

Mountain View-Edgewood Water Company
WELLHEAD PROTECTION PLAN

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EXECUTIVE SUMMARY

Wellhead Protection Area Definition

A wellhead protection area (WHPA) is a representation of where the water produced by a given well comes from. It is based upon capture zones, which describe the area of an aquifer that can contribute water to the well in a given period of time. Capture zones are typically defined for time-of-travel periods of six-months, and one, five, and ten years. Mountain View-Edgewood Water Company (Company) wellhead protection areas were defined using a six-layer numerical computer model that was developed for Lakehaven Utility District to describe the Federal Way Upland. A numerical model is a highly detailed, three-dimensional representation of water flow through the identified hydrogeologic layers.

The capture-zone modeling results indicate a generally southwesterly trending groundwater flow within the Company's primary aquifer system, the Vashon advance aquifer (Qva; Layer 2 of the Lakehaven model). The proximity of the Company's wells resulted in the definition of three capture zones: one large WHPA for Wells 3, 5, 6, 7 and 9, a WHPA for the combined area of Wells 1R and 8, and a small WHPA for Well 2. Well 5, which is completed in intermediate aquifer system, is combined into the larger WHPA of Wells 3, 6, 7 and 9, simply due the overlap of the capture zones. Well 2 is also completed in the intermediate system, but stands alone due to its northerly location.

Existing and Potential Contamination Hazard Identification

The inventory of potential contamination sources within the WHPA was performed according to the Washington State Department of Health guidance document: *Inventory of Potential Contaminant Sources in Washington's Wellhead Protection Areas* (1993). Track Info Services, LLC, an environmental database research company, reviewed 18 federal and state environmental databases for any known or potential contaminant sites within the study area. Also, an evaluation of various land-use categories and activities was performed and the results included in the list of potential hazards. In order to verify the current land-use activities and potential contamination sites identified by Track Info Services, a field survey was performed on September 23, 2004.

From this process, 24 sites or categories of land-use activities were identified as known or potential hazards to the Company's wells. These were prioritized and ranked such that the Wellhead Protection Plan implementation process can address each site or land use in a systematic manner. Each site was ranked according to four factors: proximity of potential hazard to the WHPA, type of contamination, straight-line distance from the wells to the potential hazard, and type of contaminated media.

Protection Strategies and Implementation Tasks

The completion of wellhead protection planning provides no safeguards unless effective management strategies are implemented to prevent potential contamination of groundwater sources. With the hazards identified, the Wellhead Protection Plan provides for six strategies and 26 specific tasks for the Company to undertake to complete the process. Also included is a detailed review of the State spill response plan and a contingency plan to address the possible loss of one or more water sources.

INTRODUCTION

Wellhead Protection Program

In response to the 1986 Amendments to Section 1428 of the Federal Safe Drinking Water Act, the Washington Administrative Code (WAC) was modified in July 1994 to include mandatory wellhead protection measures¹ for Group A public water systems (WAC 246-290). The overall goal of the state wellhead protection program is to prevent the contamination of ground waters used by Group A public water systems. This is to be accomplished by the definition of management zones around public wells, detection of any existing ground water contamination sources, and through the management of potential sources of groundwater contamination prior to their entry into the drinking water system. The state requires that a Wellhead Protection Plan (WHPP) shall, at a minimum, include the following aspects:

- A completed susceptibility assessment
- A delineated wellhead protection area
- An inventory of potential contamination threats
- Distribution of findings to required entities
- Contingency plans for alternative sources of drinking water
- Appropriate spill/incident response measures

Under the WAC, local public water systems have primary responsibility for developing and implementing local wellhead protection programs. Due to the limited jurisdictional and regulatory authority afforded most purveyors; it is essential that they work with other local, state, and federal agencies possessing the appropriate authority. The State Department of Health (Health) oversees the wellhead protection program.

Scope of the Mountain View-Edgewood Water Company Wellhead Protection Plan

This wellhead protection plan focuses on three primary areas:

- A hydrologic evaluation of the aquifers used by the Company and the delineation of the zone of contribution and wellhead protection areas (WHPAs) for each Company production well,
- An inventory of potentially hazardous materials inside the delineated WHPAs, and
- The development of management, spill response, and contingency plans.

Mountain View-Edgewood Water Company Overview

The Company's service area is located north of the Puyallup River valley and south of the King County - Pierce County boundary (Figure 1). The majority of the service area exists on the upland area formed between Puget Sound, the Puyallup River and the White River (in the southeastern corner of an area known as the Federal Way Upland) and generally serves the incorporated area of the City of Edgewood. Edgewood is bordered by the Cities of Milton, Puyallup and Sumner and currently has a population of 10,830 residents.

¹ The legislative authority to require wellhead protection planning can be found in the Revised Code of Washington (RCW) Chapters 43.20.050, 70.119A.060, and 70.119A.080.

The Company relies on groundwater sources to serve its needs. The Company oversees the entire water distribution system and serves water to an area slightly smaller than the incorporated area of the City of Edgewood. Approximately 7,300 customers are served through 2,812 connections. Six production wells are currently used to supply the Company's needs. An additional well exists as a possible supply source. At the present time and into the near future, the use of ground water constitutes the Company's primary and most economical guaranteed source of supply.

The Company has maintained an excellent water quality record in the 80 years it has been in service. They have never found need to treat the water they provide to their customers. This is partially due to the encapsulated recharge zone of the Qva aquifer it depends upon, the nature of the geologic materials protecting the aquifer and the lack of industrial and commercial development within the zone of contribution of these aquifers. Risks associated with commercial activity and land use are concentrated along the Meridian Avenue transportation corridor. The rest of the City of Edgewood is largely low-density residential properties. All but one of the Company's existing wells produce water from a shallow aquifer protected from contamination by a pervasive glacial till cap.

HYDROGEOLOGIC ASSESSMENT

Introduction

The basis for the wellhead protection process is the delineation of production well capture zones. A capture zone represents the total area of contribution from which a well derives ground water in a given period of time. The process of delineating wellhead capture zones quantifies aquifer characteristics in order to determine the area of an aquifer (and all overlying material) that can contribute water to the well. Capture zones are typically defined for time-of-travel periods of six-months, and one, five, and ten years. There are several methods to define the capture zones, as listed in the Wellhead Protection Program Guidance Document (Health, 1995). For this plan, a numerical model of the Federal Way Upland developed for Lakehaven Utility District (Robinson & Noble, 1992) was used to define the capture zones. A numerical model is a highly detailed, three-dimensional representation of water flow through the identified hydrogeologic layers.

The basis for the proper modeling of a complex system such as flow through aquifer systems is the creation of a conceptual model. This process attempts to identify all of the physical processes that must be represented in the numerical model and describe their relationship(s) to one another. Once a conceptual model is completed, the hydrogeologic layers identified can be translated into model layers for the numerical model. The model is then constructed and tested against known data sets to calibrate the model's performance. Once calibrated, the model can then be used to predict flow paths and timing, and thus, provides an accurate method for defining capture zones.

Database

The primary source of information for this WHPP was a series of projects and reports generated for Lakehaven Utility District by Robinson, Noble & Saltbush. Two major projects evolved from Robinson, Noble & Saltbush's studies that are pertinent to the Edgewood area, a regional aquifer description (Robinson & Noble, 1987) and a numerical computer model of the upland (Robinson & Noble, 1992). The data set generated by these three reports is extensive, and has formed the foundation for all our subsequent work on the upland area.

The raw data forming the database are mainly water well construction reports (logs) for wells drilled throughout the upland and surrounding valley areas. This includes construction reports for all of the Company's wells. These logs were cataloged and analyzed to create the conceptual hydrogeologic model of the upland (discussed below). The hydrogeologic characteristics for each data point were then summarized during the computer modeling process in order to identify the model layers.

For this project, Robinson, Noble & Saltbush performed a thorough search of both the Company and Robinson, Noble & Saltbush's files to collect all pertinent information on the Company's wells. Additionally, logs were collected for new wells drilled in the surrounding area after 1992. This data was added to the Lakehaven model data set and used to revise the model where needed.

Study Area Physiography

The study area is composed of the southernmost tip of the Federal Way Upland. The upland area is essentially a glacial-drift plain typical of the Puget Sound Lowlands, characterized by steep gullies and high bluffs along the margins and relatively low-relief on the upland itself. The study area is sharply defined by the bluffs dividing the Puyallup River to the south and the Auburn-Sumner valley to the east. The maximum elevation in Edgewood is 500 feet in the southeast. Numerous lakes and swamps are found in these interiors reflecting the poorly drained nature of the surface sediments (Luzier, 1969 and Walters and Kimmel, 1968).

