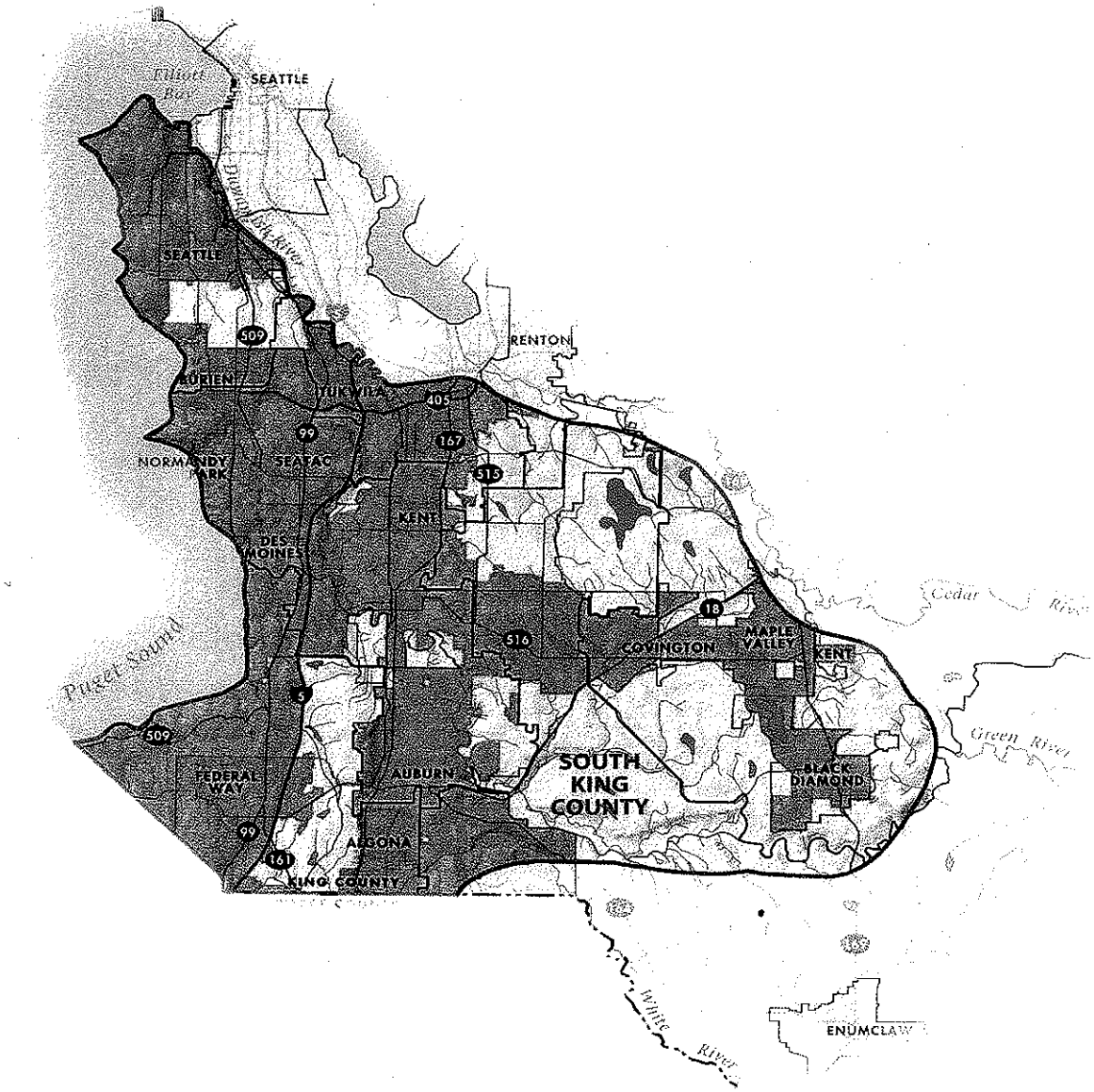
South King County
Ground Water Management Plan

Management Strategies

Concurrence Draft



Submitted July 2003 by:
South King County
Ground Water Advisory Committee

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Ground Water
Advisory Committee

SOUTH KING COUNTY
GROUND WATER MANAGEMENT PLAN

Management Strategies

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Data and technical information included was assembled prior to 1996. Subsequent data and studies by study participants and others has not been included in this plan.

Submitted by:

South King County Ground Water Advisory Committee

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WASHINGTON STATE DEPARTMENT OF ECOLOGY

EXECUTIVE SUMMARY

South King County
Ground Water Management Plan

July 2003

EXECUTIVE SUMMARY

SETTING

The South King County Ground Water Management Plan documents the work of local governments and citizens to understand and protect the ground waters underlying south King County. Within the Planning area, ground water is the major source of potable water for residents.

Most of the work done to produce this document was completed between 1990 and 1995. Since that time several events have occurred that have changed the setting in the study area. These include:

- Implementation of the Washington State Growth Management Act that required local governments to identify and protect sensitive areas and natural resources, and

- Implementation of Wellhead Protection Programs that require water utilities to identify recharge areas and water quality risks for each groundwater well in use, and

- King County has passed a ground water management ordinance and implemented a modest ground water management program.

As a result, many of the actions included in this plan have been accomplished under other programs. The Plan and process described in this Ground Water Management Plan has not been redrafted to reflect changes since 1995.

In several locations were it was deemed to be particularly helpful, an editorial update has been include. Each of these appears in a box to assist the reader.

BACKGROUND

The South King County Ground Water Management Area encompasses approximately 260 square miles in southwest King County. It is bounded on the north by the Duwamish and Cedar Rivers, on the east by the Black Diamond area, on the south by the Green River and Pierce County and on the west by Puget Sound. See Figure 1. The management area is urban in the central and western portions, suburban/rural in the eastern area and primarily commercial in the central and lower Green River Valley.

The South King County Ground Water Advisory Committee (GWAC) developed the South King County Ground Water Management Plan to meet this area's ground water protection needs. The goal is to protect the quality and quantity of area ground water, now and in the future, and to provide effective and coordinated resource management. This area's population is projected to increase, which may well affect ground water status. A

comprehensive plan, tailored to the specific needs of the region, is needed to protect the supply of this essential resource.

The goal of the ground water management plan is to promote an appreciation for the complexity of the ground water system, to describe potential threats to the system, and to identify strategies which can contribute to the long-term management and beneficial use of ground water resources.

The Ground Water Advisory Committee has developed a ground water management plan that includes:

- An area characterization report
- Identification and description of threats to ground water
- Recommended strategies that remedy or reduce these threats, and
- An implementation process
- Public involvement through the Ground Water Advisory Committee

Reliance on Ground Water

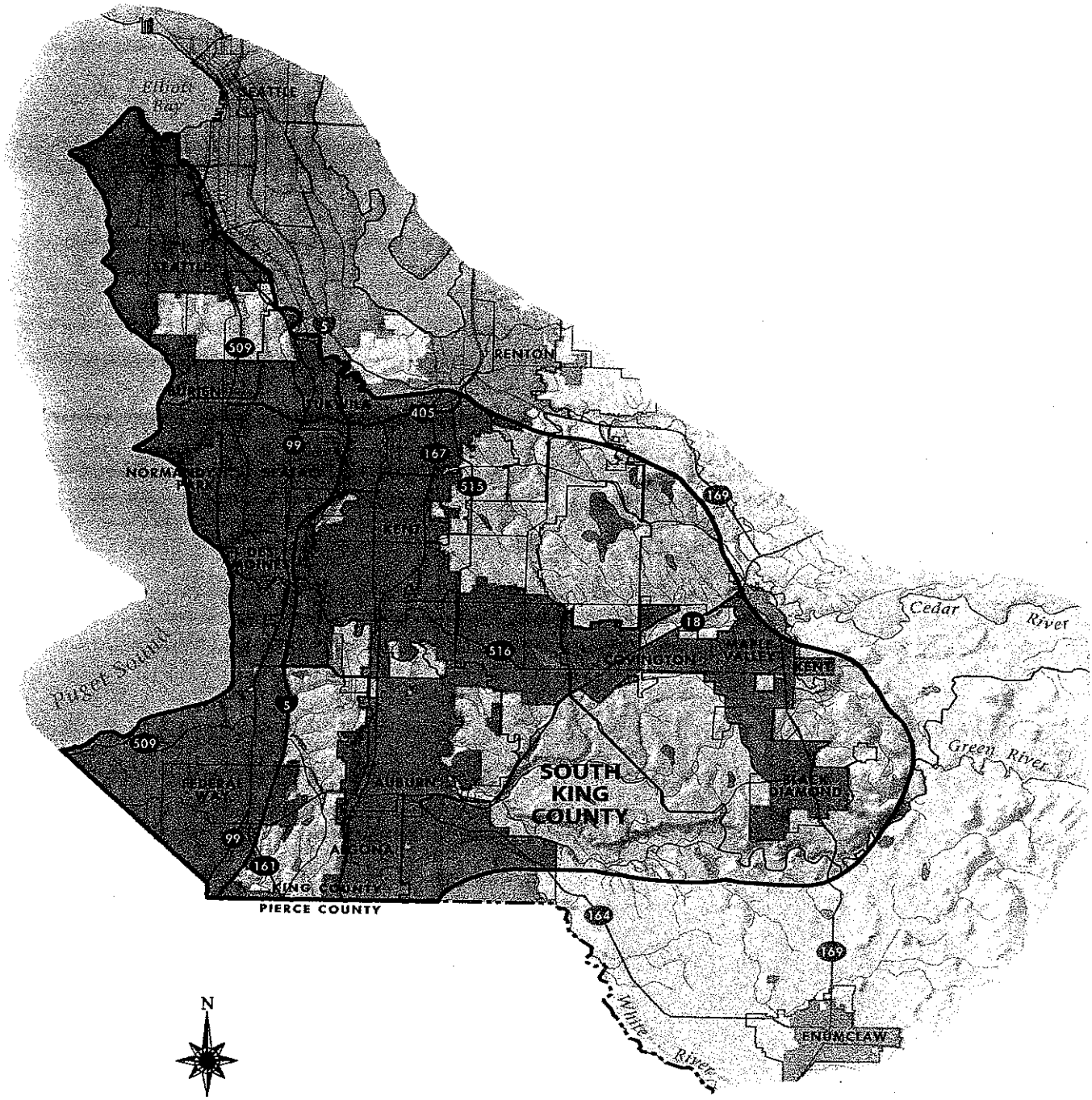
Ground water is the primary source of municipal and potable water used in the South King County Ground Water Management Area (GWMA). This includes water for private and municipal water needs, as well as industrial and agricultural needs. This comprehensive plan was developed to help avoid ground water contamination and ensure continuing availability, for once a source of ground water is contaminated, it may be lost forever. Protecting ground water from contamination is considerably less expensive than paying for cleanup. Ensuring water resource availability is crucial to continued growth. The status and extent of our ground water resource must be determined first before planning for wise use and effective management.

Plan Development

This Ground Water Management Plan represents a community consensus on the most practical protection approach and measures, and encourages local and state agencies to develop ground water regulations and programs.

The Ground Water Management Plan is based in state law. In 1985, the state legislature recognized the need for greater ground water protection by adopting legislation which directed the Washington State Department of Ecology (Ecology) to establish a process for designating and developing plans for ground water management areas. (Chapter 90.44 RCW)

The GWMA was designated a Ground Water Management Area by Ecology on October 7, 1986. In accordance with guidelines in Chapter 173-100 WAC, Ecology approved the



0 2 4 6 Miles

Source: King County Department of Natural Resources and Parks Groundwater Management Program, 2001 Annual Report

Groundwater Management Area Boundary

County Boundary

Major Road

River

Stream

Urban Growth Boundary

Lake or Open Water

Incorporated Area

Fig. 1

South King County Ground Water Management Area

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membership of the South King County Ground Water Area Ground Water Advisory Committee, consisting of representatives from many groups with broad cross section of interests. The South King County Regional Water Association (RWA) applied to the Department of Ecology for funds to conduct the ground water study. The RWA and the Seattle-King County Health Department were designated co-lead agencies by the Department of Ecology. The Seattle-King County Health Department was selected to be the co-lead agency because it has jurisdiction throughout the Ground Water Management Area, as well as a regulatory role in water systems, on-site sewage systems, solid and hazardous waste, and general environmental health concerns.

On January 1, 1996, the King County Department of Natural Resources and Parks, Water and Land Resources Division, assumed the role of co-lead agency for this study from the Seattle King County Health Department.

Land Use Impacts on Ground Water

Land use can have a significant impact on ground water quality and use. As area population grows, consumptive use of ground water will increase. In addition, as development increases, the risk of contamination of ground water resources is likely to increase. Ground water reserves can also be depleted by development covering recharge areas with impermeable surfaces that reduce aquifer recharge.

Forecasts prepared by the Puget Sound Regional Council predict that the GWMA will experience a significant increase in population during the next 30 years. Along with the increased population, employment opportunities in the GWMA will expand significantly as well. These two factors will have a major impact on area land uses, including an increase in residential housing, roadway expansion, and commercial and industrial growth. Figure 2 depicts the areas of aquifer susceptibility to ground water contamination in the GWMA.

Geology and Hydrogeology

Ground water infiltration, movement, and storage are controlled by both surface and subsurface geology. Surface infiltration depends on sediment permeability and the accessibility of those sediments to precipitation.

Direct precipitation accounts for most ground water in the GWMA. Precipitation either runs off to surface water, evaporates, is transpired by vegetation, or infiltrates into the soil where it reaches ground water. When ground water can move freely through subsurface deposits, it becomes accessible for use or discharges to surface water bodies. In this study area, the most common aquifers are formed by various outwash deposits of the last glaciation.

Water Quality

Historical ground water quality was complied from data gathered from the Washington State Department of Ecology, the Seattle/King County Health Department (SKCHD) and the United States Geological Survey (USGS). Results of known contamination sites were not

included in the statistical-trend analysis so that background results would not be skewed and regional trends in water quality could be evaluated. In general, no significant trends in any of the parameters measured were found. Very few parameters were measured at levels that exceeded maximum contaminant levels, with the exception of naturally occurring iron and manganese.

Water quality monitoring was conducted in 1990 and 1991. It appears that water quality has not been greatly impacted by industrial, residential or agricultural activities where the samples were collected.

