME AND ADDRESS

WITHIN 1/2 TO 1 MILE

4 TRUSS SPAN REDMOND
19340 NE UNION HILL RD/NE 80TH 98053
Vista ID: 1857259

NPL Status :
State Status : AWAITING SITE HAZARD ASSESSMEN
Waste # 0 : PEST,PETRO PROD
Waste # 1 :
Waste # 2 :

LUST

MAP REF #	EPA ID / AGENCY ID	SITE NAME AND ADDRESS		
WITHIN 1/8 MILE				
5		MCEACHERN PROPERTY 19805 NE NOVELTY HILL RD	REDMOND 98053	Vista ID: 3629320
		Media Affected : SOIL/LAND/SAND Leak Cause : UNAVAILABLE Remediation : CONDUCTED		
5		MCEACHERN PROPERTY 19805 NE NOVELTY HILL RD	REDMOND 98053	Vista ID: 3629320
	3694	Discovery Date : 07/24/92 Media Affected : SOIL/LAND/SAND Leak Cause : UNAVAILABLE Remediation : CONDUCTED		
11		TEXACO STATION 11520 AVONDALE RD	REDMOND 98052	Vista ID: 2883370
		Media Affected : GROUNDWATER, POSSIBLE SOIL Leak Cause : UNAVAILABLE Remediation : CLEANUP IN PROGRESS/REQUIRED		
11		TEXACO STATION 11520 AVONDALE RD	REDMOND 98052	Vista ID: 2883370
	5485	Discovery Date : 10/12/94 Media Affected : GROUNDWATER, POSSIBLE SOIL Leak Cause : UNAVAILABLE Remediation : CLEANUP IN PROGRESS/REQUIRED		
18		UNITED PARCEL SERVICE-REDMOND 18001 NE UNION HILL RD	REDMOND 98052	Vista ID: 1850837
	4726	Discovery Date : 09/24/93 Media Affected : SOIL/LAND/SAND Leak Cause : UNAVAILABLE Remediation : CLEANUP IN PROGRESS/REQUIRED		

LUST

MAP REF #	EPA ID / AGENCY ID	SITE NAME AND ADDRESS	
		WITHIN 1/8 MILE	
18		UPS REDMOND 18001 NE UNION HILL RD	REDMOND 98052
			Vista ID: 4865606
	4726	Media Affected : SOIL/LAND/SAND Leak Cause : UNAVAILABLE Remediation : CLEANUP IN PROGRESS/REQUIRED	
19		SHULTZ DISTRIBUTING INC 7822 180TH AVE NE	REDMOND 98052
			Vista ID: 1840576
		Media Affected : GROUNDWATER, POSSIBLE SOIL Leak Cause : UNAVAILABLE Remediation : CLEANUP IN PROGRESS/REQUIRED	
19		SHULTZ DISTRIBUTING INC 7822 180TH AVE NE	REDMOND 98052
			Vista ID: 1840576
	2403	Discovery Date : 08/05/91 Media Affected : GROUNDWATER, POSSIBLE SOIL Leak Cause : UNAVAILABLE Remediation : CLEANUP IN PROGRESS/REQUIRED	
26		A&A FOREIGN AUTO REPAIR 8004 AVONDALE RD NE	REDMOND 98052
			Vista ID: 1842481
	3912	Discovery Date : 08/05/92 Media Affected : SOIL/LAND/SAND Leak Cause : UNAVAILABLE Remediation : CLEANUP IN PROGRESS/REQUIRED	
26		A & A AUTO 8004 AVONDALE RD NE	REDMOND 98052
			Vista ID: 4267062
	3912	Media Affected : SOIL/LAND/SAND Leak Cause : UNAVAILABLE Remediation : CLEANUP IN PROGRESS/REQUIRED	

LUST

MAP REF #	EPA ID / AGENCY ID	SITE NAME AND ADDRESS	
		WITHIN 1/8 MILE	
29		WA STATE MILITARY ARMY NAT'L G 17230 NE 95TH	REDMOND 98052
			Vista ID: 4267030
	4223	Media Affected : SOIL/LAND/SAND Leak Cause : UNAVAILABLE Remediation : CONDUCTED	
29		ORGANIZATIONAL MAINTENANCE SHOP #10 17230 NE 95TH	REDMOND 98052
			Vista ID: 4686048
	4223	Discovery Date : 07/29/92 Media Affected : SOIL/LAND/SAND Leak Cause : UNAVAILABLE Remediation : CONDUCTED	
33		HORACE MANN ELEMENTARY SCHOOL 17001 NE 104	REDMOND 98052
			Vista ID: 1840001
	3884	Discovery Date : 07/15/92 Media Affected : SOIL/LAND/SAND Leak Cause : UNAVAILABLE Remediation : CLEANUP IN PROGRESS/REQUIRED	
33		LAKE WASHINGTON SCHOOL MANN EL 17001 NE 104	REDMOND 98052
			Vista ID: 4266890
	3884	Media Affected : SOIL/LAND/SAND Leak Cause : UNAVAILABLE Remediation : CLEANUP IN PROGRESS/REQUIRED	
35		UNOCAL STATION # 4870 16909 REDMOND WAY	REDMOND 98052
			Vista ID: 3272452
	3040	Media Affected : GROUNDWATER, POSSIBLE SOIL Leak Cause : UNAVAILABLE Remediation : CLEANUP IN PROGRESS/REQUIRED	

LUST

MAP REF #	EPA ID / AGENCY ID	SITE NAME AND ADDRESS		
		WITHIN 1/8 MILE		
35		REDMOND BP 16909 REDMOND WAY	REDMOND 98052	Vista ID: 5283664
	3040	Discovery Date : 10/15/90 Media Affected : GROUNDWATER, POSSIBLE SOIL Leak Cause : UNAVAILABLE Remediation : CLEANUP IN PROGRESS/REQUIRED		
36		WAYNE AND GARYS CHEVRON SERVIC 16760 REDMOND WY	REDMOND 98052	Vista ID: 1856314
		Media Affected : GROUNDWATER, POSSIBLE SOIL Leak Cause : UNAVAILABLE Remediation : CLEANUP IN PROGRESS/REQUIRED		
36		CHEVRON 96388 16760 REDMOND WY	REDMOND 98052	Vista ID: 1856314
	4194	Discovery Date : 02/08/93 Media Affected : GROUNDWATER, POSSIBLE SOIL Leak Cause : UNAVAILABLE Remediation : CLEANUP IN PROGRESS/REQUIRED		
41		KELLY REALTY 16450REDMOND WY	REDMOND 98052	Vista ID: 3272451
		Media Affected : SOIL/LAND/SAND Leak Cause : UNAVAILABLE Remediation : CONDUCTED		
41		KELLY REALTY 16450 REDMOND WAY	REDMOND 98052	Vista ID: 3272451
	3280	Discovery Date : 04/27/92 Media Affected : SOIL/LAND/SAND Leak Cause : UNAVAILABLE Remediation : CONDUCTED		

LUST

MAP REF #	EPA ID / AGENCY ID	SITE NAME AND ADDRESS		
		WITHIN 1/8 MILE		
43		ARCO #6067 8009 164TH AVE NE	REDMOND 98052	Vista ID: 1840484
		Media Affected : SOIL/LAND/SAND Leak Cause : UNAVAILABLE Remediation : CLEANUP IN PROGRESS/REQUIRED		
43		ARCO 6067 8009 164TH AVE NE	REDMOND 98052	Vista ID: 1840484
	2292	Discovery Date : 06/11/91 Media Affected : SOIL/LAND/SAND Leak Cause : UNAVAILABLE Remediation : CLEANUP IN PROGRESS/REQUIRED		
		WITHIN 1/8 TO 1/4 MILE		
10		ENCY FARM 12252 AVONDALE RD NE	REDMOND 98052	Vista ID: 5283227
	5395	Media Affected : SOIL/LAND/SAND Leak Cause : UNAVAILABLE Remediation : CLEANUP IN PROGRESS/REQUIRED		
22		BROWN BEAR CAR WASH REDMOND 17809 REDMOND WAY	REDMOND 98052	Vista ID: 3885715
		Media Affected : GROUNDWATER, POSSIBLE SOIL Leak Cause : UNAVAILABLE Remediation : CLEANUP IN PROGRESS/REQUIRED		
22		BROWN BEAR CAR WASH REDMOND 17809 REDMOND WAY	REDMOND 98052	Vista ID: 3885715
	3913	Discovery Date : 09/24/92 Media Affected : GROUNDWATER, POSSIBLE SOIL		

LUST

MAP REF #	EPA ID / AGENCY ID	SITE NAME AND ADDRESS		
		WITHIN 1/8 TO 1/4 MILE		
22		BROWN BEAR CAR WASH REDMOND 17809 REDMOND WAY	REDMOND 98052	Vista ID: 3885715
		Leak Cause : UNAVAILABLE Remediation : CLEANUP IN PROGRESS/REQUIRED		
		WITHIN 1/4 TO 1/2 MILE		
2		DOWN TO EARTH BULLDOZING 20840 NE 89TH	REDMOND 98053	Vista ID: 1853834
	1666	Media Affected : SOIL/LAND/SAND Leak Cause : UNAVAILABLE Remediation : CONDUCTED		
54		AETNA PROPERTY / WILLOWS INDUS 15265 NE 95TH STREET	REDMOND 98052	Vista ID: 1853868
	1740	Media Affected : SOIL/LAND/SAND Leak Cause : UNAVAILABLE Remediation : CONDUCTED		
54		CHEMLAWN SERVICES CORPORATION 15265 NE 95TH STREET	REDMOND 98052	Vista ID: 2883291
	1740	Discovery Date : 03/02/90 Media Affected : SOIL/LAND/SAND Leak Cause : UNAVAILABLE Remediation : CONDUCTED		
59		CHAMPION METAL OF WASHINGTON INC. 8708 WILLOWS ROAD	REDMOND 98052	Vista ID: 1851263
		Media Affected : SOIL/LAND/SAND Leak Cause : UNAVAILABLE Remediation : CLEANUP IN PROGRESS/REQUIRED		

LUST

MAP REF #	EPA ID / AGENCY ID	SITE NAME AND ADDRESS		
		WITHIN 1/4 TO 1/2 MILE		
59		CHAMPION METAL OF WASHINGTON INC. 8708 WILLOWS ROAD	REDMOND 98052	Vista ID: 1851263
	4943	Discovery Date : 11/30/93 Media Affected : SOIL/LAND/SAND Leak Cause : UNAVAILABLE Remediation : CLEANUP IN PROGRESS/REQUIRED		
60		BAYSIDE MOTORSPORTS 8901 WILLOWS RD NE	REDMOND 98052	Vista ID: 40440
		Media Affected : SOIL/LAND/SAND Leak Cause : UNAVAILABLE Remediation : CLEANUP IN PROGRESS/REQUIRED		
60		BAYSIDE MOTORSPORTS 8901 WILLOWS RD	REDMOND 98052	Vista ID: 40440
	2767	Discovery Date : 12/23/91 Media Affected : SOIL/LAND/SAND Leak Cause : UNAVAILABLE Remediation : CLEANUP IN PROGRESS/REQUIRED		
61		ALPINE EQUIPMENT RENTALS 9045 WILLOWS RD	REDMOND 98052	Vista ID: 1851265
		Media Affected : SOIL/LAND/SAND Leak Cause : UNAVAILABLE Remediation : CONDUCTED		
61		ALPINE EQUIPMENT RENTALS 9045 WILLOWS RD	REDMOND 98052	Vista ID: 1851265
	1790	Discovery Date : 04/24/90 Media Affected : SOIL/LAND/SAND Leak Cause : UNAVAILABLE Remediation : CONDUCTED		

LUST

MAP REF #	EPA ID / AGENCY ID	SITE NAME AND ADDRESS

WITHIN 1/4 TO 1/2 MILE

61 ALPINE EQUIPMENT RENTALS
9045 WILLOWS RD
REDMOND
98052

Vista ID: 1851265

Remediation : CONDUCTED

UST's

MAP REF #	EPA ID / AGENCY ID	SITE NAME AND ADDRESS		
		WITHIN 1/8 MILE		
3		THE OVERLAKE SCHOOL 20301 NE 108TH	REDMOND 98053	Vista ID: 1840023
	006198	Number of Underground Tanks: 1 Contents:LEADED GAS,		
6		LAKE WASHINGTON SCHOOL DISTRICT 9426 195 AVE NE	REDMOND 98053	Vista ID: 1847019
	009719	Number of Underground Tanks: 5 Contents:HEATING OIL,		
8		CADMAN/CLOSED 19101 NE UNION HILL ROAD	REDMOND 98052	Vista ID: 1850838
	006874	Number of Underground Tanks: 3 Contents:DIESEL,LEADED GAS,		
8		OLYMPIAN STONE COMPANY INC. 19150 UNION HILL ROAD PO BOX 539	REDMOND 98073	Vista ID: 1850839
	006479	Number of Underground Tanks: 5 Contents:USED OIL,UNLEADED GAS,DIESEL,		
11		TEXACO STATION 11520 AVONDALE RD	REDMOND 98052	Vista ID: 2883370
	007673	Number of Underground Tanks: 3 Contents:UNLEADED GAS,		
13		DENNIS R CRAIG CONSTRUCTION INC. 7710 185TH AVE NE	REDMOND 98052	Vista ID: 1840590
	012707	Number of Underground Tanks: 2		

UST's

MAP REF #	EPA ID / AGENCY ID	SITE NAME AND ADDRESS		
		WITHIN 1/8 MILE		
13		MIRMAR CONSTRUCTION CO INC 7760 NE 185TH	REDMOND 98052	Vista ID: 1840591
	006100	Number of Underground Tanks: 1 Contents:DIESEL,		
14		CORY DE JONG & SON INC 11818-184 AVE NE	REDMOND 98052	Vista ID: 1847033
	004214	Number of Underground Tanks: 2 Contents:UNLEADED GAS,DIESEL,		
16		GENIE INDUSTRIES 18340 NE 76TH ST./PO BOX 69	REDMOND 98073	Vista ID: 168123
	011376	Number of Underground Tanks: 1 Contents:USED OIL,		
17		SAJASA CONSTRUCTION INC. 18124 NE 76 STREET	REDMOND 98052	Vista ID: 200284
	003212	Number of Underground Tanks: 2 Contents:DIESEL,LEADED GAS,		
17		CITY SHOPS 18080 NE 76	REDMOND 98052	Vista ID: 1841879
	002947	Number of Underground Tanks: 6 Contents:USED OIL,DIESEL,UNLEADED GAS,		
17		HOS BROS. CONSTRUCTION INC. 18120 NE 76TH STREET	REDMOND 98052	Vista ID: 3885272
	008985	Number of Underground Tanks: 7 Contents:DIESEL,USED OIL,LEADED GAS,		

UST's

MAP REF #	EPA ID / AGENCY ID	SITE NAME AND ADDRESS		
		WITHIN 1/8 MILE		
18		UNITED PARCEL SERVICE 18001 NE UNION HILL RD	REDMOND 98052	Vista ID: 1850837
	097542	Number of Underground Tanks: 14 Contents:HAZARDOUS,OTHER,DIESEL,UNLEADED GAS,USED OIL,		
19		SHULTZ DISTRIBUTING INC 7822 180TH AVE NE	REDMOND 98052	Vista ID: 1840576
	010210	Number of Underground Tanks: 11 Contents:UNLEADED GAS,DIESEL,		
26		A&A FOREIGN AUTO REPAIR 8004 AVONDALE RD NE	REDMOND 98052	Vista ID: 1842481
	008892	Number of Underground Tanks: 4 Contents:USED OIL,DIESEL,		
29		ORGANIZATIONAL MAINTENANCE SHOP #10 17230 NE 95TH	REDMOND 98052	Vista ID: 1853870
	007568	Number of Underground Tanks: 1 Contents:UNLEADED GAS,		
32		MINIT-LUBE #1109 17015 AVONDALE WAY NE	REDMOND 98052	Vista ID: 1842483
	006791	Number of Underground Tanks: 2 Contents:USED OIL,OTHER,		
33		HORACE MANN ELEMENTARY SCHOOL 17001 NE 104	REDMOND 98052	Vista ID: 1840001
	012439	Number of Underground Tanks: 1 Contents:HEATING OIL,		

UST's

MAP REF #	EPA ID / AGENCY ID	SITE NAME AND ADDRESS		
		WITHIN 1/8 MILE		
35		REDMOND BP 16909 REDMOND WAY	REDMOND 98052	Vista ID: 5283664
	008523	Number of Underground Tanks: 11 Contents:OTHER,UNLEADED GAS,USED OIL,DIESEL,		
36		MAX D NICHOLLS 16717 REDMOND WAY	REDMOND 98052	Vista ID: 1848315
	012614	Number of Underground Tanks: 1 Contents:UNLEADED GAS,		
36		JACKPOT STATION 305 16757 REDMOND WAY N.E.	REDMOND 98052	Vista ID: 1848316
	004045	Number of Underground Tanks: 3 Contents:UNLEADED GAS,		
36		WAYNE AND GARYS CHEVRON SERVIC 16760 REDMOND WY	REDMOND 98052	Vista ID: 1856314
	005212	Number of Underground Tanks: 5 Contents:USED OIL,DIESEL,UNLEADED GAS,		
38		LWSD TRANSPORTATION FACILITY 8300 167 AVE NE	REDMOND 98052	Vista ID: 1847013
	009718	Number of Underground Tanks: 3 Contents:DIESEL,LEADED GAS,		
39		REDMOND ELEMENTARY SCHOOL 16600 NE 80	REDMOND 98052	Vista ID: 1841979
	012440	Number of Underground Tanks: 2 Contents:DIESEL,HEATING OIL,		

UST's

MAP REF #	EPA ID / AGENCY ID	SITE NAME AND ADDRESS		
		WITHIN 1/8 MILE		
41		PHILLIPS 66 COMPANY SS#071842 16401 REDMND WY	REDMOND 98052	Vista ID: 1848314
	002803	Number of Underground Tanks: 4 Contents:USED OIL,UNLEADED GAS,		
41		KELLY REALTY 16450REDMOND WY	REDMOND 98052	Vista ID: 3272451
	101583	Number of Underground Tanks: 3 Contents:USED OIL,LEADED GAS,		
43		ARCO #6067 8009 164TH AVE NE	REDMOND 98052	Vista ID: 1840484
	008795	Number of Underground Tanks: 5 Contents:USED OIL,DIESEL,UNLEADED GAS,		
43		REDMOND CLEANERS INCORPORATED 7981 LEARY WAY N.E.	REDMOND 98052	Vista ID: 1845825
	008322	Number of Underground Tanks: 2 Contents:HEATING OIL,		
44		EXXON 7-9068/CLOSED 16311 REDMOND WAY	REDMOND 98052	Vista ID: 1848313
	009562	Number of Underground Tanks: 5 Contents:USED OIL,DIESEL,UNLEADED GAS,		
47		CITY OF REDMOND FIRE DEPARTMENT 8450 161 AVE NE	REDMOND 98052	Vista ID: 1847014
	003438	Number of Underground Tanks: 4 Contents:USED OIL,DIESEL,UNLEADED GAS,		

UST's

MAP REF #	EPA ID / AGENCY ID	SITE NAME AND ADDRESS		
		WITHIN 1/8 MILE		
48		CHEVRON 98795 16000 REDMOND WY	REDMOND 98052	Vista ID: 2884319
	005253	Number of Underground Tanks: 9 Contents:LEADED GAS,USED OIL,DIESEL,UNLEADED GAS,		
50		JACKPOT COUNTRY STORE 304 7725 159TH PLACE NORTH EAST	REDMOND 98052	Vista ID: 1840424
	004046	Number of Underground Tanks: 3 Contents:LEADED GAS,UNLEADED GAS,		
50		A&G LEASING 7740 159TH PL NE	REDMOND 98052	Vista ID: 1840425
	000020	Number of Underground Tanks: 1 Contents:USED OIL,		
		WITHIN 1/8 TO 1/4 MILE		
8		GOLDEN RULE & B&J ROOFING 19205 NE 80TH	REDMOND 98053	Vista ID: 1841981
	011042	Number of Underground Tanks: 1 Contents:LEADED GAS,		
8		SCHROEDER & SONS 19222 NE 80TH	REDMOND 98053	Vista ID: 1841982
	008893	Number of Underground Tanks: 3 Contents:USED OIL,		

UST's

MAP REF #	EPA ID / AGENCY ID	SITE NAME AND ADDRESS		
		WITHIN 1/8 TO 1/4 MILE		
20		REDMOOR CORPORATION 6848 180TH AVE NE PO BOX 691	REDMOND 98052	Vista ID: 1840575
	002518	Number of Underground Tanks: 4 Contents:DIESEL,LEADED GAS,		
22		BROWN BEAR CAR WASH REDMOND 17809 REDMOND WAY	REDMOND 98052	Vista ID: 3885715
	006896	Number of Underground Tanks: 8 Contents:UNLEADED GAS,DIESEL,		
25		DUNKIN & BUSH PAINTING INC 17301 NE 70TH	REDMOND 98052	Vista ID: 129291
	004418	Number of Underground Tanks: 2 Contents:DIESEL,UNLEADED GAS,		
55		JOBE SKI CORP 15320 NE 92	REDMOND 98052	Vista ID: 219152
	001491	Number of Underground Tanks: 2 Contents:AVIATION GAS,UNLEADED GAS,		
56		CLAYBURN REFRACTORIES 8916 152ND AVE NE	REDMOND 98052	Vista ID: 1840410
	005833	Number of Underground Tanks: 1 Contents:UNLEADED GAS,		
57		J E WORK INC 8525 152ND AVENUE NE	REDMOND 98052	Vista ID: 2882901
	100834	Number of Underground Tanks: 3 Contents:UNLEADED GAS,DIESEL,		

CUSTOMER USE LIMITATIONS - Customer proceeds at its own risk in choosing to rely upon VISTA services, in whole or part, prior to proceeding with any transaction. VISTA assumes no responsibility for the accuracy of government records, for errors occurring in conversion of data, or for customer's use of VISTA services. VISTA's obligation regarding data is solely limited to providing portions of data existing in government records as of the date of each government update received by VISTA.

VISTA NATIONAL RADIUS PROFILE

VISTA Report #: 6/086240-001 Date of Report: 10/11/95

UNMAPPABLE SITES

Unmappable sites are environmental risk sites that cannot be geocoded, but can be located by zip code or city name.

In general, a site cannot be geocoded because of inaccurate or missing locational information in the record provided by the agency. For many of these records, VISTA has corrected or added locational information by using U.S. Postal address validation files and proprietary programming that adds locational information from private industry address files. However, many site addresses cannot be corrected using these techniques and those sites cannot be mapped.

Of the sites that cannot be mapped, VISTA identifies those that have complete zip code or city name information. All ungeocoded sites that have a ZIP code in the radius are considered for inclusion. Ungeocoded sites that do not have a ZIP code but do have a street name are considered for inclusion if they have a city in the radius. An ungeocoded record may be excluded if it can be determined to be outside the relevant radius searched for a particular database.

 For more information call: (619) 450-6100

VISTA SPECIAL REPORT

10/11/95

VISTA Report #: 6/086240-001

UNMAPPABLE SITES

RCRA-LgGen

SITE NAME AND ADDRESS	VISTA ID	EPA ID / AGENCY ID
CORNE CONSTRUCTION CO: 19114 NE 84TH, REDMOND 98053	1853807	
Generator Class :Generators who generate at least 1000 kg./month of non-acutely hazardous waste (or 1 kg./month of acutely hazardous waste).		WAD988471025

RCRA-SmGen

SITE NAME AND ADDRESS	VISTA ID	EPA ID / AGENCY ID
KING CO MATERIALS LAB: 7733 LEARY WAY NE, REDMOND 98052	228947	
Generator Class :Generators who generate less than 100 kg./month of non-acutely hazardous waste.		WAD981764657
PROTOTRON INC: 2653 151ST PL NE, REDMOND 98052	341161	
Generator Class :Generators who generate 100 kg./month but less than 1000 kg./month of non-acutely hazardous waste		WAD981772395
MICROSOFT CORPORATE CAMPUS: 1 MICROSOFT WAY, REDMOND 98052	4865143	
Generator Class :Generators who generate 100 kg./month but less than 1000 kg./month of non-acutely hazardous waste		WAD988523148
UNIVERSAL SHEET METAL INC: 14400 NE NORTH WOODINVILLE WAY, WOODINVILLE 98072	5510641	
Generator Class :Generators who generate 100 kg./month but less than 1000 kg./month of non-acutely hazardous waste		WAD980724272

LUST

TE NAME AND ADDRESS	VISTA ID	EPA ID / AGENCY ID
DMOND NIKE SITE 13/14: , REDMOND 98052	3885107	
Discovery Date : 11/30/92		4345
Media Affected : SOIL/LAND/SAND		
Leak Cause : UNAVAILABLE		
Remediation : CLEANUP IN PROGRESS/REQUIRED		
KE REDMOND: , REDMOND 98052	4266843	
Media Affected : SOIL/LAND/SAND		4345
Leak Cause : UNAVAILABLE		
Remediation : CLEANUP IN PROGRESS/REQUIRED		

SWLF

SITE NAME AND ADDRESS	VISTA ID	EPA ID / AGENCY ID
CEDAR HILLS LANDFILL: ,	4287600	
Facility Type : SANITARY LANDFILL/LANDFILL Owner Name : DRRODNEY HA Owner Address : 400 YESLER WAY RM 600 SEATTLE , 98104		
EASTMONT TRANSFER STATION: ,	4287671	
Facility Type : TRANSFER STATION Owner Name : MRNICK HA Owner Address : PO BOX 46018 SEATTLE , 98146		
FIRST NORTHEAST T.S.: ,	4287686	
Facility Type : TRANSFER STATION Owner Name : DRRODNEY HA Owner Address : 400 YESLER WAY RM 600 SEATTLE , 98104		
GRO-CO: ,	4287694	
Facility Type : COMPOSTING FACILITY Owner Name : MRMILAN MOSS Owner Address : PO BOX 80502 SEATTLE , WA 98108 Facility Type : RUBBLE FILL (DEMO,ETC)		
HOUGHTON TRANSFER STATION: ,	4287710	
Facility Type : TRANSFER STATION Owner Name : DRRODNEY HA Owner Address : 400 YESLER WAY RM 600 SEATTLE , 98104		

SWLF

SITE NAME AND ADDRESS	VISTA ID	EPA ID / AGENCY ID
IDDINGS: ,	4287713	
Facility Type : COMPOSTING FACILITY Owner Name : MRLORI IDDINGS Owner Address : 27525 COVINGTON WAY SE KENT , WA 98042 Facility Type : RUBBLE FILL (DEMO,ETC)		
MT OLIVET LANDFILL: ,	4287769	
Facility Type : RUBBLE FILL (DEMO,ETC) Waste Type 1 : CONSTRUCTION/DEMO Owner Name : MRJOHN MC Owner Address : PO BOX 547 RENTON , 98057		
NORTH SEATTLE: ,	4287783	
Facility Type : TRANSFER STATION Owner Name : MSNANCY GLASER Owner Address : 505 DEXTER HORTON, 710 2ND AVE SEATTLE , WA 98104 Facility Type : TRANSFER STATION		
PACIFIC COAST COAL COMPANY: ,	4287805	
Facility Type : SPECIAL WASTE Owner Name : MRDAVID MO Owner Address : PO BOX 450 BLACK DIAMOND , 98010		
SILVIGROW: ,	4287864	
Facility Type : SLUDGE PROCESSING Waste Type 1 : SLUDGE/SEPTAGE/SEPTI Owner Name : MRPETE MA Owner Address : 821 2ND AVE MS-81 SEATTLE , 98104		

SWLF

SITE NAME AND ADDRESS	VISTA ID	EPA ID / AGENCY ID
SW SUBURBAN SEWER DISTRICT: ,	4287889	

Facility Type : COMPOSTING FACILITY
Owner Name : MRDALE CAPP
Owner Address : 432 SW AMBAUM BLVD
SEATTLE , WA 98166
Facility Type : RUBBLE FILL (DEMO,ETC)

WHITE RIVER SYSTEMS: , 4287914

Facility Type : EXEMPT
Owner Name : MRWALTER PACHECO
Owner Address : 3815 156TH AVE SE
AUBURN , WA 98002
Facility Type : SPECIAL WASTE

WASTE MANAGEMENT OF SEATTLE: , 4287932

Facility Type : RESOURCE RECOVERY (RECYCLING)
Owner Name : MRNICK HARBERT
Owner Address : 7091 1ST AVE S
SEATTLE , WA 98108
Facility Type : RESOURCE RECOVERY (RECYCLING)
Waste Type 1 : RECYCLABLES

UST's

TE NAME AND ADDRESS	VISTA ID	EPA ID / AGENCY ID
MMAMISH CENTRAL OFFICE (2590-B02): 20926 N.E. SAMMAMISH, REDMOND 98052	1844171	
Number of Underground Tanks: 1 Contents:DIESEL,		012319
REDMOND: 7733 LEARY WAY NE, REDMOND 98052	2883933	
Number of Underground Tanks: 3 Contents:USED OIL,DIESEL,UNLEADED GAS,		006879
DMOND NIKE SITE 13/14: , REDMOND 98052	3885107	
Number of Underground Tanks: 11 Contents:OTHER,DIESEL,LEADED GAS,		101903

DESCRIPTION OF DATABASES SEARCHED

Below are general descriptions and search parameters of the federal and state databases that VISTA searches for the National Radius Report.