The Edgewood area, like most of the Puget Lowland, is characterized as a mid-latitude, humid-marine climate (Jones, 1999). The near proximity of Puget Sound moderates temperatures in the area providing relatively cool summers and warm winters. Precipitation falls almost exclusively as rain. Onshore storms from the Pacific occur most frequently in the winter months. The wet season is typically October through March and average annual precipitation averages 39 to 40 inches per year (Western Regional Climate Center, 1995).

Conceptual Model

In order to represent all of the variable conditions of the study area properly in a numerical model, a conceptual model is first constructed. The conceptual model of the Federal Way Upland defines the hydrogeologic units that make up the upland (three aquifers and three non-aquifer/confining units) and surrounding valley areas (two valley aquifers; Robinson & Noble, 1987). This model was modified for the Lakehaven Utility District's modeling effort (Robinson & Noble, 1992) in order to add additional detail and to re-define the hydrogeologic layers as model layers (see below).

Hydrogeologic Overview

The southeast portion of the Federal Way Upland consists of a thick sequence of unconsolidated sediments. The Company's source wells are all associated with aquifers beneath the upland, though two the wells are located along the upland's southern edge. The core of the upland is comprised of pre-Vashon glacial and interglacial sediments which are found at relatively high elevations at the eastern margin of the upland. These sediments dip to the west.

The Vashon glaciation deposited a broad sheet of outwash material as the glacier advanced towards the Edgewood area (Vashon advance outwash or Qva). This thick sequence of sand and gravel serves as a primary aquifer of the upland region and is a substantial source for the major purveyors of the area (including Lakehaven Utility District, and the City of Milton). Particular to the Federal Way upland is a channel feature within the Qva materials extending from the Redondo area north of Federal Way to the Milton area where the Hylebos drainage joins the Redondo-Milton Channel (RMC) Aquifer (Robinson & Noble, 1987). Remnants of RMC deposits are found along the southern tip of the upland where erosion or re-working by the Puyallup River has truncated the deposits and left them separated from the RMC deposits further to the north (along the Hylebos drainage near Interstate 5). Figure 2 shows the surface geology of the subject area, Figure 3 depicts the well and cross-section locations and Figure 4 provides a schematic cross-sectional interpretation of subsurface relationships beneath the area.

The upland area that underlies Edgewood and Milton is the recharge area for the Qva aquifer system tapped by most of the Company's wells. A semi-permeable till surface caps most of the recharge area on the upland. Much of the surface water tends to flow to local depressions on the

till surface rather than runoff to drainages that would escort the water off of the upland. The limited areas where recessional outwash sediments are present represent portions of the upland that are more suited to recharge than most other places (Figure 2). This is because a trough in the till that was subsequently filled with the recessional sediments allows water to move vertically into the more permeable recessional material more rapidly and provides a better opportunity for that water to infiltrate through the underlying till over time. Between the leakage from local depressions and the contributions from the recessional sediments leaking ground water through the till, a substantial amount of recharge reaches the underlying Qva sediments.

The basal material of the Qva is dominated by silt and clay deposits which transition into proglacial lake clays. These lower permeability materials serve as the base of the Qva aquifer system. Once water enters the Qva material, it moves vertically to the water table. The preponderance of the water then moves southwestward toward the Puyallup Valley where it discharges as springs or through subsurface discharge to the shallow sediments of the Puyallup River alluvium. The Qva aquifer can be envisioned as a westward-thickening wedge of sediments laid over an erosional ramp carved into the older, generally lower-permeability pre-Vashon sediments. To some degree, the physical presence of the ramp dictates the flow of ground water through the upland materials. The water table in the advance sediments reflects the variability of permeability between the fine-sand, coarse-sand and, sand and gravel facies of these sediments.

The Company's major production wells are completed in the gravel or sand and gravel deposits within the Qva aquifer. The western margin of the Milton/Edgewood upland area is dominated by very coarse material ranging from sand and gravel to relatively clean (sand-free) gravel and are remnant deposits of the RMC depositional event discussed above. Wells 1R, 8, and 9 are all completed in the RMC deposits. Though the wells at the Lake Chalet site (Wells 3 and 7) are completed in similar gravel material, this location appears to be more laterally limited as would be expected from a pocket of gravel surrounded by sand. The water level responses observed in this aquifer through many years of production appear to support that interpretation. The remainder of the Company's wells are completed in materials that represent lower-transmissivity facies of the advance material or deeper but related unconsolidated aquifers of pre-Vashon age. These wells have the lowest production potentials of the Company's wells.

Most water discharge from the upland aquifer is into the shallow alluvium of the Puyallup Valley along the western edge of the upland. Though some ground water would be expected to drain eastward off of the back-side of the "ramp" formed by the older lower permeability material, this has not been well documented nor is it expected to be a significant component of the water resource development in the Edgewood/Milton area.

A deep well drilled along the eastern edge of the upland in 1981 by Dr. Tim Jolley encountered an aquifer substantially below the elevation of the valley floor comprised of older sediments that pre-date the Vashon glaciation. This well did not identify sufficient production potential above the elevation of the valley which, therefore, required the deeper exploration. This supports an interpretation that the low-permeability transition clays and silts serve as a local base for the advance aquifer and tend to force water to flow to the west or southwest to discharge from the upland.

Physical Definition of the Hydrogeologic System

Based on our modeling effort for Lakehaven Utility District, the hydrogeology of the study area is described by model layers; each model layer representing a different hydrostratigraphic unit

(Robinson & Noble, 1992). The nomenclature used is shown on Table 1. In total, there are six major hydrostratigraphic units delineated on the Federal Way upland down to 700 feet below sea level. Beneath these are hundreds of feet of additional unconsolidated sediments that have not been differentiated.

Table 1: Layer/Unit Nomenclature

Model Layer	Hydrostratigraphic Unit	Notes
1	Vashon Till	Also contains, at some locations, a thin recessional outwash at the top of the unit.
2	Vashon Advance Aquifer System	Also known as the Qva unit; locally equivalent to the RMC. This unit is the primary source of ground water for Mountain View Edgewood.
3	Lower Confining Layer	Confining layer beneath the Qva and RMC
4	Intermediate Aquifer System	Well 5 and the Jolley Well withdraw water from this aquifer.
5	Deep Confining Layer	Confining layer beneath the MLA, above the deep aquifer.
6	Deep Aquifer System	Contains the Federal Way Deep Aquifer.

Each of the model layers is briefly described below based on the definitions made during the modeling process. Additional detail for each layer and their respective interactions can be found in the model report.

Layer 1, Vashon Till

Layer 1 includes the Vashon till and the Vashon recessional deposits that overlie the till in some areas. The unit is generally less than 150 feet thick and covers most of the upland. The till is a compact mixture of sand and gravel in a silt and clay matrix. The till has a low permeability, which retards groundwater flow through it. The recessional deposits are typically coarse sand and gravel which supply perched water in some areas.

Layer 2, Vashon Advance Aquifer System

Across most of the Edgewood upland, Vashon advance outwash deposits exist beneath the Vashon till. These deposits form the Vashon advance aquifer system, with distinct aquifers formed in the higher permeability portions of the unit. The most prominent aquifer is the Redondo-Milton Channel (RMC), which extends southward into the Mountain-View Edgewood area. With the exception of Well 5, Layer 2 is the primary source for all of the Company's wells.

The outwash deposits which make up the unit are varied, ranging from silty sand to very clean, sandy gravel. The unit's thickness varies from absent to more than 200 feet at the thickest portion of the RMC.

Layer 3, Lower Confining Unit

Layer 3 is the lower confining unit for the Qva and RMC. It represents the aquitard between the Vashon advance aquifer system and the intermediate aquifer system. It is formed by a thick sequence of silt and clay-rich sediments, including the Lawton Clay member of the Vashon Drift and, in places, a till. At many locations, the unit is predominantly silt and clay; at other locations, it is primarily a mixture of sand and gravel with silt and clay included as a matrix. The unit varies widely in thickness. Where the RMC reaches its maximum thickness, Layer 3 is very thin to absent. Elsewhere, the layer can exceed 300 feet thick.

Layer 4, Intermediate Aquifer System

The intermediate aquifer system is a mixture of isolated aquifers and lower-permeability sediments laterally deposited (as opposed to deposition above or below the layer) between the aquifers. The most significant aquifer in the unit is the Mirror Lake Aquifer located in Federal Way. The aquifer system also includes smaller, isolated aquifers on both sides of the upland, collectively referred to as the Eastern Upland Aquifers and the North Shore Aquifers. The unit has upper and lower aquifer zones within it. This zonation is particularly evident in the Eastern Upland Aquifers.

Layer 5, Deep Confining Unit

Layer 5, (the deep confining unit) is the aquitard between the intermediate aquifer system and the deep aquifer system. It is the most substantial confining layer on the upland. It is found throughout the upland and is 200 to 400 feet thick at most locations. It consists largely of low permeability materials ranging from clay to silty, fine sand.