Very few samples contained contaminant levels in excess of maximum contaminant levels, as determined under the Safe Drinking Water Act. Semi-volatile organics, pesticides and polychlorinated biphenyls were not detected at any of the sampling sites. Overall, water quality in each of the tested aquifers, appears to be relatively free of inorganic, microbiological and organic contamination.

Water Use

Area ground water is used primarily for domestic and public water supply, industrial use, fire suppression, and providing base flow to streams and lakes.

There are many major public water systems (Group A) in the study area. These include the cities of Algona, Auburn, Black Diamond, Kent, Pacific, Renton, Seattle, and Tukwila; and the special purpose/water districts of Cedar River, Covington, Highline, Lakehaven, Soos Creek and King County Water Districts 20, 49, 111 and 125. In addition there are about 300 Group B public water systems in the GWMA serving two to nine household connections.

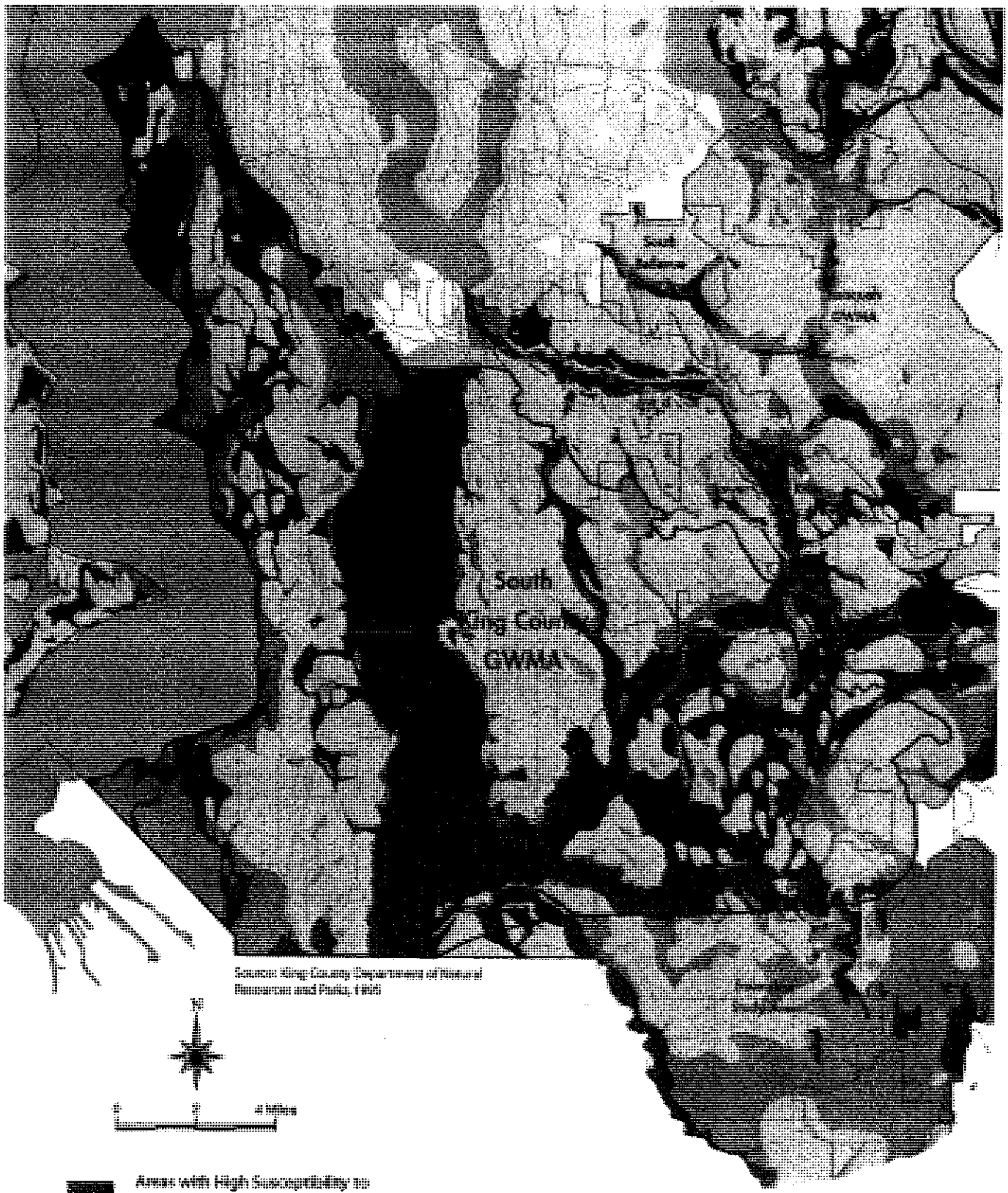
Purveyors need to prepare for future growth and development within the area by planning, identifying, financing, and developing new water sources.

Types of Ground Water Contamination

Three types of contaminants found in ground water threaten public health: microbial pathogens, inorganic chemicals and organic chemicals.

Microbial pathogens include bacteria, viruses and other disease-causing organisms. Improperly maintained sewage disposal systems, poorly constructed wells, leaking sewers and animal wastes are common ground water sources of microbial pathogens.

Inorganic chemicals include sodium, chloride, nitrate and heavy metals. Nitrate occurs naturally, and as a result of human activities such as septic systems, fertilizer use, and contaminated storm water runoff. Nitrate is an important ground water-quality indicator, because it is associated with other pollutants. Metals also may be naturally occurring, or come from human activities such as commercial and industrial land uses, or from stormwater runoff from streets and parking lots. Many metals are known to be harmful to health, including copper, zinc, lead, arsenic and cadmium. Iron and manganese are common in



Areas with High Susceptibility to Ground Water Contamination

Areas with Moderate Susceptibility to Ground Water Contamination

Areas with Low Susceptibility to Ground Water Contamination

Ground Water Management Area and Study Area Boundaries

Urban Growth Area Boundary

Fig. 2

Areas of Aquifer Susceptibility to Ground Water Contamination

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ground water in King County. They do not pose a health threat, but may occasionally affect the taste of the water and may cause staining. Organic chemicals include oil, gasoline, degreasers, solvents and some pesticides. Organic chemicals come from the improper use, storage or disposal of fuels, solvents, pesticides and herbicides. Organic chemicals may persist in ground water for decades, and are known to cause cancer and contribute to a variety of illnesses.

Potential Sources of Contamination

Contaminants come from a wide variety of sources. Specific potential contamination sources that the Plan covers include: hazardous materials, underground storage tanks, on-site sewage disposal systems, pesticides and fertilizers, well construction and decommission methods, sewers, solid waste landfills, burial of human remains, sand and gravel mining, and land application of biosolids and effluent.

MANAGEMENT STRATEGIES

The GWAC adopted the following ground water management recommendations, based on careful study and deliberation about possible, effective protection measures. The recommended programs either influence or relate to ground water quality and/or quantity. Table ES-1 outlines the numerous Management Strategies that are presented in Chapter 2 of the South King County Ground Water Management Plan. Each Management strategy is comprised of goals, issues, discussions and tasks.

TABLE ES-1 Management Strategies as Presented by Goals

MANAGEMENT STRATEGIES
PROGRAMS RELATED TO GROUND WATER QUALITY & QUANTITY
Goal: Special Area Designations to Enhance Ground Water Protection
SA-1A Elimination of Categorical Exemptions to SEPA
SA-1B Designation of Environmentally Sensitive Areas
SA-1C Adoption of General Aquifer Protection Policies
SA-1D Enhanced Environmental Review to Protect Aquifers
SA-1E Definition of Ground Water Concern Areas
SA-2 Wellhead Protection
Goal: Developing and Implementing Data Collection and Management Program
DCM-1 Data Collection, Analysis and Management – King County, Cities and Water Purveyors
DCM-2 Data Collection, Analysis and Management – Transfers to Ecology
Goal: Promote Stormwater Management Practices
ST-1 Runoff versus Recharge
ST-2A Ground Water Quality Concerns – Zoning
ST-2B Ground Water Quality Concerns – Facility Requirements
ST-2C Ground Water Quality Concerns – Study
ST-3A Education - Review

MANAGEMENT STRATEGIES cont.
PROGRAMS RELATED TO GROUND WATER QUALITY & QUANTITY cont.
ST-3B Education - Reporting
ST-3C Education - Developing Program
ST-3D Education - Coordinate Program
ST-4A Coordination Between Surface and Ground Water Planning Efforts: Ecology Program
ST-4B Coordination Between Surface and Ground Water Planning Efforts: Puget Sound Water Quality Authority
ST-4C Coordination Between Surface and Ground Water Planning Efforts: King County
ST-5 Assessment of Existing Storm Water Facilities
ST-6 Roadway Runoff
ST-7 Soil Amendment
Goal: Educating Agencies, Jurisdictions, Businesses and Citizens about Ground Water
ED-1 Existing Education
EC-2 New Educational Elements
PROGRAMS (RELATED) TO PROTECT GROUND WATER QUALITY
Goal: Hazardous Waste Management
HM-1 State Hazardous Waste Plan – Implementation
HM-2 Dangerous Waste Management Unit
Goal: Hazardous Waste Contamination Sites
HM-4 Hazardous Waste Contamination Sites – Site Referral and Public Education
Goal: Hazardous Materials Spills
HM-5 Implementation of the Uniform Fire Code
HM-6 Implementation of the Emergency Planning and Community Right-to-Know Act
HM-7A Transportation – Related Hazardous Materials Spills – Purveyor Assessment
HM-7B Transportation – Related Hazardous Material Spills – Management Committee Evaluation
Goal: Ensure Underground Chemical and Fuel Storage Tanks and Piping Systems are Managed
UST-1A Augment State Underground Storage Tank Program - Inspection
UST-1B Augment State Underground Storage Tank Program – Ordinance
UST-2A Exempt Tanks – Secondary Containment
UST-2B Exempt Tanks – Testing
UST-3A Heating Oil Tanks: Abandonment and Maintenance
UST-3B Heating Oil Tanks: Location
UST-3C Heating Oil Tanks: Education
Goal: To Promote On-site Sewage Treatment and Disposal Practices
OS-1 Nitrate Concerns
OS-2A Hazardous Materials: Inventory, Educate and Monitor
OS-2B Hazardous Material: Regulations
OS-3A Household Hazardous Waste: Onsite Disposal Risks
OS-3B Household Hazardous Waste: Educational Program
OS-4 Operation and Maintenance

MANAGEMENT STRATEGIES cont.
PROGRAMS (RELATED) TO PROTECT GROUND WATER QUALITY cont.
Goal: Prevent Ground Water Contamination from Use of Pesticides and Fertilizer
PF-1A Pesticide and Fertilizer Use: Farm Plans
PF-1B Pesticide and Fertilizer Use: Pesticide Reduction Program
PF-1C Pesticide and Fertilizer Use: Vegetation Maintenance Practices
PF-2A Education and Proposed Programs: Strategy
PF-2B Education and Proposed Programs: Review
Goal: Protect Quality of Ground Water in the GWMA by Ensuring Proper Well Construction and Decommissioning
WC-1 State Program
WC-2A Well Identification: Disclosure
WC-2B Well Identification: Permits
WC-3A Decommissioning Cost: Funding Mechanism
WC-3B Decommissioning Cost: Alternate Procedures
WC-4 Education
Goal: Prevent Degradation of Ground Water caused by Waste Water
SP-1A Sewer Programs
SP-1B Leakproof Piping
SP-2 Ground Water Depletion – Backfill
Goal: Prevent Occurrence of Ground Water Contamination Associated with Solid Waste Disposal Facilities
SW-1 Standards
SW-2 Abandoned Sites
SW-3 Education
Goal: Ensure Regulatory Programs are Adequate to Prevent Adverse effects from Sand and Gravel Mining Operations
SG-1 Regulatory Modifications
SG-2A Ground Water Protection
SG-2B Aquifer Impacts and Regulation
SG-3A Reclaimed Sand and Gravel Mines
SG-3B Zoning Code – Reclamation Plans
Goal: Provided Assurance that Ground Water will not be Contaminated by Reuse of Wastewater Effluent
BSE-1 Guideline Revision
PROGRAMS RELATED TO GROUND WATER QUANTITY
Goal: Manage Ground Water Resources to Optimize Availability of Ground Water
WQ-1 Policies and Ordinances
WQ-2A Data Needs
WQ-2B Policies and Ordinances
WQ-3 Water Rights
WQ-4A Conservation: Landscaping
WQ-4B Conservation: Group B Systems
WQ-5A Education: Low Water-Use Plants
WQ-5B Education: Schools and General Public
WQ-5C Education: Aquifer Recharge
WQ-5D Education: Individual Systems
WQ-6 Artificial Recharge

PROGRAMS RELATED TO GROUND WATER QUALITY AND QUANTITY

Special Area Designations to Enhance Ground Water Protection

A Ground Water Management Program may be enhanced by any number of special federal state, and area designations by providing a funding source to implement ground water protection measures, enhancing eligibility for grant funds, or expanding review of development proposals.

The Ground Water Advisory Committee Goal is to: *Use available special area designations together with local regulations and policies to enhance ground water protection efforts in the GWMA.*

The proposed management strategies are:

- Designate the GWMA as an Environmentally Sensitive Area so that categorical exemptions, as determined under SA-1A, may be eliminated (SA-1B)

- King County, cities and special-purpose districts will jointly determine whether any categorical exemptions to SEPA should be eliminated, especially in physically susceptible and recharge areas. (SA-1A)

- Provide guidance to SEPA document reviewers, so they can 1.) identify proposed development that may significantly impact ground water, 2.) recognized and require adequate information to assess impacts upon ground water; and 3.) recognize and propose effective mitigation. (SA-1D)

- King County, cities, and special-purpose districts should adopt general aquifer protection policies, and place a priority on implementation of the proposed Management Plan Strategies in physically susceptible areas and recharge areas, including land use designation and wellhead protection- area policies. (SA - 1C, 2; SA – 1D; SA-1E)

Data Collection and Management Program

Managing the ground water resource and continuing to develop a conceptual characterization of ground water hydrology within the area, requires long-term data collection on ground water quality and quantity, precipitation and stream flow.

The Ground Water Advisory Committee Goal is to: *Protect ground water quantity and quality by developing and implementing a data collection and management program.*

The proposed management strategies include developing and implementing a data collection and management program that collects needed data, enters the data into the ground water management program database, and analyzes the data to provide useful information to decision makers (DCM- 1); and for Ecology to input the local ground water data into its database. (DCM-2)

Storm Water Management

The most serious public health concern about storm water recharge is the possible effects on the quality of ground water used as a source of drinking water. Storm water management practices, past and present, often cause ground water quantity and quality problems.