FEDERAL DATABASES

Please check the "Summary of Environmental Risks Found" matrix on the cover of this profile to determine the specific dates of the federal databases searched for this profile.

U.S. EPA: NPL

The National Priorities List (NPL) is the EPA's database of uncontrolled or abandoned hazardous waste sites identified for priority remedial action under the Superfund Program. A site, to be included on the NPL, must either meet or surpass a predetermined hazard ranking systems score, or be chosen as a state's top-priority site, or meet all three of the following criteria:

1) The US Department of Health and Human Services issues a health advisory recommending that people be removed from the site to avoid exposure.
2) The EPA determines that the site represents a significant threat.
3) The EPA determines that remedial action is more cost-effective than removal action.

U.S. EPA: CERCLIS

The CERCLIS List is a compilation by the EPA of the sites which the EPA has investigated or is currently investigating for a release or threatened release of hazardous substances pursuant to the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA or Superfund Act).

U.S. EPA: RCRA (RCRIS/HWDMS)

The EPA's Resource Conservation and Recovery Act (RCRA) Program identifies and tracks hazardous waste from the point of generation to the point of disposal. The RCRA Facilities database is a compilation by the EPA of reporting facilities that generate, transport, treat, store or dispose of hazardous waste.

U.S. EPA: ERNS

The Emergency Response Notification System (ERNS) is a national database used to collect information on reported accidental releases of oil and hazardous substances. The database contains information from spill reports made to federal authorities including the EPA, the US Coast Guard, the National Response Center and the Department of Transportation.

STATE DATABASES

Please check the "Databases Searched" to determine if the following type of databases are available from VISTA for the state in which the subject property of this report is located. Please note that if the Summary does not list one of the following databases, it is not currently available. You may also determine the specific names and dates of the databases searched for this profile in the summary.

STATE: SPL

The State Priority List is a generic name for databases maintained by many states that contain sites considered to be actually or potentially contaminated and presenting a possible threat to human health and the environment. These sites are generally listed by the state to warn the public or as a part of an investigation and cleanup program managed by the state.

STATE: LUST

This is a database maintained by state or local agencies of known or suspected leaking underground storage tanks.

STATE: UST

This is a database maintained by state or local agencies of registered underground storage tanks.

STATE: SWLF

This is a database maintained by state or local agencies of Solid Waste Landfills, Incinerators, and transfer stations.

KING COUNTY SARA TITLE III (HAZARDOUS MATERIALS) DATABASE ENTRIES WITH "REDMOND" ADDRESSES

as supplied by Rich Tokarzewski of King County March 1997

ID	EHS	CITY	FACILITY NAME	ADDRESS 1	ADDRESS 2	CONTACT POINT	BUSINESS	CHEMICALS
1	FALSE	REDMOND	CHEVRON	5040	148TH NE	LISA WELLMAN	348-1682	GASOLINE
2	FALSE	REDMOND	ARCO	8009	164TH NE	BTA, INC	885-1195	GASOLINE
3	FALSE	REDMOND	HFI FOODS, INC	17360 NE	67TH	GARY GOODROAD	867-3261	LIQ NITROGEN
4	TRUE	REDMOND	GTE, REDMOND CO	7311	148TH NE	ROSALEEN FARMER	881-2121	SULFURIC ACID
5	TRUE	REDMOND	GTE, EDUCATION HILL	11529	WOOD-RED RD	ROSALEEN FARMER	881-2121	SULFURIC ACID
6	TRUE	REDMOND	GTE, CHERRY CREST	3035	134TH NE	ROSALEEN FARMER	881-2121	SULFURIC ACID
7	TRUE	REDMOND	GTE, AVONDALE 2561	18825 NE	132ND	ROSALEEN FARMER	881-2121	SULFURIC ACID
8	TRUE	REDMOND	GTE, AVONDALE	16736 NE	40TH	ROSALEEN FARMER	881-2121	SULFURIC ACID
9	TRUE	REDMOND	GTE, OVERLAKE	2780	156TH NE	ROSALEEN WESTWOOD	881-2121	SULFURIC ACID
10	TRUE	REDMOND	GTE, WILLOWS	10105	WILLOWS	ROSALEEN WESTWOOD	881-2121	SULFURIC ACID
11	TRUE	REDMOND	GTE, SAMMAMISH	20929	RED-FALL	ROSALEEN FARMER	827-2121	SULFURIC ACID
12	FALSE	REDMOND	JB INSTANT LAWN	14020 NE	124TH	Chris Schram	821-0444	gasoline, diesel, acetylene, oxygen, propane
13	TRUE	REDMOND	CIRCUIT TECHNOLOGIES	12226	134TH CT NE	T KIRKENDALE		GASOLINE
14	FALSE	REDMOND	MUTUAL MATERIALS	7760	185TH NE	PAUL CALDEIRA	881-6700	LIME, PORTLAND CEMENT
15	FALSE	REDMOND	BROWN BEAR	15248	BELL-RED RD	Larry Silva	442-7160	gasoline
16	FALSE	REDMOND	BROWN BEAR	17809	REDMOND-FALL CIT	Larry Silva	442-7160	gasoline
17	TRUE	REDMOND	BAXTER HEALTHCARE	3660	148TH AVE	MAUREEN MCLARNEY	882-8408	CHLOROFORM,ETHANOL,CH20,HCL,NITRIC & SULFURIC ACID
18	FALSE	REDMOND	WASTE MANAGEMENT	14535 NE	91ST ST	TERRY BICKEL	885-4744	DIESEL
19	TRUE	REDMOND	UNISEA FOODS, INC	15110 NE	90TH	JOE BEJYL	861-5234	AMMONIA
20	FALSE	REDMOND	NW PIPELINE CORP	22821	RED-FALL CITY	PIPELINE CONTROL	800-972-77	
21	FALSE	REDMOND	TIME OIL	16757	REDMOND WAY	TIME OIL CO	885-2080	gasoline, diesel
22	FALSE	REDMOND	TIME OIL	7725	159TH PL NE	TIME OIL	881-4295	gasoline, diesel
23	FALSE	REDMOND	ALPINE EQUIPMENT RENTAL	9045	WILLOWS RD	JERRY SCHNEIDER	821-2030	DIESEL, GASOLINE
24	FALSE	REDMOND	BP - TOSCO	740	228TH NE	LARRY SILVA	442-7160	DIESEL FUEL #2, GASOLINE
25	TRUE	REDMOND	T D FEEDS	16355	CLEVELAND	E KUPPENBENDOR	885-9226	SODIUM SELENITE,2-OH-4-METHIO BUT ACID
26	TRUE	REDMOND	PACIFIC CIRCUITS	17550 NE	67TH CT	SAM BRINDLEY	883-7575	SULFURIC ACID, FORMALDEHYDE, NITRIC ACID
27	FALSE	Redmond	Pacer Propane	18459 NE	76th	Thomas Krake	836-5283	propane
28	FALSE	REDMOND	ARCO FACILITY 5920	9015 S	WILLOW	FACILITY MANAGER	882-8586	GASOLINE
29	FALSE	REDMOND	S SEATTLE ODORANT ST			WILLIAM E CLU?	868-1010	MERCAPTAN, GLYCOLS,
30	FALSE	REDMOND	NORTHWEST Mfg	15133 NE	92ND	JACK LARSON	883-3700	LIQ NITROGEN, LIQ OXYGEN
31	TRUE	REDMOND	MK BATTERY, REDMOND	7730	185TH NE #2	DAVID BRUNELLE	800-372-9253	LEAD, SULFURIC ACID
32	TRUE	REDMOND	GTE, UNION HILL	208TH NE	91ST	ROSALEEN FARMER	827-2121	SULFURIC ACID
33	TRUE	REDMOND	GTE REDMOND SCIENCE CT	18120 NE	68TH	ROSALEEN FARMER	881-2121	SULFURIC ACID
34	TRUE	REDMOND	PAEGITZER REDMOND	12226	134TH CT NE	TODD KIRKENDALL	823-6464	SULFURIC ACID, AMMONIA, FORMALDEHYDE,NITRIC ACID
35	FALSE	REDMOND	Interpoint	14833 NE	87TH	BOB GASES	232-4726	NITROGEN
36	FALSE	REDMOND	BOB'S CHEVRON SERVICE	16000	REDMOND WAY	Geo Jannusch	885-9135	gasoline
37	FALSE	REDMOND	INTERPOINT	14833 NE	87TH	DANNY MC KEAN	232-4726	nitrogen
38	FALSE	REDMOND	PUGET POWER	13635 NE	80TH	S PEABODY	454-6363	GASOLINE,DIESEL
39	FALSE	Redmond	Texaco - M&M Quick Stop	24821	Red Fall City Rd	Jade Koh	868-9620	gasoline
40	TRUE	REDMOND	OLIN ROCKET RESEARCH	11441	WILLOWS NE	JOHN SHUBA	885-5000X533	HYDRAZINES, NITROGEN
41	TRUE	REDMOND	ALLIED SIGNAL	15001 NE	36TH	MARY ANDERSON	885-8075	SULFURIC ACID, HYDROGEN SULFIDE,HF, IPA
42	FALSE	REDMOND	J E WORK	8525	152ND NE	JIM WORK	885-0300	DIESEL
43	FALSE	REDMOND	TRUGREEN-CHEMLAWN	15265 NE	95TH	LARRY LITTEN	881-3233	LIME,UREA,IRON SULPHATE
44	FALSE	REDMOND	TEXACO	10801	AVONDALE	ROBIN LANE	889-3253	GASOLINE, DIESEL
45	FALSE	REDMOND	SUPER RENT	17950	REDMOND	STUART MULLOY	885-0505	GASOLINE, DIESEL, ACETYLENE, HELIUM, WASTE OIL
46	FALSE	REDMOND	SHULTZ DISTRIBUTING	7822	180TH NE	BOB DOXSEE	882-8427	Diesel, oils, gasoline
47	FALSE	REDMOND	SEALED AIR CORP	6812	185TH NE	JOEL ARNOLD	885-9648	RESINS, MINERAL OIL
48	FALSE	REDMOND	Olympian Precast	19150	Union Hill	Judy Jewell	868-1922	MURIATIC ACID,DIESEL,CEMENT
49	FALSE	REDMOND	O'BRIEN INTERNATIONAL	14615 NE	91ST	MIKE MILLER	881-5900	NAPTHA,XYLENE,CYCLOHEXANEACETON,DIISOCYANATES
50	FALSE	REDMOND	PUGET POWER	18150	REDONDO WAY	BUCK JONES	885-1513	DIESEL

CITY OF REDMOND BUSINESS LICENSE DATABASE ENTRIES WITH SELECTED SIC CODES

SEE FOLLOWING TABLE FOR SELECTED SIC CODES

BusLic	BusName	HouseNum	Street	Zip	PhoneNum	BusDescr	SicCode	OwnerRep	Zone	SqFt	NoEmp
857	NORTHWEST NURSERY WHOLESALE	8818	132 AVENUE NE	98052	2068220076	WHOLESALE NURSERY	0181	COLMAN, JAMES M	R5	0	4
1295	TERRACE HILL APTS	8736	164 AVENUE NE	98052	2062226738	APARTMENT HOUSE	6513	LOU, GEORGE	R20	0	1
2421	WEISS PROPERTY MANAGEMENT	16928	NE 82 STREET	98052	2068684179	APARTMENT HOUSE	6513	WEISS, DARRYL H	R20	0	2
2404	SUMMERWOOD APARTMENTS	9805	AVONDALE ROAD	98052	2068817253	APARTMENT RENTAL	6513	NEVES, MANNY	R12	0	4
2396	SAMMAMISH BEACH CLUB	17525	NE 40 STREET	98052	2068691993	APARTMENT RENTALS	6513	LONGNECKER, DIANE	R20	0	3
2213	WESTWOOD MANAGEMENT	16307	NE 83 STREET	98052	2068810646	APARTMENT MANAGEMENT	6513	CHAUSSEE, CAROL L	CC7	1800	4
2041	REDMOND FIVE-PLEX	8389	167 AVENUE NE	98052	2068837700	APARTMENTS	6513	BOREN, P JAMES	CC5	4380	1
1856	TALL FIRS APARTMENTS	9445	AVONDALE ROAD	98052	2068852211	APARTMENT RENTAL	6513	WILSON, GREGORY J	R30	0	1
1665	COLONY AT BEAR CREEK APTS.	9301	AVONDALE ROAD	98052	2068857460	RENT APARTMENT UNITS	6513	DEAL, GARY	R30	0	6
1529	9200 REDMOND PLACE	9200	RED-WOOD ROAD	98052	2068699200	APARTMENT UNITS RENTAL	6513	AXELROD, ALAN	R30	0	3
1524	GALLERY PLACE APARTMENTS	8935	160 AVENUE NE	98052	2064539030	APARTMENT RENTAL	6513	BEVAN, ROBERT L	CC6	2000	5
1428	WILLOWS APARTMENTS, THE	8501	WILLOWS ROAD #240	98052	2068838890	APARTMENT RENTAL	6513	HIGGENS, SHERRY	R30	940	4
146	AVONDALE APARTMENTS	9451	AVONDALE ROAD	98052	2068852373	APARTMENT RENTAL	6513	LILJEGREN, GUSTAV	R30	0	1
1367	VALLEY VIEW I	8920	164 AVENUE NE	98052	2068823360	APARTMENT RENTAL	6513	WINTER, MARCIA	CC1	16000	2
3612	PETER'S CREEK RETIREMENT	14431	REDMOND WAY	98052	2068692273	RETIREMENT COMMUNITY	6513	GODFREY, JIM	R5	0	37
1109	RIVERSIDE APARTMENTS	7435	159 PLACE NE	98052	2068670924	APARTMENTS	6513	TOWER, SCOTT - DIST MANAGER	CC2	0	4
1077	SIXTY 01 APARTMENT COMMUNITY	6001	140 AVENUE NE	98052	2063822909	APARTMENT COMPLEX/MANAGEMENT	6513	HANSEN, KRISTEN	R12	0	2
1065	REDMOND EIGHT-PLEX APARTMENTS	7920	168 AVENUE NE	98052	2068430936	APARTMENTS	6513	BEEBE, BOB D	CC5	0	1
968	PINEWOOD APARTMENTS	16518	NE 91 STREET	98052	2067465012	APARTMENTS	6513	FEDIGAN, MARTIN J	R20	0	2
944	PARKWAY APARTMENTS	3970	W LAKE SAMMAMISH PKWY	98052	2064671010	APARTMENT HOUSE	6513	FERRELL, RICHARD E	R20	0	2
943	PARKSIDE APARTMENTS	16910	NE 80 STREET #305	98052	2068817314	APARTMENT RENTALS	6513	WILSON, KAREN	R20	0	2
877	OLDE REDMOND PLACE	7001	OLD REDMOND ROAD	98052	2068834260	APARTMENTS	6513	HENRY, DEAN	R12	58526	4
507	GORDON APARTMENTS	9447	166 AVENUE NE	98052	2068680615	APARTMENTS	6513	CHIU, WUYAN	R20	0	1
296	COLONIAL ROOMS	7952	LEARY WAY	98052	2065836011	APARTMENTS/ROOM RENTALS	6513	NEAL, TED	CC8	4000	1
152	B & B APARTMENTS	9110	RED-WOOD ROAD	98052	0000000000	APARTMENT HOUSE	6513	ELHART, LARRIE E	R30	6000	1
1426	WILLOW VIEW APARTMENTS	8101	WILLOWS ROAD	98052	2067423641	APARTMENTS	6513	PATTON, STAN	R30	0	1
5618	WELLINGTON PARK APARTMENTS	8127	149 PLACE NE	98052	2068618632	APARTMENT RENTAL	6513	MCLEAN, R E	R30	0	2
7657	EAGLE RIM APARTMENTS	17325	NE 85 PLACE	98052	2068851128	PROPERTY MANAGEMENT	6513	BACHLER, SUZANNE	R12	0	4
6663	BELLAIRE PLACE APARTMENTS	16539	NE 35 COURT	98052	2068830000	APARTMENT COMMUNITY	6513	MCCREEDY, KENT	PAB	500	5
6561	HEIGHTS AT BEAR CREEK, THE	17771	NE 90 STREET #E126	98052	2068822900	APARTMENT HOME RENTAL	6513	HAWKINS, MICHAEL MANAGER	R20	0	8
6456	LOCHMOORE SHORES APARTMENTS	4006	W LK SAMM PKY NE/C-7	98052	2068692907	APARTMENT RENTAL	6513	ANDERSON, GREG	R20	0	2
6279	TERRACE HILL APARTMENTS	8704	164 AVENUE NE	98052	2065678967	APARTMENT MANAGEMENT	6513	HOY, ELLEN	R20	0	1
6245	9200 REDMOND PLACE	9200	RED-WOOD ROAD	98052	2068699200	APARTMENT RENTALS	6513	NAKATA, NELSON	R30	0	4
6215	CHARDONNAY PARK	8501	WILLOWS ROAD	98052	2068838890	RESIDENTIAL APARTMENTS	6513	FEICHTMEIR, PETER	R30	0	2
6147	VALLEY VIEW APARTMENTS	8920	164 AVENUE NE	98052	2063436049	APARTMENT BUILDING	6513	VON HAGAN, SUSAN AND JOHN	R20	0	1
6073	HERITAGE WOODS APARTMENTS	16518	NE 91 STREET	98052	2068823699	APARTMENT RENTALS	6513	RATLIFF, GREG	R20	51773	2
6042	SPRINGFIELD APARTMENTS	18651	NE 61 COURT	98052	2068854375	LEASE APARTMENTS	6513	SPEER, JENNIFER	R12	0	6
2650	SAMMAMISH RIDGE APARTMENTS	14860	REDMOND WAY	98052	2068816108	APARTMENT RENTAL	6513	GAUDETTE, TERRIE	R30	0	5
5815	REMINGTON PARK APARTMENTS	18666	REDMOND WAY	98052	2068683800	RESIDENTIAL APARTMENT LEASING	6513	ALLEN, CATHLEEN H	R20	0	9
3102	REMINGTON PARK APARTMENTS	18666	REDMOND WAY	98052	2062416342	APARTMENT RENTALS	6513	AUSTIN, WILLIAM B	R30	266	8
5546	LOGAN'S RIDGE	6110	186 PLACE NE	98052	2068838296	APARTMENT RENTALS	6513	ZIMMERMAN, ROBERT	R30	0	6
4923	REDMOND CREST APARTMENTS	8020	169 AVENUE NE	98052	2068820355	APARTMENT RENTALS	6513	BUCKLIN, GERALD S	R30	0	1
4716	TIMBERLAWN APARTMENTS	15850	NE 40 STREET	98052	2068836801	APARTMENT RENTAL	6513	EGECK, RICHARD	R30	32000	3
4648	BELLAIRE PLACE	16539	NE 35 COURT	98052	2068830000	APARTMENT RENTAL	6513	CLANCY, DAVID	PAA	0	6
4609	EVERGREEN PARK APARTMENTS	16800	NE 39 COURT	98052	2068833654	REAL ESTATE MANAGEMENT	6513	ROBILLARD, MICHAEL J	PA-	1000	7
4511	HERITAGE GREEN APARTMENTS/MGR	8370	166 AVENUE NE	98052	2068816317	APARTMENT HOMES	6513	HUDECEK, SANDRA L	CC5	0	2
4466	CAMBRIDGE PARK APARTMENTS	7910	170 PLACE NE	98052	2063255688	APARTMENT RENTALS	6513	HOOKER, RODMAN	R30	0	2
4460	AUTUMN VIEW APARTMENTS	15325	REDMOND WAY	98052	2068818478	APARTMENT RENTAL	6513	PADOVEN, PETER	R20	0	6
4270	SHADOWBROOK APARTMENTS	8500	148 AVENUE NE	98052	2068815978	APARTMENT COMPLEX	6513	BOHANNON, LINDA	R30	0	8
4108	EAGLE RIM APARTMENTS	17202	NE 85 PLACE	98052	2068859989	PROPERTY MANAGEMENT/APARTMENT	6513	COOMBS, DEBORAH A	R12	1000	4
8210	CAMBRIAN APARTMENTS, THE	15606	NE 40 STREET #Z	98052	2068822222	APARTMENT MANAGEMENT	6513	LENIART, ROBERT	R30	0	15
5879	HERITAGE GREENS APARTMENTS	8370	166 AVENUE NE	98052	2068816317	APARTMENT MANAGEMENT	6513	CUMMINS, SHELLY	CC8	200	2
1084	REDMOND WERKSHOP	14718	NE 91 STREET	98052	2068857677	REPAIR AUTOS	7538	NELSON, DERRYL	LI	1850	2
57	A A A AUTO SERVICE CENTER	8004	AVONDALE ROAD NE	98052	2065581092	AUTO REPAIR AND SERVICE	7538	DONBOLI, NADER	GC	2650	2
2965	CASCADE AUTO CLINIC INC.	7867	159 PLACE NE	98052	2068855752	AUTO REPAIR	7538	EASLEY, TOM	CC2	3000	2
2854	JESS' AUTO REPAIR INC	9155	WILLOWS ROAD	98052	2068671995	AUTO REPAIR	7538	ALBERTSON, JESS	LI	3600	5
2784	FIRESTONE STORES, INC. #3123	18014	REDMOND WAY	98052	2068836551	TIRE/SERVICE CENTER	7538	SHIRTS, AL	LI	5815	13

CITY OF REDMOND BUSINESS LICENSE DATABASE ENTRIES WITH SELECTED SIC CODES

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BusLic	BusName	HouseNum	Street	Zip	PhoneNum	BusDescr	SicCode	OwnerRep	Zone	SqFt	NoEmp
2538	WHOLESALE AUTO REPAIR	8509	152 AVENUE NE	98052	2068838866	AUTO REPAIR	7538	SCOTT, PAT	LI	5000	5
2529	THAT MUFFLER & BRAKE PLACE	18014	REDMOND WAY	98052	2068820630	AUTO SERVICE	7538	BAERMANN, GARY	LI	1760	4
2369	NORTHWEST AUTOMOTIVE TECHNICAL	15143	NE 90 STREET	98052	2068852886	AUTO REPAIR	7538	LENIK, WAYNE	LI	2500	2
2285	AUTO TECH OF REDMOND	16311	REDMOND WAY	98052	2068852146	AUTOMOTIVE SERVICE	7538	BOLLA, KRISRANK	CC8	1600	4
2020	QUEEN CITY AUTO REBUILD, INC.	7502	159 PLACE NE	98052	2068833300	AUTO-BODY REBUILD/REFINISHING	7538	BOURGEOIS, ROBERT J	CC2	4200	11
3700	DANA'S CUSTOM COACHWORKS	7929	159 PLACE NE	98052	2068831323	AUTOMOTIVE CARE/REPAIR	7538	CONNELLY, DANA	CC2	0	1
1397	WASHINGTON DIESEL SERVICE, INC	17611	NE 70 STREET	98052	2068850353	EQUIPMENT REPAIR	7538	CARLSON, BRIAN W	LI	3000	4
4120	WALT'S RADIATOR MUFFLER	2355	NE BEL-RED ROAD	98052	2065629550	AUTOMOTIVE REPAIR	7538	BIRNBAUM, PATRICK	CB	3039	4
1082	REDMOND TRANSMISSION	8537	152 AVENUE NE	98052	2068833131	AUTO TRANSMISSION REPAIR	7538	ROOD, LEO - PRESIDENT	LI	5000	7
1053	REDMOND AUTOMOTIVE	7927	159 PLACE NE	98052	2068854333	AUTOMOBILE REPAIR	7538	MUENZE, WILLIAM D	CC5	4000	3
1049	REDMOND AAA RADIATOR INC	9165	WILLOWS ROAD	98052	2068854165	RADIATOR REPAIR SHOP	7538	SMITH, JAMES L	LI	2049	3
1030	QUIN'S AUTO & TRUCK REPAIR	8040	AVONDALE ROAD	98052	2068853332	AUTO/TRUCK REPAIR	7538	DE VITIS, QUINTO	GC	2600	2
1023	Q-LUBE INC #1109	17015	AVONDALE ROAD	98052	2068820140	AUTO PARTS/SERVICE	7538	COUSENS, LARRY G	CC5	1500	6
997	PROCAR, INC.	17825	NE 65 STREET	98052	2068855706	AUTO REPAIR	7538	URBAN, ROY E JR	LI	5000	5
622	JIM'S AUTOMOTIVE PERFORMANCE,	17825	NE 65 STREET	98052	2068856609	AUTO REPAIR (GENERAL)	7538	MINEO, JAMES E	LI	5400	5
621	JIM'S AUTO CLINIC	13720	NE 81 STREET	98052	2068857066	AUTO REPAIR/SERVICE	7538	MACLIN, JAMES R, JR	R4	636	1
591	IMPORT CAR SPECIALISTS	17825	NE 65 STREET	98052	2068692419	AUTO REPAIR/SERV/IMPORT CARS	7538	PECK, MICHAEL J	LI	2100	5
552	HAYES ROTARY ENGINEERING	9135	WILLOWS ROAD	98052	2068813604	AUTOMOTIVE REPAIRING	7538	HAYES, DENNIS A	LI	4400	5
1541	ADAMS, D E INC	18014	RED-FALL CITY RD #E44	98052	2068675069	AUTOMOTIVE/RV REPAIR	7538	ADAMS, DANIEL E	LI	2700	3
6417	PERFORMANCE AUTOMOTIVE	9175	WILLOWS ROAD	98052	2068820246	AUTO REPAIR/MAINTENANCE	7538	BENNETT, KEVIN	LI	3611	3
7900	WASHINGTON TRUCK & EQUIPMENT	17611	NE 70 STREET	98052	2068850353	HEAVY EQUIPMENT REPAIR	7538	HANCOCK, JOSEPH	LI	3000	1
7838	KELLEY'S TRANSMISSION	16161	CLEVELAND STREET	98052	2068836650	VEHICLE TRANSMISSION REPAIR	7538	BARNABY, ROBERT A	CC1	150	4
7774	EASTSIDE AUTO WORKS	8509	152 AVENUE NE	98052	2060000000	AUTO REPAIR	7538	EASLEY, TOM	LI	5000	2
7537	SAL'S MECHANIC SERVICE	18557	NE 116 STREET	98052	2068838164	MECHANIC SHOP	7538	LOPEZ, SALVADOR		850	1
7350	EUROPEAN CAR AUTHORITY, INC.	9131	WILLOWS ROAD	98052	2068812185	AUTO REPAIR/EUROPEAN CARS	7538	SEATON, KENNETH	LI	1750	3
6991	EXPRESS TUNE	2355	BEL-RED ROAD #100	98052	2066413808	AUTOMOTIVE REPAIR	7538	MARSHALL, REGINALD	CB	1200	4
6900	OFFROAD OUTLET, INC	18014	REDMOND WAY #25	98052	2065589238	RETAIL AUTOMOTIVE ACCESSORIES	7538	WYMAN, KEVIN M	LI	2992	2
6889	DAVIS BROTHERS MOTORSPORTS	15205	NE 90 STREET	98052	2068812824	RETAIL AUTO PARTS/SERVICE	7538	DAVIS, JAMES P	LI	3000	3
6568	T N T 4 BY & AUTO SPECIALTIES	9805	AVONDALE ROAD #245	98052	2065584623	AUTO/SECURITY SERVICES	7538	BENWAY, TIMOTHY	R12		1
3499	IMPORT AUTO TECH	17825	NE 65 STREET #A-165	98052	2068690821	IMPORT AUTO RETAIL	7538	AMBROSE, STEVE	LI	2100	1
6462	BIGFOOT AUTO GLASS	7435	159 PLACE NE #D321	98052	2068857377	REPAIR/REPLACE AUTO GLASS	7538	WHITE, FRANKLIN DEAN	CC5	0	1
8044	REDMOND MOTORSPORT	15205	NE 90 STREET	98052	2068812824	AUTO SALES/REPAIR/ACCESSORIES	7538	TAYLOR, CHARLES	LI	2800	2
6007	BELLEVUE MOTOR WORKS	2040	152 AVENUE NE	98052	2067467141	AUTOMOTIVE REPAIR SHOP	7538	SOTOUDEH, ALI	CB	4100	3
5857	GUARANTEED AUTO REBUILD	17657	REDMOND WAY	98052	2068830919	AUTO BODY/FENDER REPAIR	7538	GRIMM, TERESA CAROL	BP	3200	5
5600	FOREIGN AUTO MECHANICAL	18014	REDMOND WAY #D-34	98052	2068698324	AUTO REPAIR	7538	BEAN, BRAD	LI	2980	3
4826	WILLOWS ROAD AUTOMOTIVE	9175	WILLOWS ROAD	98052	2068820246	AUTO REPAIR SHOP	7538	SPEARS, PAUL STEVEN	LI		3
4808	ALLSTAR TRUCK REPAIR INC.	7927	159 PLACE NE	98052	2068813662	TRUCK REPAIR	7538	BAKAMUS, J A	CC2	4000	3
4663	MOTORSPORT DISTRIBUTING	15205	NE 90 STREET	98052	2068812824	AUTO REPAIR/ACCESSORIES/SALES	7538	SPENCER, BILL	LI	3000	3
4660	LAMMERS ENGINEERING, INC.	18080	NE 68 STREET #D130	98052	2068618571	ASSEMBLING KIT CARS	7538	LAMMERS, JAY	LI	2500	6
4525	OLYMPIC AUTO CENTER, LTD.	15212	BEL-RED ROAD	98052	2060000000	AUTO SERVICE/SALES	7538	SIMIROTIS, ANGELO	CB	2600	2
4283	BELLEVUE MOTOR WORKS, INC.	2040	152 AVENUE NE	98052	2067467141	AUTOMOTIVE REPAIR SHOP	7538	KHOSRAW, G YAHYA	CB	4100	2
4258	GERMAN AUTO TECH	9131	WILLOWS ROAD	98052	2068812185	AUTO REPAIR	7538	FEDDEMA, WILLEM	LI	1750	2
6551	RABBIT SERVICE CO.	18014	REDMOND WAY #E-48	98052	2060000000	VW AUTOMOTIVE REPAIR	7538	STECHER, TIMOTHY	LI	1445	1
3650	HAIR FX OF REDMOND	15930	REDMOND WAY	98052	2068851539	HAIR SALON	7231	JENSEN, LORI A	CC2	1800	5
4748	REDMOND HAIR & NAILS	16795	REDMOND WAY	98052	2068832970	HAIR/NAILS	7231	HUNG, HOANG	CC8	500	4
2296	ARLENE'S DRY HAIR TRIMS	7971	170 AVENUE NE	98052	2067814447	DRY HAIRCUTTING	7231	HELTON, ARLENE	CC5		1
2340	HAIR AFFAIR	16130	NE 87 STREET	98052	2068831660	BEAUTY SALON/MASSAGE	7231	BARLOW, SHIRLEY	CC2	940	1
2409	TOPPERS	7295	W LK SAMM PKWY NE	98052	2068850495	BEAUTY SALON	7231	PEMSEL, WOLFGANG KURT	CB	0	4
2652	SCRIBNER'S, ROBERT HAIR STUDIO	16150	NE 85 STREET, #213	98052	2068821891	BEAUTY SALON (HAIR STUDIO)	7231	SCRIBNER, ROBERT	CC1	750	2
2729	FACE UP	17207	NE 36 STREET	98052	2068812605	BEAUTY SALON (SKIN CARE ETC)	7231	IVERSON, KATHY JEAN	R4	400	1
2864	SALON CHELSEA	15935	REDMOND WAY	98052	2068834440	HAIR SALON	7231	MERY, BRENDA	CC8	1100	10
2911	LAUTENBACK, CHUCK/HAIR DESIGNS	16267	NE 81 STREET	98052	2068670535	HAIRSTYLING	7231	LAUTENBACH, CHUCK	CC5	0	1
2948	D J'S SERVICE CO.	16133	REDMOND WAY	98052	2068830633	HAIR SALON	7231	JANUS, DANIEL	CC2	570	1
3019	BARBER SHOP, THE	7883	159 PLACE NE	98052	2068817297	BARBER/HAIR STYLIST	7231	JACKSON, JEANNE	CC2	400	1
3058	FAROUCHE SALONS INC	17130	REDMOND WAY	98052	2068838899	HAIR SALON	7231	PASLEY, MICHAEL	CC8	1500	19
3195	SHEAR NAIL DESIGN	7983	LEARY WAY NE	98052	2068695891	BEAUTY SALON	7231	HOLE, CARMEN E	CC8	670	4
2076	ULMER, KRISTINE	16983	REDMOND WAY	98052	2068821617	BEAUTY SALON (HAIR STYLIST)	7231	ULMER, KRISTINE	CC3	225	1