Layer 6, Deep Aquifer Unit

Little is known about the deep aquifer system, which contains the Federal Way Deep Aquifer (FWDA), but it is probable that the system is hydraulically connected to the deep aquifers in the Puyallup Valley. The unit includes the fine-to-medium sand deposits of the Federal Way Deep Aquifer, as well as lower permeability sediments found elsewhere on the upland where the FWDA is missing. The unit is probably also in direct continuity with Puget Sound.

WHPA DELINEATION

The capture-zone modeling results indicate a generally southwesterly trending groundwater flow regime within the Company's primary aquifer system (the Qva/RMC, or Layer 2 of the model). The proximity of the Company's wells to one another and their common completion within the Qva (except for Well 5) results in wellhead protection areas (WHPAs) that overlap and orient into two distinct zones: one composed of the Wells 1R and 8 WHPA and the other composed of the remaining wells. The WHPAs and particle track travel times calculated for the Company's wells are shown on Figure 5. A comparison of the modeled production values for each well with the Company's pumping records and water rights data is located on Table 2.

Table 2: Comparison of the WHPP model production parameters with pumping records and water rights data

Well	Water Rights			Production (in gallons)				Modeled	
	Qi (gpm)	Qa (ac-ft)	WR type	Historical Use*	%	2003	%	Production**	%
1R	500	672	P	1,197,391,000	22.8	182,577,000	53.0	310,540,550	55.4
2	150	240	S	-	-	-	-	-	-
3	350	560	S	102,734,100	2.0	-	-	-	-
5	390	570	S	358,072,600	6.8	12,609,000	3.7	20,380,985	3.6
6	250	375	S	614,919,490	11.7	16,030,500	4.7	8,338,059	1.5
7	1,200	550/1226	P/S	871,033,800	16.6	5,414,000	1.6	22,526,538	4.0
8	750	554	P	984,562,200	18.8	27,828,000	8.1	46,662,028	8.3
9	1,000	800	S	1,121,298,000	21.4	99,984,000	29.0	151,783,890	27.1
Total	4,590	1,776		5,250,011,190		344,442,500		560,232,050	

*represents the sum of pumping records compiled over the past seventeen water years

**modeled production rates were determined by distributing the Company's primary water rights between the wells in proportion to the 2003 production rates

Wells 1R and 8

The Company's southernmost wells, Wells 1R and 8, located at the foot of the Federal Way Upland near Meridian Avenue, form their own distinct WHPA. The wells are located within 40 feet of each other and are completed less than 100 feet below ground surface (bgs) in materials connected to the RMC. Historical pumping records show Wells 1R and 8 have pumped 41.6% of the Company's total production in the past seventeen years. The 2003 pumping records indicate these wells account for 61.1% of the Company's current production.

These wells are particularly vulnerable to traffic accidents on the Meridian transportation corridor. Trucks carrying hazardous materials down Meridian Avenue could potentially have an accident on the steep hill. The shoulders on either side of the road may channel spilled materials toward the wells located at the foot of the hill.

Well 2

Well 2, the Company's northernmost well, is located on the northeast side of the intersection of Meridian and 8th Street East near the King County boundary. Well 2 is currently a backup well that is available for emergency use. The well is completed at 397 feet below ground surface, and is

well protected from surface contamination due to the presence of two confining layers (non-aquifer material). No historical pumping records are available for this well.

Wells 3 and 7

Also known as the Lake Chalet Wellfield, Wells 3 and 7 are located on the east side of Meridian Avenue in the center of Edgewood. The two wells are similarly constructed and are completed in the Qva aquifer at approximately 240 feet bgs. Well 3 is used only in the event of an emergency and has not been utilized in the previous two years on record. Historical pumping records indicate Well 7 supplied 16.6% of the company's total production in the past seventeen years.

These wells appear to be well protected from contaminant sources despite their proximity to the Meridian commercial corridor.

Well 5

Well 5, also known as the Barth Well, is located on the southwest boundary of the district and is the only major production well that is completed in the intermediate aquifer system. The 10-year capture zone for this well lies within the capture zones delineated for Wells 3, 6, 7 and 9. Over the last eighteen years, Well 5 has produced about 6.6% of the Company's annual production. In the last few years the annual production has diminished to between 1.0% and 2.7% of the Company's total production or 8,894,000 gallons in the most recent water year.

This well is better protected from possible contaminant sources than the Company's other sources due to its completion in the intermediate aquifer.

Well 6

The Chalet North Well, or Well 6, is located east of Meridian Avenue near the center of the contribution zone of the wellhead protection areas. Well 6 is completed 385 feet bgs in the Qva aquifer. This well has produced 11.7% of the Company's annual production in the past seventeen years. Recent production rates have decreased to around 4.0% of the company's production.

The only known contaminated location determined by this study, the Shell station at 2325 Meridian East, is located 1,200 feet west of Well 6. Three vapor extraction wells are currently remediating the site.

Well 9

Well 9, or the Fred Meyer Well, is the Company's westernmost point of withdrawal and the most prolific well the Company operates. The transmissivity of the near well aquifer has been calculated at 2,500,000 gpd/ft. This well is completed at 248 feet bgs in the RMC aquifer.

The high volume of water withdrawn from the well and its location next to the Josties Pit, adjacent and to the east of the well elevates the potential for contamination from activities at the pit site. The Josties Pit is the second highest ranked, non-land-use potential contaminant source determined from this study.

CONTAMINANT SOURCE INVENTORY

The inventory of potential contamination sources within the WHPA was performed according to the guidance document entitled *Inventory of Potential Contaminant Sources in Washington's Wellhead Protection Areas* (Heath, 1993). This section summarizes the basic steps for conducting an inventory, including:

- Review and identification of potential and known contaminant sources
- Data management
- Prioritizing risks to the WHPA

A summary of common sources of groundwater contamination is presented in Table 3. These sources were considered when performing the contamination inventory for the Company's WHPA.

Potential Contamination Ranking

The potential hazardous sites and land uses discovered through the zoning map examination, database search, and field survey were ranked as to the highest potential for contamination of the well sources. This process will better allow the Company to concentrate its wellhead protection efforts on issues of the highest concern.

Methodology for Establishing Risk Priority

The methodology for prioritizing risks in the Company's WHPA was partially based on the EPA Guidance document entitled *Managing Ground Water Contamination Sources in Wellhead Protection Areas: a Priority Setting Approach* (1991). The ranking effort was also based on the level of confidence in data and information that is currently available for known and potential contamination sites.

Each site was ranked according to four factors called decision levels. The decision levels are listed below in Table 4 (Level I represents the highest hazard risk criteria, Level IV is the lowest).

Contaminant Source Inventory Methodology

Track Info Services, LLC, a database research company, reviewed the federal and state environmental databases listed in Table 3 for any known or potential contaminant sites within the boundaries of the WHPA. The Environmental FirstSearch Report is presented in the Appendix. To evaluate the potential impact of land use on water quality, a copy of the Department of Planning and Land Services' (DPLS) Generalized Proposed Land Use for Pierce County (effective March 30, 1998) was obtained. To verify both the potential contamination sites identified by Track Info Services and land use, a windshield survey was performed on September 23, 2004.

Table 3 - Potential Contaminant Sources Listed by Type

Category I

Sources Designed to Discharge Substances

- Subsurface Percolation (e.g. septic tanks and cess-pools)
- Injection Wells
 - Hazardous waste
 - Non-hazardous waste (e.g. brine disposal and drainage)
 - Non-waste (e.g. enhanced recovery, artificial recharge solution mining, and *in situ* mining)
- Land Application
 - Wastewater (e.g. spray irrigation)
 - Wastewater byproducts (e.g. sludge)
 - Hazardous waster
 - Non-hazardous waste

Category II

Sources Designed to Store, Treat, and/or Dispose of Substances; Discharge through Unplanned Release

- Landfills
 - Industrial hazardous waste
 - Industrial non-hazardous waste
 - Municipal sanitary
- Open Dumps, Including Illegal Dumping (Waste)
- Residential (or Local) Disposal (Waste)
- Surface Impoundments
 - Hazardous waste
 - Non-hazardous waste
- Waste Tailings
- Waste Piles
 - Hazardous waste
 - Non-hazardous waste
- Materials Stockpiles (Non-waste)
- Graveyards
- Animal Burial
- Above-ground Storage Tanks
 - Hazardous waste
 - Non-hazardous waste
 - Non-waste
- Underground Storage Tanks
 - Hazardous waste
 - Non-hazardous waste
 - Non-waste
- Containers
 - Hazardous waste
 - Non-hazardous waste
 - Non-waste
- Open Burning Sites
- Detonation Sites
- Radioactive Disposal Sites