The Ground Water Advisory Committee goal is to: *Promote storm water management practices that provide the greatest amount of recharge while protecting ground water quality.*

The proposed management strategies are:

- Preserve recharge by requiring that rural zoning, residential zoning, and open space in the most physically susceptible and recharge areas be maintained (ST - 2A).
- Preserve ground water quality by requiring that runoff be infiltrated when site conditions permit. (ST - 1)
- Require all types of storm water facilities to use best management practices as outlined in Ecology's approved design manuals. (ST - 2B, 2C)

Ground Water Education Program

A comprehensive ground water education program is needed to:

- Help engender understanding and concern in order to protect the resource.
- Aid in developing resource protection messages that are consistent regardless of the specific education program.
- Coordinate with other resource protection programs that focus on a specific issue, such as solid waste, hazardous waste or storm water management
- Develop specific education activities and materials for point and non-point sources of contamination.

The Ground Water Advisory Committee goal is to: *Increase individual participation in protecting ground water resources by educating agencies, jurisdictions, and businesses in the threats to ground water quantity and quality, and ways they can reduce those threats.*

The proposed management strategy is to develop and implement an education program that builds upon existing education efforts in the county and adds specific elements as identified in the various management programs. (ED - 1, 2)

PROGRAMS TO PROTECT GROUND WATER QUALITY

Hazardous Materials Management

Ground water contamination can occur when hazardous materials migrate through the soil, or when hazardous materials are spilled into surface water that is connected to ground water. Human health threats occur when contaminated ground water reaches aquifers used for drinking water supplies. Cleaning up contaminated aquifers is difficult, costly, time-consuming, and potentially unsuccessful.

The Ground Water Advisory Committee Goal is to: *Ensure that ground water is not contaminated due to improper management of hazardous substances.*

The proposed management strategies are:

- Support current plans such as the Washington State Hazardous Waste Plan, and to request that Ecology and the Washington Legislature fund and carry out the provisions of the Plan. (BA4-1)

- Enhance existing regulations (for example):,

  - Ecology may amend the Dangerous Waste Regulations (Chapter 173-303 WAC) to require setbacks from the seasonal high ground water level. (HM-2)

  - King County and cities within the Ground Water Management Area should implement through education and regulation, Uniform Fire Code Article 80 in both new and existing facilities. (HM-5)

  - King County and cities should seek a permanent source of funding to provide necessary staff and resources to complete a comprehensive Local Emergency Management Plan. (FM-6)

  - Provide for future protection of larger Public Water Systems' wellhead protection areas by assessing the risk of transportation related hazardous material spills (HM -7A)

Underground Storage Tank Management

Commercial underground petroleum and chemical storage tanks represent a significant potential threat to ground water quality in King County. Leakage from underground storage tanks and associated piping often occurs without detection and some volatile organic compounds can rapidly migrate through the soil to ground water and have serious adverse affects. Leaking underground home heating oil tanks may also present a threat to ground water quality. Both federal and state agencies adopt a less aggressive approach to regulation of heating oil tanks.

The Ground Water Advisory Committee Goal is to: *Ensure that underground chemical and fuel storage tanks and piping systems are managed/regulated to prevent contamination of ground water.*

The proposed management strategies are:

- Enhance existing regulations:
  - King County and cities should enhance current inspections of underground storage tank Installation and removal in these Environmentally Sensitive Areas to include the relevant requirements of Chapter 173-360 WAC - Underground Storage Tank Regulations. (UST-IA, IB)
- The King County Department of Natural Resources will prepare an ordinance for the King County Council's consideration requiring:
  - Secondary containment for underground storage tanks as defined by Chapter 173-360-120 WAC, and for the following exempt or deferred tanks, heating oil tanks of all sizes and motor fuel tanks of 1100 gallons or less;
  - Disclosure at the time of sale of any property in King County of the number, location, and legal status of existing underground storage tanks; proof from the Fire Marshall or fire chief that the underground home heating oil tank was abandoned in accordance with regulations prior to release of any permits associated with energy conversions (gas piping, electrical, etc.);
  - Proof from the Fire Marshall or fire chief that the underground home heating oil tank was abandoned in accordance with regulations prior to release of any permits associated with energy conversions (gas piping, electrical, etc.);
  - Require all underground storage tanks without secondary containment to be tested at regular intervals for integrity (UST-1B, UST-2A, UST-2B, UST-3A).
- Provide education.
  - King County and cities should jointly educate homeowners and exempt tank owners regarding tank abandonment requirements of the Uniform Fire Code through the Ground Water Management Plan Education Program. (UST-3C)

On-site Sewage Treatment and Disposal System Use

If on-site sewage systems are improperly designed or constructed, installed in inadequate soils, used by an excessive development density, or to treat and dispose of non-domestic wastewater, they can adversely impact surface and ground water quality, as well as public health. Ground water contamination associated with domestic on-site sewage system effluent

can involve a number of contaminants, including nitrate, bacteria, viruses, and trace organic chemical compounds.

The Ground Water Advisory Committee goal is to: *Promote on-site sewage treatment and disposal practices that are effective in protecting ground water resources from possible adverse impacts.*

The proposed management strategies are:

- Evaluate the effect of on-site systems on ground water, and to propose residential densities that would keep nitrate concentrations at safe levels. The Management Committee should consider requiring that Wellhead protection programs incorporate Nitrate loading analysis (OS - 1)

- Keep hazardous material from being disposed into on-site sewage disposal systems; King County will inventory facilities served by on-site sewage disposal systems which potentially use, store, or dispose of hazardous materials; educate operators and the general public regarding hazardous materials management; and selectively monitor those facilities that appear to represent a significant risk to ground water quality. (OS - 2A, OS – 2B, OS - 3A, OS - 4)

Pesticides and Fertilizers

Pesticides and fertilizers are in everyday use all around us. The major categories of use are agriculture, home, forestry and rights-of-way maintenance. Pesticides and fertilizers have the potential to contaminate ground water when they are used improperly.

The Ground Water Advisory Committee goal is to: *Prevent ground water contamination from the use of pesticide and fertilizer.*

The proposed management strategies are:

- Provide immediate protection for ground water.

  - King County and cities should use non-chemical vegetation maintenance practices or will use only chemicals which, when used at approved application rates, do not pose a threat to ground water. (PF - 1 C)

- Provide for future ground water protection.

  - King County, cities and water purveyors should evaluate the Cooperative Extension Pesticide Reduction Program for effectiveness in protecting ground water, and its applicability to the GWMA. (PF -IB)

- Provide education.

  - King County and cities encourage and support the King Conservation District's development of Farm Plans using Best Management Practices for any agricultural user of pesticide and fertilizer in physically susceptible areas, and water purveyors may contract with the Conservation District to develop Farm Plans in their physically susceptible and recharge areas (PF- 1A).

  - This plan supports the strategies in "Protecting Ground Water: A Strategy for Managing Agricultural Pesticides and Nutrients", April, 1992, and the 1991 Puget Sound Water Quality Authority Plan that helps insure that small farmers and homeowners receive more information about pesticide and fertilizer use. (PF –2A)

  - The King County Department of Natural Resources will review the current educational programs of Soil Conservation Service, Cooperative Extension and others to ensure that the Plan goals and policies are reflected. This will be done as part of the Plan Education Section. (PF – 2B)

Well Construction and Decommissioning

Wells provide a link between an aquifer and the ground surface. Old improperly constructed wells or wells with inadequate seals can serve as a conduit for contaminated surface water to quickly travel to an aquifer. Under State law, any well that is unusable; whose use has been permanently discontinued; or is in such disrepair that its continued use is impractical or is an environmental, safety, or public health hazard, must be decommissioned. An improperly decommissioned well also may serve as a conduit for contaminated ground or surface water.

<u>The Ground Water Advisory Committee Goal is to:</u> *Protect the quality of area ground water by ensuring that proper well construction and decommissioning procedures are followed.*

The proposed management strategies include:

- Provide proper oversight and implementation of the existing regulations. King County and Ecology should develop a local health department program to implement the delegated portion of Ecology's well construction and decommissioning program. (WC - IB)

- Identify and catalogue wells.

  - The King County Council should pursue legislation to require sellers of real property to disclose to buyers the existence of used or unused wells on their property. (WC - 2A)

  - King County and cities should require that applicants establish the location and

status of wells present on the property in question during SEPA review and land use permit applications. This information will be provided to Ecology as well. (WC - 2B)

- Ensure proper decommissioning of wells. Provide assistance to those needing to decommission wells, such as funding or alternative methods. (WC - 3 A, 3 B)

- Provide education about well construction and decommissioning. The South King County Ground Water Management Plan Education Program will include information on well identification, well construction, proper well maintenance, contamination sources and well decommissioning. (WC - 4)

Sewers

Older sewers were made from materials such as concrete, brick and clay. Joints were more susceptible to leaking with the use of these materials. Many of these older pipes are still in use today and may be contributing to infiltration, inflow and exfiltration problems. Infiltration is ground water entering sewers, both as runoff during storms, or as base flow from other sources. Inflow refers to direct flows of storm water into sewers through hookups such as roof and footing drains. Infiltration and inflow causes a decrease in ground water, as this water flows through the sewage treatment system into Puget Sound. Exfiltration occurs where sewage discharges from leaking pipes and joints causing ground water contamination.

The Ground Water Advisory Committee goal is: *Prevent the degradation of ground water, which may be caused by waste water leaking from sewers and side sewers, and to prevent the loss of water through infiltration to sewers and side sewers.*

The proposed management strategies are:

- Prevent impacts to ground water:

  - King County, Cities and Sewer utilities should continue, or adopt, regularly scheduled leak-detection-and-repair programs and public education programs to protect ground water aquifers. (SP - IA)

  - King County should amend the Comprehensive Land Use Plans and King County Code 13.24 to require that new sewer piping installed in the most physically susceptible and recharge areas be leakproof (SP - IB)

  - Ecology should consider amendments to sewer construction specifications that will stop the transmission of ground water along pipe alignments. (SP 2)

Solid Waste Landfills

There are environmental impacts associated with solid waste landfills, including leachate and gas production. Leachate is water, or other liquid that has been contaminated by dissolved or

suspended materials due to contact with solid waste, or gases from solid waste. Landfills may pose a threat to ground water quality due to leachate production. Ground water that currently is not being used for drinking water also needs to be protected from leachate contamination, as it may become a drinking water source in the future.

The Ground Water Advisory Committee goal is to: *Prevent ground water contamination problems associated with operating solid waste disposal facilities in King County.*

The proposed management strategies are:

- Provide protection through regulations. The Seattle King County Health Department (SKCHD) will prepare amendments to Title 10 to adopt Chapter 173-351 WAC by reference for King County Board of Health's consideration. (SW-1)

- Remediate existing problems. The SKCHD will evaluate the remediation efforts of King County on abandoned sites and make a report to the Management Committee. (SW 2)

- Provide education. Include information about the relationship between solid waste disposal and ground water in the education program. (SW - 3)

Burial of Human Remains

The Ground Water Advisory Committee concluded that ground water impacts from cemeteries are not a concern in the GWMA.

Sand and Gravel Mining

It is not unusual for productive sand and gravel mines to be located over vulnerable aquifers. Mining activities in these areas can increase ground water vulnerability to contamination both from the extraction process and from site reclamation.

The Ground Water Advisory Committee Goal is to: *Ensure that regulatory programs are adequate to prevent adverse effects upon ground water quality attributed to sand and gravel mining operations.*

The proposed management strategies are:

- Provide future protection:

    - King County and cities should comply with the National Pollutant Discharge Elimination System Permit Program and Ecology's "General Permit" requirements (SG-1)

    - Actively support changes that provide better ground water protection with the SEPA guidance document including best management practices for sand,

gravel and rock quarries. (SG-2A, 2B)

- King County and cities should provide comments to the State Department of Natural Resources on Mine Reclamation Plans proposed within the GWMA. Additionally, King County and other jurisdictions will develop Best Management Practices (BMPs) for mining operations. (SG-3 A)

- King County and cities should require that reclamation plans for mineral extraction sites include measures to protect ground water quality and quantity. (SG-3B)

Land Application of Biosolids and Effluent

Currently, nearly all the biosolids generated and disposed of in King County are used for silviculture, composting, soil improvement, or agricultural purposes through land application. Potential contaminants in raw biosolids include nitrogen, phosphorous, heavy metals, hydrocarbons, microorganisms, and radionuclides. Based on present technology, properly managed land application of biosolids poses little threat to health or the environment.

Sewage effluent is the liquid that remains after the sewage has been treated. Reuse of effluent is regulated by the state Water Pollution Control Act, administrated by the Department of Ecology, which also administers the Wastewater Reclamation and Reuse Interim Standards. Currently, reuse of sewage effluent by land application is not widely practiced in King County.

The Ground Water Advisory Committee Goal is to: *Provide assurance that the ground water resources in King County will not be contaminated by the reuse of waste water effluent.*

The proposed management strategy is to provide future protection by encouraging Ecology to include ground water protection in the revised guidelines for reuse of effluent. (BSE - 1)

PROGRAMS TO PROTECT GROUND WATER QUANTITY

The ground water resource reflects the geology and climate of the area. Aquifer and surface water levels are maintained by preserving recharge. State law dictates how water may be appropriated through the water rights program.

The Department of Ecology administers laws dealing with water appropriations and allocations. Allocation to new users must not conflict with existing use. However, the information needed to make allocation decisions may be incomplete. Water users are developing and using innovative techniques to decrease their water use and increase water availability, such as conservation and artificial recharge. Recent interest in maintaining surface water resources has spotlighted the interaction of ground water and surface water. Future ground water resource management must include consideration of this interaction.