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3541	WEST WIND HAIR SALON	2407	152 AVENUE NE	98052	2066432608	HAIR SALON	7231	BLESSING, GREG	CB	700	3
2075	SALON DE CHERISSA	16983	REDMOND WAY	98052	2068851552	BEAUTY SALON/HAIR CARE	7231	HELFENSTEIN, PETER P	CC3	800	4
3696	ZOSKI, MELISSA	16315	NE 87 STREET	98052	2068839690	MANICURIST	7231	ZOSKE, MELISSA		0	1
3702	HAIR BY NAOMI	16315	NE 87 STREET	98052	2068699629	BEAUTY SALON/HAIR STYLING	7231	SATERO, NAOMI L	CC1	350	2
3714	DERMA CARE INSTITUT	2677	151 PLACE NE #H	98052	2068617409	DISTRIBUTION/BEAUTY SUPPLIES	7231	KASHFIA, MITRA	BP	870	2
3736	ACCIMUS, MICHELLE	16315	NE 87 STREET	98052	2068695194	HAIR SALON	7231	ACCIMUS, MICHELLE	CC1	0	1
3801	ESPECIALLY FOR YOU	15815	NE 83 COURT	98052	2068851849	ESTHETICIAN/MANICURIST SERVICE	7231	BURRIS, FRANKIE J	CC8	0	1
3864	NAILS BY PAM	16545	NE 80 DRIVE	98052	2068691696	MANICURING NAILS	7231	MARTENSON, PAM L	CC4	1100	1
3865	NAILS BY SHELLEY	7877	159 PLACE NE	98052	2068691696	MANICURING NAILS	7231	MAZZAFERRO, SHELLEY KAY	CC2	200	1
4028	KONKLER, DARICE	14431	REDMOND WAY	98052	2068692273	HAIR STYLIST/RETIREMENT CENTER	7231	KONKLER, DARICE	R5	0	1
4126	GRAYSON, BARBARA	16315	NE 87 STREET	98052	2068697988	MANICURIST/ARTIFICIAL NAILS	7231	GRAYSON, BARBARA	CC1	0	1
4181	LIGHT, SHARON R	2956	152 AVENUE NE	98052	2068830495	HAIR SALON	7231	LIGHT, SHARON R	CO	0	1
4273	VICTORIAN PLACE SALON	8336	165 AVENUE NE	98052	2068857850	HAIR SALON	7231	WELLMAN, SHERRY	CC5	900	1
10	ATTRACTIONS HAIR DESIGN	8080	160 AVENUE NE	98052	2068811918	HAIR SALON/COSMETOLOGY	7231	MCJUNKIN, DENISE	CC2	528	4
3242	WRIGHT, SHARI HAIR DESIGN	16315	NE 87 STREET	98052	2068619799	HAIR DESIGNING	7231	WRIGHT, SHARI	CC1	0	1
797	MIRAGE	16517	NE 80 STREET	98052	2068815066	HAIR SALON	7231	ADAMS, KATHY G	CC7	1500	
25	HAIR BY RENE'	13823	NE 74 STREET	98052	2068812332	HAIR SALON	7231	HOWELL, RENE' L	R6	0	1
221	BURKE, LINDA FRANCINE	7875	170 PLACE NE	98052	2068619969	HAIR SALON STYLIST	7231	BURKE, LINDA F	CC5	20	1
279	CHEQUERS HAIR DESIGN	9640	169 AVENUE NE	98052	2068692709	HAIR SALON	7231	KUSMAN, CATHERINE A	R5	200	1
340	CUT-UPS BY TONI	7805	159 PLACE NE	98052	2068831222	BEAUTY SALON (HAIRCUTTING)	7231	TAYLOR, TONI	CC2	800	2
417	ELEGANT AFFAIR	14830	NE 24 STREET	98052	2068834247	BEAUTY SALON/SAUNA/MASSAGE	7231	TAKANO	CB	0	5
535	HAIR BY MARY	7805	159 PLACE NE	98052	2068831222	BEAUTY SALON	7231	LAZICH, MARY	CC2	800	1
536	HAIR FASHIONS	7925	170 AVENUE NE	98052	2068816770	BEAUTY SALON (HAIR SALON)	7231	VEGAS, YVONNE	CC5	450	1
537	HAIR MASTERS	16541	REDMOND WAY	98052	2068822595	BEAUTY SALON	7231	WHITAKER, TOM S	CC8	1500	16
548	HARDIN, TERRY	6702	143 AVENUE NE	98052	2068830872	BEAUTY SALON	7231	HARDIN, TERRY	R6	0	1
553	HEAD SHED	13773	NE 77 PLACE	98052	2068853465	BEAUTY SALON	7231	DOLLEMORE, KAREN	R6	0	1
632	PERMANENT COSMETICS LTD.	6260	139 AVENUE NE #83	98052	2068690408	BEAUTY SALON SERVICES	7231	HINTZE, KARAN M	R12	300	1
692	LE SALON	16267	NE 81 STREET	98052	2068852697	BEAUTY SALON (HAIR)	7231	CHAPMAN, GAIL	CC7	900	1
2161	TEWS, MICHELLE, HAIR SALON	9726	162 AVENUE NE	98052	2068823524	HAIR SALON	7231	TEWS, MICHELLE J	R5	166	1
757	MARY'S PLACE	6305	150 AVENUE NE	98052	2068819786	HAIR SALON	7231	TANNER, MARY LOU	R5	50	1
4843	BERRI, TAMMY	7875	170 PLACE NE	98052	2068619969	NAIL STATION	7231	BERRI, TAMMY	CC5		1
798	RUX, LAURA L	16517	NE 80 STREET	98052	2068815066	HAIR STYLIST	7231	RUX, LAURA L	CC7	60	1
836	NICHOLLS, PENNY	7875	170 PLACE NE	98052	2068821506	HAIR SALON	7231	NICHOLLS, PENNY	CC5	1100	1
950	PATE'S PERFECT SOLUTIONS	8240	133 AVENUE NE	98052	2068690343	MANICURING/PEDICURING/MAKEUP	7231	CALLAHAN, PATRICIA	R4	0	1
981	SALON PORTER'S	8105	164 AVENUE NE	98052	2068817373	BEAUTY SALON (HAIRSTYLING)	7231	PORTER, RANSOM	CC7	1000	7
1043	RAPUNZEL'S HAIR STYLING	17215	AVONDALE WAY NE	98052	2068853971	HAIRSTYLING/CUTTING/MANICURES	7231	PETERSON, DIANE E	CC3	969	12
1188	SHEAR MAGIC	3423	180 AVENUE NE	98052	2068819689	BEAUTY SALON	7231	HEALEY, SUSAN	R4	0	1
1189	SHEARS AT SEARS, #22804	2200	148 AVENUE NE	98052	2068411000	BEAUTY SALON	7231	FLOREK, RANDOLPH	CB	870	13
1305	THOMPSON, LISA	16315	NE 87 STREET	98052	2068831318	HAIR STYLING	7231	THOMPSON, LISA	CC7	400	1
1312	TINA'S HAIR DESIGN	3930	172 AVENUE NE	98052	2068815129	BEAUTICIAN (HAIR STYLE SALON)	7231	CRAIG, TINA B	R4	0	1
1494	LAN'S HAIRCARE	10316	179 AVENUE NE	98052	2068830755	BEAUTY SHOP	7231	NGUYEN, LAN	R5	650	1
1637	PICCHENA, ERIN ALISA	7875	170 PLACE NE	98052	2068619969	BEAUTY SALON OPERATOR	7231	PICCHENA, ERIN ALISA	CC5	0	1
1860	JOHNSON, JULIE	7950	RED-KIRK HIGHWAY	98052	2068854157	BEAUTY SALON (HAIRSTYLIST)	7231	JOHNSON, JULIE L	R30	0	1
740	MAGIC NAILS SALON	16150	NE 85 STREET #101	98052	2068691962	NAIL SALON	7231	MINH, LE VAN	CC1	630	2
7126	KLINE, TROY	7865	LEARY WAY	98052	2068694410	HAIR SALON	7231	KLINE, TROY	CC1	75	1
4349	PRIVATE TIME	2803	177 AVENUE NE	98052	2068833509	MANICURES/PEDICURES/WAXING	7231	HAZARD, THERESA B	R4	300	1
6416	LOLA'S	16723	NE 103 PLACE	98052	2068838118	HAIR SALON	7231	WELTON, LAURA	R6	225	1
6431	LEWIS, DANELA HAIR DESIGN	7987	LEARY WAY	98052	2068695891	HAIRDRESSER	7231	LEWIS, DANELA	CC1	36	1
6502	POOCHAY, DONALD L	14830	NE 24 STREET	98052	2068834247	HAIR STYLING	7231	POOCHAY, DONALD L	CB	48	1
6543	GREAT CLIPS	6810	132 AVENUE NE #E	98052	2068836486	BEAUTY SALON	7231	NICKSON, SHELLEY R	CB	1055	6
6549	BIO AZUR	2188	148 AVENUE NE	98052	2066445857	HAIR SALON/DAY SPA	7231	STOVICEK, VLADISLAVA	CB	2500	3
6619	HAIR DESIGN BY BECKY	16267	NE 81 STREET	98052	2068619339	HAIR SALON SERVICES	7231	JAMESON, ANNETTE	CC4	100	1
6828	TAKANO, SUKI	14830	NE 24 STREET	98052	2064541248	MANICURE/PEDICURE/WAXING	7231	TAKANO, SUKI	CB	48	1
6910	D J'S BEAUTY SALON	2956	152 AVENUE NE	98052	2068830495	BEAUTY SALON	7231	STODDART, DOROTHY J	BP	125	1
6920	CUTTING LOFT, THE	8201	164 AVENUE NE	98052	2068692069	HAIR STYLING SALON	7231	HEADINGTON, CHRISTINA	DD3	800	3
6929	ELEGANT AFFAIR	14830	NE 24 STREET	98052	2068834247	BEAUTY SALON BUSINESS	7231	KEENAN, YURIKO	CB	0	3
7002	FARACA, DEIDRE'	16130	NE 87 STREET	98052	2068831660	COSMETOLOGY	7231	FARACA, DEIDRE' ANA		36	1

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6143	LUSTROUS ILLUSIONS	16564	CLEVELAND STREET	98052	2068851849	NAIL TECHNICIAN/MANICURIST	7231	NOYCE, EVA LOUISE	CC2		1
7117	BOMBAII CUTTERS	7865	LEARY WAY	98052	2068694410	HAIR SALON/BEAUTICIAN	7231	LAMONT, DEBBIE	CC1		2
6027	ATTRACTIONS HAIR & NAIL SALON	8080	160 AVENUE NE	98052	2068811918	HAIR/NAIL SALON	7231	ZAMANI, GUITTY	CC3	1056	6
7173	VALDEZ, LINDA	8080	160 AVENUE NE	98052	2068811918	HAIR SALON STATION	7231	VALDEZ, LINDA	CC3		1
7332	ESTHETICS BY DEBORAH	8080	160 AVENUE NE	98052	2068811918	SKIN CARE PRODUCTS/SERVICES	7231	HOFFMAN, DEBORAH	CC3	600	1
7435	TAMMY NAILS	8163	161 AVENUE NE	98052	2068859147	MANICURING NAILS	7231	TRANG, NGUYEN	CC4	400	2
7605	RAPUNZELS	17215	AVONDALE WAY NE	98052	2068853971	HAIR/NAIL SALON	7231	CLARK, DOROTHY	CC3	900	8
7616	SHEAR NAIL DESIGN	7987	LEARY WAY NE	98052	2068695891	NAIL/COSMETOLOGY SERVICES	7231	SHAFFER, KRISTINE	CC1	795	1
7685	GREAT CLIPS	17051	REDMOND WAY #1500	98052	2068658675	HAIR SALON	7231	BROWNING-LARSEN, ERIC	CC3	1176	8
7802	BUSHWACKERS	7865	LEARY WAY NE	98052	2068213028	HAIR SALON	7231	DECKER, LYNNE	CC1	300	4
7865	HOLE NAIL, THE	11145	156 PLACE NE	98052	2068812140	NAIL SALON	7231	HOLE, CARMEN	R6	120	1
7955	PERFECT TEN, A	7512	135 PLACE NE	98052	0000000000	MANICURES/ACRYLIC NAILS	7231	DELANEY, ERIN	R5	120	1
8109	SCOTT, LESLIE AT MIRAGE	16517	NE 80 STREET	98052	2068672439	STYLE HAIR/SCUPTURE NAILS	7231	SCOTT, LESLIE	CC4	0	1
8135	ZIZI'S SALON	4842	159 AVENUE NE	98052	2068613866	COSMETOLOGY	7231	SHABRAWY, FATMA	R6	500	1
8239	RED NAILS	7828	166 AVENUE NE	98052	2068515882	NAIL CARE SERVICES	7231	NGUYEN, BRYANT	CC1	730	2
7033	TERESA'S NAILS	16702	REDMOND WAY	98052	2068816355	MANICURES/PEDICURES	7231	LE, HIEN THI	CC1	650	1
5701	BOEHME, SALLY	14830	NE 24 STREET	98006	2060000000	BEAUTICIAN	7231	BOEHME, SALLY	CB	48	1
4856	EURO-AMERICAN SKIN CARE	7875	170 PLACE NE	98052	2068619969	COSMETOLOGIST/BEAUTICIAN	7231	SAMSEL, HALINA	CC5	65	1
4939	HENRY, JEAN MARIE	16983	REDMOND WAY	98052	2068851552	COSMETOLOGY	7231	HENRY, JEAN MARIE	CC3	0	1
4966	HANLIN, PAM HAIR DESIGN	16517	NE 80 STREET	98052	2068694939	HAIR TREATMENTS	7231	HANLIN, PAM	CC1	5	1
5000	SONRISE SALON	17009	NE 105 STREET	98052	2068818486	HAIRSTYLING SALON	7231	LUCARELLI, CINDY	R6	200	1
5048	CINDY'S	16133	REDMOND WAY	98052	2068830633	HAIR STYLIST	7231	POLLOCK, CINDY	CC2	100	1
5095	THOMAS, MARIANNE	10909	AVONDALE RD NE #Q166	98052	2068693897	IMAGE CONSULTANT	7231	THOMAS, MARIANNE R	R12		1
5173	FARQUHASON, SUSAN L	10901	176 CIRCLE	98052	2065568160	BEAUTY SALON SERVICE	7231	FARQUHARSON, SUSAN	CC7	0	1
5235	SUPERCUTS	8693	161 AVENUE NE #1	98052	2068853808	HAIR SALON	7231	SAVAGE-MICHEL, SUSAN M	CC1	1150	10
5254	NORMA'S FAMILY HAIRCARE	8010	138 AVENUE NE	98052	2068690856	HAIRSTYLING	7231	MARVIN, NORMA J	R4	462	1
5277	DYNASTY NAILS	2020	148 AVENUE NE	98052	2067477511	MANICURIST	7231	TRA, TRO	CB		1
5354	GREAT CLIPS	15157	NE 24 STREET	98052	2068224653	HAIR CARE	7231	HENDRICKSON, PAUL	CB	1500	4
5370	NAILS BY MARY ANN	16564	CLEVELAND STREET	98052	2068851365	MANICURES/ACRYLIC NAILS	7231	DETORE, MARY ANN		12	1
6342	NAILED BY SANDIE	16564	CLEVELAND STREET	98052	2064885917	ARTIFICIAL NAIL TECHNICIAN	7231	MASTERJOHN, SANDRA L	CC1	0	1
5695	KEENAN, YURIKO	14830	NE 24 STREET	98052	2064541248	BEAUTICIAN	7231	KEENAN, YURIKO	CB	48	1
5831	MAGIC NAILS SALON	8693	161 AVENUE NE #4	98052	2068691962	MANICURES/PEDICURES/FACIALS	7231	VU, TUYET	CC3	960	1
5990	TERESA'S NAILS	16702	REDMOND WAY	98052	2068816355	NAIL SALON	7231	TRAN, TOMMY	CC4	650	1
5983	NISHIOKA, MICHELE	7875	170 PLACE NE	98052	2068619969	MANICURING/SKIN CARE	7231	NISHIOKA, MICHELE	CC6	36	2
5982	MAURICE'S HAIR CARE	7865	LEARY WAY	98052	2068830393	HAIR CARE/MANICURES	7231	SINGER, MAURICE CONRAD	CC1	300	1
5970	BEAUTY SALON AT SEARS #22804	2200	148 AVENUE NE	98052	2068446749	BEAUTY SALON	7231	VIGDAL, DAVID EXEC VP/CAO	CB	1040	5
5935	ANGIE'S TRAVELING HAIR SERVICE	18710	NE 59 COURT #G1052	98052	2065580759	TRAVEL/HOME HAIR STYLING	7231	LYNDE, ANGELA	R30		1
5692	WILKES, ANN C	14830	NE 24 STREET	98052	2068834247	COSMETOLOGY	7231	WILKES, ANN C	CB	48	1
5875	TOP NAILS	16646	REDMOND WAY.	98052	2068695020	NAIL CARE	7231	PHAN, DINH NGOC	CC1	800	4
8275	HOWARD, CHRISTY	18002	NE 30 STREET	98052	2068691053	COSMETOLOGY/HAIR CARE	7231	HOWARD, CHRISTY	R4	0	1
5761	LOGAN, DEBBIE	14830	NE 24 STREET	98052	2068834247	FACIALS/MEDICURES/PEDICURES	7231	LOGAN, DEBBIE	CB	48	1
5754	TOPPERS	7295	W LAKE SAMM PKWY	98052	2068850495	BEAUTY SALON	7231	DY, BENJAMIN	CB	800	4
5743	HAIR FASHIONS	7925	170 AVENUE NE	98052	2068816770	BEAUTY SALON	7231	MORRIS, MARTIN L	CC6	450	2
5710	YAMADA, ROSE	14830	NE 24 STREET	98052	2064541248	HAIR SERVICES	7231	YAMADA, ROSE D	CB	48	1
5702	DANNER, ROSEMARIE	14830	NE 24 STREET	98052	2068834247	COSMETOLOGIST	7231	DANNER, ROSEMARIE	CB	48	1
5904	FINE THINGS	7840	159 PLACE NE #B	98052	2068610138	NAIL SALON & BOUTIQUE	7231	MARKLEY, JEANNE	CC5	434	1
570	HILL'S BARBER SHOP	15924	REDMOND WAY	98052	2068851690	BARBER SHOP	7241	HILL, MICHAEL R	CC2	450	1
1700	DEL'S HAIRCUTTING SERVICE	17208	REDMOND WAY	98052	2068838869	BARBER SHOP	7241	STALWICK, DEL	CC3	300	3
7542	TOSCO REFINING & MARKETING CO.	17809	RED-FALL CITY ROAD	98052	2068859494	GAS STATION/CAR WASH	7542	THOMAS, RAY S	BP	0	12
7245	CONCOURS D'ELEGANCE	10834	RED-WOOD ROAD NE	98052	2067140595	AUTOMOBILE DETAILING	7542	CALKINS, WALLACE	R6	500	1
5551	DETAIL ORIENTED	7045	180 AVENUE NE #19	98052	2062338859	AUTO DETAILING	7542	HENDERSON, RICK L JR	BP		1
5270	KASE CAR DETAILING	16311	REDMOND WAY	98052	2063657263	AUTO DETAILING	7542	HINSON, ABRAHAM	CC8		1
2858	MAGNUS' CLASSIC AUTO DETAIL	14798	NE 95 STREET	98052	2068834545	AUTO DETAILING	7542	ANDERSSON, MAGNUS	LI	1300	2
1613	BROWN BEAR CAR WASH	15248	BEL-RED ROAD	98052	2067893700	CAR WASH/GASOLINE	7542	ODERMAT, VICTOR D	CB	3600	10
1612	BROWN BEAR CAR WASH #5506	17809	REDMOND-FALL CITY RD	98052	2067893700	STORE (CONV)/GAS/CAR WASH	7542	ODERMAT, VICTOR D	BP	1560	7
1052	REDMOND AUTO DETAIL	18014	REDMOND WAY #E-3	98052	2068850661	AUTO DETAIL	7542	CAMPBELL, KENNETH P	LI	300	4
5921	N C F COMMUNICATIONS	4168	148 AVENUE NE	98052	2068824741	COMMUNICATIONS	3661	WHITE, STEPHEN C	BP	1100	8

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BusLic	BusName	HouseNum	Street	Zip	PhoneNum	BusDescr	SicCode	OwnerRep	Zone	SqFt	NoEmp
1897	LINC TECHNOLOGY CORPORATION	2635	151 PLACE NE	98052	2068822206	ELECTRONICS ASSEMBLY/MARKETING	3661	MAES, MICHEL E	LI	750	10
999	PROCTOR & ASSOCIATES COMPANY	15050	NE 36 STREET	98052	2068817000	TELEPHONE SYSTEM COMPONENTS	3661	PROCTOR, D F	BP	20000	46
998	PROCTOR & ASSOCIATES COMPANY	14915	NE 40 STREET	98052	2068817000	TELEPHONE ELECTRONIC EQUIPMENT	3661	PROCTOR, D F	BP	15020	8
359	DEES COMMUNICATION	4130	148 AVENUE NE	98052	2068691963	TELECOMMUNICATION SALES	3661	STURDY, MORGAN PETER W	BP	2100	5
4813	RADIO SPECTRUM LABS, INC.	16541	REDMOND WAY #357	98052	2068827867	COMMUNICATIONS EQUIPMENT	3663	ROBINSON, LARRY J	CC8	200	1
4000	AMATEUR RADIO ENGINEERING INC	16650	NE 79 STREET #103	98052	2068822837	MFG AMATEUR RADIO ACCESSORIES	3663	EVERETT, WILLIAM	CC7	300	3
2532	TRANS WEST COMMUNICATION	6742	185 AVENUE NE #3-300	98052	2068823140	TELEPHONE EQUIPMENT VENDOR	3663	D'AMICO, J T	LI	2500	7
1461	ZETRON, INC.	12034	134 COURT NE	98052	2068206363	RADIO/TELECOMMUNICATIONS MFG	3663	ZEUTSCHEL, MILTON F	BP	200000	278
4926	G PRIME ENGINEERING	9733	163 PLACE NE	98052	2068813041	ENGINEERING ALARMS/GALLERIES	3669	GIBBONS, RONALD R	R5	100	2
2094	SEATTLE TELECOM & DATA, INC.	18005	NE 68 STREET #A115	98052	2068838440	COMPUTER MFG/IBM COMPATIBLE	3669	DE CARO, JOSEPH J	LI	6000	4
1182	SETCON TECHNOLOGIES, INC.	17371	NE 67 COURT	98052	2068850205	ELECTRON MFG/TRAFFIC CONTROL	3669	HART, R A	LI	2000	8
6035	SCALZO, ROBERT INC	22506	NE 46 STREET	98053	2068857134	CONSTRUCTION	5211	SCALZO, PAUL G		0	4
3968	ROCKBESTOS COMPANY, THE	16425	NE 44 WAY	98052	2068855168	SALESMAN/ROCKBESTOS COMPANY	5211	JONES, HOWARD	R4	0	1
3963	SAM'S RETAIL YARD	18814	NE 80 STREET	98052	2068684500	RETAIL SAND/GRAVEL	5211	STONE, SAMUEL R	BP	0	2
3501	K S T HOLDINGS INC.	16917	NE 100 STREET	98052	2068618382	TELEMARKETING	5211	WATSON, SUSAN	LI	200	1
1998	PELLA WINDOW STORE, THE	15230	NE 24 STREET #Q	98052	2065629350	WINDOWS/DOORS/SUNROOMS	5211	BANKS, RICHARD A	CB	1500	3
1250	STONEWAY ROOFING SUPPLY, INC.	9001	151 AVENUE NE	98052	2068610100	ROOFING MATERIALS DISTRIBUTOR	5211	SANDERS, CATHY	LI	9600	6
985	PRECISION GARAGE DOOR	14790	NE 95 STREET	98052	2068857638	GARAGE DOOR INSTALL/SERVICE	5211	STOCKDILL, RICHARD	LI	1400	6
719	LUMBERMEN'S OF REDMOND	17875	REDMOND WAY	98052	2068830788	LUMBER/BUILDING SUPPLY/RETAIL	5211	LEISI, WARREN E	BP	29000	40
510	GOSSARD LUMBER AND HARDWARE	16131	CLEVELAND STREET	98052	2068854242	LUMBER/HARDWARE, RETAIL	5211	GOSSARD, C E	CC2	6000	13
6785	BALANCE WITHIN, INC	8107	161 AVENUE NE	98052	2068616843	FITNESS/CONDITIONING STUDIO	7997	HU, GAIL E	CC3	1350	5
6578	AMERICAN HEALTH & FITNESS	7370	170 AVENUE NE	98052	2068821700	HEALTH CLUB	7997	MICHAEL, JOHN J	CC3		10
4832	AMATEUR BOWLERS TOUR	7975	LEARY WAY	98052	2068832695	BOWLING TOURNAMENT OFFICE	7997	CRAMER, JAMES FREDERICK	CC8	300	0
5100	REDMOND CLEANERS, INC.	7981	LEARY WAY	98052	2068854151	DRY CLEANER	7216	ENG, CHRIS	CC8	0	5
891	OVERLAKE CLEANERS	15129	NE 24 STREET	98052	2067467070	DRY CLEANERS	7216	LEE, DAVID J	CB	1400	2
892	OVERLAKE CLEANERS	16940	NE 79 STREET	98052	2067467070	DRYCLEAN PICKUP/TUXEDO RENTAL	7216	LEE, DAVID J	CC5		3
1259	SUN CLEANERS, INC.	15230	NE 24 STREET #P	98052	2066438499	DRY CLEANING	7216	ASHRAFI, MEHDI	CB	1450	3
2308	CLEANING CENTER OF REDMOND THE	15796	REDMOND WAY	98052	2068852254	DRY CLEANING	7216	HARRIS, BOYCE R	CC2	1500	15
2802	DIRK'S FINE DRYCLEANING	8460	164 AVENUE NE	98052	2068691365	DRYCLEANING	7216	BAKKER, DIRK	CC7	2107	2
576	HOLLYWOOD CLEANERS	14820	NE 24 STREET	98052	2068851508	CLEANERS/CLOTHING	7216	CHA, SIMON	CB	1600	1
4001	ECHO CLEANERS	8084	160 AVENUE NE	98052	2068817960	DRYCLEANER	7216	HONG, CHONG AH	CC2	2700	2
7883	FAMILY CLEANERS	7293	W LK SAMM PKWY NE	98052	2063491694	DRY CLEANING	7216	CHUN, SOK KUN	CB	1200	2
5273	FAMILY DRY CLEANERS	7293	W LAKE SAMM PKWY NE	98052	2068815418	CLEANERS/CLOTHING	7216	KIM, JOHN C	CB	1600	4
6504	BELLA CLEANERS	8867	161 AVENUE NE #B	98052	2068839029	DRY CLEANING	7216	PHILLIPS, SCOTT C	CC3	2000	3
6520	MICHAEL'S FINE DRY CLEANING	13200	OLD REDMOND ROAD #105	98052	2068817666	DRY CLEANING	7216	YI, SANG HONG	CBC	1400	1
7064	PLAZA CLEANERS	16150	NE 85 STREET #106	98052	2068873186	DRY CLEANING/ALTERATIONS	7216	HONG, MINA	CC4	600	1
7276	OVERLAKE CLEANERS	15129	24 AVENUE NE	98052	2067467070	DRY CLEANING	7216	LEE, DAVID	CB	0	5
7603	ECHO DRY CLEANERS	8084	160 AVENUE NE	98052	2068830209	DRY CLEANING	7216	MO, SANG BIN	CC3	1500	2
3980	CLASSIC CLEANERS	6253	E LAKE SAMMAMISH PARK	98052	2060000000	DRY CLEANING/ESPRESSO	7216	CHONG, KIM	BP	1200	5
5953	RAINIER WELDING, INC.	19020	NE 84 STREET	98052	2068681300	FABRICATION SHOP	3441	FORSTER, MARY K	HI	0	16
5532	SEATTLE SPIRAL	8503A	152 AVENUE NE	98052	2068850842	DISPLAY FIXTURE MANUFACTURER	3443	BRUNT, JOHN J	BP	600	2
4634	R.L.D. SHEETMETAL, INC.	15370	NE 96 PLACE	98052	2068617249	SHEETMETAL/ROOFING MFG	3444	DILL, ROBERT L	LI	0	4
853	NORTHWEST MANUFACTURING, INC.	15120	NE 92 STREET	98052	2068833700	SHEET METAL MFG/JOB SHOP	3444	BROWN, A	LI	65500	145
1804	GREEN FUNERAL HOME	16551	NE 79 STREET	98052	2068851529	FUNERAL SERVICE	7261	GREEN, H MICHAEL	CC8	2000	2
7968	EXQUISITE PAINTED FINISHES	10130	178 AVENUE NE	98052	2068822715	REFINISHING/PAINTING FURNITURE	7641	GAWENKA, PATRICIA	R5	0	1
6033	HEROLD, JOHN UPHOLSTERY	7881	159 PLACE NE	98052	2068610251	UPHOLSTERY	7641	HEROLD, JOHN W	CC5	1500	2
4396	MARYMOOR FURNITURE REFINISHING	17725	NE 65 STREET #A-115	98052	2068679073	REFINISH/RESTORE FURNITURE	7641	MATTHEWS, EDWARD	LI	1200	2
1492	K AND M ENTERPRISES	2027	184 AVENUE NE	98052	2066436804	UPHOLSTERY/SEWING	7641	THOMPSON, KRISTI M	R3	400	2
8388	REDMOND GAS MART	16757	REDMOND WAY	98052		GAS/CONVENIENCE STORE	5541	CHATTHA, BASHARAT	CC1	0	2
7999	REDMOND COUNTRY STORE	7725	159 PLACE NE	98052	2068814295	GAS/CONVENIENCE STORE	5541	CHATTHA, BASHARAT	CC5	3200	2
6565	A M / P M MINI-MARKET #5455	9015	WILLOWS ROAD NE	98052	3104201291	CONVENIENCE STORE/GASOLINE	5541	ONWOCHEI, BEN	BP	2500	11
6102	PREMIUM TUNE N' LUBE, INC.	16311	REDMOND WAY	98052	2068617300	AUTO SERVICES	5541	LAWSON, BRIAN	CC1	1500	2
5529	REDMOND'S BP	16909	REDMOND WAY	98052	2068675797	SERVICE STATION	5541	SPEARS, PAUL STEVEN	CC3	4800	5
1403	GARY'S CHEVRON SERVICE	16760	REDMOND WAY	98052	2068851675	SERVICE STATION	5541	MILLER, G	CC8	1000	7
1310	TIME OIL COMPANY	7725	159 PLACE NE	98052	2062852400	CONVENIENCE STORE/GASOLINE	5541	ROGAINIS, I J	CC2	1430	0
1050	REDMOND ARCO #6067	8009	164 AVENUE NE	98052	2068851195	SERVICE STATION	5541	NOWAK, JEFF	CC7	3000	8
616	TIME OIL COMPANY	16757	REDMOND WAY	98052	2062852400	SERVICE STATION	5541	ROGAINIS, I	CC8	300	2