Category III

Sources Designed to Retain Substances during Transport or Transmission

- Pipelines
 - Hazardous waste
 - Non-hazardous waste
 - Non-waste
- Materials Transport and Transfer Operations
 - Hazardous waste
 - Non-hazardous waste
 - Non-waste

Category IV

Sources Discharging Substances as a Consequence of Other Planned Activities

- Irrigation Practices (e.g. return flow)
- Pesticide Applications
- Fertilizer Applications
- Animal Feeding Operations
- De-Icing Salt Applications
- Urban Runoff
- Percolation of Atmospheric Pollutants
- Mining and Mine Drainage
 - Surface mine-related
 - Underground mine-related

Category V

Sources Providing Conduit or Inducing Discharge through Altered Flow Patterns

- Production Wells
 - Oil (and gas) wells
 - Geothermal and heat recovery wells
 - Water supply wells
- Other Wells (non-waste)
 - Monitoring wells
 - Exploration wells
- Construction Excavation

Category VI

Naturally Occurring Sources whose Discharge is Created and/or Exacerbated by Human Activity

- Ground Water - Surface Water Interactions
- Natural Leaching
- Saltwater Intrusion/Brackish Water
 - Upconing (or intrusion of other poor-quality natural water)

Table 4. Federal and State Environmental Databases searched by EDR

Database Acronym	Database Name	Database Source
NPL	National Priority List	U. S. Environmental Protection Agency (EPA)
RCRIS-TSD	Resource Conservation and Recovery Information System- Treatment, Storage, or Disposal Sites	EPA
CSCSL	Confirmed and Suspected Contaminated Sites List	Washington State Department of Ecology (Ecology)
CERCLIS	Comprehensive Environmental Response, Compensation, and Liability Information	EPA
CERC-NFRAP	Comprehensive Environmental Response, Compensation, and Liability Information	EPA
RCRA-COR	RCRIS Corrective Action Report	EPA
SWF/LF	Solid Waste Facility Database	Ecology
LUST	Leaking Underground Storage Tank Database	Ecology
UST	Underground Storage Tank	Ecology
RCRIS-GEN	Resource Conservation and Recovery Information System- Small and Large Quantity Generators	EPA
HMIRS	Hazardous Material Information Reporting System	EPA
PADS	PCB Activity Database System	EPA
ERNS	Emergency Response Notification System	EPA
FINDS	Facility Index System	EPA/ National Technical Information Service (NTIS)
TRIS	Toxic Chemical Release Inventory System	EPA
NCDB	National Compliance Database	FTTS
NPDES	National Pollution Discharge Elimination System	EPA
NRDB	National Radon Database	EPA

Table 5: Overall Risk Prioritization

Decision Level	Available Data and Information
I	Proximity of potential hazard to the WHPA
II	Type of contamination
III	Straight-line distance from the wells to the potential hazard
IV	Type of contaminated media

Each known and potential hazard was first scored and then ranked using decision level one. Sites with equal level one rankings were then further scored and ranked using decision level two. If sites were still equal in priority, they were further sub-prioritized under decision level three, etc. Once sites were differentiated in priority, no further ranking was necessary. The criteria for scoring sites within each level are discussed below.

Decision Level I–Proximity to WHPA

For the first decision level, the sub-prioritization of contaminated sites was based on their location in the WHP zones; the shorter the travel time, the higher the priority. Scores for each site and hazard category are summarized on Table 5.

Table 6: Decision Level I: Proximity to Source

Sub-Priority Score	Proximity to Source
1	1-year time-of-travel from the source, Zone 1
2	5-year time-of-travel from the source, Zone 2
3	10-year time-of-travel from the source, Zone 3
4	Outside of Zone 3; upgradient from wells
5	Outside of Zone 3; downgradient from wells

Decision Level II–Type of Contamination

For the second decision level, the sites were ranked as either known contamination or potential contamination sites. Known contamination sites were defined as those with known releases of contaminants according to the environmental database survey results. Potential contamination sites are sites or land areas that are used in ways that could pose a risk to the ground water. This category's scoring is summarized on Table 6.

Table 7: Decision Level II: Type of Contamination

Sub-Priority Score	Known or Suspected Contamination	Type of Contaminated Site	Assumption
1	Known	Confirmed and Suspected Contaminated Sites (CSCSL) and Comprehensive Environmental Response, Compensation, and Liability Information (CERCLIS)	As a worst case scenario, contamination is assumed to be comprised of the most toxic chemical identified for the site, based on information contained in the Ecology and EPA databases.
2	Known	Leaking Underground Storage Tanks (LUST)	All contamination sites assumed to contain petroleum products.
3	Known	Washington Independent Cleanup Report (WA ICR)	Since not confirmed as totally cleaned, assumes cleanup not 100% effective.
4	Potential	Septic Systems	Nitrates and bacterial contamination are assumed to be health risks, along with potential chemical hazards, but it is not known what the likelihood is for sites to contaminate the wells.
5	Potential	Resource Conservation and Recovery Act Sites (RCRA)	It is assumed that hazardous chemicals may be stored on site, but contamination has not necessarily occurred. FINDS sites are included with this category.
6	Potential	Underground Storage Tanks (UST)	It is assumed that petroleum products are stored in underground storage tanks on site, but contamination is not eminent.
7	Potential	Accidental Spills	This category includes highways and railroad tracks that pass through the WHPA. The risk is based on the possibility of hazardous material spill (e.g., gasoline).
8	Potential	Pesticide Application	Pesticide use appears to be concentrated along transportation corridors and power lines.
9	Potential	Storm Water	This category includes the potential release of lead, petroleum products, and/or solvents.
10	Potential	Fertilized Sites	This category is predominantly represented by fertilized lawns and hobby farms.

Decision Level III–Straight–line Distance from Wells

For potentially hazardous sites with similar characteristics for prioritization decision levels one and two, the straight-line distance from the site to the closest Company well was used to further rank the sites. Those sites closest to the wells were given a higher priority.

Decision Level IV–Type of Contaminated Media

This decision level was not used, since all nine sites with known contamination could be ranked by the third decision level.

Land Use

Land zoning within the study area includes, (in order of prevalence): residential single family districts, business districts, residential multi-family districts, light manufacturing districts, a planned development district (including the gravel pit near I-5), open space districts, a residential moderate-density district, community facilities districts, and a mixed-use town center district (Figure 11). Since most of these zones share many features and types of uses, many of the potential contaminants will likewise be similar. The large majority will fall into one of the two categories listed below.

Residential Land Use

The Company is predominantly made up of residential districts. Potential contaminant issues related to residential land use include: nitrate loading from the disposal of household chemicals through septic systems, small livestock operations, fertilizer and pesticide applications, and petroleum hydrocarbons. The principal concern for residential areas is the impact of nitrogen. Properly maintained and used septic systems convert nitrogen to nitrates, which are then transported in the environment in the groundwater system. Livestock operations and other hobby farming can also add nitrates to the ground water. Hobby farms, lawns and flowerbeds represent potential hazards because they typically receive application of fertilizers, herbicides, and pesticides. The presence of multiple sources of pesticides can result in the potential for additive loading to the groundwater system resulting in a possible progressive decline in water quality.

Commercial and Light Manufacturing Land Use

The majority of the commercial and light manufacturing land use is found along the Meridian Avenue corridor. The most likely potential contaminants related to either commercial or industrial uses include, but are not limited to, petroleum hydrocarbons and metals. These potential contaminants are generally due to the historical or current presence of heating oil and fuel in underground storage tanks (USTs). Additional potential contaminants could also be associated with auto repair facilities, radiator repair, and metal fabricators.

Petroleum hydrocarbons can become a serious concern for wellhead protection in commercial and residential areas. There are numerous potential sources for petroleum hydrocarbons within the WHPA. These include gasoline stations, commercial operations that fuel and maintain equipment and vehicles, home/commercial heating oil tanks and bulk transport of such fuels. Petroleum hydrocarbons are typically stored in USTs in volumes ranging from 100 gallons (residential use) to up to 1,000 gallons per tank (gasoline service stations). Large spills involving petroleum hydrocarbons are a greater risk than small spills (leaks, etc.).

Groundwater contamination from metals is a potential threat at commercial and industrial sites which handle or use materials with significant metallic constituents (paints, waste oil, etc.) and historical pesticide use areas (historical pesticides were typically metal-based compounds).

Of additional concern are those portions of the WHPA that are not sewered; and thus use septic systems for waste disposal. Septic systems are considered to be a potential hazard because they deliver bacteria, nitrate-rich water, and other contaminants (if disposed of improperly into a drain

or toilet) directly into the subsurface. This is a particular concern for unsewered industrial and commercial areas where there is the potential for the use (and improper disposal) of numerous hazardous chemicals.