The Ground Water Advisory Committee Goal is to: *Manage ground water resources to optimize the preservation and enhancement of the quantity of ground water available to South King County.*

The proposed management strategies are:

- Provide policy direction:
  - King County, cities and other lead agencies should consider impacts on the quantity of aquifer recharge during SEPA checklist review. (WQ - 1)
  - The Ground Water Advisory Committee supports Ecology's Sea Water Intrusion Policy. (WQ - 2B)
- Maintain and enhance natural recharge. King County and cities should consider amending landscaping ordinances and surface water management requirements to encourage conservation and to maintain pre-construction recharge capabilities. (WQ - 4A)
- Provide for information collection and analysis:
  - A ground water data collection management program will be designed and implemented which would enable land and water use decision makers to make water resource decisions based on complete information. (WQ - 2A)
  - Utilities will update their water-right records and report to Ecology, as per the recommended program in the "Five Year Water Resource Data Management Plan". (WQ - 3)
- Provide for conservation:
  - The Seattle-King County Health Department will propose a revision to regulations for Group B Small Public Water Systems to cover water conservation goals and measures. (WQ - 4B)
  - The Education program will include elements to promote water conservation. (WQ - 5B)
- Explore new techniques for quantity enhancement. Purveyors will be encouraged to investigate artificial recharge programs. (WQ - 6)

IMPLEMENTATION AND FUNDING

Management Committee

The GWAC has recommended that the implementation and management of the Plan be done by a locally based Ground Water Management Committee. The Committee membership includes one representative from: the GWAC, King County, each city in the planning area, each Tribal Nation in the planning area, each Group A water purveyor, and a private citizen. The Management Committee provides oversight to the implementation of the South King County GWMP. Its duties include:

- Review and recommend an annual budget for implementation activities for the South King County GWMP, or any annual revision;
- Monitor the implementation of the South King County GWMP:
- Review annual reports on implementation prepared by the lead agency;
- Determine whether implementation is adequate and whether changes are needed in priorities, monitoring, reporting etc. during the implementation period.
- Act as a forum to consider new or ongoing ground water protection issues of significance to the GWMA;
- Determine whether revisions are needed to the South King County GWMP; and
- Perform tasks as assigned in the South King County GWPM.

Lead Agency

In general, the Management Committee will serve as the "Lead Agency". From time to time the Management Committee may need to assign Plan implementation tasks. This may include staff to perform day-to-day tasks. The Management Committee should delegate an appropriate local government to serve as lead for specific tasks as necessary and consistent with their statutory authority.

Funding Plan

The GWAC recommends that those who will benefit should financially support the GWMP. Users of the ground water resource are water utilities, special purpose districts, water associations, small water systems, individual water systems, industrial, irrigators and (perhaps) surface water utilities. Plan implementers that have service charges or a fee collection system in place should collect their ground water management investments from customers. All fee-collection and participation by water utilities, districts and water associations, shall be on a cooperative, voluntary basis.

Concurrence Process/Plan Adoption/Certification

Public Review

Upon completion, the Draft South King County Ground Water Management Plan is subject to public review. Ecology will hold a local public hearing for comment and review of the plan.

Adoption

Following the hearing, each affected agency and government will have 90 days to evaluate and either concur or disagree with the plan. The Ground Water Advisory Committee will negotiate with nonconcurring agencies and governments to reach agreement. After concurrence, and the Ground Water Advisory Committee finds the plan to be consistent with the intent of Chapter 173-100 WAC, Ecology will certify the plan.

Implementation

Affected agencies and jurisdictions will be responsible for implementing the plan following certification. The implementation process is described in Chapter 3 of the Plan. The Ground Water Advisory Committee has provided a mechanism for modifying the plan to adapt to changing conditions under the supervision of the Management Committee. This committee will advise and oversee ground water management activities that take place under this plan. The committee will also review new issues and programs that emerge during and after Plan preparation. The Management Committee will develop methods to incorporate the new issues and programs into the implementation of the plan.

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CHAPTER 1 INTRODUCTION

1.1 SETTING

The South King County Ground Water Management Plan documents the work of local governments and citizens to protect the ground waters underlying south King County. Within the Planning area, ground water is the major source of potable water for residents.

Most of the work done to produce this document was completed between 1990 and 1995. Since that time several events have occurred that have changed the setting in the study area. These include:

- Implementation of the Washington State Growth Management Act that required local governments to identify and protect sensitive areas and natural resources, and

- Implementation of Wellhead Protection Programs by all of the water utilities that requires each utility to identify recharge areas and water quality risks for each groundwater well in use, and

- King County has passed a ground water management ordinance and implemented a modest ground water management program.

As a result, the many of the actions included in this plan have been accomplished under other programs. The Plan and process described in this Ground Water Management Plan has not been redrafted to reflect changes since 1995.

In several locations were it was deemed to be particularly helpful, an editorial update has been include. Each of these appears in a box to assist the reader.

South King County is a rapidly growing area, which is heavily reliant upon ground water resources. The issue of water resource management, both in quantitative and qualitative terms, is a concern shared by the citizens, municipalities, utilities, and county agencies who live in and serve the South King County area. The ever-increasing water demands for irrigation, municipal, industrial, domestic and recreational uses, have raised questions regarding the adequacy of existing resources to meet the combined demands of all ground water resource users. In addition, examples of water quality contamination at specific sites within South King County and elsewhere throughout the State and nation create interest in evaluating and protecting the water quality of the ground water resources throughout the area.

The citizens and officials of King County are the stewards of the ground water resource, both for present and future generations. This Plan is intended to inform and guide ground water protection efforts of the citizens as well as government agencies. The South King County Ground Water Management Plan (Plan) for the South King County Ground Water

Management Area (GWMA) has been developed because (1) ground water is a limited resource, vital to both the well being of area residents, and the natural environmental resources; (2) ground water is part of the complete hydrological cycle and therefore, ground water needs to be protected and managed as a part of the entire hydrologic system, ecosystem, and economic system.

The GWMA is approximately 260 square miles in southwest King County. The management area is bounded on the north by the Duwamish and Cedar Rivers, on the east by the Black Diamond area, on the south by the Green River and Pierce County, and on the west by Puget Sound. The GWMA is primarily suburban and rural in the eastern portion, primarily commercial/industrial in the lower Green River area, and urban in the central and western portion. Ground water is naturally stored underground in aquifers. An aquifer is a saturated underground soil or rock formation that yields water in sufficient quantity to be economically useful. Aquifers supply water for many uses in the GWMA, including drinking water, industrial use, and irrigation. Also, ground water may provide base flow to surface water bodies during periods of low or no rainfall, and sustains fish, wildlife and recreational needs.

Aquifer recharge, or replenishment, occurs when water from rain, snow, stormwater runoff, surface water or other sources reaches an aquifer. The rate of infiltration and the quantity of water that reaches an aquifer are influenced by natural and constructed elements. Natural elements include the amount and pattern of precipitation, soil characteristics, vegetation and topography. Constructed elements include impermeable surfaces (such as roads, parking lots, buildings), changes to natural vegetation or ground cover, soil compaction, and other changes to the natural environment.

It is essential that the ground water resource be protected from contamination. Once a ground water source is contaminated, costs for restoration can be enormous or the resource may be lost forever. The cost of protecting ground water from contamination is considerably less than the cost of remedial action. Ensuring ground water availability is also crucial. The natural hydrologic system can be interrupted by development and over use of the aquifer.

1.2 GROUND WATER MANAGEMENT PROGRAM PURPOSE AND SCOPE

The purpose of the Washington State Department of Ecology's Ground Water Management Program is to foster the development and implementation of local Ground Water Management Plans. These Plans represent a community consensus on the most practical ground water protection measures to safeguard quality and ensure continued availability of the resource. The South King County Ground Water Management Plan (Plan) guides local and state agencies in developing regulations and programs to protect ground water.

The Plan documents activities for the second of two grants provided by the Department of Ecology (Ecology) which, in part, have funded the preparation of this Plan. The document has been prepared under a program initiated by the Washington State Legislature in 1985

wherein they directed Ecology to establish a process of designating ground water areas for development of ground water management programs.

Preparation of the Plan has been done in accordance with the requirements of Chapter 173-100 WAC, Ground Water Management Areas and Programs. The regulations led to the designation of South King County as a Ground Water Management Area (GWMA) on October 7, 1986. The GWMA used for the study is bound by Puget Sound on the west; Pierce County on the south; Green River, Black Diamond on the east; and the Cedar and Duwamish Rivers on the north.

An Interlocal Agreement was entered into between the Seattle-King County Health Department (SKCHD) and the South King County Regional Water Association (RWA) on December 17, 1986. This Agreement established both entities as co-lead agencies for the evaluation and preparation of this Plan. On January 1, 1996, the King County Department of Natural Resources and Parks (KCDNR) replaced the SKCHD as co-lead agency for this study.

The RWA consists of water utilities within the South King County area who are interested in evaluating and managing the water resources and public water supply within the area. Their interest has stimulated the preparation of this document, a companion evaluation of ground water resources by the U.S. Geological Survey (USGS), independent investigations by the separate utilities and a Coordinated Water System Plan.

The Plan was prepared under funding by two grants. In Grant No. 1 there were two volumes produced. Volume I provides a summary of the major ground water findings, conclusions, and recommended implementation efforts needed to continue development of the Plan in the second grant activities. Volume II provides technical supporting data and additional information developed for the study and each of the study's four individual subareas. Volumes I and II were completed in April 1991. These Volumes contain the plan development process, an analysis of historical data and recommendations for new data collection.

This Plan, developed in Grant No. 2, contains the results of the data collection and analysis, and provides recommendations for action on a variety of management issues and policies deemed appropriate by the Ground Water Advisory Committee (GWAC) in order to provide a comprehensive management strategy for ground water resources throughout South King County. The supporting data and additional information developed for Grant No. 2 is contained in the Supplement 1 – Area Characterization.

The completed Plan has been reviewed and accepted by the GWAC. The State process requires concurrence from all affected agencies. Affected local governments will be asked to adopt or amend regulations or ordinances to implement the provisions and recommendations of the Plan.

Development of the complete Plan, as required by Ecology, includes five major phases of work: Phase 1 - Program Development/Grant Application; Phase 2 - Public

Involvement/Administration; Phase 3 - Data Collection/Analysis; Phase 4 - Management Alternatives and Implementation Plan; and Phase 5 - Public Review and Adoption.

Grant No. 1 activities focused primarily on work elements in Phase 2 and 3, with initial efforts in Phase 4. The essence of Grant No. 1 was to analyze and trend existing information characterizing the topography/geology, climate, water quality, and water resources requirements of the Plan. Grant No. 2 activities focused primarily on planning policy and implementation and new data collection and analysis.

1.3 GROUND WATER MANAGEMENT PROGRAM HISTORY

In response to growing concern in Washington State about ground water resources, the state legislature passed Substitute House Bill 232 in 1985, codified as Chapter 90.44.400 RCW Regulation of Public Ground Waters. This legislation directed the Washington Department of Ecology (Ecology) to:

- Identify specific locations in need of ground water management programs;
- Establish a program to provide financial assistance to these locations; and
- Develop guidelines for the implementation of local ground water management strategies.

Ecology responded by adopting Chapter 173-100 WAC Ground Water Management Areas and Programs. These regulations define a ground water management area as a specific geographic area that encloses one or more aquifers, and which exhibits a justifiable concern for the quality and/or quantity of the ground water.

Ecology's ground water program (Chapter 173-100 WAC) establishes how a local ground water management plan must be developed. A ground water management plan is designed to protect ground water quality and assure ground water quantity for current and future uses. Chapter 173-100 WAC establishes a well defined process that allows for ground water issues, concerns and opportunities from all interested groups and agencies to be incorporated into the planning process in an effective and efficient manner. The process is designed so that a ground water management plan can be initiated and developed on the local level while being supported by state legislation and regulations. The ground water management program process also provides local government with a method to achieve comprehensive ground water protection goals.

King County and the RWA petitioned Ecology to designate the GWMA as a ground water management area. The petition document outlined a number of ground water protection problems facing the area:

- South King County is primarily dependent upon ground water for the continued viability of water supply to its existing and future citizens.

- Major aquifers have the potential for over use based on projected future demands.
- Potential contamination sources threaten ground water quality, or ground water is susceptible to contamination.
- Ground water management procedures that are consistent with both local needs and state water resource policies and management objectives including the protection of water quality, assurance of quantity, and efficient management of water resources to meet future needs should be identified.

Ecology designated the GWMA on October 7, 1986. According to guidelines in Chapter 173-100 WAC, Ecology approved the membership of the Ground Water Advisory Committee (GWAC), consisting of a broad cross section of interests with representatives from many groups. Ecology selected the Seattle-King County Health Department (SKCHD) to be the co-lead agency with the RWA, because it has jurisdiction throughout the GWMA and has a regulatory role in water systems, on-site sewage systems, and other environmental health concerns.

A GWAC was formed in accordance with Chapter 173-100-050 WAC, to guide development of the Plan. The GWAC is composed of a variety of public and private interest groups. The GWAC, through the lead agencies, submitted a grant request to Ecology on January 30, 1987, for assistance in preparing this document. Notice to proceed on the Plan was provided by Ecology on July 31, 1987. In view of limited grant funding, preparation of the Plan was segregated into two grants.

Activities of the first grant have focused on collecting and evaluating background data regarding the quantitative and qualitative aspects of the ground water resource, along with identifying resource management and strategy issues which need to be addressed in Grant No. 2.

Key activities in development of the Plan document under Grant No. 1 were guided by the GWAC and its three subcommittees. The GWAC reviewed the preparation of the Plan and the development of the Scope of Work and grant application. The Technical Subcommittee reviewed the technical approach, findings, and recommendations of the Plan in Grant No.1. The Policy Subcommittee addressed potential management issues, strategies, and policy requirements that required further refinement in Grant No. 2. The Public Involvement Subcommittee, through the Public Involvement Plan, created a public awareness of the need for protection of ground water quality and quantity, during Grant No. 1. This Plan incorporated a variety of media and public education activities including newspaper articles, speakers bureau for local civic groups, releases for radio and television, and various public workshops during Grant No. 1 activities. Several of the above actions were pursued, including a presentation at four different ground water fairs at Federal Way, Auburn, Kent, and the Covington area.

The GWMA boundaries closely coincides with that used by the USGS in a concurrent study which also addressed regional ground water conditions in South King County. These two

study area boundaries were coordinated to ensure the availability and utilization of common data for each study. The Plan has expanded on information provided from USGS and provided a more detailed evaluation of four subareas within South King County. These four subareas are: Des Moines Upland, Federal Way Upland, Green River Valley, and Covington Upland. Areas further south and east of the study area on the Enumclaw Plateau were not included in the GWMA.

A master database of hydrogeologic information was developed for the GWMA. This database, located at SKCHD, relied upon data provided by the USGS for approximately 780 wells which were field checked throughout the area. Data for an additional 180 wells was added. Geologic logs for approximately 700 wells were also computerized. The information on the database has also been digitized to facilitate computer mapping as generated from information within the database.