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163	BARNABY'S, BOB SERVICE, INC.	16000	REDMOND WAY	98052	2068859135	SERVICE STATION	5541	BARNABY, ROBERT A	CC2	600	6
1753	ERNST HOME CENTER INC. #241	17170	REDMOND WAY	98052	2068837788	HARDWARE/ELECTRICAL/RETAIL	5251	SMITH, HAL L	CC3	44324	32
5578	NORTHWEST FLOOR DESIGN INC.	4176	148 AVENUE NE	98052-51	2068824961	FLOORCOVERING SALES	5713	GARDNER, GARY EDWARD	BP	780	1
1636	CARPET REMNANT OUTLET	7805	LEARY WAY, #C	98052	2068853734	FLOORCOVERING SALES	5713	LONG, JACK M			2
1058	REDMOND CARPET AND INTERIORS	7680	159 PLACE NE	98052	2068816964	FLOORING COVERINGS	5713	HUGHES, JOHN R	CC5	8000	5
423	EMERALD CITY PROJECTS CORP.	15042	NE 40 STREET #201	98052	2068838212	FLOOR COVERING/TILE/MARBLE	5713	EL-SHARAWY, SALAM	BP	1000	4
4889	PHOENIX LIMOUSINE SERVICE	9200	RED-WOOD RD #D134	98052	2068816123	LIMOUSINE SERVICE	4119	KIRK, RICHARD J	R30		1
6993	PROTO DESIGN, INC. TOOLING	17824	NE 65 STREET	98052	2065580600	CNC MACHINE SHOP	3544	BLECHSCHMIDT, WOLF	LI	8316	19
2709	PARAGON DESIGN GROUP	14624	NE 95 STREET	98052	0000000000	LIGHT MFG/COMPOSITE TOOLING	3544	WING, RICK D	LI	3500	3
4858	FABRICATION CONCEPTS	6479	137 AVENUE NE #366	98052	2068834004	MFG PRODUCTION TOOLING	3545	ROBLES, CHARLIE	R12	1400	1
1884	LAKE GOODWIN SCALE CO., INC.	14752	NE 95 STREET	98052-25	2068695200	SCALES/ELECTRONIC/MFG/DISTRIB	3545	BLENCH, CARL	LI	3000	1
861	NORTHWESTERN PRECISION TOOL	7434	159 PLACE NE	98052	2068817088	TOOL & DIE SHOP	3545	O'KEEFE, JACK STUART	CC6	1440	1
3979	AVIATION AIRTOOLS	18100	NE 95 STREET #KK1050	98052	2068617517	REBUILD AIRPLANE TOOLS/RESALE	3546	GREGSON, MARLENE	R30	600	3
7777	HYDRAULIC COMPONENTS CO. INC	15000	NE 90 STREET	98052	2067470927	HYDRAULIC EQUIPMENT DISTRIB	3599	HILL, WILLIAM	LI	6400	7
5560	C N A MANUFACTURING SYSTEMS	18103	NE 68 STREET #C100	98052	2068614065	ENGINEERING CONSULTING SERVICE	3599	SMITH, HAROLD H JR	LI	8173	38
3709	4-D PRECISION MFG., INC.	14676	NE 95 STREET	98052	2068695377	PRECISION MACHINE SHOP	3599	SLOTA, MICHAEL	LI	1900	10
2446	MACRO TECHNOLOGIES, INC.,	15500	NE 90 STREET	98052	2068854688	MACHINE SHOP/MFG	3599	KONISHI, HOWARD	LI	0	30
2182	U.H.C., INC.	9640	153 AVENUE NE	98052	2068850564	MACHINE SHOP/TOOL AND DIE	3599	HOLLER, KLAUS	LI	7440	4
1108	RIGHT WAY TOOL, INC.	14848	NE 31 CIRCLE	98052	2068837363	MACHINE SHOP	3599	ARGUELLES	BP	2000	8
960	PETERSEN PRECISION ENGINEERING	17642	NE 65 STREET	98052-35	2068208743	MACHINE SHOP/CNC	3599	PETERSEN, LEONARD	LI	6865	2
731	M L INDUSTRIES, INC.	6975	176 AVENUE NE #310	98052	2068698357	TOOLING & MACHINING	3599	SANBORN, MIKE	LI	1500	3
191	BJORKLUND MACHINE & TOOL CO	4640	148 AVENUE NE	98052	2068815824	MACHINE STOP	3599	BJORKLUND, MARVIN E	BP	5200	7
4473	FRESA BIOMEDICAL LABORATORIES,	2239	152 AVENUE NE	98052	2066442460	MEDICAL DIAGNOSTICS LABORATORY	8071	LAHAYE, PETER G	CB	3650	4
4462	BIOCONSULTANTS, INC.	2897	152 AVENUE NE	98052	2068694224	RESEARCH LAB	8071	RATHE, CHRIS	BP	3500	3
1733	NATIONAL HEALTH LABORATORIES	15305	NE 40 STREET	98052	2068823400	MEDICAL LABORATORY	8071	MEDAWAR, AMIR	BP	44000	230
567	HIEMSTRA, S MD	2103	152 AVENUE NE	98052	2067462400	MEDICAL PRACTICE	8071	HIEMSTRA, S MD	CB	5250	4
220	BURK, GARY L	16455	NE 85 STREET #103	98052	2068837726	DENTAL LAB	8071	BURK, GARY LEE	CC7	400	1
6101	VUTRONICS REPAIR	7893	151 AVENUE NE	98052-42	2068823476	ELECTRONICS/TV-VCR REPAIR	7622	VU, BINHT	R5	1000	1
188	BIGFOOT STEREO	8135	161 AVENUE NE	98052	2068610706	TV SERVICE/REPAIR	7622	POLZIN, TIM	CC2	400	1
3333	A B C TV & VIDEO REPAIR	21045	NOVELTY HILL ROAD	98053	2068682815	TV/VCR REPAIR	7622	DEMCZUK, ALEKSANDER		0	1
5590	POLAR TECH REFRIGERATION	14233	NE 73 STREET	98052	2068816028	REFRIGERATION TRANSPORT	7623	PRESSES, WILLIAM D	R5	0	1
5260	J L COMPACT DISC REPAIR	9304	168 PLACE NE	98052	2068679002	COMPACT DISC REPAIR	7629	LEIKAM, JOSH K			1
5075	BELL, F W	4016	148 AVENUE NE	98052-51	2062361426	ELECTRONIC EQUIP CALIB/REPAIR	7629	TRAPP, GARY D	BP	2378	5
4948	REDMOND ELECTRONICS REPAIR	7989	GILMAN	98052	2060000000	ELECTRONICS REPAIR	7629	STATON, MICHAEL	CC8	1900	4
4835	AMERICAN RENTALS & SALES	16005	REDMOND WAY	98052	2068697000	APPLIANCE/TV SALES/RENTALS	7629	HABENICHT, BRAD P	CC2	1750	2
4820	T & M ENTERPRISES	17325	NE 85 PLACE IIC-205	98052	2068696766	ELECTRONIC EQUIP/RESELLER	7629	SWEENEY, THOMAS R	R12	60	1
3934	EASTSIDE MECHANICAL SERVICE	14309	NE 77 STREET	98052	2068821156	APPLIANCE SERVICE/REPAIR	7629	DRAKE, MARC LEE	R5	400	1
3448	SEARS PRODUCT SERVICES	12310	134 COURT NE	98052	2068206368	RETAIL PARTS/SERVICE	7629	DOROTHY, M	BP	5500	4
5261	GENERAL REPAIR	9805	AVONDALE #118	98052	2068837771	ELECTRONICS REPAIR	7629	MITCHELL, WILLIE	R30		1
2983	NOVADYNE COMPUTER SYSTEMS, INC	14926	NE 31 CIRCLE	98052	7147984121	SERVICE/COMPUTER EQUIPMENT	7629	GEPNER, JENNIFER	BP	2253	4
4341	LASERFIX, INC.	15074	NE 40 STREET	98052	2068820676	LASER SERVICE	7629	BARNETT, PAUL	BP	700	3
1881	LAB PERFORMANCE SPECIALISTS,	15531	NE 90 STREET	98052	2068823670	INSTRUMENT REPAIR/ELECTRONIC	7629	MAJERLE, EDWARD J	LI	2100	2
1825	HIGHLANDER BUSINESS PRODUCTS	604	228 AVENUE NE	98053	2068688064	COMPUTER OFFICE PRODUCTS	7629	SOBOL, CHRISTOPHER		0	1
1527	TOY-SERVICES	6305	143 AVENUE NE	98052	2068833489	TOY REPAIRS/SERVICE	7629	SOHN, JOHNNY	R6	100	1
1453	XTEK CORPORATION	14824	NE 31 CIRCLE	98052	2068856969	ELECTRONICS REPAIR	7629	GOOBIE, NORM	BP	0	10
1171	SEARS PARTS & SERVICE CENTER	2803	152 AVENUE NE	98052	2068831101	APPLIANCE PARTS/SERVICE	7629	COLE, M D	BP	0	12
872	OFFICE SYSTEMS SERVICE CENTER	17403	NE 45 STREET #159	98052	2068837038	OFFICE EQUIPMENT/SALES-SERVICE	7629	HASELFELD, NEIL E	R20	0	1
635	KEITH'S APPLIANCE REPAIR	16629	NE 107 STREET	98052	2068855256	APPLIANCE REPAIR	7629	GIER, KEITH T	R4	100	1
309	COMPUTER TECHNICAL SERVICES	3916	150 AVENUE NE	98052	2068699595	COMPUTER HARDWARE	7629	GOLDSTEIN, STEVE	BP	1000	3
3056	ALLWEST ELECTRONICS & SUPPLIES	4068	148 AVENUE NE #M	98052	2068698587	ELECTRONIC REPAIR SERVICE	7629	WINNIE, DAVID M	BP	2400	5
6803	VOLTMASTERS	10919	159 AVENUE NE	98052	2068856715	ELECTRONIC REPAIR	7629	BOSS, GREGORY A	R6	35	2
5804	PRESTIGE PRODUCTS INC	4306	156 AVENUE NE #00-144	98052	2069300100	TANNING EQUIPMENT SALES	7629	CLIFFORD, KURTIS NELSON	R30	200	2
5539	TELEPHONE TECHNICAL SERVICES	2731	152 AVENUE NE	98052-55	2068821500	TELECOMMUNICATIONS SERVICE	7629	BARBER, MICHAEL	CB	1200	5
2165	TIMEZONE, INC.	2200	148 AVENUE NE	98052	2066303985	WATCH REPAIR	7631	SCHAUER, RICHARD	CB	80	3
6344	WATCH REPAIR ETC.	2176	148 AVENUE NE	98052	2067471211	RETAIL/WATCH REPAIR	7631	BALDA, SHERRIE A	CB	500	2
4396	MARYMOOR FURNITURE REFINISHING	17725	NE 65 STREET #A-115	98052	2068679073	REFINISH/RESTORE FURNITURE	7641	MATTHEWS, EDWARD	LI	1200	2
1492	K AND M ENTERPRISES	2027	184 AVENUE NE	98052	2066436804	UPHOLSTERY/SEWING	7641	THOMPSON, KRISTI M	R3	400	2

CITY OF REDMOND BUSINESS LICENSE DATABASE ENTRIES WITH SELECTED SIC CODES

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BusLic	BusName	HouseNum	Street	Zip	PhoneNum	BusDescr	SicCode	OwnerRep	Zone	SqFt	NoEmp
7968	EXQUISITE PAINTED FINISHES	10130	176 AVENUE NE	98052	2068822715	REFINISHING/PAINTING FURNITURE	7641	GAWENKA, PATRICIA	R5	0	1
6033	HEROLD, JOHN UPHOLSTERY	7881	159 PLACE NE	98052	2068610251	UPHOLSTERY	7641	HEROLD, JOHN W	CC5	1500	2
5380	DUDLEY, L K SERVICES	3602	E LK SAMM PKWY NE	98053	2068686598	WELDING	7692	DUDLEY, KENNETH		250	1
3342	EAST SIDE WELDING	18014	REDMOND WAY D38	98052	2068619024	WELDING	7692	BEAUDETTE, FRED	LI	1275	1
157	B.C. MACHINING	14576	NE 95 STREET	98052	2068618335	PARTS MACHINING	7692	CLEMANS, WILLIAM A	LI	2100	3
5490	BASEMENT TOYS	7112	134 AVENUE NE	98052	2068855113	GUN SMITHING/SALES	7699	LINDGREEN, RONALD E	R6	140	1
1093	RELIABLE SAW SHOP	16167	CLEVELAND STREET	98052	2068833234	TOOLS REPAIR/SHARPENING	7699	RHOADES, WILLIAM J	CC8	800	4
1054	REDMOND BLACKSMITH SHOP	7903	170 PLACE NE	98052	2068851869	REPAIR	7699	ASKEW, BEN/GERALD	CC5	400	1
1267	SUPERIOR OFFSET SPECIALISTS,	14730	NE 95 STREET	98052	2068821032	PRINTING EQUIPMENT/SALES/SERV	7699	PAULSEN, DALE	LI	1000	2
7005	NORTHWEST JIG GRINDING COMPANY	6855	176 AVENUE NE #255	98052	2065582072	JIG GRINDING	7699	PARKER, JOHN A	LI	1500	2
802	MISTER FIXIT	7809	146 AVENUE NE	98052	2068853589	WEAPONS REPAIR/HANDYMAN	7699	LIPSON, MARK R	R5	240	1
786	MICROLAB NORTHWEST	7609	140 PLACE NE	98052	2068859419	MICROSCOPE ACCESSORIES/SALES	7699	CRUTCHER, E R	R5	1800	1
6618	C L S CLEANING AND LAUNDRY	6615	146 AVENUE NE	98052-46	2068679765	REPAIR LAUNDRY/CLEANING EQUIP	7699	SHAFFER, DAVID A	R5	200	1
880	OMEGA MEDICAL MECHTRONICS	14854	NE 31 CIRCLE	98052	2068815420	MEDICAL EQUIPMENT/SERVICE	7699	DAY, J MARIUS	BP	1074	3
714	LOCKWORKS INC.	16510	REDMOND WAY	98052	2068834767	ALARMS/LOCKS/SAFES	7699	BOSTON, BILL	CC8	1400	6
7519	PRECISION IMPELLER & MARINE	6848	180 AVENUE NE	98052	0000000000	IMPELLER REPAIR/SALES	7699	REYES, JOEL	LI	800	2
4395	LODER INSTRUMENT CO. INC.	17725	NE 65 STREET #B260	98052	2068693861	MEDICAL INSTRUMENT DESIGN	7699	LODER, WILLIAM C	LI	2400	5
477	FRAMER VS. FRAMER	17164	REDMOND WAY	98052	2068855987	PICTURE FRAMING	7699	CHESTER, JAMES A	CC3	1200	2
443	EXACT EQUIPMENT CORP.	3962	150 AVENUE NE	98052	2068832497	GROCERY EQUIP SALES/SERVICE	7699	NASH, LOUIS A	BP	1080	3
343	CYLINDER HEAD SERVICE	9123	151 AVENUE NE	98052	2068813020	CYLINDER HEADS/INDUST/REBUILD	7699	WEEKS, ALBERT L	LI	5000	4
7551	TAKE CARE EQUIPMENT REPAIR	18666	REDMOND WAY #H1064	98052	2068362737	EXERCISE EQUIPMENT REPAIR	7699	APPEL, CHRIS	R30	100	1
287	COAST COMPOSITION EQUIPMENT,	16770	NE 79 STREET #104	98052	2068812330	TYPESETTING EQUIP/RECONDITION	7699	SWANSON, ROBERT	BP	858	3
241	R.C.I. INC.	3016	177 AVENUE NE	98052	2068614010	GAS APPLIANCE INSTALLATION	7699	CAHOON, RUSSEL	R4	80	1
7832	D M C MACHINE	14016	NE 62 STREET	98052	2068832958	MACHINE REPAIR	7699	MCKENNEY, DENNIS	R6	0	1
713	LOCK TECH SAFE & LOCK CO.	16144	NE 87 STREET	98052	2068690707	LOCKSMITH/SALES/INSTALL	7699	FROGGET, MIKE	CC7	1150	1
6069	FASTFRAME	16310	NE 85 STREET	98052	2068810896	CUSTOM PICTURE FRAMING	7699	BRADY, WILLIAM N	CC4	750	2
5683	WASHINGTON HYDRAULICS, INC.	17611	NE 70 STREET	98052	2068679299	SERVICE HYDRAULIC EQUIPMENT	7699	DUTY, TODD	LI	500	1
5722	MUELLER, CAROLYN S BS/RPT/CCM	17703	NE 33 STREET	98052-58	2068851950	MEDICAL CONSULTING	7699	MUELLER, CAROLYN S	R4		1
5928	SPORT FIRE	6051	137 AVE NE #347	98052	2068832574	FIREARM SALES/SAFETY TRAINING	7699	DERRICK SUMMERS	R12	900	2
4815	SEATON'S	17207	NE 138 STREET	98052	2068613812	HANDYMAN	7699	SEATON, JAMES J		0	1
4414	ARTBEAT GALLERY & FRAMING	18210	REDMOND WAY	98052	2068614931	PICTURE FRAMING/ART GALLERY	7699	BROWN, STEVEN B	BP	2000	2
6016	BOOTHILL GUNS	10707	165 PLACE NE	98052	2068820375	GUNSMITHING FIREARMS	7699	PALMER, FRED EDWARD	R6		1
3905	S.R. COMPANY	1624	219 PLACE NE	98052	2068687847	GENERAL CONTRACTOR	7699	SMITH, DAVID S		0	4
1627	LA ROCK, C STRING INSTRUMENTS	7873	159 PLACE NE	98052	2068838452	STRING INSTRUM/SALES/REPAIRS	7699	LA ROCK, CLIFFORD E	CC2	640	1
3426	H-D PARTS & MOTOR SERVICE	16241	CLEVELAND STREET #B	98052	2068810751	MOTORCYCLE PARTS/REPAIRS	7699	BRADSHAW, MICHAEL J	CC8	1200	1
6383	GUITAR PERFORMANCE ENGINEERING	9009	AVONDALE ROAD NE H215	98052	2068818437	GUITAR REPAIR	7699	SAVARISE, MARC	R20	200	1
6098	LINCARE INC.	9595	153 AVENUE NE	98052	8135307700	HOME HEALTH/OXYGEN DELIVERY	7699	CRISP, DONALD R	LI	2980	6
6110	B/E AEROSPACE	2653	151 PLACE NE	98052	2068856478	SALES/SERVICE	7699	BYRD, CLAYTON T	CB	1475	8
2550	CRAPO APPLIANCE SERVICE	7440	159 PLACE NE	98052	2068856001	HOME APPLIANCE REPAIR/PARTS	7699	CRAPO, DAVID A	CC5	3600	6
5491	PIANO SHOPPE	16541	REDMOND WAY #124-C	98052	2066549218	PIANO TECHNICIALS	7699	BRAMLETT, SHERI LEE	CC8	600	3
5478	LAZER CONNECTION	8023	145 AVENUE NE	98052	2068859155	RECHARGING LASER CARTRIDGES	7699	COLE, ARTHUR	R20	300	1
5604	ROSSWORKS	13832	NE 66 STREET #596	98052	2068679805	RACKET/COMPUTER SERVICE	7699	ROSS, DEBRA LYNNE	R12	1500	1
1662	COLE KEY CORPORATION	2200	148 AVENUE NE	98052	2066411000	CONCESSION (KEY-RETAIL)	7699		CB	0	5
6375	REDMOND CASH REGISTER	16812	NE 92 STREET	98052-37	2068851846	SERVICING CASH REGISTERS	7699	VIKTORSON, GEORGE	R5	0	1
3560	R G PRO FRAMING	16720	NE 103 PLACE	98052	2068698781	PICTURE FRAMING	7699	GRAY, ROBIN	R6	350	1
5788	SPECIALTY TRANSPORT	6975	176 AVENUE NE	98052	2068698519	FLEET MANAGEMENT/AUTO MFGRS	5012	MEHL, MARTY A	LI	1000	4
5367	AUTO CONNECTOR	14606	NE 65 COURT	98052	2068857523	AUTO MARKETING SERVICE	5012	HUDDLE, WILLIAM R	R5		2
3819	J & L AUTOMOBILES	14930	NE 31 CIRCLE	98052	2068229412	WHOLESALE VEHICLE DISTRIBUTION	5012	JUNKIN, MICHAEL W			1
108	AMERICAN ISUZU MOTORS INC.	8727	148 AVENUE NE	98052	2068810203	AUTOMOBILE DISTRIBUTION	5012	ZAKZASKA, P	LI	8546	18
5344	BELLEVUE ISUZU	15212	BEL-RED ROAD	98052	2067474500	SERVICE/AUTO SALES	5511	MICHELAKIS, SOFIA	CB	2500	11
5153	SWEARINGEN MOTORCAR COMPANY	8935	160 AVENUE NE #A406	98052	2068616382	AUTOMOTIVE RETAIL SALES	5511	SWEARINGEN, STEPHEN	CC4		1
4847	CAR PLACE, INC.	2040	152 AVENUE NE	98052	2067467293	AUTOMOBILE DEALERSHIP	5511	KHOSRAW, GHULAM YAHYA	CB	4000	2
3867	REDMOND AUTO CENTER	7760	159 PLACE NE	98052	2068856707	USED CAR SALES	5521	TARR, VICTOR G	CC2	1728	3
3372	VINTAGE RACING MOTORS, INC	9255	151 AVENUE NE	98052	2068698112	VINTAGE AUTO DEALER	5521	THORSON, THURWOLD	LI	12000	7
1036	R P AUTO SERVICE & SALES	7430	159 PLACE NE	98052	2068811658	SALES/SERVICE USED CARS	5521	PETERSON, ROBERT	CC8	6000	4
83	AERONAUTICAL MARKETING CORP.	3423	260 AVENUE NE	98053	2068689370	AIRCRAFT/COMM/TRADE/LEASE	5599	DOLLENS, JAMES R		0	2
6230	GENERAL NUTRITION CENTER #1023	17246	REDMOND WAY	98052	4122884662	VITAMIN SUPPLEMENTS SALES	5912	WATTS, JUDITH C	CC3	1100	4