Undeveloped Areas

Though all the land within the WHPA is zoned, not all is developed. Undeveloped areas in the WHPA, including the designated open space districts and the planned development district are expected to have the lowest potential for contamination due to the nature and low impact of activities occurring there.

The one exception to this low-potential condition is the Josties Sand & Gravel Pit west of and adjacent to Well 9 (Site 5 in the contaminant inventory, see below). Openwork mining of sand and gravel deposits allows a direct route for potential contaminants to enter the groundwater system. While it is assumed that the pit operated under best-management practices and conformed to all appropriate state regulations, the lack of vegetated cover and continued disturbance of the pit when in operation makes it a potential site for contamination. Furthermore, recently fill has been imported to the site. The source of this fill has not been determined.

Identified Contaminant Sources

In all of the federal and state databases reviewed by Track Info Services, 16 sites within the WHPP study area were identified as either potential hazards (fifteen) or sites where actual contamination has occurred (one). Of these sites, seven were located during the windshield survey or during discussions with the Company. The windshield survey yielded nine additional potential hazard sites due to land use factors (Table A1). The 25 hazard sites² are mapped on Figure 5. The one reported contaminated site, the Shell service station at 2325 Meridian, is listed on the LUST database for a petroleum release and is ranked tenth on the hazard list.

Potential Groundwater Concerns

For wellhead protection planning, it is important to understand the potential sources and types of contamination to the WHPAs. However, potential pathways for contaminant migration are also important to understand because these contaminant pathways can increase the vulnerability of an aquifer by decreasing travel time from a source to a wellhead. The following section will briefly summarize the main mechanisms for transport of contaminants to the subsurface.

Discharge onto the Ground Surface: Direct discharge to the ground surface occurs when products or waste materials are spilled or placed onto the ground. With the help of rainfall infiltration, the materials percolate into the subsurface and, if a sufficient volume of material is released, they eventually reach the water table and migrate downgradient in the aquifer.

Direct Discharge to the Subsurface: Discharge to the subsurface occurs from septic systems and dry wells. Discharge into the subsurface is a more direct mechanism for transport because contaminants are discharged closer to the water table and because subsurface discharge bypasses the upper layers of soil which have the ability to absorb and disperse many types of contaminants.

² There are 3 actual and 25 potential hazards listed on Table A1.

Abandoned Wells: Old, improperly constructed, or improperly abandoned wells³ can act as direct conduits for contaminant transport to the aquifer. In such wells, transport can occur between the ground surface and aquifer zones because of lack of seals or inadequately constructed seals.

Stormwater Runoff: Rainfall onto the ground either induces infiltration into the subsurface or runoff. The quality of the water which infiltrates or runs off is dependent on the type of land use and the potential presence of contaminants which may be located on the ground surface. Stormwater infiltration issues are similar to those of discharge to the ground surface. Stormwater runoff is considered differently because it runs over the surface of the ground, picking up and dissolving potential contaminants, and may eventually discharge these contaminants to ground water via infiltration from ditches or ponds designed to percolate water.

The potential concerns due to water infiltration or runoff are diverse and reflect the land use activities in the area of interest. Improved roadways, parking areas, and residential developments can contribute heavy metals and petroleum hydrocarbons, which originate primarily from automobiles. Industrial and commercial areas can discharge the same constituents as automobiles in addition to a variety of organic pollutants commonly used business practices (e.g., solvents, paints, and dry cleaning solutions).

³ Washington State has standards for construction and abandonment of wells, WAC 173-160.

MANAGEMENT STRATEGIES AND IMPLEMENTATION TASKS

Introduction

The completion of wellhead protection planning provides no safeguards unless effective management strategies are implemented to prevent potential contamination of groundwater sources. The Company does not own or control all of the land within its WHPA. Maximum effectiveness can be achieved in implementing the WHPP through a cooperative effort between the Company, neighboring purveyors, and the state and local agencies that regulate potentially harmful activities within the WHPA. A key component to its management of the area will be the notification of the existence and extent of the management area to the proper agencies in Pierce County, King County, neighboring communities, and to local residents.

Wellhead Protection Management Strategies

The following sections detail proposed strategies developed to protect the integrity of the Company's water sources.

Long-Term Management and Cooperation

This WHP program is designed to be a continuing management activity to meet the Company's future planning needs or to adapt to changes in the physical conditions of the aquifer system. As such, the management strategies and practices outlined within this study provide a general direction, but will periodically need to be refined to fit specific conditions. Additional adaptations may be needed to address future activities and regulations, or changes in current regulations that may affect the WHPA.

Establish a WHP Committee:

The Company currently maintains an Emergency Management Committee to address community response to various potential emergency situations. The wellhead protection issues and spill response planning could naturally fall to this committee. It is recommended that this committee be expanded to address the following wellhead protection planning efforts:

1. Evaluate the implementation status of the WHP tasks
2. Review federal, state, and local programs regarding the WHP
3. Review changes in surface activities within the WHPA
4. Meet WHP regulations and requirements

The group should strive to focus on promoting existing or future water quality and quantity resource protection programs for the WHPA.

Land Management Activities:

The Company should encourage owners or agencies responsible for large land parcels and developments to use and monitor best management practices (BMP) for control, reduction, and restriction of potential contaminants into the WHPA.

WHP Land Use Strategies

The Company has no authority to directly control land use for those areas of the WHPA that are outside the Company limits. Therefore, the Company must develop a cooperative relationship with those state and local agencies that administer land use programs. At the present time, the best strategy for the Company is to seek special designations for the WHPA from pertinent agencies. The Company should evaluate and seek the different designations that may be most beneficial.

Possible Special Protection Area Designations:

- A *Special Protection Area* designation under the state ground water quality standards (WAC-173-200),
- A *Special Use Area* by the Department of Agriculture,
- An *Environmentally Sensitive Area* under various County-level programs.

WHP Regulatory Strategies

This WHPP is designed to use the existing statutory rules and regulations to protect ground water quality. The Company, in coordination with state and local agencies having statutory authority in the area, would monitor regulated activities within the WHPA. The following regulatory strategies are recommended.

Well Drilling Inspections inside the WHPA: The Company should encourage the continued delegation of well construction inspection authority be transferred from Washington State Department of Ecology to the Tacoma Pierce County Health Department (TPCHD). Regardless of the responsible agency, the Company should encourage more frequent well construction inspection than currently occurs.

Washington State Environmental Policy Act (SEPA)/Hydrogeologic Evaluations: The Company should request Pierce County Planning and Land Services (PALS) to require hydrogeologic evaluations that specifically address impacts to groundwater quality and quantity parameters for any development within the WHPA which requires SEPA action or seeks Determination of Non-Significance (DNS) designation. Additionally, the Company should enter into a Memorandum of Understanding (MOU) with PALS and the City of Edgewood seeking comment on the effects such development will have on the groundwater system. Designation of the area as a Special Protection Area will be the first step toward gaining such an agreement.

Septic Tanks: The Company should request Pierce County to require that as-builts, drafted by a septic design professional, of new septic systems be recorded with property deeds. Additionally, the Company should support the implementation of laws and regulations requiring proper inspection and maintenance of septic systems.

Planning Strategies

A substantial degree of future protection for the WHPA will be achieved through present-day planning and coordination. In order to accomplish the required level of future protection, the following strategies are recommended.

Sewers: The Company, in coordination with the managers of local sewer systems, should develop emergency plans to be implemented in the advent of sewage leaks or spills. The Company could encourage the appropriate county to require all industrial and commercial facilities within the WHPA to connect to sanitary sewers, if such services are reasonably available.

Storm Water Management: The Company should conduct or promote research on the impact of storm water discharge on water quantity and quality. Additionally, the Company, in coordination with the responsible agencies, should evaluate the adequacy of storm water facilities, including proper routing, retention, and detention. A balance must be found that allows optimum recharge of storm water to groundwater systems while adequately protecting the water quality of the aquifers.

Emergency Response for Transportation Corridors: The Company should notify the appropriate emergency response organizations of the location of the WHPA and establish formal communication protocols with the first-response emergency units.

Petroleum Pipelines: The Company should document the location and use of petroleum pipelines and to establish emergency response plans for pipeline failure. These efforts should be coordinated with the pipeline companies and the federal, state, and county agencies responsible for emergency, petroleum-product spill response.

Hazardous Material Transport: The Company should investigate the feasibility of re-routing the transport of hazardous materials away from the WHPA one-year time of travel zone. This option may necessarily have to exclude the I-5 corridor, since it represents a major regional transportation route.

Data Management Strategies

One of the principal goals of the WHPP is the development of a data collection network and analysis plan capable of providing the Company with advance warning of contamination to the Company's water supply. The following data management strategies seek to establish and maintain scientific data upon which future WHPP actions can be based.