Information on water rights and water quality were also entered on the database and correlated to individual wells where sufficient location information allows such correlation to occur. Water quality analysis were evaluated for over 450 wells reported for public and private uses by the SKCHD, Ecology, the Washington State Department of Health (Health), the Environmental Protection Agency (EPA), or other entities. Statistical analyses were conducted on over 200 of these wells for results of key indicator parameters tested since 1970 to evaluate regional trends in water quality.

Simultaneous to the development of the Plan, several other ongoing local activities have complimented the Plan effort.

Major activities are summarized below:

- In 1985, the USGS initiated efforts related to an evaluation of ground water resources in South King County.

  A joint funding agreement was reached in the spring of 1986 to coordinate the activities of the USGS and the GWMP. The USGS effort focused more upon a regional evaluation, whereas the Plan focused upon regional and subarea concerns. Water resource information for approximately 2,100 wells was computerized by the USGS. Field verification for approximately 780 wells was accomplished by the USGS through well inventory. The RWA worked cooperatively with King County Parks, Planning, and Resource Department in preparation of a Coordinated Water Supply Plan for South King County. The Coordinated Water Supply Plan study area is nearly identical as that for the Plan except for the inclusion of the Enumclaw area and the elimination of the West Seattle area. The Coordinated Water Supply Plan presents an assessment of municipal and industrial water supply needs in South King County and a program to effectively provide supply and service to customers throughout the area.

- A variety of drilling activities occurred during the development of the Plan, which provided useful data to the study. These drilling activities were sponsored by

individual utilities throughout the study area. All of these wells were predominately for test proposes.

- The City of Seattle has conducted a five-year demonstration project under a grant from the U.S. Bureau of Reclamation on the use of artificial recharge at its Highline Well Field located north of the SeaTac airport.

- The City of Tacoma has pursued construction of Pipeline No. 5 transmitting water from an intake on the Green River through South King County, and eventually supplying potable water to the Tacoma/South King County Region.

- The SKCHD has also conducted water quality monitoring studies of landfill operations in the Kit Corners area.

- King County Surface Water Management has conducted an extensive evaluation of the geology characteristics throughout South King County.

- Finally, other studies conducted in relation to the Midway Land Fill investigation, Western Processing contamination site, and other site-specific investigations provided useful information in the preparation of this document.

Since preparation of this document, many of the water utilities located within the study area and King County have continued to collect data and study ground water conditions in the study area.

1.4 GROUND WATER MANAGEMENT PLAN GOALS AND OBJECTIVES

After Ecology designates the area, and the GWAC membership and lead agency are established, the first step in developing a Ground Water Management Plan is to establish goals and objectives.

The GWAC developed the following goal and objectives:

Goal: Establish and implement ground water management procedures and functional responsibilities that will protect existing water resources and prevent the future degradation of water quality or inefficient utilization of ground water resources within South King County. In addition, ensure the development of the Plan is appropriately integrated with the Coordinated Water Supply Plan for South King County.

Objectives:

- Designate the GWMA, making it eligible for state grants designated for development of ground water management programs and plans.

- Develop a Ground Water Management Plan. This plan must:
  - Be consistent with federal regulations, state ground water management laws and local ordinances.
  - Include the public and local agencies' participation in drafting, reviewing and modifying the plan.
  - Include elements as described in Chapter 173-100 WAC Ground Water Management Areas and Programs. These include:

    1) A public involvement plan to educate and inform the public about ground water and the South King County Ground Water Management Plan (Plan) process. The public will be informed of the need to protect the ground water resource from contamination and overuse and will provide support to the public and private actions required to protect the resource.

    2) An "Area Characterization" that includes mapping, jurisdictional boundaries showing land and water use management authorities boundaries and goals; a description of the locale; the hydrogeology; the ground water quality; and the current ground water use and future needs.

    3) Identification and description of threats to ground water; stating goals and objectives related to these threats; and recommending strategies that solve or reduce these threats. Technical understanding of the ground water resource will be developed to assist decision makers in formulating public policy.

    4) An implementation process for the plan, which includes: a work plan for each affected agency and jurisdiction, an effectiveness monitoring system, and a process for periodic review and revision.

    5) Obtain local approval and state certification of the Plan, which will ensure implementation of the recommended ground water protection measures. Public agencies will work cooperatively to fulfill their responsibilities to protect the ground water resource. Local, state and regional land use and water use plans, policies and regulations will be effective in protecting the ground water resource.

1.5 PLAN TEAM AND RESPONSIBILITIES

The following agencies and committees were responsible for developing a Ground Water Management Plan for the South King County region:

Department of Ecology (Ecology)

Ecology appointed the GWAC in cooperation with local governments. Ecology is also a participant on the advisory committee. Ecology reviews and approves interim plan products, such as the Public Involvement Plan, the Data Collection and Analysis Plan, the Quality Assurance/Quality Control Plan, and the Data Management Plan. These plans, required by Ecology in the scope of work, provide the basis for development of the ground water management plan. Ecology certifies the final Plan after all affected agencies have concurred.

Seattle/King County Health Department (SKCHD)

As co-lead agency, the SKCHD was responsible for coordinating the activities necessary for development of the Plan. This has included preparation of a scope of work; scheduling advisory committee meetings; developing the issue papers; revising the land use section of the Area Characterization section of the Plan; updating the database; preparing the SEPA checklist and the Declaration of Nonsignificance; summarizing the consultant responses to GWAC comments; and preparation of the draft Plan.

King County Department of Natural Resources and Parks

On January 1, 1996, the King County Department of Natural Resources and Parks, Water and Land Resources Division, replaced the SKCHD as the co-lead agency for this Plan.

The King County Department of Natural Resources and Parks is responsible for the County's GWMP.

South King County Regional Water Association (RWA)

The RWA was delegated the following lead agency tasks: prepare sub-area designation request to Ecology; develop the scope of work in conjunction the SKCHD; develop budget; prepare final grant application to Ecology; and coordinate with the consultants and purveyors for data collection, and management of the consultant contract.

Ground Water Advisory Committee (GWAC)

The GWAC played a critical role in developing a sound ground water management plan. The GWAC represented a broad cross section of ground water interest groups, including local, state and federal government agencies, large and small businesses, environmental organizations and citizens. The GWAC was responsible for assuring that the Plan is both technically and functionally sound. The committee will give final approval to the Plan before it is submitted to Ecology for certification. The committee's specific duties included:

- Oversee the development of the Plan;

- Review the work plan, schedule and budget developed by the lead agencies;
- Assure that the Plan is functional, and will not cause environmental or economic adversity;
- Verify that the Plan is consistent with the state's regulations on ground water protection; and
- Formulate and implement a public involvement plan.

Consultants

This Plan was developed jointly with Economic and Engineering Services, Inc., Hart-Crowser and Associates, Inc., Pacific Groundwater Group, and Robinson and Noble, Inc. The consulting team drafted Volumes I and II of Grant No. 1 of this Plan. The consulting team prepared portions of this document with the SKCHD and the RWA including the Data Collection and Analysis Plan, and the Quality Assurance Project Plan in Grant No. 1; and in Grant No. 2, the elements in the Supplement 1 - Area Characterization of this Plan, assisted in establishing the database, provided information for drilling of the test wells, developed, coordinated and trained purveyors in and coordinated the data collection program, and carried out data analysis and quality assurance/quality control of the samples collected.

1.6 PUBLIC REVIEW, ADOPTION, AND IMPLEMENTATION

Public Review. Upon completion, the Draft Plan shall be subject to public review after Ecology holds a local public hearing for comment and review of the Plan. Public comments will be included in Appendix C.

Adoption. Following the hearing, each affected agency and government will have 90 days to evaluate the plan and either concur or disagree with the plan. The GWAC will negotiate with non-concurring agencies and governments to reach agreement. After concurrence, and when the plan is found to be consistent with the intent of Chapter 173-100 WAC, Ecology will certify the plan.

Implementation. Affected agencies and jurisdictions are responsible for implementing the plan following certification. The implementation process and schedule is described in Chapter 3. The GWAC has provided a mechanism for modifying the plan to adapt to changing conditions under the supervision of the GWMA Management Committee. This committee will advise and oversee ground water management activities that take place under this plan. The committee also will review new issues and programs that have emerged during and after Plan preparation. The Management Committee will develop methods to incorporate the new issues and programs into the implementation of the plan.

CHAPTER 2

MANAGEMENT STRATEGIES

South King County
Ground Water Management Plan

July 2003

CHAPTER 2 MANAGEMENT STRATEGIES

2.1 INTRODUCTION

Each ground water management plan, per Chapter 173-100 WAC, must contain management strategies to address the perceived threats to ground water quality and quantity in the planning area. The South King County Ground Water Advisory Committee (GWAC) identified the topics or potential problems of concern and adopted management strategies for each area. The GWAC identified the following topics that they wanted to consider: Special Area Designations to Enhance Ground Water Protection, Storm Water Management, Hazardous Materials Management, UST Management, On-site Sewage Disposal System Use, Pesticides and Fertilizers, Well Construction and Abandonment, Sewer Pipes, Solid Waste Landfills, Burial of Human Remains, Sand and Gravel Mining, Land Application of Biosolids and Effluent, and Ground Water Quantity.

These topics were presented to the GWAC in an issue paper format, developed by Seattle King County Health Department (SKCHD) and the project consultants. These issue papers contained technical information about the topic, a description of the existing regulations and any existing programs, and then identified issues that could be addressed by one or more management strategies. During discussion, the GWAC discarded some proposed strategies and added others. Other strategy modifications were made between initial GWAC consideration of the issues and final management strategy adoption, as specific programs and regulations related to recommended management strategies changed. The final adopted strategies as presented in this chapter reflect all of the above for this ground water protection plan.

In developing the management strategies, the GWAC attempted to make maximum use of existing governmental programs and regulatory structures. The GWAC was determined to build on existing efforts rather than developing new and potentially duplicated programs. The management strategies were based upon complete research into the problems as presented in the issue papers. Each strategy was evaluated for feasibility, including implementation cost. However, these program elements were identified in 1995 and subsequently may require revisions due to changes in conditions or approach. The GWAC preferred strategies that could be understood and supported by the citizens in the South King County area. The GWAC recognized that increasing an agency's activity would also increase their need for funding. Funding sources are discussed in Chapter 3.

This Chapter contains identified topics of ground water concern and the adopted management strategies. The structure for presentation of each topic is as follows: a summary of the key background information considered by the GWAC; the adopted Goal(s); important

protection issues; selected management strategies; discussion of the decision for the strategies selected; and suggested implementation plan.

It should be noted that as the GWAC considered each issue, data collection and management, and educational management strategies were adopted for many of the issues. These are compiled into the Data Collection and Management Program and the Education Program, described in the first section of the Chapter.

In conclusion, the GWAC realized that the adopted strategies would not totally prevent contamination problems from occurring in the South King County aquifers, but that it should greatly limit the frequency and severity of such problems. The Plan (Plan) is intended to provide a framework to assist cooperation between various regulatory agencies through implementation of the adopted ground water protection measures. It is also intended to serve as a guide to further focused research on the aquifers in addressing data and regulatory protection gaps.

2.2 PROGRAMS RELATED TO GROUND WATER QUALITY AND QUANTITY

2.2.1 Special Area Designations to Enhance Ground Water Protection

There are a number of special federal, state, and local area designations that may be used to enhance a Ground Water Management Program. Incorporating them may offer benefits such as providing a source of funds to implement ground water protection measures, enhancing eligibility for grant funds, or expanding review of development proposals. Increased public recognition of the value of an aquifer may be an important ancillary benefit of a special area designation.

The special area designations discussed in this chapter are:

- Areas with a critical recharging effect on aquifers used for potable water per RCW 36.70A Growth Management;
- Wellhead Protection Areas per the 1986 amendments to the federal Safe Drinking Water Act;
- Environmentally Sensitive Areas per WAC 197-11 State Environmental Policy Act Rules;
- Special Protection Areas per WAC 173-200 Water Quality Standards for Ground Waters of the State of Washington;
- Sole Source Aquifers per the federal Safe Drinking Water Act of 1974;
- Aquifer Protection Areas per RCW 36.36

Areas with a Critical Recharging Effect on Aquifers used for Potable Water per RCW 36.70A Growth Management Act

The GMA (GMA) of 1990 requires all counties and cities in Washington to plan in order to manage growth. This act, much of which is codified in RCW 36.70A, requires that the largest and fastest growing counties (and the cities within them) plan extensively in keeping with the following goals:

- Conservation of important timber, agricultural and mineral resource lands;
- Protection of critical areas;
- Planning coordination among neighboring jurisdictions;
- Consistency of capital and transportation plans with land use plans;
- Early and continuous public participation in the land use planning process.

Counties and cities must adopt comprehensive plans and regulations to protect designated critical areas and timber, agricultural, and mineral resource lands. The GMA requires the designation and protection of the following "critical areas:" wetlands; areas with a critical recharging effect on aquifers used for potable water; fish and wildlife habitat conservation areas; frequently flooded areas; and geologically hazardous areas. The GMA also requires that the comprehensive plans contain land use controls to protect quality and quantity of ground water used for public water supplies (RCW 36.70A.070(1).

The GMA requires that the comprehensive plans of adjacent jurisdictions or those who share related regional issues must be coordinated and consistent - a requirement of utmost importance for effective ground water protection. Meaningful protection of a dynamic resource that is shared by several jurisdictions is impossible without the cooperation of these jurisdictions.

Chapter 365-190 WAC, Minimum Guidelines to Classify Agriculture, Forest, Mineral Lands, and Critical Areas (Guidelines) were adopted by the Washington Department of Community Development now the Board for Community, Trade and Economic Development and pursuant to the GMA. The Guidelines, which are advisory in nature, provide a general framework for classification, designation, and regulation of critical areas.

The Guidelines define "areas with a critical recharging effect upon aquifers used for potable water" as "areas where an aquifer that is a source of drinking water is vulnerable to contamination that would affect the potability of the water". Although this definition is somewhat circular, it is clear that aquifers used for drinking water are deserving of particular attention. In addition, it is suggested that those aquifers that are vulnerable to significant contamination be targeted.

The Guidelines refer frequently to "aquifer recharge areas" without defining the term. The term is used very generally and appears to refer to the entire drainage basin in which an aquifer is contained and from which it receives water (recharged) due to infiltration of precipitation, runoff, and other surface water.