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BusLic	BusName	HouseNum	Street	Zip	PhoneNum	BusDescr	SicCode	OwnerRep	Zone	SqFt	NoEmp
4887	PAY LESS DRUG STORES #5199	17220	REDMOND WAY	98052	5036824100	RETAIL DRUG/VARIETY	5912	NELSON, PAT	CC3	21250	34
2477	DOUGLASS DRUG STORE	8301	161 STREET NE #101	98052	2068851980	PHARMACY/DRUG STORE	5912	O'REILLY, PHIL	CC4	812	3
1997	PAY LESS DRUG STORE #5200	14880	NE 24 STREET	98052	2068833110	DRUG/VARIETY STORE	5912	BETASSA, DICK	CB	0	30
1849	INTERLAKE PHARMACY	2103	152 AVENUE NE	98052	2068419400	PHARMACY	5912	SMITH, DEBRA A	CB	750	6
679	LAKESIDE DRUG	15840	REDMOND WAY	98052	2068852323	DRUG STORE	5912	ROSS, ALAN R	CC2	10000	25
2827	ALLIED STEEL FABRICATORS, INC.	4604	148 AVENUE NE	98052	2068619558	WELDING, STRUCT FABRICATION	3312	EXE, MICHAEL	BP	7800	29
3530	KIRKLAND COURIER, INC.	14941	NE 95 STREET	98052	2068614660	NEWSPAPER PUBLISHING	2711	HALEY, THOMAS P	LI	1500	5
4162	SAMMAMISH VALLEY	14941	NE 95 STREET	98052	2068614660	NEWSPAPER PUBLISHING	2711	HOUSE, DREW E	LI	1500	6
5080	C & A COMICS	3241	180 AVENUE NE	98052	2068812366	AUTHOR/PUBLISHER COMIC BOOKS	2721	WIXX, CARMEN	R4		2
4551	A & D PUBLICATIONS CORP.	8577	154 AVENUE NE	98052	2068675024	MAGAZINE PUBLISHING	2721	HEARN, EDWARD	BP	4500	10
3439	ROCKWELL PUBLISHING COMPANY	15305	NE 40 STREET #300	98052	2068812517	PUBLISHING	2731	HAUPT, KATHRYN J	BP	10000	6
3292	TRADE SERVICE CORPORATION	16710	NE 79 STREET #202	98052	2068691464	PUBLISHING BUSINESS INFORM	2731	SIMPSON, JAMES A	CC7	632	4
4389	DATA SOLUTIONS	17710	NE 103 COURT	98052	2068690723	EDIT/PUBLISH/SELL BOOKS	2731	HUANG, JOHN C	R5	210	1
3124	MILLENNIUM PUBLISHING	16117	NE 95 COURT	98052	2068698744	DESKTOP PUBLISHING	2731	COMSTOCK, MELODY	R30	120	1
4591	VENTURE CATALYST, INC.	17525	NE 40 STREET #E-123	98052	2068811670	PUBLISH MUTUAL FUNDS NEWS	2731	MCCANN, BYRON B	R20	72	2
7902	TIMELINE PUBLISHING CO., INC	2613	151 PLACE NE	98052	2062500142	DISTRIBUTE/PUBLISH LEGAL DATA	2731	ACTON, ANN	CB	5758	23
2878	WOLLACK & ASSOCIATES, INC.	8555	154 AVENUE NE	98052	2068852144	EMPLOYMENT TEST PUBLISHER	2731	WOLLACK, STEPHEN	BP	3056	2
2631	HILLTOP PUBLISHING	10806	166 PLACE NE	98052	2068813580	DESKTOP PUBLISHING SERVICE	2731	MACDONALD, BILL	R4	250	2
1932	MEDIC PUBLISHING CO.	14515	NE 91 STREET #7	98052	2068812883	PRINT/BIND PATIENT EDUCATION B	2731	SWANSON, MURRAY A	LI	3950	4
1533	A/D HOLDING COMPANY	8577	154 AVENUE NE	98052	2068675024	PUBLISH FILMS/BOOKS/MAGAZINES	2731	HEARN, ED	BP	7200	1
6628	PROSPERO'S TABLE	7583	OLD REDMOND RD #C307	98052	2068836584	PRODUCTION/COOKBOOKS	2731	COFFARO, JOYCE	R12	300	2
6639	M-ALOU PUBLISHING	7435	159 PLACE NE #G343	98052	2068833562	PUBLISHER/ARTIST	2731	MCCAMBRIDGE, MARY LOU	CC5	80	1
1447	WORD GRAPHICS, INC.	2045	152 AVENUE NE	98052	2066242626	PREPRESS/HIGH RESOLUTION	2731	DECANO, JOHN	CB	2745	7
614	J & J PUBLISHERS	15105	NE 67 PLACE	98052	2068810135	PUBLISHING/SELLING BOOKS	2731	JOHNS, THERESE	R5	0	1
7608	TAWEYA PRODUCTIONS	7829	LEARY WAY NE	98052	2067020622	PUBLISHING/NATURE EDUCATION	2731	GRIFFITH, KIRSTIN	CC1	64	4
7615	HANSSON, THEODORE CO.	14952	NE 31 CIRCLE	98052	2068818084	BUSINESS PUBLICATIONS	2731	HANSSON, THEODORE	BP	1260	4
7662	ZIFF-DAVIS PUBLISHING COMPANY	14921	NE 40 STREET	98052	6173933160	COMPUTER TRAINING MANUAL SALES	2731	CREASON, ANNEMARIE	BP	6400	8
3121	INTERLAKE PRINTING & GRAPHICS	15165	NE 24 STREET	98052	2066430644	PRINTING/GRAPHICS	2732	SCHRAMM, CHRIS	CB	1410	3
3792	RAINBOW FACTORY, THE	2425	178 AVENUE NE	98052-58	2068812457	PUBLISHER/DISTRIBUTOR	2741	FOLGEDALEN, GAIL E	R3	150	1
2925	CONTEXT COMMUNICATIONS	15610	NE 61 COURT	98052	2068832536	PUBLISHING	2741	SEWALL, HEIDI JEAN	R4	0	1
4312	REDMOND COMMUNICATIONS, INC.	2535	152 AVENUE NE #B2	98052	2068823396	COMMUNICATION SERVICES/PUBLISH	2741	PARKER, JEFF	BP	0	2
2861	PUGET SOUND ENVELOPE, INC.	17985	NE 65 STREET	98052	2068692420	IMPRINTING ENVELOPES	2752	OSBORNE, KENT	LI	3715	10
6465	P M C INC	18005	NE 68 STREET #A120	98052	2068819609	COMPUTER GRAPHIC DESIGN	2752	FISHBAIN, MARK	LI	900	1
1725	R K PRINTED PRODUCTS, INC.	14505	NE 91 STREET	98052	2068831919	PRINTING/OFFSET	2752	COOLEY, RUSSELL	LI	900	12
1306	IMPRESS	8250	165 AVENUE NE #101	98052	2068838841	PRINTING/COPYING	2752	HIEGER, MARK	CC5	2000	4
3890	MARSHALL, D T	9145	151 AVENUE	98052	2068692525	COMMERCIAL PRINTING	2752	MARSHALL, D TODD	LI	5460	7
863	NOW IMPRESSIONS, INC.	17985	NE 65 STREET	98052	2068815911	PRINTING FORMS	2752	OSBORNE, KENT F	LI	6136	15
6411	ADCORP	18005	NE 68 AVENUE #A120	98052	2068675744	ADVERTISING/PRINTING	2752	WILSON, LINDA	LI	0	9
602	INTEGRITY PRESS INC.	18396	REDMOND WAY #C	98052	2068671266	PRINTING/OFFSET	2752	SMITH, GREGORY S	LI	2200	4
272	CENTER, INC., THE	18005	NE 68 STREET #A120	98052	2068819220	PRINTING/COPYING	2752	BITTS, MARCIA	LI	13774	26
1802	GRAPHIC SYSTEMS NORTHWEST	8681	154 AVENUE NE	98052	2068831212	PRINTING/TYPESETTING	2752	GERADA, DAVID	BP	9356	23
4424	CLASSIC PRESS	14764	NE 95 STREET	98052	2068338610	PRINTING SERVICES	2752	CLOGSTON, KEN	LI	1800	5
4007	ROCORPA, INC	17725	NE 65 STREET	98052	2068812345	PRINTING/GRAPHICS	2752	REYNOLDS, ROBERT J	LI	4800	4
3479	JENSEN CUSTOM PRINTING INC.	4154	148 AVENUE NE #1-A	98052	2068692993	PRINTING	2752	JENSEN, NELS	BP	960	2
284	CITY PRESS, INC.	18465	NE 68 STREET, #100	98052	2068830001	PRINTING/COMMERCIAL	2752	MEISER, KIRK	LI	6200	21
3307	LABEL MASTERS INC.	17985	NE 65 STREET	98052	2068692422	IMPRINTING LABELS	2752	OSBORNE, KENT F	LI	1855	3
4854	EMERALD CITY LABEL, INC.	14768	NE 95 STREET	98052	2068838801	PRINTING LABELS	2752	SHANLEY, TED	BP	1802	7
5159	TIGER PRESS	16625	REDMOND WAY #M405	98052	2068686128	PRINTING SERVICES	2752	WHITBECK, JERRY	CC8	0	1
70	ACCUMARK	3922	150 AVENUE NE	98052	2068817403	MANUFAC/HOT STAMP/ENGRAVING	2752	BARRAUGH, WM A	BP	600	2
268	CEDAR GRAPHICS, INC.	15030	NE 95 STREET	98052	2068817202	PRINTING	2752	COURSON, ROGER M	LI	3000	4
2096	SECORD PRINTING	9215	151 AVENUE NE	98052	2068832182	PRINTING	2754	SECORD, JAY	LI	9200	6
5787	HERZOG ENVELOPE, INC.	17644	NE 65 STREET	98052	2068696441	ENVELOPE PRINTING WHOLESALE	2754	HERZOG, MELISSA	LI	3000	6
2922	VILLAGE PRESS, THE	9581	153 AVENUE NE #B	98052	2068854329	OFFSET COMMERCIAL PRINTING	2754	SMITH, ERIC R	LI	1000	4
3665	MCKINNEY ENVELOPE	17644	NE 65 STREET	98052	2068696441	PRINTING	2754	TALLEY, BOB E	LI	3300	5
759	MARYMOOR PRESS, INC.	17725	NE 65 STREET #A140	98052	2068812436	PRINT SHOP	2759	COURTMANCH, CINDY	LI	1150	4
1362	V N GRAPHICS INC.	14640	NE 91 STREET	98052	2064545165	PRINTING PLATE TRADE SHOP	2759	NOBLE, HAROLD O	LI	8540	25
1028	QUANTUM GRAPHICS INC	8541	152 AVENUE NE	98052	2068813350	INDUSTRIAL SCREEN PRINTING	2759	WARD, LINDA G	LI	5000	5

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BusLic	BusName	HouseNum	Street	Zip	PhoneNum	BusDescr	SicCode	OwnerRep	Zone	SqFt	NoEmp
6784	PERFECT PRESS INC	14788	NE 95 STREET	98052	2608615629	PRINTING	2759	KONDEL, DAVID	LI	1800	2
1756	PRESS, THE	14914	NE 31 CIRCLE	98052	2068838112	OFFICE SUPPLY & PRINTING	2759	WEBBER, JAY	BP	2500	8
2392	ROBERI GRAPHICS	7841	159 PLACE NE	98052	2068857902	PHOTOGRAPHY & SILKSCREENING	2759	RICHTER, ROGER	CC2	2100	2
2597	PIP PRINTING #858	15230	NE 24 STREET #0	98052	2066441494	PRINTING SERVICE	2759	LEAVITT, JEFFREY	CB	1500	3
6117	ZIPPRO PRESS	8310	154 AVENUE NE	98052	2068819760	PRINTING SERVICES	2759	ZIPPRO, BRYAN WILLIAM	BP	465	4
354	DARWIN INDUSTRIES, USA, INC.	17455	NE 67 COURT #D	98052	2068838030	PRINTING/PAPER PRODUCTS	2782	NIEUWENHUIS, RUDY	LI	15500	20
245	TRIMSEAL USA, INC.	17371	NE 67 COURT #A2	98052	2068871522	PAPER PRODUCTS/PRINTING-MFG	2782	MATTHEWSON, JIM	LI	9500	2
1867	KARLA'S HAND BINDERY	17824	NE 65 STREET	98052	2068838611	BINDERY/BOOKS/FOLDERS	2789	YANTZ, KARLA	LI	8200	8
7028	MILLER'S BINDERY	19020	NE 84 STREET	98052	2064860291	BOOK BINDING	2789	MILLER, TERRY	HI 6	2000	2
4175	EASTSIDE HAND BINDERY	16052	NE 106 STREET	98052	2068855784	BINDERY	2789	STEINER, MIKE	R6	400	2
1726	EAGLE PRINT	2813	152 AVENUE NE	98052	2068839010	PRINTING	2791	TRUESS, WARD J	BP	0	3
2438	ACCENT PRESS	16150	NE 85 STREET, #108	98052	2068821370	PRINTING/TYPESETTING	2791	MACPHAIL, KAREN	CC1	800	2
1826	HILLTOP SHOP, THE	6123	149 COURT NE	98052	2068831304	PRINTED MATERIAL/COMPOSITION	2791	DART, IRWIN	R5	0	1
833	ESTES ENGRAVING INC.	14683	NE 95 STREET	98052	2068822890	PAPER ENGRAVING	2796	ESTES, NOELLA	LI	1800	4
332	CREATIVE COLOR SERVICE CORP.	7495	159 PLACE NE	98052	2068857300	LITHOGRAPHIC REPRODUCTIONS	2796	WINTER, ELMER J	CC2	7300	2
4580	MOBILE CONCEPTS	14826	NE 95 STREET	98052	2068696091	SALES/SERVICE CELLULAR PHONES	4812	ALEXANDER, HEATHER	LI	1250	2
3180	DURACOM	15333	NE 90 STREET	98052	2068834373	TELEPHONE RESELLER	4812	DURAND, JON	BP	1260	8
1718	DUNKIN & BUSH PAINTING, INC.	17301	NE 70 STREET	98052	2068857064	PAINTING CONTRACTOR/INDUSTRIAL	4812	DUNKIN, TOM II	LI	2500	8
2288	LUCENT TECHNOLOGIES, INC	14946	NE 31 CIRCLE	98052	2016447170	TELEPHONE SYSTEMS/SERVICE	4813	POWERS, DENNIS	BP	1260	9
838	NORTH AMERICAN GATEWAY	7981	168 AVENUE NE	98052	2068820880	DATA COMMUNICATION PRODUCTS	4813	SMITH, H CLAYTON	CC7	320	2
2194	VIACOM CABLE	14870	NE 95 STREET	98052	2065268400	CABLE TELEVISION SYSTEM	4841	ROTONDO, JERRY	LI	18500	127
2708	PACER PROPANE	18459	NE 76 STREET	98052	2068834242	PROPANE DISTRIBUTOR	4925	KRAKE, THOMAS	LI	1950	7
269	CEDAR KING LUMBER COMPANY, INC	9150	WILLOWS ROAD	98052	2068831978	CEDAR SIDING	2421	STRANACK, GENE	LI	0	32
1642	CASCADIA MONTESSORI SCHOOL	4239	162 AVENUE NE	98052	2068812885	PRIVATE ELEMENTARY SCHOOL	8211	FRANKLIN, MARILYN	R4	2400	7
1147	SAMMAMISH MONTESSORI SCHOOL	7655	178 PLACE NE	98052	2068833271	DAYCARE/PRESCHOOL	8211	STARLING, JOAN M	GDD	11668	20
6002	ALL PHASE PLUMBING	22845	NE 8 STREET #443	98053	2068684356	PLUMBING CONTRACTOR	1711	STRAND, RANDAL W		144	4
5777	DIGITAL METERING, INC.	8551	154 AVENUE NE	98052	2068850900	SALES/SERVICE METERING EQUIP	1711	DIESSO, DANIEL E	BP	2342	13
5905	NORTH CASCADES HEATING & AIR	16820	NE 106 STREET	98052	2068813949	MECHANICAL CONTRACTOR	1711	FISHBAUGHER, ROBERT E	R6	150	1
4503	EXCEL CONTRACTING	15332	NE 96 PLACE #C1	98052	2068812496	MECHANICAL INSULATION CONTRACT	1711	SHORT, L	LI	1300	3
2187	UNIVERSAL MECHANICAL SERVICE	14734	NE 95 STREET	98052	2068859100	AIR CONDITION/HEATING/VENT	1711	BRANIN, W DUFF	LI	2100	24
2180	TY-WEST ELECTRIC	14588	NE 95 STREET	98052	2068610777	ELECTRICAL CONTRACTOR	1711	SUNDERLAND, RYCK	BP	1850	30
2135	SULLY'S PLUMBING	5607	160 AVENUE NE	98052	2068852388	CONTRACTOR/PLUMBING	1711	SULLIVAN, BILL J	R4	0	1
6548	LANGFORD PLUMBING	21004	NE 115 STREET	98053	2068820361	PLUMBING CONTRACTOR	1711	LANGFORD, FRED F			3
1908	MACDONALD MILLER RESIDENTIAL	18103	NE 68 STREET #C200	98052	2068817920	MECHANICAL CONTRACTORS/HVAC	1711	LOVELY, STEVEN C	LI	12400	58
2400	SHILLER ELECTRIC COMPANY, INC.	14750	NE 95 STREET	98052	2068839199	ELECTRICAL CONTRACTOR	1711	SHILLER, JAMES M	LI	950	6
1773	FOUR WINDS HEATING & AIR	6400	242 AVENUE NE	98053	2068686400	AIR CONDITION/HEAT/VENTILATION	1711	STONEBURNER, BART E		0	5
6169	R L S COMMERCIAL PLUMBING INC	4204	232 AVENUE NE	98053	2068364195	PLUMBING/COMMERCIAL/RESIDENCE	1711	STUDER, ROBERT L			1
1750	ENGEL MECHANICAL INC.	18080	NE 68 STREET #D-160	98052	2068812990	PLUMBING/HVAC FIRE PROTECTION	1711	ENGEL, JERRY	LI	4500	4
6376	RUDY'S PLUMBING	22651	NE INGLEWOOD HILL RD	98053	2068689400	PLUMBING SERVICE	1711	DIAZ, ANDREW R		810	2
6393	HENDERSON ENTERPRISES, INC	15208	NE 110 PLACE	98052	2068672400	INDUSTRIAL VENTILATION	1711	HENDERSON, ROBERT H	R1	216	2
6533	BERG, B C MECH	22936	NE 27 PLACE	98053	2068685654	PLUMBING	1711	BERG, BRIAN C			1
2022	R A C, INC.	17725	NE 65 STREET #B200	98052	2068821001	CONTRACTOR/REFRIG/AIR COND	1711	RUBIN, SAM	LI	1500	5
4958	HUDY PLUMBING & HEATING	18115	NE 113 STREET	98052	2068619848	PLUMBING/HEATING	1711	HUDY, STEPHEN C	R5	120	2
3244	LOSS, HOWARD C CONSTRUCTION	16455	NE 99 STREET	98052	2068853042	CONSTRUCTION/REMODELING	1711	LOSS, HOWARD C	R5	150	1
2934	SYSTEM AIRE	9642	153 AVENUE NE	98052	2068619464	INSTALL HEATING/AIR CONDITION	1711	DONELSON, ERIC	LI	1440	1
4469	DEBOLTE PLUMBING & HEATING,	33705	NE 60 STREET	98052	2064517173	COMMERCIAL PLUMBING	1711	LEIGH, DEANNA		0	4
4483	ALPINE HEATING	14822	NE 95 STREET	98052	2068617473	HEATING CONTRACTOR	1711	BEQUETTE, GARY	LI	1500	1
8320	HIGHLANDER HEATING & COOLING	6015	210 AVENUE NE	98052	2068662971	HVAC INSTALLATION	1711	DUFF, THOMAS E		0	1
4736	RED-WOOD HEATING & COOLING INC	15068	NE 95 STREET	98052	2068810759	HEATING/COOLING SYSTEMS	1711	KORATICH, A MAXINE	LI	4000	12
5627	SAMMAMISH HEATING AND AIR	6104	185 COURT NE #L207	98052	2068819710	HVAC	1711	COOK, PERRY R	LI	200	1
4931	SOLID ROCK HANDYMAN SERVICES	14322	NE 77 STREET	98052	2068617313	HANDYMAN SERVICES	1711	STEIGENGA, GORDON	R5		1
5547	AARON'S FURNACE WORKS	16904	NE 104 COURT	98052	2068618795	HVAC INSTALLATION	1711	PIERCE, SCOTT	R6	0	2
5050	COMFORT HEATING & AIR	15817	NE 90 STREET #E338	98052	2068859597	HEATING/AIR CONDITIONING SERV	1711	STANGLER, MICHAEL D	R20	150	1
5053	ALL PHASE PLUMBING	22845	NE 8 #443	98053	2068687468	PLUMBING CONTRACTOR	1711	STROUD, RANDAL			1
5298	IMPERIAL PLUMBING INC.	14574	NE 95 STREET	98052	2068618058	SUB-CONTRACTOR OF PLUMBING	1711	JOHNSON, BOB	LI		4
5376	RAY'S PLUMBING & HEATING	20528	NE UNION HILL ROAD	98053	2068682032	PLUMBING CONTRACTOR	1711	FLIPPINE, RAY		0	2
5468	KIMAT PLUMBING	23915	NE 43	98052	2068680793	PLUMBING	1711	SORENSON, SHAWN			2

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5488	WASHINGTON WATER MANAGEMENT	6001	140 AVENUE NE #2	98052	2068670928	CONTRACTOR/RETROFIT WATER SYST	1711	GRIFFIN, JIM	R6	117	1
5910	METALCLAD PACIFIC CORPORATION	2793	152 AVENUE NE #7D	98052	2068670609	INSULATION CONTRACTING/SALES	1711	SWEETSER, THOMAS E	BP	2000	4
4807	OVERLAKE SHEET METAL CO.	2647	151 PLACE NE	98052	2068851224	HVAC SALES/SERVICE	1711	NEUBAUER, DARREN	BP	3900	5
8011	CLEAN ENVIRONMENT	9830	164 AVENUE NE	98052	2065560382	HEATING/AIR CONDITIONING	1711	LORETO, MAURICIO	R20	1500	1
7144	RANDY'S QUALITY SPRINKLER	16821	NE 39 COURT #E2015	98052	2068693930	INSTALLING SPRINKLER SYSTEMS	1711	FROMEL, RANDY	PAA	100	1
1248	STICKLER CO., INC., THE	9405	168 PLACE NE	98052	2068856194	PLUMBING REPAIR/SERVICE	1711	STICKLER, JAMES B	R5	400	2
7089	H S SHEET METAL FABRICATION	16025	NE 116 AVENUE	98052	2068612709	SHEET METAL HVAC FABRICATION	1711	SORTEBERG, HOWARD	R1	0	1
7370	PARKWAY SERVICE CO	6000	E LK SAMMAMISH PKY NE	98052	2068618021	HVAC SERVICE/INSTALLATION	1711	BARMORE, R F	R4	150	1
629	K & M PLUMBING AND HEATING	22037	SE 4	98053	2064532347	PLUMBING/HEATING SERVICE	1711	LARSON, K		500	5
7738	AIR CONDITIONING CO, INC	16400	NE 74 STREET	98052	2068548444	MECHANICAL CONTRACTORS/HVAC	1711	AVERSANO, JOHN	CC2	0	3
1507	RAGING RIVER PLUMBING INC.	18398	RED-FALL CITY ROAD	98052	2068684454	PLUMBING CONTRACTOR	1711	PEACEY, ROBERT R	BP	212	7
193	BOB'S HEATING AND AIR	8347	154 AVENUE NE	98052	2067471630	HEATING SYSTEM INSTALLATIONS	1711	RICE, ROBERT G	BP	5500	40
8269	REDCO	4115	169 COURT NE	98052	2068697932	GENERAL CONTRACTOR	1711	CIMBUREK, DAVID E	R4	0	2
6735	PEARCE HEATING AND AIR	21134	NE 78 STREET	98053	2068686328	HVAC	1711	PEARCE, BRIAN K		0	1
4792	KRAUSE HOUSE PAINTING	18316	NE 25 STREET	98052	2068858626	HOUSE PAINTING	1721	KRAUSE, STEVEN D	R3	300	1
87	ALBERTSON PAINTING, INC.	15614	NE 59 WAY	98052	2068834448	CONTRACTOR (PAINTING)	1721	ALBERTSON, DUANE E	R4	0	3
4193	COLOR STRIDE	27253	UNION HILL ROAD	98053	2068853501	PAINTING	1721	BENNETT, CARL		0	1
5327	EASTSIDE BRUSHWORKS, INC.	13618	174 AVENUE NE	98052	2068679267	PAINTING/WALLPAPERING	1721	SHELLEY, SANDY		0	2
5895	A.C. PAINTING	15614	NE 59 WAY	98052	2068857501	PAINTING COMPANY	1721	ALBERTSON, KRAIG LORNE	D8	0	1
2416	VANDERLIP & COMPANY, INC.	15032	NE 95 STREET	98052	2068854110	PAINTING CONTRACTOR	1721	VANDERLIP, FRANK T	LI	4200	7
3900	R. C. PAINTING, INC.	7881	159 PLACE NE	98052	2068692557	PAINTING CONTRACTOR	1721	COWIN, RANDY	CC2	0	4
3822	INGERSOLL PAINTING	8321	172 AVENUE NE	98052-39	2068854739	HOUSE PAINTING	1721	INGERSOLL, TONY	R6	600	1
2368	NORRIS, CHRISTOPHER	21003	NE 17 STREET	98053	2068683032	HOUSE PAINTING	1721	NORRIS, CHRISTOPHER		0	1
7470	PENTIMENTO PAINTING COMPANY	17004	NE 88 STREET	98052	2068822462	PAINTING CONTRACTOR	1721	CARDER, KEVIN	R5	50	1
2419	WALLCOVERING BY MA	3834	175 AVENUE NE #403	98052	2065870935	WALLPAPERING	1721	SON LIET MA	R20	160	2
5926	2+1 PAINTING	15325	REDMOND WAY #H291	98052	2068820284	PAINTING HOMES INSIDE/OUTSIDE	1721	COLLINS, ED AND DENAMARSHEL	R30		2
6893	REDDY PAINTING	15161	NE 84 STREET #197	98052	2068610439	PAINTING/CONSTRUCTION	1721	REDDY, DEVENDRAN	R30		1
6613	NICK'S CUSTOM PAINTING	8360	165 AVENUE NE	98052	2069965156	PAINTING	1721	HARTMAN, NICK	CC6	0	1
6867	HANG UPS	17204	NE 45 STREET #57	98052	2068670420	WALLCOVERING, PAINTING	1721	ZINS, ANDRE VICTOR	R4	0	2
7026	R.C. PAINTING INC.	7835	159 PLACE NE	98052	2068692557	PAINT CONTRACTOR	1721	COWIN, RANDY	CC5	0	8
1735	EASTSOUND SERVICES CORP.	16149	REDMOND WAY #301	98052	2068859036	GEN CONTRACT//PAINT/REMODEL	1721	MCPEAK, WILLIAM	CC2	450	2
1146	HUNTER, ANNETTE	16983	REDMOND WAY	98052	2068821617	BEAUTY SALON (HAIR STYLING)	1731	HUNTER, ANNETTE	CC3	225	1
2606	A & I ELECTRIC	15339	NE 92 STREET	98052	2068850831	ELECTRICAL CONTRACTOR	1731	WHITE, GEORGE	LI	3600	4
709	LINDER ELECTRIC INC	7004	180 AVENUE NE	98052	2068852769	ELECTRICAL CONTRACTOR	1731	LINDER, ROBERT	LI	0	5
4912	ZORKO ELECTRIC, INC.	651	213 PLACE NE	98053	2068681113	ELECTRICAL CONTRACTOR	1731	VANDERWEIDE, SID		0	1
4866	HIGH ENERGY GRAPHICS	14700	NE 95 STREET	98052	2064869048	CONTROL SYSTEM CONSULTATION	1731	KOSTORA, MARK REGINALD	LI		1
1587	BEL-RED ELECTRIC SERVICE, INC.	18390	REDMOND WAY	98052	2068837178	ELECTRICAL CONTRACTOR	1731	EMSLEY, ALLEN D	BP	2000	15
6429	AZTECH ELECTRIC, INC.	18005	NE 68 STREET #A110	98052	2065584221	ELECTRICAL CONTRACTOR	1731	DAHLMAN, ANDREW R	LI	7000	7
5112	RAINBOW ELECTRIC	8730	250 NE	98053	2068680426	ELECTRICAL CONSTRUCTION	1731	HAWLEY, GERALD R		0	1
2806	GENERAL DATACOMM, INC.	2509	152 AVENUE NE #C	98052	2065741116	DATA COMMUNICATION EQUIP SALES	1731	BELSON, ROSS	CB	712	5
2821	T.E.C. ELECTRICAL SERVICE CO.	8441	154 AVENUE NE	98052	2068813247	ELECTRICAL CONTRACTOR	1731	FRANCIS, C DOUGLAS	BP	2410	4
2879	COMMUNICATIONS SPECIALISTS,	18005	NE 68 STREET	98052	2068853100	TELECOMMUNICATIONS EQUIPMENT	1731	WOODRUFF, E H (BETTY)	BP	3120	21
101	ALPINE ELECTRIC, INC.	18211	NE 68 STREET #E-130	98052	2068853553	ELECTRICAL CONTRACTOR	1731	KENAGY, ROBERT	LI	6000	5
6486	WESTECH SERVICE CO.	16915	NE 43 COURT	98052	2069956797	COMMUNICATION/SECURITY SERVICE	1731	FROHM, J PETER	R4	100	1
4355	E.N.C. ELECTRIC, INC	7661	159 PLACE NE	98052	2068697472	ELECTRIC CONTRACTOR	1731	ROBERTS, JOHN H	CC2	400	4
6513	M F S NETWORK TECHNOLOGIES	15323	NE 90 STREET	98052	2068850013	FIBER OPTICS INSTALLATION	1731	WALLACE, MICHAEL	LI	3465	14
3580	DOUBLEDAY ELECTRIC CO INC	8226	196 AVENUE NE	98053	2064539394	ELECTRICAL CONTRACTOR	1731	DAY, TOM		0	1
3648	AMERICAN PLUMBING & ELECTRIC	2795	152 AVENUE NE	98052	2068822987	INSTALL ENERGY CONSERVATION	1731	BALLE, DAVID R	BP	6228	28
1731	EASTSIDE ANGLERS, INC.	72650	W LAKE SAMMAMISH PARK	98052	2068691861	FISHING SUPPLIES/RETAIL	1731	HARRETT, NEAL			2
2675	WARNE ELECTRIC	17525	NE 31 COURT	98052	2066331933	ELECTRICAL CONTRACTOR	1731	WARNE, RICHARD D	R4	144	1
5562	PROGRESSIVE COMMUNICATION	4306	156 AVENUE NE #VV264	98052	2069306448	COMMUNICATION SERVICES	1731	CONNELL, SETH A	R30	120	1
5825	BRISTOL ELECTRIC	6519	144 AVENUE NE	98052	2068850604	ELECTRICAL CONTRACTING	1731	BAEZA, ALFONSO	R5	400	1
5807	NEAT NETWORK	9551	AVONDALE ROAD NE #11	98052	2068675348	TELECOMMUNCATIONS	1731	ALEXANDER, JAMES C	R30		1
5726	SYSTEMS INTEGRATION GROUP, THE	8383	158 AVENUE NE #310	98052	2068856976	ELECTRICAL CONTRACTOR	1731	DEAL, JOHN V	CC4	0	2
8005	R M A LIGHTING, INC.	6912	151 AVENUE NE	98052	2069545558	ELECTRICAL CONTRACTOR	1731	ALLERT, ROBERT M JR	R5	100	2
5837	RESIDENTIAL ELECTRIC	8425	166 AVENUE NE #5	98052	2068838806	ELECTRICAL CONTRACTOR	1731	MONNIN, GUY MICHAEL	CC8	1000	3
7159	PLATEAU ELECTRICAL CONSTRUCTOR	14960	NE 31 CIRCLE	98052-53	2068815127	INDUSTRIAL ELECTRICAL CONST	1731	MARTINEZ, THOMAS	BP	3196	6