Groundwater Monitoring Plan

The Company should actively participate in the collection and analysis of regional and local groundwater information. The development of a proper groundwater-monitoring plan will be crucial to the Company's capability to protect their water sources. This can be accomplished in cooperation with the Regional Water Associations of Pierce County, Tacoma-Pierce County Health Department (TPCHD), Department of Natural Resources (DNR), Washington State Department of Ecology (DOE), and other entities seeking to monitor the groundwater resources of the region.

Abandoned Well Inventory: The Company could locate and inventory decommissioned, abandoned, and unused wells. Owners of these wells could be notified of the potential liability such wells cause and be educated on the benefits of well decommissioning.

Herbicide and Pesticide Survey: The Company could inventory and monitor major herbicide and pesticide use within the WHPA. This inventory may be used to guide future groundwater monitoring and WHP-related education programs. In addition, the Company could encourage county, state, and private land managers to use vegetation management practices that protect groundwater quality.

Underground Storage Tanks Inventory: The Company could inventory and locate underground storage tanks (UST's). Besides those presently identified by the current hazard inventory, this

inventory should include new tanks placed after the hazard inventory was finished, and residential home heating oil USTS/and or other tanks that were not previously identified.

Drywell Monitoring: The Company should encourage King County and Pierce County Surface Water Management to develop an evaluation and monitoring plan for drywells within the WHPA.

Education Strategies

Education of the public and industrial/commercial occupants of the WHPA concerning groundwater protection is a critical portion of the WHPP. Through proper education, the degree and potential for future contamination can be greatly reduced; therefore, the following recommendations are made.

If not already begun, the Company should begin groundwater educational programs to educate the WHPA residents, particularly on groundwater quality issues. The WHPA could be targeted for distribution of literature regarding septic tank maintenance, fuel oil storage tank maintenance and abandonment, residential use of herbicides and pesticides, and hazardous material use, disposal and storage. TPCHD maintains a cooperative program to assist water purveyors in Pierce County with their WHPPs. This includes educational materials that will support this process. Included in the appendix is an example of an informational pamphlet to hand out or mail to water customers.

In addition to any programs offered by the City of Edgewood, the Company could participate in and support small-quantity waste disposal programs and actively work with state and local government in developing and creating public education programs concerning ground water.

Wellhead Protection Implementation Tasks

In order to accomplish the protection of the WHPA, it is recommended that the Company adopt the WHP Implementation Tasks listed below. These tasks have been ordered in their recommended priority of implementation. The Company may institute all or a portion of these tasks, depending upon available funding, time, or other concerns.

Task 1: The Company's Emergency Management Committee will include WHP planning. This group will:

- Promote adoption of the WHPA into the Tacoma-Pierce County Health Department database
- Focus applicable state and local programs to the area
- Review management strategies
- Incorporate new data
- Evaluate new requirements
- Oversee educational programs
- Evaluate new approaches to WHP

Task 2: Establish formal communication with first responders. This task is fully described in the Spill Response Section of the WHPP, as well as the Company emergency response plan.

Task 3: The Company will supply notification of the existence of the WHPA to TPCHD and Pierce County PALS. The Company will request that:

- 1) TPCHD assist small water systems with wellhead protection by initiating a small system WHP Coordination Program, and
- 2) Pierce County PALS consider the WHPA in their designations of critical areas regulations, susceptibility mapping, and development permitting.

The Company will provide susceptibility data to the County to update their maps.

Task 4: Consider seeking designation of the WHPA as a special protection area with the City of Edgewood. As mentioned previously, there are numerous special designations the Company may wish to seek in order to protect the WHPA. The Company should evaluate the protection offered by these designations and seek those most appropriate for the WHPA.

Task 5: Communicate the location of the WHPA, explain basic WHP concepts, and address specific WHP concerns to industrial/commercial site owners and local gravel mine owners.

Task 6: Increase public awareness of homeowners who are connected to the Company's water system through notification letters to customers within the WHPA. This notification letter should be given to homeowners either at the time of service hookup or as part of property escrow.

Task 7: Encourage the requirement that engineering as-builts of new septic systems be recorded with property deeds. These as-builts should be drawn and submitted by septic tank designers who are registered professional designers licensed by Washington State. Support the implementation of state laws and regulations regarding septic system inspection and maintenance programs. Participate in public education programs to notify public concerning the impact of septic systems on the WHPA. Promote and coordinate public education programs concerning proper septic tank maintenance and proper hazardous waste disposal.

Task 8: Review routine leak detection procedures for sewer lines. Request utilities use "leak proof" piping for new sewer construction and replace older lines. Develop emergency response procedures for sewer force main breaks within the 1-year travel zone of the WHPA.

Task 9: Document the location and use of petroleum pipelines and develop appropriate emergency procedures.

Task 10: Participate in a regional groundwater data development and management program. This will help assure that an adequate regional database is developed.

Task 11: Support Pierce County in maintaining a delegation of well drilling inspection authority. This could provide advance notice of drilling to the Company and allow more frequent inspection of wells drilled within the WHPA than currently occurs.

Task 12: Assure that the hydrogeologic impact of surface development is adequately evaluated during the SEPA process.

Task 13: Promote and coordinate the public education programs regarding household hazardous materials use, storage and disposal with the county local hazardous waste management program.

Task 14: The Company should develop data on the number and size of exempt underground tanks within the one-year WHPA. Promote and coordinate public education programs concerning underground tank hazards, leak detection methods, and proper removal and closure procedures. These programs should target owners of exempt underground tanks.

Task 15: Seek to have Washington State Department of Ecology prioritize the investigation of contaminated and potentially contaminated sites within the WHPA. This could assure that those areas with existing contamination within the WHPA and any subsequent contamination events are given highest priority in relation to the amount and type of contamination in clean-up activities and budgets.

Task 16: Encourage development and use of best management practices. This effort should focus upon large land units including large residential developments, schools, golf courses, parks, mining operations, and forest parcels.

Task 17: Request County, State, and private landowners to utilize vegetation management practices to protect water quality.

Task 18: Encourage thorough analysis of groundwater impacts for siting, operation and reclamation of mines. Seek to have the proper agencies require mine operators to install monitoring wells. These wells should be capable of monitoring for potential impacts from site operations for mines within and adjacent to the WHPA. Seek to have the owners document the use of hazardous materials in mining activities within and near the WHPA.

Task 19: The Company should inventory decommissioned, abandoned or unused wells in the one- and five-year time of travel zones. The owners of these wells should be informed about proper well decommissioning procedures.

Task 20: The Company could seek to have appropriate agencies require sewer hook-up for all industrial-commercial facilities within the WHPA if sewer service is reasonably available.

Task 21: Investigate the need for re-routing transport of hazardous materials through the WHPA.

Task 22: Work with responsible parties to assess adequacy of stormwater systems. This task should evaluate the existing stormwater detention facilities, establish priority for stormwater upgrades, and seek maximum infiltration of storm water where possible, given the limitations of the upland geology. An evaluation of local stormwater detention, retention, and routing priorities should likewise be considered. Promote research on the impacts of stormwater discharge from residential areas. Encourage the periodic monitoring of drywells. Review water quality data generated under general National Pollutant Discharge Elimination System (NPDES) Storm Water Permit.

SPILL RESPONSE PLAN

Introduction

The purpose of this section is to outline and evaluate spill response procedures and capabilities for the Company's WHPA. To conduct this evaluation, major spill response organizations were identified. Local response organizations were contacted to determine their response capabilities, back-up assistance, and general understanding of wellhead protection issues.

Spill events can be large or small, and can consist of highly toxic or inert materials. Events can occur under conditions where the spill is easily contained or where clean up time is ample, or they can occur where surface water, waterways, or ground water are under immediate threat. This range of possibilities has prompted a spill response (and emergency response) system that is nationwide in scope and can involve federal agencies, yet is designed to handle the more common, small-scale (yet potentially dangerous) spills. This assessment takes into account this range of possible spills and responses.

The ability of the Company to affect the protocols and procedures of the national and state response systems is limited. However, more common spills are small and require local response, as a minimum. Therefore, for the purposes of this effort, focus is given to local response capabilities and to the needs associated with these local response systems.

Spill Response in the Wellhead Protection Areas

Given the Company's reliance on wells completed in the Qva and RMC, hazardous spills could potentially affect the groundwater supply for much of the defined WHPA. Should such a spill occur, within the WHPA, a 911 call should be made immediately. The 911 operator will ask several questions concerning the location and nature of the spill and send either personnel trained in hazardous materials incidents from the nearest fire department or send directly for a full Hazardous Materials (HAZMAT) team from either King or Pierce County. In order to inform emergency responders of the sensitive nature of the area and allow them to evaluate what hazardous spill response measures are necessary, a notification letter is being sent to Edgewood Fire Department, neighboring fire jurisdictions in both counties, the Pierce County Sheriff and the Washington State Patrol (included in the appendix).