Mapping known critical areas is encouraged as the best way to communicate to developers and regulators the location of the protected lands. It is recognized, however, that mapping wetlands and aquifer recharge areas can be difficult and imprecise. Section 040(2)(g) of the Guidelines recommends that changes in designated areas be allowed as new information becomes available and errors are found.

The Guidelines suggested that the following be included in local government designation of critical areas that are to receive protection under the Growth Management Act (GMA):

- Sole Source Aquifer recharge areas designated pursuant to the Federal Safe Drinking Water Act of 1974;

- Special Protection Areas designated pursuant to RCW 90.54, Water Resources Act of 1971, and RCW 90.48, Water Pollution Control; and

- Wellhead Protection Areas designated pursuant to the 1986 amendments to the Federal Safe Drinking Water Act.

King County and cities have adopted criteria for designating critical aquifer recharge areas in order to meet the requirements of the GMA. Regulations have been adopted or existing authority to regulate has been clarified. Comprehensive inter-jurisdictional coordination envisioned by the GMA continues to be addressed.

The Wellhead Protection Program under the Federal Safe Drinking Water Act

The 1986 amendments to the Safe Drinking Water Act established a Wellhead Protection Program (WHPP) intended to safeguard ground waters that are tapped by public water supply wells. Each state is required to develop and implement a WHPP in accordance with criteria established by the EPA.

A State Wellhead Protection Program must:

- Specify the roles and duties of state agencies, local government entities, and public water suppliers in a Wellhead Protection Area;

- Provide the criteria for delineating the boundaries of Wellhead Protection Areas;

- Establish procedures for identifying sources of contamination within each Wellhead Protection Area;

- Develop management programs to protect ground water supplies within each Wellhead Protection Area from sources of contamination;

- Develop contingency plans for each public water supply system to respond to well contamination;

- Provide siting criteria for new public water system wells to maximize yield and minimize contamination; and

- Ensure public participation.

A Wellhead Protection Area is defined in the Safe Drinking Water Act as "the surface and subsurface area around a well or wellfield supplying a public water system through which contaminants are reasonably likely to move toward and reach such water well or wellfield" (42 U.S.C.A. 300h-7(e)). The first step in the implementation of a Wellhead Protection Program is to delineate the Wellhead Protection Area boundaries.

The Washington State Department of Health (DOH) has been designated by the governor as the lead agency for developing and administering the WHPP in this state. Approximately 12,000 public water systems in the state were included in the Wellhead Protection Program. Group A water systems have completed their WHPPs. The Drinking Water Regulations (Chapter 246-290 WAC) have been revised to contain the WHPP requirements.

Due to the nature of wellhead protection, much of the actual implementation efforts will be done by public water systems, local governments and by those agencies with source-specific jurisdictional responsibilities. For example, Ecology regulates USTs while the Washington Department of Agriculture regulates pesticide use. Those agencies would be responsible for emphasizing protection of the Wellhead Protection Area within their jurisdictional authority.

The following are highlights of the Wellhead Protection Program for Washington:

- Delineation of Wellhead Protection Areas primarily based on the area immediately surrounding the well casing and areas describing the 1, 5, and 10 year time of ground water travel to the well from the recharge area;

- Inventory of potential sources of ground water contamination within the Wellhead Protection Area;

- Development of management strategies to eliminate or minimize the possibility that these potential sources contaminate ground water.

Public water system purveyors are responsible for delineating the Wellhead Protection Area and inventorying sources of contamination within the Wellhead Protection Area. State agencies are responsible for integrating wellhead protection measures into their existing programs. In many cases, this will primarily be done by placing a priority on existing activities to emphasize protection within the Wellhead Protection Area.

Local land use authorities (cities, counties) are responsible for zoning controls and pollution sources outside the authority of the federal or state government. Local governments, where necessary, may also be responsible for developing more stringent programs than federal and state governments currently provide.

It is clear that a WHPP will be of particular value to municipal water systems whose Wellhead Protection Areas are located completely or primarily within their boundaries. However, where public water systems do not control surrounding land-use, the success of the WHPP will depend on the willingness of other city and county governments to impose necessary land-use or other restrictions.

Considering that there are approximately 1700 large and small public water system wells within King County, individualized land-use controls for each public well or wellfield in the county may be unworkable for King County. However, it may be possible to develop a generic, county-wide WHPP under which very small water purveyors could apply to the county for protection. This type of WHPP could be implemented under the auspices of the aquifer recharge area provisions of the GMA. The preference towards county-wide requirements is reinforced in situations where well or wellfield owners lack sufficient resources to develop an individual WHPP. The state WHPP recommends a county-wide approach to wellhead protection although it is not required at present. While a cooperative, multi jurisdictional program would, by definition, involve compromise, individual public water systems could build upon the basic program at their discretion.

Development of minimum county-wide Wellhead Protection Program strategies involves an investment of time and money by the county, cities, and public water system purveyors. It will be technically demanding and politically challenging to develop a program that both provides necessary protection for Wellhead Protection Areas and complements the Ground Water Management Plan and other existing ground water protection efforts. The way would be made easier, however, by taking advantage of the recent experience gained in many cities and states around the nation. There are now many models for wellhead protection to be studied.

Local jurisdictions have developed programs to facilitate the development of individual Wellhead Protection Programs. There are also some efforts to develop coordinated

approaches. For example, the City of Kent, Covington Water District and King County Water District 111 have developed their wellhead protection program together because their wellhead protection areas overlap or adjoin one another.

Environmentally Sensitive Area Designation under the State Environmental Policy Act.

The State Environmental Policy Act (SEPA) (Chapter 43.21RCW) is intended to provide decision makers and the public with sufficient information to evaluate the environmental consequences of proposed land, air, or water-use activities when those activities involve an action by a governmental agency. Such an action could range from the issuance of a building permit to undertaking a major construction project such as a dam or a highway. The procedural provisions of SEPA attempt to outline a process for distinguishing between actions that are likely to have a significant adverse environmental impact and those that are not. In cases where significant adverse impacts are anticipated, an environmental impact statement must be prepared.

The State Legislature authorized the Washington State Department of Ecology (Ecology) to develop rules for the implementation of SEPA. The rules that were subsequently developed and adopted by Ecology, Chapter 197-11 WAC/SEPA Rules, are intended to provide a uniform environmental review process in all political jurisdictions within the state. They are also intended to help define what constitutes a significant adverse environmental impact and to outline the content of environmental documents prepared under SEPA.

The SEPA rules are implemented in unincorporated King County through Chapter 20.44 of the King County Code, "County Environmental Procedures". The SEPA Section of the Department of Development and Environmental Services is responsible for environmental review in King County. Municipalities within King County have either adopted the SEPA rules by reference or have developed their own regulations that incorporate the SEPA rules. Municipalities conduct environmental review for projects occurring within incorporated boundaries.

In developing the SEPA rules, Ecology determined that some classes or types of activities, because of their size or nature, are not likely to represent a significant environmental impact and should, under ordinary circumstances, be exempt from SEPA requirements. Section 197-11-800 of the SEPA rules contains a list of these exempted types of activities, termed categorical exemptions. The categorical exemptions include some activities that could potentially represent a significant adverse environmental impact in areas of unusual ground water sensitivity.

These activities include:

- The installation of underground chemical storage tanks with a capacity of less than 10,000 gallons;
- The construction of commercial buildings of less than 4,000 square feet and associated parking for up to 20 automobiles;
- The construction of parking lots for up to 20 vehicles;
- The construction of agricultural structures of under 10,000 square feet;
- The periodic use of Washington Department of Agriculture approved chemicals to maintain a utility or transportation right of way in its design condition;
- The appropriation of 2,250 gallons per minute of ground water for any purpose.

Local governments have the authority to lower thresholds for requiring environmental review by designating certain portions of their land use jurisdiction as Environmentally Sensitive Areas. These areas are generally more vulnerable to the adverse affects of land and water-use activities. The SEPA rules state that Environmentally Sensitive Areas may include "but [are] not limited to areas with unstable soils, steep slopes, unusual or unique plants or animals, wetlands, or areas that lie within flood plains."

In designating a portion of its jurisdictional area to be an Environmentally Sensitive Area, a county or city can eliminate many of the categorical exemptions found in Section 197-11-800 (WAC), including all but one of the land and water uses listed above. Categorical exemptions regarding appropriations of ground water cannot be revoked.

An Environmentally Sensitive Area designation may provide several important benefits for an area that is susceptible to ground water contamination. First, it would assist in raising the level of awareness of both the public and governmental agencies regarding the sensitivity of the aquifer system to contamination from overlying land-use activities.

Secondly, designation would permit the King County Council and city councils to eliminate many of the categorical exemptions from environmental review that are currently allowed under the SEPA rules. As a result, certain exempted land-use activities that pose a relatively high risk of contaminating ground water, such as installation of underground chemical storage tanks of under 10,000 gallons, could be required to undergo environmental review.

In determining the number of categorical exemptions to be eliminated, caution should be taken to revoke only those exemptions that bear a direct and significant relationship to ground

water quality. A wholesale elimination of categorical exemptions might result in an unfavorable public reaction since many relatively innocuous activities such as adding a recreation room to an existing house or constructing a garage would require environmental review. Not only would such a broad-brush approach add an unnecessary burden on the public, but it would potentially create a glut of environmental checklists that would significantly add to the workload of agencies that must review or process environmental documents without actually affording better ground water protection.

One significant shortcoming of the SEPA process is that while environmental review assists the public and decision-makers in identifying the probable adverse environmental impacts of a proposed activity or action, it does not provide basis for mitigation of the adverse impacts. Mitigation measures cannot be imposed unless some legally adopted ordinance, regulation, or policy exists that supports the requirement for mitigation. Adoption of the South King County Ground Water Management Plan (Plan) will provide the County and cities in the South King County Ground Water Management Area (GWMA) legal basis for requiring mitigation because it contains policy for lands within the GWMA. This policy would be in addition to any existing regulations or policies already adopted.

Special Protection Areas Established Under Washington Water Quality Standards for Ground Waters

Chapter 173-200-090 WAC outlines procedures for Ecology to designate Special Protection Areas within the State of Washington. The purpose of designating Special Protection Areas is to identify portions of the state with ground waters that require extraordinary consideration or increased protection because of one or more unique characteristics.

Such characteristics include, but are not limited to:

- Recharge areas and Wellhead Protection Areas that are vulnerable to pollution because of hydrologic characteristics;
- Ground waters that support a beneficial use or ecological system requiring more stringent ground water quality criteria than those based primarily on drinking water standards;
- Sole Source Aquifers.

Ecology will grant a Special Protection Area designation if an area contains one or more of the three aforementioned characteristics and such a designation is deemed by Ecology to be in the public interest.

Ecology can designate a Special Protection Area at its own discretion or at the request of a federal agency, another state agency, an Indian tribe, or local government. Requests for

designation prepared by entities other than Ecology must provide sufficient information in support of the request to demonstrate that the designation would be appropriate under the conditions set forth in Chapter 173-200 WAC. At a minimum the following information is required:

- A rationale for the proposed designation;
- Supporting technical and hydrogeologic data;
- A description of proposed boundaries for the Special Protection Area, and
- Documentation of coordination with affected state and local agencies, tribes, and water users.

Compliance with general procedures for public hearings, public involvement, and notification of affected governments including tribes is required before Ecology renders a decision concerning a request for designation of a Special Protection Area.

Ecology will consider the unique characteristics of a Special Protection Area when developing regulations, guidelines, and policies; when regulating activities; and when prioritizing department resources for ground water quality protection programs. Within Special Protection Areas, Ecology can choose to establish more stringent ground water quality criteria and contaminant enforcement limits.

In addition, Ecology can impose special requirements for permits issued under authority of Ecology administered programs. Examples would be the State Waste Discharge Permit Program (Chapter 173-216 WAC) and permits for the withdrawal of ground water (water rights) issued pursuant to Chapter 90.44 RCW (Regulation of Public Ground Waters).

Sole Source Aquifer Designation under the Federal Safe Drinking Water Act

The Sole Source Aquifer Program was established under section 1424 (e) of the Safe Drinking Water Act of 1974 and is administered by the Environmental Protection Agency (EPA). The primary intent of the program is to prevent projects that receive federal financial assistance from contaminating aquifers that represent the sole or principal source of drinking water for an area. Projects that receive a portion, but not 100 percent, of their funding from the federal government are affected. An example would be a highway construction project funded jointly by the federal and state government. By contrast, a military installation is wholly financed by the federal government and thus is not restricted by the provisions of the Sole Source Aquifer Program.

In order to qualify for Sole Source designation, an aquifer must meet the following basic criteria:

- It must supply 50 percent or more of the drinking water consumed within the area for which the aquifer is supplying water; and

- Alternative sources of drinking water must be of inadequate quantity or not be economically feasible to develop as a replacement for the aquifer.

The EPA is authorized to declare a ground water system to be a Sole Source Aquifer upon receipt of a satisfactory petition requesting such a designation. A petition can be submitted by any individual, corporation, company, partnership, municipality, state, or federal agency. The petition must contain sufficient technical documentation to demonstrate that the aquifer meets the criteria for Sole Source designation (U.S. Environmental Protection Agency, February 1987).

~~There are a number of positive aspects of a Sole Source Aquifer designation,~~ the most important of which is its public awareness value. Sole Source Aquifer designation helps people realize that an aquifer is unique or valuable and is worthy of protection. The designation can serve as kind of rallying point around which support for ground water protection and management efforts can coalesce. Because of the attention that a Sole Source Aquifer designation draws to an aquifer, new land development projects that may potentially harm underlying ground water may be more closely scrutinized by the public and by government agencies.

As discussed previously, the primary purpose of the Sole Source Aquifer Program is to prevent contamination of aquifers representing the sole or principal source of drinking water for an area. Once a Sole Source Aquifer has been designated, the EPA will review all projects in the "project review area" that are partially funded by the federal government. The project review area encompasses the surface area above the aquifer and the basin from which water potentially drains into the aquifer. The EPA will determine whether projects pose a potential threat of contamination to the aquifer. Should it be determined that a project may contaminate the aquifer, the commitment for federal financial assistance may be withdrawn unless mitigation measures are implemented.