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773	MEIER ELECTRIC, INC.	23056	NE 64 STREET	98053	2068684020	CONTRACTOR/ELECTRICAL	1731	MEIER, DON		0	1
5474	R P M SYSTEMS CORP.	17371	NE 67 COURT A-5	98052	2068693901	ELECTRONICS DESIGN	1731	MORAN, RICHARD P		550	3
2417	VERSATEL INC.	4316	162 AVENUE NE	98052	2068859464	TELECOMMUNICATIONS	1731	SMITH, RICHARD T	R4	1500	1
7436	A N M ELECTRIC INC	8709	172 AVENUE NE	98052	2068699380	ELECTRICAL CONTRACTOR	1731	CLARKE, ANDREW	R5	0	2
771	MCRAE THEATRE EQUIPMENT	6975	176 AVENUE NE #360	98052	2068856231	MOTION PICTURE/SOUND EQUIPMENT	1731	MCRAE, ROBERT B	LI	1800	3
6125	EYE ON SECURITY	18100	NE 95 STREET #QQ2082	98052	2068855165	CCTV SALES/SERVICE	1731	DYER, ROBERT THOMAS	R30	400	2
707	LILLY ELECTRIC, INC.	14954	NE 31 CIRCLE	98052	2068699559	CONTRACTOR/ELECTRICAL	1731	BROOME, NORMAN	BP	1200	2
2973	SOMERS MASONRY	13506	OLD REDMOND ROAD	98052	2068853319	MASONRY	1741	SOMERS, KEITH L	R6	0	4
8159	WORDEN MASONRY	19106	NE 103 STREET	98053	2068685445	MASONRY CONSTRUCTION	1741	WORDEN, JAMES R		0	3
1618	BURNHAM INSULATION, INC	4608	148 AVENUE NE	98052	2068812666	CONTRACTOR (INSULATION)	1742	BURNHAM, TERRY	BP	5000	35
414	ELCO NORTHWEST INC.	16151	CLEVELAND STREET	98052	2068818868	DRYWALL CONSTRUCT/WOOD STOVES	1742	ROSSITER, FRED C	CC8	5000	9
4069	SHARI'S INTERIORS	8231	149 WAY NE #130	98052	2068616374	PAINTING/WALLCOVERING/DRYWALL	1742	SHELTON, SHARI	R30	150	1
3750	ENVIRONMENTAL ACOUSTICS INC.	17646	NE 65 STREET	98052	2068696423	ACOUSTICAL CONTRACTING	1742	FAA, DONALD C	LI	4400	10
3668	NORTHWEST TILE & COATINGS	14768	NE 95 STREET	98052	2068833624	DISTRIB/SPECIALTY CONTRACTOR	1743	RATTI, RICHARD C	LI	3400	6
4485	ARIZONA TILE	16425	NE 96 PLACE	98052	2068810883	TILE INSTALLATION	1743	WELLS, CRIS	R5	100	1
3881	DECKS UNIQUE INC.	7911	159 PLACE NE	98052	2068618833	GENERAL CONT/DECKS/REMODELING	1751	CAVNESS, BOB	CC5	600	7
2273	NORTHWEST WOODWORKS INC	14624	NE 95 STREET	98052	2068671702	CONTRACTOR/CABINETRY	1751	MEKEEL, HARRISON G	LI	5295	20
8242	EXCELSIOR KITCHENS LIMITED	16340	NE 83 STREET #F136	98052	2065560343	KITCHEN CABINETS	1751	KASSIMATIS, STEVE	CC4	200	2
7462	WARREN QUALITY CONST INC	20409	NE 116 STREET	98053	2068853968	FINISH CARPENTER CONTRACTOR	1751	WARREN, HOWARD			3
2892	LA POINTIQUE INC.	2829	152 AVENUE NE	98052	2068822645	CUSTOM CABINET MAKING	1751	WONG, THERESA	BP	200	3
5130	EASTLAKE GARAGE DOOR	15510	NE 90 STREET #A201	98052	2068238980	GARAGE DOOR SALES/INSTALL/SERV	1751	ABRAHAM, ANIL	LI	5850	2
5687	G M J CONSTRUCTION	8241	149 WAY NE #134	98052	2068852375	GENERAL CONTRACTOR	1751	JOHANNESSEN, STIG			1
3631	MIGUEL'S CARPET SERVICE	7001	OLD REDMOND ROAD B206	98052	2068618482	CARPET/REPAIR/INSTALLATION	1752	BARAJAS, MIGUEL	R30	0	1
896	OVERLAKE FLOORING	2753	152 AVENUE NE	98052	2068850844	INSTALL/FINISH HARDWOOD FLOORS	1752	LAKE, B F. SR	BP	2076	11
1622	C & H FLOORS	3214	176 COURT NE	98052	2068812478	CARPET INSTALLATION	1752	CROTHERS, ROBERT J	R4	90	2
1345	TUCKER'S TILE, INC.	18320	NE 28 STREET	98052	2068816548	CONTRACTOR/TILE INSTALLATION	1752	STARBUCK, BRUCE D	R3	100	4
469	FLOORCRAFT, INC.	7842	159 PLACE NE	98052	2068854161	FLOORCOVERING/SALES/INSTALL	1752	REED, DUANE	CC2	9000	51
2313	COMMERCIAL INTERIORS, INC.	9840	WILLOWS ROAD NE	98052	2068833304	FURNITURE/WALL/FLOOR COVERING	1752	GILSTRAP, MARK A	BP	4000	10
3965	RAINBOW CARPETS INC.	2508	181 AVENUE NE	98052	2068811762	FLOOR COVERING/CARPET LAYING	1752	MIDDAUGH, BRUCE	R3	400	1
5011	FERGUSON FLOORS	9705	159 PLACE NE	98052	2068827911	CARPET SALES/INSTALLATION	1752	FERGUSON, MARK R	R5	0	2
5015	CARPET SPECIALTIES	21019	NE 33 PLACE	98053	2068680421	CARPET REPAIRS/INSTALLATIONS	1752	ZUBROD, JOHN			1
5342	JOHN'S CARPET SERVICE	8942	REDWOOD ROAD	98052	2062440592	CARPET INSTALLATION	1752	ZUBROD, JOHN	R20		1
4574	LOGAN CARPET SALES	18012	NE 99 STREET	98052	2068690280	CARPET SALES/INSTALLATIONS	1752	LOGAN, PAUL	R4	0	1
5725	CREATIVE NW DEVELOPMENT	15213	NE 90 STREET	98052	2068618803	GENERAL CONTRACTOR	1752	MAHLER, PETER	LI	0	4
23	GOWING FLOOR COVERING	7970	170 AVENUE NE	98052	2068816567	GENERAL CONTRACTOR	1752	GOWING, TOM	CC5	900	1
5956	MASTERPIECE WOOD FLOORS INC	15845	NE 51 STREET	98052	2068610556	INSTALLATION/WOOD FLOORS	1752	BENDER, LARRY	R6	300	2
3838	ALLWOOD FLOORS	4220	162 AVENUE NE	98052	2068850713	INSTALLATION/HARDWOOD FLOORING	1752	CURRY, PATRICK J	R4	0	1
6241	MOSS DOCTOR	14868	NE 95 STREET	98052	2068222345	ROOF MAINTENANCE	1761	ROGERS, KIM S	LI	1150	5
5959	SUPERIOR ROOF	2105	179 COURT NE	98052	2067463273	ROOF CLEANING	1761	VERA, JORGE	R3		1
1973	OLSON'S CONTINUOUS GUTTER	9011	195 AVENUE NE	98053	2068850911	GUTTER SERVICE	1761	OLSON, DOROTHY		0	1
1530	A ROOFING INC.	17527	NE 67 COURT	98052	2068679643	ROOFING CONTRACTOR	1761	RUBIN, WAYNE	LI	3200	5
2611	APSCO	2911	216 AVENUE NE	98053	2068688179	ROOF CONSULTING/ENGINEERING	1761	STOCKER, WILLIAM		0	9
5923	HOWARD ROOFING CO INC	7840	LEARY WAY	98052	2068816334	ROOFING	1761	HOWARD, KENNY DON	CC1	400	1
7223	SHAKE SPECIALISTS, INC	4815	228 AVENUE NE	98052	2068666698	ROOFING CONTRACTOR	1761	HURN, CLIFFORD		0	4
953	PEAKE ROOFING CO	10442	WILLOWS ROAD	98052	2068851155	ROOFING CONTRACTOR	1761	PEAKE, JEAN I	BP	0	5
8093	PRIMO DRYWALL & PAINTING	21335	SE THIRD STREET	98052	2063916480	CONTRACTOR	1761	PETERSON, KARRIN		10	1
95	ALLIED ROOFING, INC.	17371	NE 67 COURT #A-10	98052	2068834003	ROOFING	1761	DECHAINEAU, DENISE	LI	600	9
8184	INTERSTATE SHEET METAL	16250	NE 74 STREET	98052	3606945368	CONSTRUCTION/SHEETMETAL	1761	SHIFTON, MIKE		0	1
2463	AFFORDABLE EXTERIORS	18217	NE 102 COURT	98052	2067721406	CONTRACTOR (SIDING)	1761	PARKS, GLENN R	R3	0	1
3719	K J ROOFING	18609	REDMOND-FALL CITY HWY	98052	2068682214	ROOFING	1761	REGAN, KELLY	R30	800	6
4646	REDMOND ROOFING	18916	NE 103 STREET	98052	2068360123	RESIDENTIAL ROOFING	1761	HERNACKI, ROBERT C		0	4
4613	RESIDENTIAL ROOFING CO., INC.	14960	NE 90 STREET	98052	2068819771	ROOFING CONTRACTOR	1761	HAIGHT, LARRY	LI	420	13
5576	CUSTOM CONCRETE CONSTRUCTION	7628	136 PLACE NE	98052-40	2068211677	CONCRETE CONSTRUCTION	1771	DAVISON, JAMES M	R6	294	6
5957	K & B CONCRETE CONSTRUCTION	15845	NE 51 STREET	98052	2068833889	CONSTRUCTION	1771	BENDER, LARRY	R6	300	1
5958	M & B CONCRETE CONSTRUCTION	15845	NE 51 STREET	98052	2068833889	CONSTRUCTION	1771	BENDER, LARRY	R6	300	1
425	EMILS CONCRETE CONSTRUCTION	7661	159 PLACE NE	98052	2068851216	CONSTRUCTION (CONCRETE)	1771	BULYCA, EMIL JR	CC2	1000	15
1130	RUSSELL, MAC ENTERPRISES, INC.	6530	154 AVENUE NE	98052	2068839968	STRUCTURAL/MISC STEEL DETAIL	1791	RUSSELL, MAC	R5	1200	2

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BusLic	BusName	HouseNum	Street	Zip	PhoneNum	BusDescr	SicCode	OwnerRep	Zone	SqFt	NoEmp
4844	BOATLAND USA	17343	NE 70 STREET	98052	2068852628	BOAT MFG/SALES/RENTALS	3732	EDSON, WALTER A JR	LI	21000	2
6076	INNOVATIVE BICYCLE COMPONENTS	3832	148 AVENUE NE	98052	2068675477	MFG BICYCLE COMPONENTS	3751	TERRY, JANELLE	BP	9500	9
2994	RAY'S WOODKRAFTERS	9404	171 AVENUE NE	98052	2068839426	WOODWORKING/IND WASTE DISPOSAL	4212	PETERS, RAYMOND A	R5	576	1
1206	WASTE MANAGEMENT/SNO-KING, INC	14535	NE 91 STREET	98052	2068854744	GARBAGE COLLECTION	4212	HARDEBECK, JERRY	LI	7000	15
6852	BRUNT'S HAULING	8503B	152 AVENUE NE	98052	2068858842	SHIPPING MERCHANDISE/EQUIPMENT	4212	BRUNT, PAUL	BP	100	2
1357	UNITED PARCEL SERVICE	18001	NE UNION HILL ROAD	98052	2066216318	PACKAGE DELIVERY	4212	MINTON, DAVID	BP	57000	788
4179	GRAEBEL/QUALITY MOVERS, INC.	14920	NE 95 STREET #C	98052	2063959700	TRANSPORTATION/MOVING/STORAGE	4212	GRAEBEL, DAVE	LI	0	45
4474	J.J. CITY SERVICES	9404	171 AVENUE NE	98052	2068839426	HAULING WASTE	4212	HILL, JAMES R	R5	0	1
1238	STAR MOVING SYSTEMS	14920	NE 95 STREET	98052	2068679606	MOVE-STORE/HOUSEHOLD GOODS	4214	POWELL, DAN	LI	12600	10
3398	DASH COURIER SYSTEMS INC.	15076	NE 40 STREET	98052	2068859902	DELIVERY COURIERS	4215	JOHNSON, PRICE	BP	700	10
4549	EXPRESS MEALS INC	2871	152 AVENUE NE	98052	2068617500	RESTAURANT TAKEOUT/DELIVERY	4215	STRODTBECK, DEAN	BP	900	10
4944	M & M SERVICE	8500	148 AVENUE NE #GG3118	98052	2068670748	TAXI/PACKAGE DELIVERY SERVICE	4215	CHARAWALA, MOIZ S	R30	100	1
6499	FASTSERV MEDICAL OF REDMOND	14764	NE 95 STREET	98052	2068692838	MEDICAL EQUIPMENT REPAIR	4226	MARTIN, JOHN A	LI	1851	3
6498	JAC SERVICE COMPANY	14764	NE 95 STREET	98052	2068692838	FOOD VENDING MACHINES	4226	MARTIN, JOAN A	LI	1851	1
2350	L.P. PRODUCTIONS, INC.	9601	153 AVENUE NE	98052	2068815100	TRADE SHOWS/SPECIAL EVENTS	4226	PRESSEY, RODNEY E	LI	5900	4
4962	FAHEY, JAMES C AND COMPANY	18360	REDMOND-FALL CITY RD	98052	2068699136	PACKING/SHIPPING	4783	KORMANIK, MICHAEL J	BP		4
210	BRIDGE-ALASKA, INC.	17820	NE 65 STREET	98052	2068830304	SHIPPING WHOLESALE GOODS/RURAL	4783	BURNS, GARY	LI	5300	8
6519	EMERALD RENTAL TRUCK	6347	137 AVENUE NE #267	98052	2068694951	TRUCK RENTAL	7513	ECHEVERRI, CARLOS	R12	150	1
3914	A & G LEASING INC	7740	159 PLACE NE	98052	2068854424	LEASING TRUCKS/CARS	7514	AREND, WALTER	CC2	2000	8
1467	B & W LEASING	6240	E LAKE SAMMAMISH PARK	98052	2068856991	LEASING VEHICLES/EQUIPMENT	7515	BARRETT, DELBERT H	BP	0	2
4619	LEASEGROUP ONE	15303	NE 90 STREET	98052	2068618100	VEHICLE LEASING/MANAGEMENT	7515	FRANCIS, J R	LI	1270	2
4855	RENT-A-CAR	8155	161 AVENUE NE	98052	2066411365	AUTOMOBILE LEASING	7515	BURKMAN, TODD	CC2	300	5
7619	ISW 830	4610	148 AVENUE NE	98052	2068819886	WHOLESALE AUTO PARTS	5015	HOFFMAN, MARK S	BP	4200	10
6855	REDMOND ANIMAL CLINIC	17980	UNION HILL ROAD	98052	2068851476	VETERINARY HOSPITAL	0742	SISLEY, STEPHEN	BP	5800	8
6529	PROFESSIONAL EQUINE	17980	NE 80 STREET	98052	2068059064	VETERINARY SERVICES	0742	BRIDGES, DANA A			1
6455	ANIMAL HEALING CENTER	8015	165 AVENUE NE	98052	2068855400	VETERINARY PRACTICE	0742	SIEGLER, LARRY	CC4	2000	3
6089	HANSEN, THOMAS O DVM	16541	REDMOND WAY #274C	98052-44	2064851396	VETERINARIAN	0742	HANSEN, THOMAS O	CC1	500	1
6031	ANIMAL MEDICAL IMAGING	16390	NE 87 STREET	98052	2068838455	RADIOLOGY CONSULT/ANIMALS	0742	ROOT, CHARLES ROBERT	CC3	733	4
6018	VETERINARY MEDICAL CLINIC	7915	159 PLACE NE	98052	2068875883	VETERINARY INTERNAL MEDICINE	0742	CAPE, LYSANNE	CC5	1764	2
5925	EQUINE VETERINARY SERVICES	7517	243 NE	98053	2068360551	VETERINARY AMBULATORY PRACTICE	0742	JOHNSTON, CRAIG C			1
5741	ANIMAL MEDICAL CLINIC	8015	165 AVENUE NE	98052	2068855400	VETERINARY HOSPITAL	0742	COHEN, MARK		2200	4
5619	BISHOP, DONNA H	18540	NE 58 COURT #1089	98052	2065580330	VETERINARY SERVICE/HOUSE CALLS	0742	BISHOP, DONNA H	R30		1
5202	REDWOOD ANIMAL HOSPITAL	8705	164 AVENUE NE	98052	2068856666	VETERINARY HOSPITAL	0742	ADE, GARY W	CC1	2000	12
2033	REDMOND ANIMAL CLINIC INC PS	17980	NE 80 STREET	98052	2068851476	VETERINARY CLINIC	0742	SATHER, DR B T	BP	6000	12
1931	MEDI-PETS	7915	159 PLACE NE	98052	2068815188	ANIMAL CLINIC	0742	GAMBREL, THERESA L M	CC2	1164	2
1559	ANIMAL MEDICAL CLINIC	8015	165 AVENUE NE	98052	2068855400	VETERINARY HOSPITAL	0742	MOHNEY, DOUGLAS C	CC	2250	2
171	BEAR CREEK ANIMAL CLINIC	17223	AVONDALE ROAD	98052	2068832766	VETERINARY	0742	CARSCH, RANDOLPH P	CC7	1308	14
5380	DUDLEY, L K SERVICES	3602	E LK SAMM PKWY NE	98053	2068686598	WELDING	7692	DUDLEY, KENNETH		250	1
3342	EAST SIDE WELDING	18014	REDMOND WAY D38	98052	2068619024	WELDING	7692	BEAUDETTE, FRED	LI	1275	1
157	B.C. MACHINING	14576	NE 95 STREET	98052	2068618335	PARTS MACHINING	7692	CLEMANS, WILLIAM A	LI	2100	3
1195	SHULTZ DISTRIBUTING, INC.	7822	180 AVENUE NE	98052	2068857044	PETROLEUM PRODUCTS	5171	SHULTZ, G E	LI	2000	4
4882	NORTHWEST BEARING SERVICE, INC	8820	152 AVENUE NE	98052	2068853221	LUBRICATION COATING DISTRIB	5172	NORTHRUP, SHARON K	LI	2600	3
1573	ATLANTIC RICHFIELD COMPANY	PO	BOX 486	98073	4155712424	PETROLEUM MARKETER (WHOLESALE)	5172	KING, ERICA		0	2
784	MICRO SURFACE CORP	8820	152 AVENUE NE	98052	2068853221	LUBRICATION/MACHINE PARTS	5172	NORTHRUP, SHARON	LI	2600	3
3363	PRECISION PHOTOGRAPHIC	8539	154 AVENUE NE	98052	2068838659	CIRCUIT BOARD PHOTOGRAPHY	7384	MIZUMORI, RON Y	BP	997	2
2901	BALL, BRENDA INTERIOR DESIGNER	10525	176 COURT NE	98052	2068832943	INTERIOR DESIGN	7384	BALL, BRENDA	R5	150	1
2881	PRO IMAGE	15352	NE 96 STREET	98052	2067463403	COMMERCIAL PHOTO LAB	7384	STONEMAN, JON B	LI	0	2
1772	FOTO FAST NO 2	8020	164 AVENUE NE	98052	2068859891	PHOTOGRAPHIC/PRINT/DRIVE-THRU	7384	PALMER, FREDERICK J	CC7	65	1
130	ART 1 HOUR PHOTO	16541	REDMOND WAY	98052	2068839191	PHOTO PROCESSING	7384	LEE, PAUL	CC6	600	2

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3656	ERECTION COMPANY, INC., THE	9117	151 AVENUE NE	98052	2068212777	CONSTRUCTION/STEEL ERECTION	1791	JONES, ADAM	LI	1100	11
800	MIRROR MAGIC INC.	9646	153 AVENUE NE	98052	2068690559	CUSTOM MIRROR AND SHOWER DOOR	1793	SALERNO, TIM	LI	1440	2
6843	BENSON INDUSTRIES INC.	3089	157 PLACE NE	98052	5032267611	GLAZING SUBCONTRACTOR	1793	POTWIN, PETER	PAC	0	1
1069	REDMOND GLASS & MIRROR, INC.	7438	159 PLACE NE	98052	2068855026	GLASS/GLAZING-AUTO/RESIDENTIAL	1793	JENSEN, JAMES J	CC6	1357	2
3608	GRANDRIDGE GLASS & STOREFRONTS	7815	160 PLACE NE	98052	2068856066	GLASS INSTALLATION	1793	LAWSON, STANLEY C	CC2	0	4
2549	CONSTRUCTION GLASS	18130	NE 76 COURT #6	98052	2068691687	GLASS CONSTRUCTION	1793	OBORN, MICHAEL	LI	0	2
777	MERIT HERZOG GLASS INC.	4610	148 AVENUE NE	98052	2064532352	WINDOWS/GLASS MFG/INSTALLATION	1793	HERZOG, ROBERT E	BP	0	6
6987	EMERALD GLASS CO., INC.	15334	NE 96 PLACE #C-2	98052	2068810997	COMMERCIAL STOREFRONT GLAZING	1793	SAVOYA, ROBB	LI	1440	5
5503	NORTHWEST GLASS, INC	18080	NE 68 STREET #B-150	98052-67	2068690304	GLASS CONTRACTOR	1793	HERD, NORMAN	LI	2100	4
1734	EASTSIDE STUMP	10519	158 AVENUE NE	98052	2068830943	STUMP REMOVAL	1794	DOLLIVER, DEL	R6	600	1
5865	G T E TRUCKING & EXCAVATING INC	22647	RED-FALL CITY ROAD	98053	2068688736	SIDE SEWER CONTRACTOR	1794	EADIE, GARY T		0	3
8183	PETRA CONSTRUCTION	1125	250 AVENUE NE	98053	2068363177	EXCAVATING CONTRACTOR	1794	SOLEIM, KNUTE		0	2
1156	SANTANA TRUCKING & EXCAVATING	22725	RED-FALL CITY ROAD	98053	2068681111	EXCAVATING/TRUCKING	1794	THOMPSON, ROBERT J		0	4
4325	PIONEER EXCAVATING	16149	REDMOND WAY	98052	2068683929	EXCAVATING	1794	HAGENOEHRL, CRAIG	CC2	0	1
3593	NUPRECON, INC	14540	NE 91 STREET	98052	2068810623	CONSTRUCTION/DEMOLITION	1795	HENNESSY, JOHN	LI	21000	30
518	GRASS MASTER	19370	NE UNION HILL ROAD	98052	2068671117	GRASS/HYDROSEEDING	1799	TREWIN, CHRIS	LI	320	1
7610	CERBERUS PYROTRONICS, INC.	15253	NE 90 STREET	980952	2068820712	FIRE DETECTION SYSTEMS	1799	WOODS, JIM	LI	0	12
778	MERIT MECHANICAL, INC.	9630	153 AVENUE NE #B-1	98052	2068839224	CONTRACTOR (MECHANICAL)	1799	KIRKWOOD, ROD V - PRESIDENT	LI	1740	29
7612	ARTWORKS-ENVISION IT	10625	184 AVENUE NE	98052	2068694274	INTERIOR DECORATING/STENCILS	1799	KRUSE, BRENDA	R3	0	1
7731	ECKSTROM INDUSTRIES INC	2803 1/2	HEWITT AVENUE	98052	2062584614	INSTALL KITCHEN HOODS	1799	ECKSTROM, T S		0	3
7741	FRANKLIN HOME SERVICES	11335	REDWOOD HWY NE	98052	2068820170	HOME MAINTENANCE/REPAIR	1799	FRANKLIN, JAMES W	R1	0	1
7761	ALL SEASONS HOME CONSULTING	10019	169 AVENUE NE	98052	2069474445	RETAIL SERVICE	1799	YODER, ROBERT S	R5	200	1
7998	NORTHSTAR FIRE PROTECTION	16149	REDMOND WAY #403	98052	2068812160	FIRE PROTECTION CONTRACTOR	1799	NELSON, THOMAS F	CC1	0	3
8012	SECURITY FIRE PROTECTION	9718	163 PLACE NE	98052	2068613473	FIRE SPRINKLER INSTALLATIONS	1799	EVANS, KYLE	R6	0	2
3906	SERVICEMASTER TOTAL CLEANING	9123	151 AVENUE NE	98052	2068819042	GEN CONTRACT/RESTORE/CLEANING	1799	LANCE, JERRY C	LI	5000	10
3904	RESTEC CONTRACTORS, INC.	14700	NE 95 STREET #101	98052	2068671981	GEN CONT/ASBESTOS ABATEMENT	1799	WALKER, WILLIAM J	LI	11900	10
7751	S H CONSTRUCTION		AVALON-AVONDALE ROAD	98052	2068682729	SIDE SEWER CONTRACTOR	1799	HAUPT, SUSAN		0	2
6104	E V MANUFACTURING	10902	160 COURT NE	98052	2068610741	HANDYMAN	1799	VELDERRAIN, ERNESTO	R6	200	1
2654	SHAMROCK CONSTRUCTION	815	218 AVENUE NE	98053	2068684311	FENCES/DECKS INSTALL/REPAIR	1799	HESTER, RICHARD J		0	2
2657	STERLING COMMERCIAL AWNINGS	8503	152 AVENUE NE	98052	2068850842	CONTRACTOR/AWNING MFG/INSTALL	1799	BRUNT, MARTIN V	LI	8000	5
5259	STA-WELD	15609	NE 113 COURT	98052	2068853757	WELDING	1799	STALEY, LARRY	R3	0	1
2376	PAPER ROUTE, THE	10621	169 AVENUE NE	98052	2068833837	WALLPAPER HANGING	1799	GRAY, JOANIE	R6	1500	1
2838	DESIGN WEST POST	25538	152 AVENUE NE	98052	2068854132	BUILDING MAILBOX STANDS	1799	BENNETT, SHARON ANN	BP	1200	1
4487	ATLAS TRACK AND TENNIS	15817	NE 59 WAY	98052	2068815416	CONTRACTOR	1799	HUGHES, DAVID	R4	0	1
4245	SERVPRO OF REDMOND	17371	NE 67 COURT #B4	98052	2068697232	CLEAN/RESTORE COMMERCIAL	1799	MEWES, JAMES O	LI	300	3
3271	OHM REMEDIATION SERVICES CORP	17836	NE 65 STREET	98052	2068614617	ENVIRONMENTAL REMEDIATION SERV	1799	MILLER, LISA T	LI	1000	11
3958	VERTECS CORPORATION	14700	NE 95 STREET #201	98052	2068851990	SPECIALTY CONTRACTORS	1799	BOYETT, FREEMAN	LI	11900	18
1821	HARRIS, HAL INSTALLATIONS	5710	155 AVENUE NE	98052	2063996030	GAS APPLIANCE INSTALLATIONS	1799	HARRIS, HAL T W	R5	0	1
7127	I F T CONSULTING INC.	2317	183 COURT NE	98052	2066418646	HOCKEY STADIUM CONSTRUCTION	1799	SUDARKIN, IGOR	R3	20	3
3438	WESTERN STATES FIRE PROTECTION	7102	180 AVENUE NE #A-105	98052	2068810100	FIRE PROTECTION CONTRACTOR	1799	ROTHMIER, LARRY E VP	LI	7500	18
6261	TRI STAR SERVICES, INC.	6453	139 PLACE NE #45	98052	2068611943	GENERAL CONTRACTOR	1799	UNASH, STEVEN	R12	400	3
6630	COURT GAMES, INC	14778	NE 95 STREET	98052	2068851711	SPORT COURT CONTRACTOR	1799	KEENEY, BARRY	LI	1600	2
6631	SIMPSON, PETER K	15031	NE 144 STREET	98052	2067287964	COMMUNICATIONS CONSULTING	1799	SIMPSON, PETER K			1
6786	COMPOSITE CONSTRUCTION	8331	154 AVENUE NE #G-2	98052	2068810344	ENGINEERING/CONSTRUCTION	1799	REBAR, JOHN V	BP	5655	13
2625	ENVIR-O-COMPLY, INC.	15040	NE 95 STREET	98052	2068675111	ASBESTOS ABATEMENT CONTRACTOR	1799	CRANFORD, BUD	LI	4800	8
6802	NOR-TECH FIRE PROTECTION	8161	NE 164 AVENUE NE	98052	2065560933	FIRE SPRINKLER CONTRACTORS	1799	WEIMER, JAMES R	CC4	800	5
1316	PAUL ENTERPRISE, THE	9905	167 AVENUE NE	98052	2068831219	CONTRACTOR/GENERAL	1799	PAUL, TAMAS	R6	0	1
4519	MANNING WALLCOVERINGS	16117	NE 98 STREET	98052	2068690786	WALLPAPER INSTALLATION	1799	MANNING, ESMOND	R5	480	1
4992	SAMMAMISH VALLEY CYCLE	8451	164 AVENUE NE	98052	2068818442	BICYCLES/RETAIL	5941	AGUIRRE, JEAN ANN	CC1	2600	4
367	DICKSON ENTERPRISES	15845	NE 91 WAY	98052	2068815930	RESELLER/MARINE COMMODITIES	5941	DICKSON, RICHARD D	R1	120	1
447	EXERCISE EQUIPMENT CENTER	8413	154 AVENUE NE	98052	2068833933	EXERCISE EQUIPMENT	5941	RUBSTELLO, LEO	BP	7000	11
467	FITNESS SHOP	15230	NE 24 STREET #A	98052	2066431033	EXERCISE EQUIP RETAIL SALES	5941	POTTS, JOHN F	CB	1680	2
996	PRO GOLF DISCOUNT INC	15015	NE 24 STREET	98052	2066416766	GOLF SALES/RETAIL	5941	SILVER, RANDY	CB	4190	6
1197	SILVER FOX SADDLERY, INC.	16717	REDMOND WAY	98052	2068836735	SADDLERY/RETAIL	5941	MARRS, DEBORAH D	CC8	700	3
1479	FISHIN' TACKLE STORE, THE	16811	REDMOND WAY	98052	2068695117	FISHING TACKLE/RETAIL SALES	5941	ROLSING, MARK	CC3	3500	5
1571	ATHLETIC SUPPLY COMPANY, INC	16101	NE 87 STREET	98052	2068821456	RETAIL SPORTING GOODS	5941	ENGSTROM, STEVE D	CC3	7800	5
1585	BEAR CREEK GUNS	16116	NE 87 STREET	98052	2068830818	FIREARMS (GUNS/GUNSMITH)	5941	GREGG, RAY	CC1	1440	4