The State Patrol is the pre-designated Incident Command Agency for all incidents occurring on state highways. Without a pre-arranged agreement with the Company for HAZMAT incidents, the State Patrol must contact an agency with jurisdiction and capability (such as a local fire district) to secure a HAZMAT response team. This situation represents a potential delay, and therefore, may increase the risk to the surface and groundwater quality, particularly along the I-5 corridor. If the Company is able to secure an agreement with nearby HAZMAT teams (either directly or through the Edgewood Fire District), the response time may be lessened significantly.

The role of the Department of Ecology will be described in detail in the remainder of the section. This agency provides an important function in spill management and cleanup. They are not generally considered a "first response" agency, but because of their regional offices and their environmental protection responsibilities, they are often quickly on-scene, and can provide clean up or containment advice and services (though usually through contractors).

State and Regional Support for Local Spill Response Capability

Spill response planning has been underway throughout Washington State and within each of the two counties for many years. As a result, there are many response plans in existence, each focusing on a specific geographical area or type of substance. In addition, organizations involved in the storage and transportation of hazardous materials have been required to develop contingency plans. Accordingly, this assessment of spill response capability and recommendations for enhanced response is intended to be consistent with existing spill response plans for the area and the state.

The foundation for systems and procedures outlined in this section are described in documents such as the "Statewide Master Oil and Hazardous Substance Spill Contingency Plan" (Ecology, 1991) and the "Washington State Comprehensive Emergency Management Plan" (Department of Community, Trade and Economic Development (CTED), 1987).

The Department of Ecology is continuing the development of the State Master Oil and Hazardous Substance Spill Contingency Plan. The next major phase in the effort is the production of a volume of the plan specifically focused on operational issues. This document, when completed, will provide spill responders and key agency staff with the information and procedural guidelines necessary to effectively respond to spills. These procedures will include such items as enforcement protocols and laboratory support procedures.

The following are the spill response plans in effect in Washington State which cover inland (non-marine) areas such as wellhead protection areas and aquifer recharge areas⁴:

- National Oil and Hazardous Substances Pollution and Contingency Plan (NCP) prepared by the EPA.
- Oil and Hazardous Substance Pollution Contingency Plan for Federal Region 10 (RCP) - prepared by Region 10 of EPA.
- Washington Statewide Master Oil and Hazardous Substance Spill Contingency Plan - prepared by Ecology.
- Washington State Emergency Response Plan - prepared by CTED.
- Local Emergency Response Plans - prepared by county governments.

Spill Response Terminology

The term contingency plan should not be confused with the water supply contingency plan developed in the following chapter. Contingency planning for the purpose of this section should be construed to mean "spill response contingency" plans.

In the various contingency plans applicable to Washington State, there are repeated references to an "Incident Commander (IC)" and an "On-Scene (Site) Coordinator (OSC)." The IC is the person who is in command of an incident during its emergency phase and OSC is the person who is in charge of spill or release management and cleanup. While there is an IC in charge of the situation, the OSC takes direction from this person. After the emergency response is complete, the authority is transferred to the OSC for final cleanup.

⁴ Portions of existing statewide documents have been condensed and modified for presentation in this section.

Spill Response Organizations

Depending on the magnitude of the spill event, numerous organizations at all levels of government, the private sector, and some voluntary organizations, can have a role in spill response and cleanup. Each of the plans mentioned above describes the relationship and roles of these organizations in terms of the particular concern. Listed below are a few of the organizations which might be, depending on the size and nature of the release, involved in a spill response in a wellhead protection area or ground water recharge area.

The Ecology Spill Response Team consists of Washington State Department of Ecology regional office personnel. This team is responsible for determining the source, cause, and responsible party, as well as initiating appropriate enforcement action. Additional responsibilities include ensuring containment, cleanup, and disposal are carried out adequately. The team coordinates its actions with other state, federal, and local agencies.

The Local Response Team (LRT) consists of state and local government agencies, industry personnel, academic organizations, and other private interests that may assist the OSC in pollution response and planning. The composition and level of participation in the LRT is dependent upon the area involved, the hazard posed, and the type of assistance required. Normally, the LRT will consist of the state environmental response agency and clean-up contractors.

The Technical Assistance Team (TAT) is a contractor used by the EPA Region 10 office to provide technical oversight at spills and uncontrolled hazardous waste sites. Requests for the TAT are made via the EPA. Once on site, the TAT will report the situation to the EPA duty officer who then decides whether an EPA OSC needs to be on scene.

Initially, the resource damage assessment program was an Ecology-led effort designed to organize the state natural resource trustee agencies into an effective resource damage assessment taskforce. The state Natural Resource Damage Assessment (NRDA) team consists of representatives from Ecology, Health, CTED, the Department of Fish and Wildlife (DFW), the Parks and Recreation Commission, and the Department of Natural Resources (DNR). In the event of a major pollution event that damages natural resources, this committee's mission is to organize personnel, materials, and equipment necessary to conduct reconnaissance evaluations and initiate detailed assessments of natural resource damages.

The Environmental Response Team (ERT), based in Edison, New Jersey, was established to advise the OSC and Regional Response Team (RRT) on environmental issues surrounding spill containment, cleanup, and damage assessment. ERT personnel have expertise in areas such as treatment technology, biology, chemistry, hydrology, geology, and engineering.

The RRT, consists of representatives from selected federal and state agencies. The RRT is the regional body responsible for planning and preparedness before spill occurs, and provides advice to the OSC following such incidents.

The National Response Team (NRT) consists of representatives from the various federal agencies (such as EPA, the US Coast Guard (USCG), Fish and Wildlife Service, etc). It serves as the national body for planning and preparedness actions prior to a spill and as an emergency advisory center when a spill occurs.

Roles and Responsibilities

Spill response plans stress that for spill response procedures to be effectively executed, each party must be fully aware of their specific roles and responsibilities. Moreover, there must be an understanding of the roles of other parties involved in response activities, as well as effective coordination, cooperation, and communication among responding agencies, organizations, and individuals. This section describes the specific roles and responsibilities of the key parties, including:

- Responsible party or spiller
- Federal and state agencies
- Local government
- Facility owners
- Contractors

The Responsible Party

The primary responsibility for assessing, responding to, and containing an oil spill or discharge falls upon the individual, agency, or company responsible for the spill incident. The responsible party (RP), whether there is an approved contingency plan or not, is responsible for containment and cleanup of the spill, disposal of contaminated debris, restoration of the environment, and payment of damages. State and federal law specifically require that the removal of a discharge of oil or hazardous substance should be immediate.

Environmental Protection Agency

The EPA has primary responsibility for spills that occur on land and on inland U.S. waters not under USCG jurisdiction. As directed by the NCP, the EPA is pre-designated as OSC for spills occurring in these areas.

Department of Ecology

Ecology is the lead state agency for environmental pollution response within the State of Washington. As such, it has pre-designated the state OSC and the IC for many spills occurring in state jurisdiction. In the event of a spill occurring on a state highway, Ecology coordinates with the Washington State Patrol, which assumes responsibility as IC, and Ecology acts as the lead agency responsible for clean-up activities.

State Patrol

The State Patrol acts as the designated Incident Command agency for incidents on interstate and state highways, and other roads and jurisdictions as delegated.

CTED - Emergency Management Division

Washington State Emergency Management Division (EMD) is responsible for:

- Developing and maintaining a State Comprehensive Emergency Management Plan.
- Maintaining a 24-hour capability to receive notification of incidents and request for assistance and initial notification to local, state, and federal response agencies.
- Activating the State Emergency Operations Center (EOC) as needed to coordinate state resource identification and acquisition in support of Ecology response.

- Providing Public Information Officer (PIO) support to the Incident Command.
- Maintaining an updated list of NRDA team members submitted by participating agencies.
- Maintaining and updating a notification list of local, state, and federal agencies involved in emergency response.
- Coordinating the procurement of state resources for use by the OSC or as requested by local EMD or other designated local response agency or state response agencies.
- Participating in the NRDA team.

Department of Fish and Wildlife (DFW)

The DFW is a state agency with trustee responsibilities for wildlife, game fish, food fish, non-game fish, shellfish, and their associated habitats. The agency is also responsible for state facilities (hatcheries, properties, launching ramps, and related facilities) and assorted equipment. Of special concern are high-value habitats that may be used as nursery grounds for fish or wildlife. DFW is a participant on the NRDA team.