Sole Source Aquifer designation also has an impact on future solid waste landfill siting efforts, not as a result of provisions of the Safe Drinking Water Act, but due to requirements of the Ecology's Minimum Functional Standards for Solid Waste Handling (Chapter 173-304 WAC). The 1985 revision of the Minimum Functional Standards prohibited the construction of new or expansion of existing landfills over a Sole Source Aquifer in spite of the fact that Sole Source designation is not based upon the susceptibility of the aquifer to contamination. As a result, Sole Source Aquifer petitions have been submitted to the EPA by citizen groups

as a means of preventing construction of a new landfill or the expansion of an existing landfill in their community.

In response to concerns expressed by solid waste utilities and some county governments, Ecology modified its position concerning the prohibition of new landfills or the expansion of existing landfills located over a Sole Source Aquifer. A variance procedure has now been developed to allow the siting of new landfills or expansion of existing landfills overlying a Sole Source Aquifer if it can be demonstrated that ground water will not be adversely impacted.

Aquifer Protection Areas per RCW 36.36

The Washington State Legislature passed legislation in 1986 which provided the authority for creation of local Aquifer Protection Areas. The purpose of an Aquifer Protection Area is to establish a funding base for ground water protection, preservation, and rehabilitation programs. Aquifer Protection Areas are established through an election ballot issue requiring approval from a simple majority of voters within the proposed Aquifer Protection Area. If voters approve the Aquifer Protection Area, the county can collect modest water and septic system user fees. Fees may only be collected from users of water withdrawn from an aquifer as opposed to a surface water source (Chapter 36.36 RCW).

In 1987, voters in a portion of Spokane County established the first Aquifer Protection Area in Washington State. The water user fees established by the voters of Spokane County amount to $1.25 per month per residential equivalent. Septic tank user fees are also $1.25 per month per residential equivalent.

Until recently, the use of revenues generated from an Aquifer Protection Area has been limited to ground water protection planning, ground water treatment facilities, and wastewater treatment facilities. As originally adopted, the law did not authorize use of the Aquifer Protection Area revenues for a full spectrum of ground water protection activities. For example, regulatory programs aimed at controlling pollution from USTs, hazardous wastes, or on-site sewage disposal systems were not covered.

However, the 1991 Legislature rectified this shortcoming through passage of amendments to Chapter 36.36 RCW to allow Aquifer Protection Area revenues to be used to fund the following activities in addition to those described above:

- Monitoring of ground water quality and quantity;
- Ongoing implementation of comprehensive plans to protect, preserve, and rehabilitate ground water, including Ground Water Management Programs;

- Enforcing compliance with standards and rules relating to the quality and quantity of ground water; and

- Public education related to protecting, preserving, and enhancing ground water.

Thus, with these amendments, Aquifer Protection Area funding can support virtually all activities associated with the implementation of a Ground Water Management Program. Potential drawbacks to the use of an Aquifer Protection Area to fund the implementation of the Ground Water Management Plan include the following:

- Lack of flexibility in use of funds - must describe specific use in ballot measure - changes in specific uses require voter approval;

- Large startup costs to educate the public regarding ground water protection;

- Difficulty in adjusting fee over time - must be approved by voters;

- Inequities in fee assessment;

- Assumes that septic users are more significant contributor to potential ground water pollution than other sources such as underground chemical storage and hazardous waste;

- Assesses fees only to households; businesses are not assessed; and

- Fee is not related to amount of water used.

GOAL

To use available special area designations in conjunction with local regulations and policies to enhance ground water protection efforts in the GWMA.

ISSUES

Issue 1 - General protection of aquifers

Effective aquifer protection requires cooperation between land use jurisdictions because aquifers do not coincide with jurisdictional boundaries. General policies that provide guidance for land use decisions could be adopted by King County and cities in the GWMA to provide a basic level of protection for aquifers.

SA-1A Elimination of categorical exemptions to SEPA - King County cities and special purpose districts within the GWMA will jointly determine whether any categorical exemptions to SEPA (listed in the following discussion) should be eliminated in the GWMA, especially in physically susceptible and recharge areas as mapped by the Plan.

SA-1B Designation of Environmentally Sensitive Areas - King County, and cities within the GWMA will designate the GWMA to be an Environmentally Sensitive Area as authorized by SEPA so that categorical exemptions, as determined under SA-1A, may be eliminated.

SA-1C Adoption of general aquifer protection policies - King County, cities and special purpose districts within the GWMA will adopt the following policies for the GWMA.

1. Ground water based public water supplies should be protected by preventing land uses that adversely affect ground water quality or quantity to the extent that the supply of high quality drinking water to present and future populations might be jeopardized.

2. Protection and sustainable use of ground-water based drinking water supplies in the GWMA is an important element in the long term water supply planning of the GWMA.

3. In the ground water recharge areas that are mapped for the Plan per SA-1E:

   a) Development should occur in a manner that supports continued ecological and hydrologic functioning of water resources. Development should not have a significant adverse effect on ground water quality or quantity.

   a) In making future zoning and land use decisions which are subject to environmental review, King County shall evaluate and monitor ground water policies and their impacts on ground water quality and quantity. The depletion or degradation of aquifers needed for potable water supplies should be avoided or mitigated, and the need to plan and develop feasible and equivalent replacement sources to compensate for the potential loss of water supplies should be considered.

   a) In rural areas, ground water should be protected by:

      i. Preferring land uses that retain a high ratio of permeable to impermeable surface area and that maintain or augment the infiltration capacity of the natural soils; and

ii. Requiring standards for maximum vegetation clearing limits, impervious surface limit, and where appropriate, infiltration of water.

4. Wellhead Protection Programs will provide direction for focusing intense aquifer protection efforts in those areas, usually urban, where the existing built environment presents very significant risks to public drinking water systems.

SA-1D Enhanced environmental review to protect aquifers - King County, cities and special purpose districts in the GWMA will jointly develop guidance to assist environmental reviewers to:

- Identify proposed development that may significantly impact ground water in physically susceptible and recharge areas mapped by the Plan;
- Recognize and require adequate information to assess impacts upon ground water; and
- Recognize and propose effective mitigation.

SA-1E Definition of ground water concern areas - King County, cities and special purpose districts will place a priority on implementation of the Plan in the most physically susceptible areas. The most physically susceptible areas are referred to as the high susceptible areas in the King County Comprehensive Plan, city comprehensive plans or this Plan's maps. These areas are defined as follows:

1. Areas susceptible to ground water contamination are mapped according to the following parameters:

   a) *Soil permeability* - Soil units are defined by the Soil Conservation Service in the Soil Survey of the King County Area (Soil Conservation Service 1973). The units are rated high, moderate, or low permeability according to the description in the Survey. Soils were only given a 25 percent rating because they are a characteristic of surficial geology.

   a) *Geologic materials* - United States Geological Survey (USGS) maps provide information on surficial geology. High, moderate, or low permeability is determined by professional judgment. A clean sand and/or gravel is rated high; tight silt or clay is rated low; and materials (mixture of sand, silt or clay) that fall between the two categories are rated as moderate.

   a) *Depth to water* - Driller logs and previous investigations are used to determine depth to water. Existing water table elevation maps are used, if available. High (0-25 feet from surface), moderate (26-75 feet from surface), and low (>75 feet from surface) contamination potentials are assigned.

   Areas receive overall ratings by use of an overlay map that incorporates ratings from the three physical parameters. A combined rating score is assigned to each

portion of the mapped area. Determination of whether an area has a high, moderate, or low potential for susceptibility is then made by conservative interpretation of the combined rating.

1. Aquifer recharge areas (important to identify to protect ground water quantity): recharge only occurs where water reaches an aquifer by surface infiltration, and where there is a downward component of hydraulic head (pressure head). However, the presence of a downward component of hydraulic head cannot be determined without extensive research on well water levels, well completion and well location data. Therefore, to provide a conservative estimate, a downward component of hydraulic head is assumed to be present in all areas.

Discussion - Actions 1A through 1E provide broad protection for aquifers. Actions 1A and 1B will provide protection by bringing projects through SEPA review that are now exempt but that may have significant impacts upon ground water. These include: installation of underground chemical storage tanks with a capacity of less than 10,000 gallons; Construction of commercial buildings of less than 4,000 square feet and associated parking for up to 20 automobiles; Construction of parking lots for up to 20 vehicles; construction of agricultural structures of under 10,000 square feet; and periodic use of Washington Department of Agricultural approved chemicals to maintain a utility or transportation right of way in its design condition. (Chapter 197-11-800 WAC). It will be important to determine which categorical exemptions should be eliminated so that minor projects that would have little effect upon ground water will not require SEPA review. A two-tiered approach to categorical exemptions could be considered. For example, more categorical exemptions could be eliminated in the most physically susceptible and recharge areas. Determining which categorical exemption to eliminate would involve analyzing the development potential for each category type based on the land use in the GWMA. Then, each category will be analyzed to determine if there would be a significant impact, and if standard Best Management Practices (BMPs) could prevent ground water impacts. If any categorical exemptions are determined to be eliminated, the Management Committee (Lead Agency) will either apply for designation of the GWMA as an Environmentally Sensitive Area, or explore other options for bringing projects in these categories through SEPA review.

Agencies affected by this process, such as the King County Department of Transportation Water and Land Resources, (or their successor agencies), should be involved in determining which categorical exemptions may be eliminated. Elimination of any categorical exemptions would be by ordinance, which would allow for formal public review and require that a programmatic SEPA review of the proposed changes was performed.

Action 1C provides a general policy framework for aquifer protection. This framework includes a commitment to protect public water systems; a provision for addressing the potential for aquifer contamination from the existing and new built environment and a direction for the Wellhead Protection Programs that may benefit smaller water system

purveyors. Group A ground water based water systems have developed their WHPP as required by state regulations to provide specific protection for drinking water sources.

Wellhead Protection Programs may consist of a core of county-wide protection strategies supplemented by water-system specific strategies developed by individual purveyors. Strategies to protect water systems may include such measures as education, technical assistance, regulation, monitoring, emergency response, business relocation assistance, and land acquisition. Efficiencies will be achieved by making full use of existing programs and initiating new programs only as needed.

Action 1D provides a means for the County, cities and special purpose districts to jointly develop guidance documents and informational materials for optimal environmental review. The purpose is to raise the level of understanding of aquifers among environmental reviewers. Maps of aquifers and the most physically susceptible and recharge areas will be refined and presented in an easy-to-use format.

Action 1E provides for identification of those areas in the Plan that are particularly important to protect. Maps of these areas will primarily be used to determine priorities for implementation of the Plan. For example, the GWAC has adopted a policy of monitoring for pesticide and fertilizer contamination in agricultural areas.

The maps of physically susceptible and recharge areas will be used to determine where to focus this effort. Maps will also be used to educate and assist the public, elected officials, land use planners, environmental reviewers, and others who make decisions that may affect ground water quality or recharge. These maps will also be valuable to purveyors who are determining wellhead protection priorities. It is expected that these maps will be updated and refined based upon information from the Wellhead Protection Programs and from other ground water studies. The maps produced for the Plan and for the King County Comprehensive Plan were based on available information. Both the Plan and the King County Comprehensive Plan specify that the maps will be refined as new information becomes available. Identification and protection of areas important for ground water quantity and quality is required by the GMA for aquifers used for potable water supplies. King County expects to meet this requirement by starting with the maps currently produced, and working with water utilities and water resource agencies to refine and revise the maps, so that they are useful for planning and ground water protection.

This is reflected in King County Comprehensive Plan policy E-148, which states: "In unincorporated King County, areas identified as sole source aquifers or as areas with high susceptibility for ground water contamination where aquifers are used for potable water are designated as Critical Aquifer Recharge Areas as shown on the map, entitled Areas Highly Susceptible to Ground Contamination. Since this map focuses primarily on water quality issues, the county shall work in conjunction with cities and ground water purveyors to designate and map recharge areas which address ground water quantity concerns as new

information from ground water and wellhead protection studies adopted by county or state agencies becomes available. Updating and refining the map shall be an ongoing process."

All of the actions proposed under Issue 1 are joint actions recognizing that aquifer protection cannot be accomplished by one land use jurisdiction alone. Joint action by the County, cities and special purpose districts is consistent with GMA requirements to coordinate protection of aquifers. Joint action is practical because costs can be reduced and the regulated community will experience consistent policy towards protected areas. This is particularly important with an area that is large and located in more than one land use jurisdiction.

Implementation:

Task 1: Determine which existing categorical exemptions to eliminate (SA-1A).

Who:	King County, Cities and Special Purpose Districts via the Management Committee.
When:	The Management Committee will develop an implementation schedule.
Cost:	Costs will be determined by the Management Committee.
Funding:	By participating agencies.

Task 2: Designate Environmentally Sensitive Areas (SA-1B). King County, cities Environmentally Sensitive Areas (SA-1B). King County and cities initially accomplish this task by concurring with the Plan.

Task 3: Amend local environmental ordinances and/or resolutions to reflect the adoption of Environmentally Sensitive Areas.

Who:	King County, Cities and Special Purpose Districts.
When:	The Management Committee will develop an implementation schedule.
Cost:	Costs will be determined by the Management Committee.
Funding:	By participating agencies.

Task 4: Adopt general aquifer protection policies. This task is accomplished by concurring with the Plan. At their discretion, King County and cities may wish to amend their Comprehensive Plans.

Task 5: Develop guidance to assist environmental reviewers.

Who:	King County and cities.
When:	The Management Committee will develop an implementation schedule.
Cost:	Costs will be determined by the Management Committee.
Funding:	By participating agencies.

Task 6: Mapping physically susceptible and recharge areas. (SA-1E).

Who:	Cities and King County. King County, will be responsible for dissemination of reliable data about the locations of physically susceptible and recharge areas.
When:	The Management Committee will develop an implementation schedule.
Cost:	Costs will be determined by the Management Committee.
Funding:	By participating agencies.

Issue 2 - Wellhead Protection

Public water system purveyors are required to meet federal Wellhead Protection requirements to delineate and adopt measures to protect wellhead protection areas (Wellhead Protection Area). The Plan will support some wellhead protection needs. However, specific strategies may be required to provide an increased level of protection to public water systems.

SA-2 Wellhead Protection - King County, cities, public water system purveyors, and others jointly facilitate wellhead protection in King County by assigning to the Management Committee the following tasks:

- Develop and recommend for adoption by the King County Council, minimum county-wide wellhead protection strategies for public water systems in five size categories:
  - Those serving more than 1000 connections;
  - Those serving from 100 to 1000 connections;
  - Those serving from 16 to 99 connections;
  - Those serving from 10 to 15 connections; and
  - Those serving from 2 to 9 connections.
- Incorporate minimum county-wide wellhead protection strategies into the Plan in order to allow for their implementation to be eligible for funding by the Aquifer Protection Fund.