CITY OF REDMOND BUSINESS LICENSE DATABASE ENTRIES WITH SELECTED SIC CODES

SEE FOLLOWING TABLE FOR SELECTED SIC CODES

BusLic	BusName	HouseNum	Street	Zip	PhoneNum	BusDescr	SicCode	OwnerRep	Zone	SqFt	NoEmp
2039	REDMOND CYCLE, INC	16205	REDMOND WAY	98052	2068856363	BICYCLES	5941	ESTRIN, DENNIS L	CC8	2000	6
3430	SOCCER SHOP, THE	8092	160 AVENUE NE	98052	2068811212	RETAIL/SOCCER SPECIALTY	5941	SCHUMACHER, DAVID	CC2	652	2
103	ALPINE HUT	7875	LEARY WAY	98052	2068837669	SKI RETAIL SPECIALTY/SAILBOARD	5941	ROBINSON, JOHN	CC8	3500	2
4986	BICYCLES WEST	7905	159 PLACE NE	98052	2062427910	BICYCLE SALES	5941	SOLBERG, MICHAEL	CC2	3125	3
5039	PERFORMANCE BICYCLE SHOP	15230	NE 24 STREET	98052	9199339113	BICYCLES/RETAIL SALES	5941	GREEN, KRISTIN	CB	5525	14
5907	GY-RO SPORTS	9302	RED-WOOD ROAD #A203	98052	2068670850	IMPORTERS/EXERCISE EQUIPMENT	5941	LEONARD, ERIK JON	R30	400	2
5441	ENCORE CYCLE & FITNESS	16389	REDMOND WAY	98052	2068837900	NEW & USED SPORTING GOODS	5941	MOWBRAY, INGRID	CC8	3900	2
5792	REDMOND CYCLE	16205	REDMOND WAY	98052	2068856363	BICYCLE RETAIL/REPAIR/RENTAL	5941	ESTRIN, ERNIE	CC1	3500	7
5868	WESTERN LACROSSE SUPPLY, INC.	8434	154 AVENUE NE	98052	2068810900	SALES/EQUIPMENT LACROSSE TEAMS	5941	WARD, STEPHEN	BP	120	2
6797	SAY CHEEZ!	5533	157 AVENUE NE	98052-52	2068853032	TRADING SPORTSCARD SALES	5941	SHIMABUKURO, IVAN Y	R5	1000	1
4833	EBONY CONNECTION, THE	16623	NE 39 WAY #T2057	98052	2068610194	RETAIL/AUTO PARTS/SPORTS EQUIP	5941	EVANS, CHARLES F JR	PAA	1100	1
6940	SPITFIRE PRODUCTS	8125	WILLOWS ROAD #E49	98052	2068817054	TARGET/RECREATIONAL BLOW GUNS	5945	TAITANO, RICK	R30	900	1
6763	GAME CORNER	16504	REDMOND WAY	98052	2068821996	VIDEO GAME STORE	5945	DONOVAN, TOM	CC1	1400	3
6740	UPPER HAND	18666	REDMOND WAY #G1053	98052	2068362391	BUY/SELL COLLECTIBLE CARDS	5945	HILL, BRYCE	R30	100	2
6726	PLAY IT AGAIN TOYS	16003	REDMOND WAY	98052-38	2068816920	USED TOY SALES	5945	JONES, MARY F	CC3	2000	4
1347	TWIN DOLLS, THE	13787	NE 77 PLACE	98052	2068830786	SELLING/REPAIRING DOLLS	5945	SEABROOK, JUDITH D	R6	150	1
6606	TINY TREASURES	16421	CLEVELAND STREET #F	98052	2068838261	MINIATURES/DOLLHOUSES	5945	WATKINS, DONNA M	CC1	800	4
5992	TREE TOP TOYS	15750	REDMOND WAY	98052	2068699713	TOY STORE	5945	SNIPES, JEFFREY S	CC3	0	3
5941	REDMOND KITES	16541	REDMOND WAY SUITE L	98052	2068810777	RETAIL OUTLET FOR KITES	5945	ALBERT W. BUSH	CC1	250	1
5062	YOUR MIND'S EYE	16698	REDMOND WAY	98052	2068670801	COMIC BOOK/TRADING CARD	5945	ATTEBERY, JAMES C	CC8	740	3
3570	B & B INDUSTRIES	15752	REDMOND WAY	98052	2068614486	HOBBY/ARTS AND CRAFTS	5945	BATCH, BRUCE L	CC2	2000	2
4042	LEARNING WORLD, INC.	2421	152 AVENUE NE	98052	2066435930	EDUCATIONAL SUPPLIES/RETAIL	5945	ORKNEY, DOUGLAS	CB	3240	6
4092	SEVENTH PLANET, THE	7947	159 PLACE NE	98052	2067881618	EDUCATIONAL MATERIALS/RETAIL	5945	ADAMS, FORREST P	CC2	4038	1
4123	DART PRO SHOP	7913	159 PLACE NE	98052	2060000000	SELLING DART SUPPLIES	5945	LEOTA, BOBBIE	CC2	625	3
6995	BEARZABOUT, INC.	8465	164 AVENUE NE	98052	2068610332	RETAIL/COLLECTIBLE BEARS/DOLLS	5945	GRAHAM, CAROL A	CC4	1400	7
5942	PRO DARTS - EAST	7913	159 PLACE NE	98052	2068671933	DART SHOP	5945	SHERMAN, GERALD	CC5	800	4
3561	R G P INC	9628	153 AVENUE NE	98052	2068697272	COMPOSITE/FIBERGLASS MFG	3229	PALMER, ROGER	LI	2800	6
6365	C M T VENTURES	21837	NE 102 STREET	98053	2068687596	BUILDING STAINED GLASS WINDOWS	3231	TREIBER, CHRISTOPHER		3800	2
5786	MIRROR MAGIC	9646	153 AVENUE NE #B-9	98052	2068690559	FABRICATE/INSTALL MIRRORS	3231	FREELAND, THOMAS L	LI	1440	2
2778	TECHNICAL GLASS PRODUCTS	3950B	152 AVENUE NE #R	98052	2068224514	SPECIALTY GLASS PRODUCTS	3231	RAZWICK, GERALD	BP	5500	4
1790	GLASS DESIGN GROUP	16540	REDMOND WAY	98052	2068855955	STAINED GLASS	3231	PAULSON, CHARLES L	CC8	1000	2
2721	TILES BY TELISE'	15357	NE 90 STREET	98052	2068850876	CUSTOM TILES/CERAMIC	3253	BJURMAN, TELISE RODELV	LI	968	1
4860	FREE FORM POTTERY	2615	188 AVENUE NE	98052	2068619050	POTTERY MAKING	3269	PENG, ROBERT	R3	0	1
1911	MADE WITH LOVE PORCELAIN	13793	NE 77 PLACE	98052	2068833896	PORCELAIN ART	3269	WEBB, DENISE M	R6	70	1
6912	TRENDSET CONCRETE PRODUCTS	6820	176 AVENUE NE	98052	2068691632	MFG CONCRETE PAVING STONES	3271	FRISCH, ALFRED LEE	LI	5900	3
404	EASTSIDE MASONRY PRODUCTS	19015	NE 80 STREET	98052	2068680303	CONCRETE BLOCK MANUFACTURING	3271	NYQUIST, HERB	H1	980	36
4776	CONCRETE PRODUCTS OF	18901	NE 84 STREET	98052	2068817910	PRECAST CONCRETE BARRIERS	3272	FLYNN, JOHNNY R	HI	840	25
1334	TRENDSET CUSTOM PAVERS, INC.	6820	176 AVENUE NE	98052	2068691632	CONSTRUCTION/MANUFACTURING	3272	FRISCH, ALFRED L	LI	5600	6
878	OLYMPIAN PRECAST, INC.	19150	UNION HILL ROAD	98053	2068681922	CONCRETE MFG/PRECAST	3272	JEWELL, JUDITH C	HI	35000	49
914	OLIN AEROSPACE COMPANY	11465	WILLOWS ROAD NE	98052	2068811700	ELECTRONIC DEVICES/MFG	3761	SMITH, WILLIAM W	BP	56000	252
1115	OLIN AEROSPACE COMPANY	11441	WILLOWS ROAD NE	98052	2068855000	ROCKET ENGINES/GAS GENERATORS	3761	SMITH, W W	BP	30000	425
5679	KISTLER AEROSPACE CORPORATION	10201	WILLOWS ROAD NE	98073	2068818000	AEROSPACE DEVELOPMENT	3769	PROHL, JURGEN	BP	100	2
6099	ADROIT SYSTEMS, INC. (ASI)	17825	NE 65 STREET #A145	98052	2064503930	DEVELOP AEROSPACE SYSTEMS	3769	BUSSING, THOMAS R A	LI	1200	3
5079	TIERCEL	11119	158 AVENUE NE	98052	2068811103	AVIATION/AUTOS R&D	3721	ROYAL, RUSSELL A	R6		1
7360	I D D AEROSPACE CORPORATION	18225	NE 76 STREET	98052	2068854353	MANUFACTURE/AIRCRAFT PARTS	3721	VAN OSDOL, JAMES H	LI	49000	96
3628	K & M ENTERPRISES, INC.	14666	NE 95 STREET	98052	2068699884	AIRCRAFT SUBASSEMBLIES	3728	THORBURN, T MICHAEL	LI	1500	5
4761	ACRO TECH, INC.	17760	NE 67 COURT	98052	2068270200	MFG/AIRCRAFT/SUPPORT PARTS	3728	DONOVAN, C W, JR	LI	55000	45
5473	SPARTAN INDUSTRIES	13244	NE 108 STREET	98052	2068228143	MEDICAL/AIRCRAFT PARTS/OFFICE	3728	HOWE, ARLENE	R3	500	2
7932	OLIN AEROSPACE COMPANY	8218	154 AVENUE NE	98052	2068855000	MFG AVIATION ELECTRONICS	3728	SHUBA, JOHN A	BP	3230	25
5795	PEGASUS NORTHWEST, INC.	17519	NE 67 COURT	98052	2068610419	FABRICATE CARGO HOLD LINERS	3728	STEPANIUK, KENT S	LI	4250	4
6554	ALLIEDSIGNAL AVIONICS INC.	15001	NE 36 STREET	98052	2068853711	OFFICE/COMPUTER SYSTEM DEVELOP	3728	PEDERSLIE, DEBORAH	BP	8000	1
6759	ALLIEDSIGNAL AVIONICS INC.	8747-8767	NE 148 AVENUE NE	98052	2068853711	AVIONIC EQUIPMENT	3728	PEDERSLIE, DEBORAH C	BP	25000	1
6760	ALLIEDSIGNAL AVIONICS INC.	4532	150 AVENUE NE	98052	2068853711	AVIONIC EQUIPMENT	3728	PEDERSLIE, DEBORAH	BP	10000	1
4814	REDMOND MOBILE MARINE	5222	268 AVENUE NE	98053	2068684419	BOAT REPAIR	3732	GILLETTE, CHARLES R		0	1
4763	ALEMAN'S MARINE SERVICE	9909	168 AVENUE NE	98052	2068856278	MARINE SERVICE/AUTO REPAIR	3732	ALEMAN, GEORGE L	R5	1100	1
2842	FOSKETT, PHILIP, MARINE	16541	REDMOND WAY 297C	98052	2068429462	SAILBOAT CONVERSIONS	3732	FOSKETT, PHILIP	CC8	0	1
2642	NORTHWEST KAYAKS	15145	NE 90 STREET	98053	2068691107	KAYAKS/SEA TOUR/WHITE WATER	3732	ABBENHOUSE, JOHN	LI	7500	6

APPENDIX C

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Copy No. ___

CITY OF REDMOND

WATER SUPPLY CONTINGENCY

AND

SPILL RESPONSE PLAN

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APPENDIX D

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CAROLYN BROWNE ASSOCIATES
Community Involvement / Marketing Research

Focus Group Discussion
With Redmond Business Owners and Residents

Conducted July 18 and 23, 1996

for the
City of Redmond
Public Works Department
Wellhead Protection Program

Funded in part by a grant from
the Centennial Clean Water Fund

Prepared by

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CAROLYN BROWNE ASSOCIATES
Community Involvement / Marketing Research

City of Redmond Wellhead Protection
Focus Group Discussions with Redmond Citizens
Conducted July 18 and 23, 1996

INTRODUCTION

Two focus group discussions were conducted for the City of Redmond to learn more about public awareness of, and attitude toward, issues relating to water quality and water conservation. Redmond participants were drawn from all areas of the City so that some obtain water from the City of Seattle and some from Redmond well water.

For brevity, the Redmond-Bear Creek Municipal Supply Aquifer is referred to in this report as simply the Redmond Aquifer or the Aquifer..

The first group consisted of owners and managers of businesses that have a particular relationship to the Redmond Aquifer. They were selected from lists of businesses, supplied by the City, that use products which can be harmful to the water supply. Nine participants shared their opinions and ideas at a meeting in the Public Safety Building on June 18, 1996 from 6:00 to 7:30 p.m. The group of three women and six men was recruited by Consumer Opinion Services of Burien.

A second discussion was held with a representative group of Redmond residents (a range of ages, different residence locations, some with children in the household and some living east and west of the Sammamish Slough). They were recruited by Consumer Opinion Services from lists developed by the company. Six women and five men participated in the discussion, which was held on Tuesday, July 23, 1996, from 7:30 to 9:00 p.m. in the Public Safety Building.

SUMMARY OF RESPONSES AND THEMES

The major themes common to both discussions included:

- Surface water pollution is a major environmental concern, but there is little awareness yet about the potential for groundwater pollution.
- Redmond business people and residents have little awareness of the sources of the City's drinking water supply. Though some have heard the word, "aquifer," few are able to provide a definition.
- Although they sense that the cost for Redmond water is less than in other places, Redmond businesses and residents have little understanding of whether this is true and what determines the rate they pay.
- People sense there is not an ample supply of water to handle the future growth in the area.
- Most business people and residents had little knowledge of how toxic products they use can impact the water supply, but all were eager to learn and to change their habit patterns.
- No one in either group had heard the word, "recharge," or had any understanding of what a recharge zone is in relation to an aquifer.

SUMMARY OF RESPONSES AND THEMES - CONTINUED

- Few people have any awareness of the federal and state mandates for water protection.
- Although most business people and residents lack awareness about water protection, they are highly supportive of the City developing a major education program that will encourage everyone to comply with practices that will protect the water supply.
- There was consensus that Redmond business owners and residents will strongly support the City educating people about ways to protect and conserve the drinking water supply. Both groups offered many suggestions for getting the message out.

General Attitudes toward Redmond

Business people appreciate Redmond's Central location and freeway access to other areas. They believe City government has done a good job working with businesses and recruiting new businesses to locate in Redmond. Their greatest single concern is increasing traffic congestion.

Residents appreciate the many qualities that make the City a nice place to live - safety, central location, recreational opportunities, schools, attractive setting and good City services. Their greatest concern is overpopulation, as evidenced by traffic problems and a proliferation of malls.

General Awareness of Environmental Issues

Asked about environmental issues, both groups talked a lot about water, but their concerns related to surface water, rather than ground water. The discussions focused on pollution of the Sammamish Slough and, to a lesser extent, Lake Sammamish and the creeks in the area.

Redmond residents noted that "People in Redmond are more environmentally aware." Those in the group participate in the curbside recycling program and say the make an effort to purchase products that are environmentally safe.

General Awareness of Redmond's Drinking Water Supply

Business people and residents are only marginally aware that Redmond obtains its drinking water from both wells and from City of Seattle. There is no understanding of how the cost of Redmond water is based upon a consistent proportion of Seattle water to Redmond Aquifer water. While some had heard the term, "aquifer," only a couple in each group could provide a good definition.

There was strong agreement that the water supply is not ample for the growing population in the area. The major evidence shown for this is the memory of water restrictions a few years ago during the summer draught.

SUMMARY OF RESPONSES AND THEMES - CONTINUED

Although they can't point to any tangible reasons, members in both groups intuitively sense that water in Redmond is less expensive than in many other places in the region and in the country.

Opinions about the Purity of Redmond's Water

There was strong agreement in both groups that Redmond water does not taste good. Several use a water filter system. Their first responses to questions about the purity of the water supply related to their opinion of its taste, and some suggested that water pipes might be affecting the taste.

Few in either group had an awareness of how the use of toxic products -- in the business place or in the home -- can have an impact on the quality of the water.

Some of the business people acknowledged they are using toxic chemicals in their companies. Those with highly toxic products tend to be heavily watched and regulated by Metro.

Women, in contrast to the men, in the resident group were more aware of toxic cleaning products in the home.

Ways to Educate People About the Water Supply

Group members agreed that the public will respond to educational information about protecting the water supply. Both groups pointed out the effectiveness of the recycling program in the City which is based upon providing consistent, repeated information about the environmental and economic benefits of recycling.

A number of ideas for educating people about protecting the water supply were generated in each of the group discussions:.

<u>Business group</u>: Suggestions supported by most of the participants included:

- Have an "Officer Friendly" for water protection who will make in-person visits to businesses to help them do what is right.
- Use an educational, rather than a punitive approach, to encourage compliance with what is needed.
- Develop simple messages.
- Educate businesses, at the time they are taking out licenses or permits, about what they can do to protect the water supply.
- Educate the public so they will be aware of, and supportive toward, businesses that have clean water practices; recognize businesses that comply with a certificate or symbol that can be display at their businesses.
- Have a specialist on the City staff who will work with businesses to provide the necessary education and assistance to protect the water supply.

SUMMARY OF RESPONSES AND THEMES - CONTINUED

Resident group: Ideas shared by most of the Redmond residents included:

- Begin with the schools. Have an education program that includes a water curriculum and a broad array of educational materials for children to take home to their families
- Have a major educational program promoted through PSA's and articles in all the media.
- Develop a logo and a simple message that can posted in homes, schools and businesses
- Work with large businesses to have them assist in the creation and financing of educational materials and to develop educational programs for their employees.

GROUP 1: OWNERS AND MANAGERS OF REDMOND BUSINESSES

The Participants

The group included representatives from printing, manufacturing, auto repair and wood products industries. The range of time their businesses have been in Redmond ranges from six to 15 years.

Name	Business Name	Type of Business	Years in Redmond
Russ Albertson	Jess Auto Repair	Auto repair	6
Erik Baker	Accumark	Engraving for signs and badges	15
Marlene Cartmell	American Image Display	Trade show booths and exhibit materials	7
Scott Crane	Acrylic Concepts	Custom fabrication of plexi-glass and other plastics	12
Mike Hanson	Ryan Instruments	Temperature monitoring services	10
Dave Harja	Final Phase Finishing	Industrial Paints for high tech equipment	9
Tracey Hepner	Interior Woodworking	Building of interiors for restaurants	9
Judith Jewell	Olympian Precast	Manufacture architectural precast concrete for buildings	9
Bruce Kelleran	The Show Place	Remodeling contractor - kitchens and baths	20

Qualities that make Redmond a good place to do business

A central location is the primary quality that business people say drew them to Redmond. The City offers easy access for customers through 520 and other freeways in the region. Other factors that influenced businesses to locate in Redmond include a City government that works well with businesses and many good locations for light industrial manufacturing. One business person said they were recruited by the City.

Concerns about the future of the City

When asked about future concerns, increasing traffic congestion was the first issue brought up by the group members. They notice gridlock and problems with traffic flow that are growing worse each year. The City appears to be developing in different areas with no cohesive plan or a plan for traffic flow. One participant noted that Redmond does not seem to be developing an identity; and businesses locate here because there is space, not because there are any special qualities.

Group 1: Owners and Managers of Redmond Businesses - continued

Awareness of environmental issues

Asked about environmental issues, several talked about different issues relating to water, most often surface water. One person discussed wastewater management and expressed a concern about the stream behind her business that feeds into a salmon habitat, Another person pointed out the many names around Redmond that recall the salmon-bearing creeks (such as Bear Creek). A person who jogs along the Sammamish Slough believes that "Major corporations are dumping pollutants into the slough and nothing is being done about it,"

One of the participants was concerned that he pays "several hundred dollars a month for storm water management, and I have no idea what is being done with it." Someone else mentioned the surface water separator by the Slough, and when it was described, the previous business person was pleased to know his tax money was being well spent.

Awareness of Redmond drinking water

There was a high level of awareness that at least some of Redmond's drinking water comes from wells; a couple of people said they have their own wells. Other participants suggested Ames Lake; the Tolt Pipeline; or the City of Seattle as drinking water sources. Overall, most group members were unsure of the origins for the City's drinking water supply. None were aware that the Sammamish River is a dividing line between those getting water from Seattle and those getting water from the Redmond Aquifer.

When asked about the term, "aquifer," about half the group had heard the word, and a couple supplied reasonably good definitions ("underground river," "underground holding tank of water"). However, most of the group members were unable to provide a description of an aquifer. None had any awareness of water cost in Redmond compared with other cities. Someone thought water is cheaper in Redmond than anywhere else.

There was a general feeling that there is not an ample supply of water because of the recent history of water restrictions during summer draughts. One person commented, "We have less of a problem than anywhere in the Southwest." Someone suggested that there is an aquifer nearby "that has not even been tapped." There was consensus that the growth of the area will produce future problems for the water supply.

No members of the group had any awareness how Redmond's rates are based upon a combination of water purchased from Seattle and that pumped from the Redmond Aquifer. Someone asked, "Why are we buying water from Seattle, while we cap off a wellhead here and put a building on top of it" (referring to the Public Safety Building)?

Group 1: Owners and Managers of Redmond Businesses - continued

Perceptions of the purity of Redmond water

Most members of the group said that they don't like the taste of Redmond water. It was described as tasting heavily chlorinated. One person commented that there is a metallic after taste to Redmond water. Someone added, "well water without chemicals tastes great."

When asked what impacts water quality, their suggestions included: The way it's stored; filtration; how hard or soft it is; growth of population; the polluting of streams; putting more chlorine in because of increased pollution. Most had very little initial awareness of how habit patterns (products used for gardening, cleaning; the ways in which water is consumed, etc.) affect water purity and consumption. In response to a question about what would happen if something toxic seeped into the ground, one person responded: "I suppose it would damage the water, but how do you detect it?"

Group members were asked to think about what their business might be doing or what products it might be using that impact the water supply. One noted that "Having all the vans and trucks in our parking lots generates a lot of oil that drains off." Another commented that his firm is moving to water-soluble products.

Several acknowledged using highly toxic products in their businesses. One businessman, whose manufacturing company uses some very toxic products, pointed out that Metro highly regulates his company: "We're tested once a week." He added that he has made choices to do things that protect the environment which go beyond the guidelines provided by Metro and the State.

Most had only a small degree of awareness of the toxicity of the products they are using or how their methods of storage and use could impact the water supply.

Ways to educate and encourage businesses to be more aware

There was strong agreement that business people want to do what's right to protect the environment, and they will be responsive to educational assistance that will help them make the right decisions. Educating business owners and managers will be far more productive than imposing penalties on those who don't do what they should. Businesses are cooperating with recycling requests from the City; and they appreciate having a specialist on the City staff who works with businesses on recycling issues. They will appreciate having a specialist on the City staff who will work with businesses on all environmental issues, including water quality and conservation. They would also like the City to have a system for them to easily dispose of toxic substances, such as the program currently being done by King County. They are aware that businesses are paying more each year for disposing of toxics. One business person said his company is paying to have their toxics hauled away because they feel , "We have to do our part to keep the planet green." They know there will be more regulations in the future.

Group 1: Owners and Managers of Redmond Businesses - continued

Participants agreed that it is important for the City to educate everyone: "If you get input from employees that it is good for a company to act responsibly, it will motivate an employer to behave differently. If customers learn about this responsible behavior, it may promote more business." The group shared the opinion that legislation and ordinances work to a point, but businesses have to feel motivated to act responsibly.

Education is vital. The more that businesses become aware of their potential impact on the Aquifer, the greater will be their desire to cooperate.. People need to learn how close the Aquifer is to the surface in many areas. Someone reiterated that "People will act responsibly if they have the information."

Businesses need incentives that reward them for making environmentally responsible choices; for example, purchasing recycled, instead of new, products.

Only one person in the group had heard about the Wellhead Protection Program.
Most had little knowledge of the Federal, State and local programs mandating water protection.

None knew about the agreement between the City of Seattle and Redmond relating to the amount of water purchased from the City of Seattle.

A suggestion, that was immediately greeted with strong group approval, was to educate business owners at the time they take a building permit or a license for their new business. Group members especially liked the idea of having a personal contact where someone from the City would come out and talk to the business owner:. "Give them a how to book." Educational information could be mailed out with the new licenses each year. Another person suggested, having a two-page flyer for new businesses which describes how the City wants businesses to handle toxics, water, trash, etc.

Educational materials and presentations could be distributed through the local trade associations and the Chambers of Commerce.

Simply sending information in the mail may not get through. Businesses people say they are overwhelmed by the amount of mail they receive.

Some suggested sending representatives from the business to seminars on how to protect the water. These representatives would go back and educate the people from their company.

Response to symbols to represent the aquifer

The business representatives liked the idea of a symbol for the aquifer. Given five choices, six of the nine preferred a picture of an old-fashioned well.

Group 1: Owners and Managers of Redmond Businesses - continued

Conclusion: What do you believe will be the three most effective ways to encourage Redmond businesses to protect the aquifer?

Mike: Keep it simple. Have a graphic, simple message. Have an "Officer Friendly" come around and give businesses information. Focus on the general population as well as businesses.

Judy: Move well #5 in East Redmond. Don't provide severe restrictions on businesses by regulating the amount of chemicals they can have the way Renton has done.

Marlene: Keep it short and simple, for example develop a short list of rules that are the five most important things businesses can do to protect the Aquifer. Get the message out to the public, because businesses will respond to what their customers suggest.

Erik: Use media, like radio and TV; people get too many things to read in the mail. Have City representatives go around to the businesses and educate them.

Tracey: Likes the "Officer Friendly" idea. Information on invoices will only be seen by the business owner, but an on-sight visit, where the owner can learn what can be done better, will have a significant impact. In six months, there could be a follow-up visit, and if the business had made significant improvements, they would get a logo to display on their window. Educate residents and the City itself (timers on water sprinkling systems).

Scott: Also likes the "Officer Friendly" concept. Businesses are too unique to put a flyer out for everybody. Having someone come out in person makes more sense. Have a flyer go out at the time someone takes out a business license that invites the business to make an appointment to have someone from City come out and help them learn what needs to be done.

Dave: Agrees with having an "Officer Friendly." Between all of the currently federal, state and County regulators, it costs businesses a lot of money in fines. Businesses need to have help to comply with what is needed.. Give businesses a reward if they make improvements in six months. If you want something done, you need to help people.

Bruce: Have somebody in the City responsible for coordinating an overall program of education of business owners, employees and consumers. Utilize effective ads that demonstrate what can happen if water is not protected. Recognize businesses that are doing a good job: "This business is a water-friendly business." Have someone contact each new business when they start up.

Russ: Education is the key. Educating businesses when they first start up in the City is an excellent idea.

Group 1: Owners and Managers of Redmond Businesses - continued

Comments from the Short Follow-up Discussion with Karen Chuse

All were unfamiliar with the term, "Recharge." None had heard of the Metro Envirostars Program.

One person asked, "What's the difference between shallow well and a deeper well? Why isn't it possible to go into the deep aquifer which is safer?"

Karen explained that the City of Seattle requires Redmond to pump a specific minimum from their wells. The cost of well water is $.36 a gallon compared with $1.17 from the City of Seattle. This cost differential is a major incentive for protecting the well water supply.

Someone asked where the stormwater run off goes. Karen responded that most goes into the creeks, but there is a separator that is now in place along side the Sammamish Slough.

A participant suggested having a voluntary block watch program for environmental issues.