Department of Health (Health)

Health has the responsibility for beach closures for human health and safety purposes, public health concerns from contaminated food supply (e.g. shellfish), and general health-related matters for the safety of the public. In addition, DOH is to render all appropriate laboratory support and services to the OSC. DOH is a participant in the NRDA team.

Department of Transportation (DOT)

The DOT may provide traffic control, equipment, and personnel for non-hazardous clean-up activities on state and interstate highways. The DOT may provide and mobilize equipment necessary in a major spills incident.

Local Responders

Local emergency response organizations such as local police, county police or sheriff, and local fire districts have a key role to play in most spill situations, as they are the “first responders” for the majority of spills. These local entities provide for immediate protection of health, property, and the environment. It is this group of responders who determine the need for additional assistance and mobilization of the additional resources mentioned in this section.

Local Emergency Planning and Emergency Management

Local governments have a duty to be prepared for all disaster emergencies. Each County’s EMD is charged with establishing Local Emergency Planning Districts (LEPD) and Local Emergency Planning Committees (LEPC) to facilitate planning efforts.

LEPC’s have the responsibility to create local emergency response plans. General requirements for local response plans are contained in Title III of the 1986 SARA. Generally, local agencies, particularly fire services and law enforcement agencies, can be activated to provide emergency response services when there is a threat to life and property. Emergency response services may include: fire and explosion controls, investigation, and documentation, perimeter control, evacuation, traffic controls, and initial containment or even removal of materials, depending on the nature of the incident.

Incident Response Management

The party responsible (RP) for a spill is required by state law to notify the National Response Team (NRT) and the state EMD. The RP is also encouraged to contact the nearest appropriate regional office of Ecology. The following is a list of phone numbers for agency notification.

Washington State Emergency Management Division	1-800-258-5990
Washington State Department of Ecology	
24-hour Emergency Spill Response	1-360-407-6300
Southwest Office - Tumwater	1-360-407-6300
City of Milton Police (non-emergency)	922-8735
City of Milton Fire Department (non-emergency)	922-0944
Edgewood Fire District 8 (non-emergency)	927-2313
Federal Way Fire District 39 (non-emergency)	927-3118
Pierce County Sheriff (non-emergency)	798-4721
Federal Way Police (non-emergency)	1-253-661-4600
Washington State Patrol	
Pierce County (non-emergency)	1-253-536-6210
Environmental Protection Agency Region 10- Seattle	1-206-553-1263
National Response Center	1-800-424-8802
Pierce Country EMD (24-hours)	253-798-7470

In most spill response situations, the initial call is to a local emergency response agency such as the local fire department or district, local police, or others. The use of a 911 system will activate the local response. These first responders provide the initial on-scene control, and manage the scene under the Incident Command System described below. Attached, as Figure 13, is an organization chart for the spill response process.

State Incident Command System

The State of Washington's spill response is organized and managed under an Incident Command System (ICS). The ICS is a functional component of a larger program, the National Interagency Incident Management System (NIIMS), which was developed for the interagency management of large forest fires. The ICS, although less complex than the NIIMS, is designed to allow for the day-to-day management of response efforts and resources for all oil and hazardous substance spill responses, from the very small or routine efforts to the largest catastrophic spills involving multi-agency jurisdictions.

Specifically, the system will operate in the following scenarios:

- Single Jurisdiction/Single Agency
- Single Jurisdiction/Multi-Agency
- Multi-Jurisdiction/Multi-Agency

The ICS concept is built upon teamwork coordination and cooperation between all entities involved (or potentially involved) in a spill response. Teamwork is encouraged throughout all phases of incident management including the preparedness, mitigation, response, and recovery phases for spills of any type or size. Ecology has taken steps to ensure there is effective teamwork, coordination, and participation in the ICS by appropriate state and local agencies in addition to the USCG and the EPA.

Unified Command Structure

In Washington State, the ICS will operate using a Unified Command Structure involving representatives of the Ecology, federal government (USCG/EPA), industry, and in some circumstances local government. A Unified Command Structure is called for when the spill is multi-jurisdictional in nature, e.g., when public safety and welfare, as well as environmental damage, is imminent.

Under the Unified Command Structure, the three key On-Site Coordinators (OSC) – federal, state, and industry -- will share decision-making authority in the command post and consult with each other regarding spill response and clean-up, management issues. Participation in the Unified Command Structure does not mean that agencies such as the USCG, EPA, and Ecology, which have roles and responsibilities, set by federal and state statute, are relinquishing or surrendering their authority. Emergency situations, however, may require some actions to be taken outside of the normal permitting process.

The Unified Command Structure is a consistent, systematic means of organizing a variety of agencies having jurisdictional responsibilities surrounding an incident, into one concerted effort. The concept offers uniform and traceable procedures that enable all emergency response agencies to perform their roles effectively, yet in unison. A Unified Command is located as close to the site of the spill as practicable, without interfering in the actual spill response activities.

Organization and Staffing Principles of ICS

The ICS organization is functionally oriented around four major areas: command, planning, logistics, and administration. The flexibility to expand this organization as situations dictate is designed within the ICS, without the need to conduct major organizational changes or a cumbersome transition into a different operational system during a spill response. For example, in a minor incident a single person may serve as the OSC and perform all functions. In a major incident, the command may consist of a united command with federal and state representatives, the RP, the OSC, a staff, and a group of sections and functional units. Participants in the Unified Command/Command Post and the OSCs are normally pre-designated, any remaining sections or functions are assigned as needed.

It is important for those parties and agencies participating in ICS to understand that the key to its effective operation is the acknowledgment that the IC is in charge of the entire operation, the OSC is in charge of spill cleanup during the incident, while the section chiefs and functional unit leaders are in charge of their units or sections. As a rule, sections should have a single individual in charge with the authority to make decisions and to give orders. Without this authority, the system will fail. Accordingly, it is a maxim of ICS that section chiefs should be selected based on their experience and qualifications, not rank or seniority within their relative agency or organization.

The staffing requirements of the ICS should be viewed as a dynamic activity, not one based upon maintaining a precisely defined level. Flexibility is a key element of ICS, allowing the command structure to be as large and sophisticated, or as small and compact, as the spill event requires. As long as common sense is used, the system can be modified to fit any incident. The size of the ICS will be determined by the IC.

Recommended Spill Response Improvements

Complete Mutual Aid Agreements

Mutual aid agreements between the Milton Fire Department and Fire Districts 8 (Edgewood) and 39 (Federal Way) should be completed and routinely updated. The Fire Department should investigate agreements for direct HAZMAT response from Pierce County and King County. Response scenarios involving other potential first responders (such as the State Patrol, the King County Police, or others) should be reviewed to assure that the response protocols are clearly understood and the response system is as streamlined as possible.

Establish Responder Group

As part of the implementation of this plan, a spill responder group (consisting of local fire, police, emergency management, water districts) should be established to discuss spill response in the WHPA. Efforts should be made to communicate the extent of capture zones to the first responder organizations. This "forum" for discussion of WHP issues could take the form of a sub-group of the LEPC, or could be developed independently.

Discuss Wellhead Precautions

Through a local "responders" group, discussion should focus not only on the locations of the capture zones, but also on specific protocols and procedures for response in the zones. For example, certain types of responses may be more protective than others, depending on the chemical, the location within the zones, and the tradeoffs affecting immediate public health and safety.

ALTERNATIVE RESOURCE CONTINGENCY PLAN

Introduction

Contingency planning is needed to ensure that water users will have an adequate supply of potable water in the event of source contamination, natural disasters, or other emergencies. In recognition of this, the state WHP program requires alternative supply planning and emergency spill response planning in all WHP plans.

Water System Existing Source

The Company water system has a peak daily consumption of up to 2.2 million gallons per day (MGD), although the average daily consumption should be considerably less. The water system maintains six production wells and three storage reservoirs with a total capacity of 2,175,000 gallons.

Currently, the Company has no interties with adjoining water districts. An intertie agreement with the City of Milton and the City of Puyallup is being investigated.

Alternative Supply

The average daily consumption is based upon 2,812 connections using 260.9 gpd per connection (733,650 gpd). The Company's storage capacity allows for one day of reserve under maximum use conditions of 2.2 MGD (peak day production in 2002/2003), assuming no wells are available to produce water. However, this scenario is highly unlikely. A more likely scenario would be the loss of one or two wells due to contamination or mechanical failure, which would leave the Company with several other wells to compensate. With Wells 5, 6 and 7 in full production and including the full capacity of the storage, the Company could supply the maximum daily demand for about three days.

Should a well be permanently disabled, the Company will need to drill a new well. New well placement will depend upon the nature of the disablement. For example, if the well is disabled by a contaminant spill, the new well can be drilled up gradient of the spill. If the well is disabled due to mechanical failure, well replacement can be accomplished at the same well site.

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