One person said he is unaware of what is being done with the money collected by the City for stormwater management taxes.

One person is convinced that many of the businesses along Willows Road are dumping chemicals into the Sammamish River: "You can see it." She suggested having information along the Sammamish River trail which tells people about protecting the water supply. She also believes the City should have a campaign promoting: "Be a hero and report people who are dumping chemicals into the water."

Three out of nine had read the City's Recycling Newsletter which is sent out to all the businesses.

It was suggested that each business should designate someone who has an interest to be in charge of practices relating to clean water. Having a newsletter or educational information addressed to a specific person, instead of the company, is more likely to be read.

GROUP 2: REDMOND RESIDENTS

The Participants

The group of 11 residents included six women and five men. Five own their home and six are renters; five live west and six live east of the Sammamish River. Their age ranges are from early 20's to late 50's; six members of the group have children under 18 years of age in their households.

Name	Age Range	Children in Home	Occupation	Neighborhood	Years in Redmond
Tamara	18 - 24	None	Legal assistant	Willows Road	3
Angela	25 - 34	Two	Loan manager	Union Hill	11
Matt	18 - 24	None	Financial analyst	Near Downtown	3
Steve	45 - 54	One	Bus driver; video	Near Marymoor	10
Jonathan	35 - 44	Three	Software Engineer	Education Hill	10
Mike	35 - 44	Three	Property Maintenance	Avondale Road	17
Leigh Ann	25 - 34	None	Legal assistant	Bridle Trails	9
Briget	25 - 34	None	Clerk	Off 85th	3
Kari	25 - 34	Two	Homemaker	Grasslawn Park	4
Bill	55 - 64	One	Writer	Off 51st	22
Mary	45 - 54	None	IRS employee	Education Hill	9

Qualities that make Redmond a good place in which to live

Redmond residents suggested several qualities they appreciate in the City including: A safe city; central location; many recreational facilities; good schools; an attractive, park-like setting; excellent Police and Fire Departments.

Concerns about the future of the City

Asked about their major concerns, there was a chorus railing against perceived overpopulation. Several noted rapid growth of the area, increasing traffic and proliferation of shopping malls. The area has poor public transportation. Some are concerned that housing is becoming too expensive for a middle-class family..

Awareness of environmental issues

Pollution of the surface water in the area was the most frequently mentioned environmental concern: "Pollution of water - you can smell it at Lake Sammamish." Other talked about the deteriorating condition of the Sammamish Slough: " It looks terrible; You used to be able to canoe and swim in it, but I wouldn't let my kids go in it now." "I grew up swimming in the Slough, but it's so disgusting now."

Group 2: Redmond Residents - continued

One person said she is depressed by all of the trees being cut down. . Another described the large cement structures at the east end of town that greatly detract from the beauty of the area. She wondered if Marymoor will become an increasingly isolated oasis of green.

Asked about their current patterns that relate to the environment, all but one person said they are currently recycling. Most make an effort to purchase products that are environmentally safe. They look at the packaging labels for toxic chemicals. Only a few in the group are active gardens, but those who do garden say they are aware of safer products to use.

There was agreement that people in Redmond are more environmentally aware. It was pointed out that Redmond was the leader in doing curbside recycling. One man added, "I do curbside oil pickup." Schools, restaurants and other businesses in Redmond promote safe environmental practices. Several in the group praised the environmental education programs in the local schools: "Kids learn about recycling, wetlands and other environmental issues." One person mentioned the twice a year waste collections and believes these are very effective.

Awareness of Redmond drinking water

Asked where there drinking water comes from, only three in the group suggested the Tolt River, Seattle pipeline or wells. The rest were unsure of the source of their water. One noted, "I think this building is on one of the wells."

The facilitator explained that those west of the Sammamish River get their water from Seattle, while those east of the River use well water from the Redmond Aquifer. Those getting Seattle water said they don't think it tastes very good.

Although all but three said they had heard the word, "Aquifer," most could not supply a definition. There were two members in the group who were extremely knowledgeable because of their background: One person is a writer who has written articles about the Florida Aquifer; and another has a parent who runs a water department in California. Definitions given for an aquifer included: "A deep well pump; " "Naturally occurring water underground;" "Water which seeps through the ground and fills up a cavity in the earth."

Perceptions of the cost of water

Although they were not sure where their perceptions came from, most believe that water in Redmond is less expensive than in other cities. One person with a second home on Camano Island said water is more expensive there.

Group 2: Redmond Residents - continued

There was agreement that Redmond does not have an ample supply of water to handle its growing customer base. One person pointed out, "I pay attention to the response to rainfall and snowpack." Some are aware of the amount of growth and recognize this has to have an impact on the amount of water consumed. Others recall being asked to voluntarily stop watering during draught periods. Someone added they have an impression that there is less accessibility to water supplies.

Most had no idea how the cost of water is determined, but one suggested it is based upon how far the water has to travel to the customer, while another thought costs reflect how much has to be done to make it clean enough to drink.

When differences in the cost of Seattle water and Redmond well water was mentioned, some were upset that Redmond residents who use well water should have to pay for more expensive Seattle water. They all guessed, correctly, that Seattle water is considerably more expensive than water from the Redmond Aquifer. None were aware of how the cost of Redmond water is based upon the proportion of water obtained from wells in relation to the amount purchased from Seattle.

Perceptions of the purity of Redmond water

There was agreement that Redmond water does not taste good. Some described it as tasting "funny" or "awful." More than half in the discussion mentioned they use a Britta system so they will have better tasting drinking water. Commented one mother, "My children can taste the difference between Britta water and water out of the tap." Someone who used to live in south King County commented that the water there seemed to taste much better than Redmond's. Someone else added that Bellevue water tastes rusty, while another said that Seattle water seems cloudy. Some thought that pipes might be causing taste problems

When asked what affects the quality of water, several suggested pipes. Others mentioned pollution. and chemicals. They suggested that chemicals can get into water at the filtering plants, through wastewater and from industry.

Some mentioned the habit patterns of people that may affect water, such as people who dump things down the drain. One knowledgeable person pointed out that what we put on our ground seeps into the aquifer, including fertilizers and oil. One person added a comment about runoff from the streets during rainfalls.

Asked to guess how far below the surface the Redmond Aquifer is in its shallow locations, most had no idea, but one person guessed between 500 and 1,000 feet. All were surprised to learn that it is very near the surface (nine feet) in some places.

Group 2: Redmond Residents - continued

When asked to think about toxic products they may be using, several women in the group were quick to point out the extremely toxic cleaning products they have in their homes. One of the men pointed out problems with paint sprayers.

No one in the group had heard the term, "recharge."

Most members of the group had little awareness of how an aquifer works, but they did demonstrate an intuitive understanding of the need to protect the water supply.

Ways to encourage citizens to be more aware

Citizens are highly supportive of the City educating people about ways to protect and conserve the drinking water supply.

Children are the greatest resource for educating adults about protecting the Aquifer. Those in the group with children in their households had considerable praise for what they have already seen coming home from school with their children. There was agreement that educational programs in the schools are effective for educating the adult population, as well as children.

One person suggested providing information about the water supply in the City's utility bills. Some believe extensive PSA's on television and radio will get the message out.

One man had an idea for a festival of water. He recalled the Water Pavilion at the Spokane World's Fair. Several in the group thought this was a good idea.

A women who grew up in California, with a father who runs a water department, said her childhood was filled with constant reminders to conserve water: "When I was growing up, we had a water drop logo posted everywhere (a drop of water that said "Conserve water"). Others liked the idea of having a logo that would be everywhere promoting awareness of water quality and water conservation.

Someone suggested publishing a booklet that would describe things people can do to protect the water supply similar to the publication, "One Hundred Things You Can Do to Save the Earth."

Several like the idea of having posters everywhere around the City.

When shown the five drawings that might be the basis for a logo design, members of the group were unimpressed (even though they had been describing their responses to other logos, such as the water drop). One person commented, "I don't get the feeling any of them would work. What is the objective?" One man pointed out that wherever there are

wells in Redmond, they are clearly labeled, such as "Redmond Pump #4," so he believes people have some awareness of the wells. Although they did not like any of the suggested logo designs, there was agreement that it would be useful to have "something to catch the eye to make people more conscious." There was some confusion over whether the City wants to emphasize conservation, pollution or both.

Group members agreed that a whole educational campaign is needed including programs in the schools, materials in the utility bills, articles in the local newspapers and information through other media. They also believe that a logo needs a good catch phrase to get the message across, such as the Mariners' "Refuse to Lose." The City's overall strategy should be reflected in the phrase and logo for Aquifer protection.

One woman suggested the City needs to work on improving its signage relating to environmental issues. For example, she pointed out the sign that reads, "Union Hill Watershed - Closed" with no explanation of what a "watershed" is.

One of the youngest members in the discussion (23) admitted she did not know anything about the water supply before she came to the discussion. She believes this lack of knowledge is common among her age group. She suggested that young people need to know about hazards to the water supply.

Group members believe people are very willing to cooperate and do what is necessary: "Someone needs to get the word out so everyone can do their part before it's too late." They want the City to be pro-active rather than reactive. They pointed out how well the concept of recycling took hold and got people to learn new habit patterns.

The media should be used to full advantage. Older members in the group remembered the effectiveness of the program to restore Lake Washington more than 20 years ago.

Large businesses also provide a great resource for educating the public, both internally and externally. One person described the excellent wetlands display, created by Microsoft, that's in her child's school. The employees of the company can be given educational information, and businesses can be encouraged to contribute to the educational program: "People will support businesses that promote they are doing things to protect the water."

Conclusion: If you were in charge of the Aquifer education program for the City, what three things would you do to build awareness?

Bill: Make it an individual issue, "Water is us." Have a water festival involving kids. Get large companies to sponsor educational processes within their firms.

Kari: Start with the schools and do educational programs with children. Produce educational flyers. Have a visual reminder that people can place in their homes.

Group 2: Redmond Residents - continued

Briget: Have something in every person's home, a logo or symbol. Have committees -- Council and in the community -- to target the educational system, industries and other population segments. Have information in the local newspaper with a regular on-going feature on who has been doing good water practices. ("a brag list")

Mary: Utilize the schools. City spokespeople, such as the Mayor and City Council, can remind people where their water comes from and what they should be doing. Get information to businesses and large building contractors and encourage them to incorporate water protection into the bylaws of major subdivisions.

Leigh Ann: Conduct a major public service campaign using television, radio and newspapers, to educate people about where their water comes from and why people need to protect it. Have posters throughout the City and in the schools to remind people.

Mike: Target the schools and get Police involved with the children. Design a program, similar to DARE, for water. Mike suggested calling it, "Water Environmental Technology or WET. " A Police officer would visit the schools and do what they do with the DARE program only in relation to water awareness. Have a festival. Have signs by the freeways to let people know about things they are doing that pollute the water.

Jonathan: Do a program in the schools where children "graduate" from the program like DARE, but use people, other than Police, who have extensive knowledge about water issues. Have a media blitz. Have bumper stickers or magnetic signs on City of Redmond cars. Have signs on the drains

Steve: Produce videos, one aimed at adults and one for school children.

Matt: Narrow the scope, and deal with either conservation or pollution. Have large businesses promote water education (Microsoft/Nintendo). Utilize company email and weekly magazines. Have a logo (water drop) that is everywhere.

Angela: Begin with the schools. Have signs everywhere that promote water education, Have a water park with educational information for the children.

Tamara: Utilize the schools. Have a promotional campaign in the media. Have a symbol, like Mr. Yuck, that will be easily understood and will be widely distributed.

CAROLYN BROWNE ASSOCIATES
Community Involvement / Marketing Research

Interactive Workshops on Water Protection

Conducted July 30 and 31, 1997

Prepared for

City of Redmond
Public Works Department
Wellhead Protection Program

Funded in part by a grant from the Centennial Clean Water Fund

Prepared by

Carolyn Browne Associates

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Summary Comments from Questionnaires and Worksheets

INTRODUCTION

The City of Redmond is in the process of completing its Wellhead Protection Plan. As part of this process, two public workshops were held to educate people about groundwater protection issues and to learn more about public attitudes relating to these issues.

The Workshops were held on July 30 and 31, 1997, from 7:00 to 9:00 p.m. at Anderson Park, 7802 - 168th Avenue NE in Redmond. The Workshops used an interactive format in which participants were invited to participate in four events: A visit to a well house; a presentation on the history of Redmond drinking water; a demonstration on how an aquifer works; and a chance to meet and talk with experts on groundwater. After visiting these four areas, participants then met for a small group discussion on what types of regulations are appropriate to protect Redmond's drinking water supply.

The events were publicized through advertisements a week prior to, and just before, the workshops in the Seattle Times Eastside Edition and the Eastside Journal; flyers mailed two weeks prior to the workshops to over 5,400 Redmond households in the Wellhead Protection areas, announcements on cable access television, and news releases sent to the daily newspapers.

WORKSHOP FORMAT

Those attending the workshop participated in several activities. They were rotated through the activities based upon a "Well Pass" card they received at sign-in which showed the times they were to be at each place. These activities included:

1) A well tour
2) A demonstration of how an aquifer can become contaminated
3) A history of Redmond's drinking water supply
4) An opportunity to meet, and talk with, groundwater professionals

16820 N.E. 11th Place / Bellevue, Washington 98008 / (206) 644-6820 / FAX (206) 562-1935

After visiting each of these activity locations, all participants met in small groups, where they listed their ideas for types of regulations they feel are necessary to protect Redmond's groundwater supply. These listings were made fro businesses and for individuals. Before leaving, each person completed an Individual Questionnaire.

THE PARTICIPANTS

Thirty-one citizens attended one of the two workshops and all but two returned completed questionnaires. Nineteen were at the first (July 30) workshop, and 13 participated on the second day (July 31). Based upon the sign-in sheet, most (21) of those who attended are Redmond residents....many reside outside the city limits, but do live at a Redmond postal address. Eleven have businesses in Redmond, one is employed in Redmond, and four are City of Redmond employees.

SUMMARY OF COMMENTS FROM INDIVIDUAL QUESTIONNAIRES

Source for learning about workshops

The largest share (16) of those who attended learned about the workshops from the letter mailed to them; most of the remainder learned from a friend or neighbor or someone associated with the project (8); and a few learned from the newspaper ads (2) from email (2), from walking by (2) or from their workplace.

Reasons for coming to the workshops

Most who attended came to learn more about Redmond's groundwater and the quality of the drinking water supply (14); some came to learn about Redmond's Wellhead Protection Program (4); and the remainder came for a variety of reasons, most of which related to learning something about any problems relating to Redmond's water supply.

Perceived value of the workshops

Most of those who attended believe the workshops were a valuable experience. On a five-point scale, where 5 meant "extremely valuable," 10 rated the workshops a "5" and 18 gave the workshops a "4" rating; only 2 rated the experience below a 4, and one person had no opinion.

Preferred methods for protecting the City's drinking water supply

Those responding strongly support education for businesses (25 gave it a 5 rating on a 5-point scale) and residents (21) is the most effective method for protecting Redmond's drinking water supply. A smaller number of people strongly favor on-site inspections (17), more restrictive building codes (14), and land use restrictions (13). It should be noted that most participants gave each of the five examples a 5 or 4 importance rating.

Preferred funding methods

Participants believe that the most acceptable methods for funding aquifer protection are special permits and user fees in wellhead protection zones (23), seeking outside grants and loans to help (23) and raising development and hookup fees (21); a somewhat smaller number favor raising water rates (though 10 say they are not sure about this alternative), and re-assigning existing staff (14), but 8 believe this is not acceptable, and 7 say they are not sure.

CAROLYN BROWNE ASSOCIATES
Community Involvement / Marketing Research

Interactive Workshop on Water Protection

Questionnaire Tabulations - July 30 and 31. 1997

1. How did you learn about this public workshop?

Information Source	Number of Responses
Newspaper	2
Letter/flyer in the mail	16
Friend/neighbor/city employee	6
Other: Phil Cohen 2 City email 2 Walked by 2 At work	

2. What was the major reason for coming tonight?

Reason	Number of Responses
Interest in/learn about Redmond groundwater/water quality	14
Groundwater geologist involved with project	1
Learn where wellhead protection is going in Redmond; curiosity about Redmond's water planning process	4
We live here	1
Learn how Redmond Fire Dept. can assist in keeping our water clean	1
Concerned about growth in area and impacts	1
Curiosity/general interest	2
To get cookies and juice	2
Personal awareness of water problem	1
To comment on Wellhead Protection Plan	1
Concern as new homeowner/resident	1

3. On a scale from 5 to 1 where 5 is extremely valuable and 1 is a waste of time, how would you rate your experience at this workshop tonight?

Workshop Rating	Number of Responses
5	10
4	18
2	2
No response	1

4. Listed below are several methods the City may use to protect its drinking water from the aquifer. On a scale from 5 to 1, where 5 is extremely important and 1 is not at all important, please rank the ones you believe are most important for the City to do

Methods to Protect Drinking Water	Importance Very----------Not				
	5	4	3	2	1
More education on water protection to businesses	25	2			
More education on water protection to residents	21	2	2		
On-site inspection for hazardous materials use, storage and transportation	17	8		1	
Restrictions on land use in wellhead protection zones	13	8	2	1	
More restrictive building codes in wellhead protection zones	14	5	2	2	

5. There are several possible funding methods being evaluated to provide the money for aquifer protection. Please indicate which of the following methods listed below you believe are acceptable or not acceptable (or you may indicate if you aren't sure or don't know).

Funding Method	Acceptable	Not Acceptable	Not Sure
No additional funds; re-assign existing staff	14	8	7
Raise water rates	15	4	10
Raise development and hookup fees	21	4	4
Seek outside help (loans, grants)	23		6
Special permits and user fees in wellhead protection area zones	23	2	4
No responses			2

6. Do you reside:

Reside:	Number of Responses
In Redmond, east of the Sammamish River	15
In Redmond, west of the Sammamish River	1
Outside the City of Redmond	13
No response	2

7. Do you own a business in the City of Redmond?

Yes	5
No	23
No response	3

Other comments

Why are we here? What actions/plans are being considered by the city?
Valuable meeting tonight. "I learned so much about my water at the tap; I have come away with more information, education and a greater respect for how my water comes to me."
Why don't city employees get this information and learn how they can assist in keeping the water clean? Redmond employees did a fine job.
Very good program. You need to explore how to do more public involvement.
This was a very effective interactive workshop; it would be worthwhile to reach more people with this format (like at Derby Days or Sat. Farmer's Market).

City government should lead by example...recycling, clean water use practices, pesticides, fertilizers, vehicle washing and maintenance wastes water; storm water from buildings and city land should be looked into.

I am surprised there is so little restriction on land use and toxic substance management and practices for businesses in the near vicinity of the wellheads; it seems reasonable to impose moderate new rules for large and small businesses near the wells.

Well tour was great.

Great interactive presentation.

CAROLYN BROWNE ASSOCIATES
Community Involvement / Marketing Research

Interactive Workshop
on Water Protection

Discussion Question

What types of regulations do you feel are necessary to protect Redmond's groundwater supply?

For Businesses

Inspection and enforcement of existing regulations
Education, especially on identifying contaminants
Manuals and phonebooks on responsibilities
Training for incoming businesses and all city staff on water issues.
Risk-based regulations -- keep it simple.
Inventory of chemicals to be identified.
Keep records of businesses, including small ones.
Notify fire departments before problems occur.
Limit types of businesses than can be established in wellhead areas.(all groups)
Have stringent requirements for storage of chemicals; i.e. no outside storage of harmful chemicals; land-use restrictions. (two groups)
Monitor businesses (surprise visits).
Use business hazardous registration to monitor.
Control non-point pollution.
Have consequences for those who don't comply with the rules.
Have an Aquifer Protection Officer.
Develop cost incentives to promote safe practices.
Coordination of land-use development and groundwater source.

For Individuals

More education (all groups):
- Use cable access to educate.
- Use school system to spread education (tours and workshops like this one)
- Use water bill to educate about water protection at home.

High density housing units need to have some form of compliance with safe water practices (i.e. carwash and oil change areas)
More public relations (all groups); example: have training and information at public gatherings like Derby Days and Saturday Farmer's Market (two groups)
- Send out water success stories
- Have regular community meetings

- Set up monthly "swap meet" or residential yard sale sponsored by the "Redmond Aquifer Society" and look for ways to connect with youth groups.

Limit septic tanks/fields.
Reduce usage of chemicals for lawn care and maintenance.
Point of use treatment.
Land use restrictions

Additional regulations recommended for the City

Review old, abandoned underground tanks and secure or remove.
"Adopt an aquifer" program
Add onto the "Salmon Signs" that run along surface water sources an acknowledgment that "this is your drinking water too."
Reinforce the regulations and plans that exist.

Additional Comments Regarding Regulations

Aquifer recharge area would be monitored and regulated through King County, not just Redmond; city should communicate with other municipalities regarding maintenance of the water resources (two groups)
Drainfields should be monitored in the region.

CAROLYN BROWNE ASSOCIATES
Community Involvement / Marketing Research

Interactive Workshops on Groundwater - Sign-In

Name	Address	Phone	Resident	Business	Emp.
(—— July 30 ——)					
David Morton	15830 NE 83rd Ct., Redmond	702-1828	X		
Jon Spangler	14319 NE 84th Ct., Redmond	882-0951	X		
Larry Morris	17809 NE 103rd Ct., Redmond	881-0691	X		
Kevin O'Brien	7947 159th Pl. NE, Redmond	869-1300		X	
Catherin Moody	10817 - 176th Cir. NE, Redmond	883-1665	X		
Sage Dahm	8219 172nd Ave. NE, Redmond	885-1751	X	X	
Beryl Standlye	8219 172nd Ave. NE, Redmond	885-1751	X	X	
Loren Charlston	21624 NE 14th Pl., Redmond	868-2778	X		X
David L. South	18320 NE 107th St., Redmond	649-7200	X		
Rebecca R. Moore	18321 NE 103rd Ct., Redmond	869-1925	X		
E. C. Martz	5320 218th Ave. NE, Redmond 98053	868-8148	X		
Matthew Eldrenkamp	7947 159th Pl. NE, #101, Redmond	869-8844		X	
Tim McGrath	16940 NE 92nd St., Redmond	883-2498	X		
Paul Rosenfeld	7332-1/2 Ravenna Ave. NE, Sea. 98115	206-523-7399		X	
Dave Garland	10212 184th Ave.NE, Redmond	649-7031	X		
Don Balmer	5613 NE 200th Pl. Seattle 98155	425-483-8417			
Brieana Tye	3704 206th Pl. NE, Redmond	Don't contact	X		
Donna Johnson	18825 Leary Way, Redmond	Don't contact	X		
Rev Nick Amet	14420 Avondale, Woodinville 98072	Don't contact		X	
(—— July 31 ——)					
Jim Wilder	ENSR Cons,, 9521 Willows Rd.NE, Red.	881-7700		X	
Judy Jewell	Olympian Precast, PO Box 539, Red.98073	868-1922		X	
Glen Strachan	Hydro-Geosciences, 13008 177th Pl. NE	702-0185	X	X	
Ward Crell	12919 181st Ave. NE, Redmond	641-9900	X		
Dianne Neet	18080 76th NE, Red 98073	556-2322			X
Don Lance	Lance Env., 17211 NE 95th, Redmond	867-3016	X	X	
Kimberly Dietz O'Neill	13954 NE 60th Way, #102, Redmond	556-2415	X		X
Sherry Ducken	12319 209th Ave.NE, Redmond 98053	556-2812 (work)			X
Sharon Pagel	15727 NE 153rd, Woodinville 98072	425-483-0980			
Nancy Stevens	12219 184th Ave.NE, Redmond	883-3728	X		
Karen Worcester	18705 NE 62nd Ct., #D2032, Redmond	558-9798	X		
Judith Simpson	10655 Red-Wood. Rd. NE, Redmond	883-0944	X		

Interactive Workshop on Water Protection

Welcome

The City of Redmond is fortunate to have an excellent supply of groundwater that provides approximately half of our drinking water needs. If you live east of the Sammamish River, you are most likely obtaining your water from our aquifer. If you reside west of the Sammamish River, you are probably drinking water obtained from Seattle Water, for which we are a purveyor.

What's important to understand is that all Redmond residents benefit from the aquifer because this water source supplies drinking water that costs a third of that from Seattle. If anything were to damage this supply, we would be forced to obtain more water from Seattle, which would increase everyone's water bills.

We invite you to learn more about Redmond's drinking water supply tonight, and have a good time while you're becoming better educated about water. You have received a "Well Pass" showing where you need to be at each quarter hour, when people will be asked to move to a new Water Education Station. Our locations include: A well tour; a demonstration of how an aquifer can become contaminated; a history lesson on Redmond's drinking water supply; and a place to have information conversation with professionals in the fields of groundwater supply and distribution.

At 8:00 p.m., you'll be asked to participate in small group discussions with your neighbors and City staff and share your opinions and ideas; at 8:30, we'll share responses and complete Individual Questionnaires.

When you have completed your Individual Questionnaire, bring it with your completed Well Pass to the Sign-in Desk to receive your gifts.

And, thank you for coming tonight!!

Interactive Workshop on Water Protection

July 30 and 31, 1997
7:00 - 9:00 p.m.
Fullard House, Anderson Park, Redmond

Agenda

7:00 - 7:15	Registration
7:15 - 8:00	Visit the Water Education Stations
	Please be sure to obtain your "Well Pass" which shows the times you have been scheduled to visit each of the locations.
8:00 - 8:30	Small Group Discussions
	Please go to the table number listed on your Well Pass and share your opinions and responses with your neighbors and City Staff.
8:30 - 9:00	Share information/Complete Individual Questionnaire
	If you need to leave early tonight, please complete an Individual Questionnaire before you go (ask a Redmond staff person for one)

APPENDIX E

EXAMPLE NOTIFICATION LETTER

Business or Site Owner/Operator
Address

Subject: Wellhead Protection Notification
Business or Site Name
Business or Site Address

Dear (Site Owner/Operator):

In order to protect the drinking water supply for the customers of the City of Redmond water system, the Redmond Department of Public Works is developing a wellhead protection program to satisfy Washington State Department of Health (DOH) requirements, as specified by WAC 246-290. A principal component of the wellhead protection program for the Redmond water system that has been completed is the mapping of the areas overlying the short-term recharge zones of the water supply wells in this system. These mapped areas are called wellhead protection areas. The business or site name shown above falls within the wellhead protection area mapped for the City well _____ (INSERT WELL NUMBER), which is located at INSERT LOCATION DESCRIPTION USING ROADS OR LANDMARKS and owned and operated by the City of Redmond.

After the mapping process was completed, potential sources of groundwater contamination within the outermost wellhead protection area boundary of each well (10-year groundwater travel time to the well) were inventoried from regulatory databases and field observations. The methodology and supporting data for the wellhead protection area delineation and the contaminant inventory are presented in the City of Redmond Wellhead Protection Report dated October 30, 1997. The nature of your business or onsite activities and your site location within the wellhead protection area indicates that your business or activity at this site has the potential to affect the quality of drinking water produced from the INSERT WELL NAME water supply well.

Per DOH requirements, the City of Redmond has prepared this written notification to you and to the following agencies/local governments that regulate your type of business or activity: INSERT NAMES OF AGENCIES OR LOCAL GOVERNMENTS NOTIFIED. You should contact these agencies and local governments to request technical assistance in managing your business and onsite activities in a manner that prevents soil and groundwater contamination.

The City of Redmond complements you for environmental and groundwater protection efforts already incorporated into your business practices and activities. We hope that informing you of your location in our wellhead protection area will result in continuation of existing protective measures and appropriate increased precautions, as appropriate, to prevent releases of contaminants to the environment and adverse impacts to our groundwater supply.

Sincerely,

City of Redmond Public Works Department

cc: Agencies Listed on "Agency Notification Letter"

List of Agencies:

Department of Ecology
Department of Health
King County Department of Natural Resources
Seattle-King County Department of Public Health
Woodinville Water District
Union Hill Water District
Northeast Sammamish Sewer and Water District
East Site Hazardous Materials Team

Re: City of Redmond Wellhead Protection Program

Dear (Agency/Government):

As part of the wellhead protection program for the City of Redmond, we are hereby informing you of the findings of our wellhead protection area delineation and contaminant inventory. The notification is presented in accordance with State regulations (WAC 246-290-135). The methodology and supporting data for the wellhead protection area delineation and the contaminant inventory are presented in the City of Redmond Wellhead Protection Report dated October 30, 1997.

The City of Redmond water system has _____ service connections and provides water to a population of approximately ___. The system obtains about 20% of its water from five wells located in the City; the other 80% is obtained from City of Seattle surface water sources. Table 1 provides basic information about the City of wells covered by the wellhead protection program, including the susceptibility ratings assigned by the state Department of Health.

The enclosed map (Figure 1) shows the wellhead protection area zones designated in the Wellhead Protection Report. Also shown on the map are the locations of potential groundwater contamination sources inventoried within the wellhead protection area zones. Table 2 lists these potential contamination sources by map number, and Table 3 shows the relative risks posed to each City supply well by the various categories of contamination sources.

Any groundwater contamination that occurs within these wellhead protection area has the potential to reach the City supply wells. It is therefore of the utmost importance that all reasonable steps be taken to ensure that land use activities within this wellhead protection area do not contaminate our groundwater supply.

Thank you for your support in protecting our drinking water.

Sincerely,

City of Redmond Public Works Department

cc: Office of the Mayor, City of Redmond
Redmond City Council
Redmond Parks Department
Redmond Planning Commission
Redmond Fire Department