Discussion - In the context of the larger aquifer protection program, wellhead protection can fill a vital need to focus intense aquifer protection efforts in those areas, usually urban, where there are existing sources of contamination that present significant risks to public drinking water supplies. This recommendation is supported by King County Comprehensive Plan policy E-149 which reads: "King County should protect the quality and quantity of ground water county-wide by:

a. Implementing adopted Ground Water Management Plans

a. Reviewing and implementing approved Wellhead Protection Programs in conjunction with cities and ground water purveyors;

a. Developing, with affected jurisdictions, best management practices for development and for forestry, agriculture, and mining operations based on adopted Ground Water Management Plans, and Wellhead Protection Programs. The goals of these practices should be to promote aquifer recharge quality and to strive for no net reduction of recharge to ground water quantity; and

a. Refining regulation to protect critical aquifer recharge areas and wellhead protection areas."

Minimum wellhead protection strategies developed by the Management Committee will build upon the Plan. Some of the issues considered by the GWAC will probably be considered by the Management Committee. A determination should be made as to whether additional protective strategies are needed within a certain zone around the well in relation to these issues. The need for additional protection may be dependent upon the hydrogeology of the zone.

Additional protection may include such measures as education, technical assistance, regulation, monitoring, and emergency response. Business relocation assistance and land acquisition may be considered on a case-by-case basis. Efficiencies will be achieved by making full use of existing programs and initiating new programs only as needed.

Minimum county-wide wellhead protection strategies will not address delineation or contaminant source inventory requirements of the state Wellhead Protection Program. The Management Committee effort will focus instead upon steps taken to protect the well once the Wellhead Protection Area has been delineated and potential sources of contamination have been inventoried. Cooperative efforts by purveyors in the delineation and source inventory phases are encouraged, however.

Active participation by the DOH will be sought in developing minimum wellhead protection strategies. Inclusion of a minimum program that has the support of the DOH will speed approval by the DOH of WHPPs of individual purveyors. Many of these WHPPs have already been completed and approved by the DOH.

It is possible that certain aspects of a minimum WHPP may be amenable to codification in county laws. This will be explored by King County in the course of development of the wellhead protection strategies.

The Management Committee should address the issue of overlapping wellhead protection areas. It will not be unusual for a number of smaller Wellhead Protection Areas to be contained within the protection area for a larger system. There are also situations in which the protection areas for very large systems will overlap. Protection Zones 1, 2, and 3 will be designated within the wellhead protection areas. Zone 1 (requiring the highest protection standard) for one system may be located in zone 3 of a second system. The area should be protected to the higher of the two standards. Perhaps management of the area could be the

responsibility of the purveyor for whom the area has a higher protection standard. A shared management strategy might also be possible. This, however, is an issue that should be considered by the Management Committee.

Implementation:

Task 1: Develop minimum wellhead protection strategies and recommend for adoption by the King County Council.

Who:	King County, cities and special purpose districts through the Management Committee.
When:	The Management Committee will develop an implementation schedule.
Cost:	Costs will be determined by the Management Committee.
Funding:	By participating agencies.

Task 2. Incorporate minimum wellhead protection strategies into the Plan.

Who:	King County, cities and special purpose districts through the Management Committee.
When:	The Management Committee will develop an implementation schedule.
Cost:	Costs will be determined by the Management Committee.
Funding:	By participating agencies.

(**Note:** The GWAC did not take action on the GMA, Special Area designation and funding through Aquifer Protection Area. The following discusses why the GWAC did not take separate action.)

Growth Management Act. No actions are proposed to implement the GMA requirements to designate areas with a critical recharging effect on aquifers used for potable water. It was determined that development of county-wide criteria to implement the GMA are outside of the scope of the Plan. However, since the subject is so closely related to the goals and policies of the Ground Water Management Plans in King County, King County should consider alternate methods of addressing this matter, including Ground Water Management Areas, Sole Source Aquifers, and Wellhead Protection Areas.

Aquifer Protection Area funding: An alternate method to Aquifer Protection Area funding is proposed in Chapter 3. Some of the drawbacks of Aquifer Protection Area funding were outlined in the text of the issue paper.

Special Protection Area status: Special Protection Area status is not proposed for the initial Plan for several reasons:

- It is not certain that significant benefit would result from obtaining this designation. Ecology permit reviewers know where Ground Water Management Areas are located

and they are attentive to ground water concerns is those areas. Funding priority is already given to Wellhead Protection Programs by the Water Quality Financial Assistance Program. Special Protection Area designation for Wellhead Protection Areas would, in terms of funding priority, be redundant.

- There is concern that too many special area designations would create more confusion than protection. Special Protection Area designation may be less important than some of the other designations that are proposed.

- Considerable effort is necessary in order to obtain this designation. It would detract from other important efforts that the Ground Water Management Plan proposes.

- Ecology is nearing completion of its guidance for applicants. It is not possible to draw upon the experience of other applicants since there have been none.

A decision to apply for Special Protection Area status can always by made at a later date if it appears that the designation is needed.

2.2.2 Data Collection and Management Program

Long term data collection of ground water quality and quantity, precipitation, and stream flow is necessary for the continued development of a conceptual characterization of ground water hydrology within the ground water management area. The collected data needs to be entered into a database and analyzed to provide useful information for making resource management decisions.

When rain falls and infiltrates into the ground, the water which collects in the spaces between the mineral grains or the cracks in dense rock in the saturated zone (i.e. where all voids are full of water) is called ground water. This is the only subsurface water available to supply wells and springs. This saturated zone of ground water is known as an aquifer. An aquifer is a formation, group of formations or part of a formation that contains sufficient saturated permeable material to yield economical quantities of water to wells and springs. Ground water is always moving, is sometimes in hydraulic continuity with surface water, can provide the base flow of creeks and rivers, and may recharge surface water features such as lakes, ponds and wetlands.

When water is pumped from a well, the water level in the well may drop. When the water level in the well falls below the water level of the surrounding aquifer, ground water flows into the well. When more water is withdrawn or discharged from an aquifer than is recharged, the volume of water in the aquifer will diminish. Development of natural areas impacts water quantity in two ways: the creation of impermeable surfaces (roofs, roads, parking lots, etc.) reduces the amount of recharge and an increase in the number of water users increases the

amount of water pumped out of an aquifer. Potential ground water recharge from functioning septic systems is also lost when treated sewage effluent is piped out of the area, treated and discharged into Puget Sound.

Ground water quality maybe impacted by all land use activities such as leaking USTs, landfills, stormwater, on-site sewage systems, pesticide and fertilizer use, hazardous waste, sand and gravel mining operations and building waste runoff.

Data is collected and analyzed so that state and local agencies can:

- Protect public health
- Determine water resource trends in ground water quality and quantity
- Make informed decisions on such issues as land use and water rights
- Plan for peak water use and population growth impacts
- Conduct water programs such as well construction and abandonment, operation and maintenance
- Develop and refine a ground water model
- Respond to data requests from water agencies and other interested parties, and
- Respond to incidents such as water level declines.

Long term data collection by the monitoring of water levels from selected wells will provide trends of ground water fluctuations related to seasonal variations in ground water available, water use, recharge and land use, and will provide information for managing this resource. Similarly, regular ground water quality data collection will ensure that the resource is potable and will detect any changes or trends in water quality. Precipitation and stream flow data is necessary for the determination of recharge and runoff quantities.

The ground water management program at the SKCHD established a ground water monitoring network. Data collected within this network resulted in the establishment of a database containing precipitation, stream discharge, water level and water quality data. Description of rock and soil encountered in the drilling of wells was obtained from well logs and entered into the database. The resulting data, combined with existing precipitation, stream flow and water level data from other agencies, was only adequate for initial water balance and ground water flow analysis. The Background Land and Water Use Report, the Background Hydrology Report, the Data Collection and Analysis Plan and Data Analysis Area Characterization Report (which are products of the Ground Water Scope of Work) identified where future data collection is needed (see the Data Collection List). Further data collection and analysis is needed along with an expanded network of existing and new wells for the development of a conceptual model of ground water hydrology.

The Ground water database initiated by the SKCHD was not properly maintained and managed, consequently data was not routinely entered into the database nor were potential users able to retrieve the data. King County is attempting to correct this situation in their Ground Water Management Program. It is not yet clear if available data is collected and entered into the King County data base or that potential users have appropriate access to the data.

GOAL

To protect ground water quantity and quality by developing and implementing a data collection and management program.

ISSUES

Issue 1 - Data Collection, Analysis and Management

Ground water resource data on a long term basis enables land and water use agencies to make informed decisions. Data collection and analysis to date has been used to develop a general characterization of ground water hydrology. Additional data collection and analysis is needed to refine characterization of the aquifer and to manage the resource.

DCM-1 Data Collection, Analysis and Management - King County, cities and special purpose water and sewer districts within the GWMA should develop and implement a data collection and management program that:

1. Collects needed data

1. Provides data entry into the database, manages the data for quality control and applicability to analysis techniques, shares the data with data users and ensures data compatibility with other data collection efforts.

1. Analyzes the data to:
    - refine a conceptual understanding of the ground water hydrology for determination of the available resource
    - protect the resource from depletion and contamination
    - assess the impacts of land use on the resource
    - determine if a sophisticated numerical/computerized model is needed or would be useful.

DCM - 2 Data Collection, Analysis and Management - Data transfers to Ecology: Ecology will input local ground water management area data into Ecology's ground water data

base. Ecology will make a best effort to coordinate data access format changes to maintain compatibility for two way transfer.

Discussion - The Data Collection and Analysis Plan should be adjusted as necessary based on recommendations from data users and King County staff. A modified monitoring program would include collection of data from existing network sites, plus collection of data from sites added to fill data gaps recognized during initial data analysis. Monitoring stations would be omitted where data was no longer needed. Data collected would include water quality monitoring for pesticide and fertilizer contamination, hazardous waste contamination and sea water intrusion, the identification of wells and their locations by well identification tagging and refinement of maps showing areas of high, medium and low recharge. All data collected would be entered into the King County database and regularly shared with other water agencies including Ecology, DOH, cities and utilities.

Data generated would not only result in an increased level of confidence supporting conclusions drawn from the data, but would also serve to generate additional information needed to fill data gaps and promote an increased conceptual understanding of ground water hydrology. Potentially data could be useful to develop ground water modeling.

A ground water flow model could include considerations for surface water linkages to ground water and the impacts to surface waters resulting from increased withdrawal. Model development may provide the technical information necessary to make informed management decisions relating to ground water and surface water resources.

Implementation:

Task 1: Monitoring of water quality, water level and stream discharge parameters. Where water level declines or ground water contamination is observed, appropriate action would be taken. Conduct other activities listed in the Data Collection.

Who:	King County
When:	The Management Committee will develop an implementation schedule.
Cost:	Costs will be determined by the Management Committee.
Funding:	By participating agencies.

Task 2: Tag existing and new wells where found.

Who:	SKCHD, Ecology, Cities, Utilities, Well Drillers and Volunteers.
When:	Ongoing.
Cost:	Costs will be determined by the Management Committee.
Funding:	By participating agencies.

Task 3: Enter data collected into the King County database. Maintain database and download this data regularly to Ecology, and affected cities and water districts. Ecology to enter ground water management area data into Ecology's ground water database. Provide data to other users as appropriate.

Who: King County and Ecology.
When: During concurrence and at predetermined intervals after concurrence.
Cost: Costs will be determined by the Management Committee.
Funding: By participating agencies.

Task 4: Development of a numerical or computerized ground water hydrology model.

Who: King County or assigned lead agency.
When: The Management Committee will develop an implementation schedule.
Cost: Costs will be determined by the Management Committee.
Funding: By participating agencies.

DATA COLLECTION LIST

The following table identifies the elements of the data collection management program in order of priority for implementation. The prioritization was established by the Ground Water Advisory Committee. The rankings are 1 for high priority, 2 for medium priority and 3 for low priority.

Table 2.1 Elements of the Data Collection Management Program

RANKING	ELEMENT
1	Monitor water quality and water levels from existing networks. a. Surface water monitoring at stream gauging sites and 9 precipitation stations. b. Ground water monitoring at 60 wells for water levels and 48 wells for water quality.
1	Select additional monitoring wells located somewhat distant from the pumping center to provide much better definition of regional water level changes.
1	The water quality data collected from wells at and surrounding the closed Puyallup/Kit Corner landfill, etc. by the King County DNRP Solid Waste Division and the SKCHD Solid Waste Section should be assessed and entered into the King County ground water database.

RANKING	ELEMENT
1	Although all public water systems routinely collect pumpage information, a system for standardizing data gathering and recording efforts should be created and implemented throughout the ground water management area. A protocol for forwarding pumpage data to King County or other lead agency and incorporating it into a database should also be developed.
1	Hazardous materials spills, particularly transportation spills, need to be monitored for their impacts on ground water.
1	Supply data collected under the Plan to those utilities conducting Wellhead Protection Programs, and coordinate the integration of results from monitoring conducted under the Wellhead Protection Program. This task has been completed
1	Resample the wells 19A02, 25Q03, and 16N01 and analyze for the elevated parameters to determine if contamination from heavy metals is present. If results are positive, investigate and determine the sources of contamination.
1	Ensure that trip blanks are carried to all sampling sites for quality assurance/quality control verification.
2	Ground water data collected by the Seattle Public Utilities and the City of Renton needs to be forwarded to King County and shared with interested agencies.
2	An Ecology unique well identification tag should be attached to all of the existing monitoring wells. The six digit identification number will serve as a future standard within the State. The database should be modified to accommodate this well numbering system and all future data collection should adhere to this system.
2	Many of the wells on record have not been computerized given the limitation of projects resources. In addition, many of the wells that were received from the USGS database system (WATSTOR) have not been field checked. Field survey of wells would provide accurate definition of well location, elevation, construction details, water levels, and ownership. At a minimum, all public water system wells should be field checked and incorporated into the database. This task has been completed
2	Evaluate future water quality data collected in relation to the new maximum contaminant levels.
2	Update parameter lists on an annual basis to ensure complete analysis of required parameters.
2	Those sites with nitrate levels above 2 mg/l should be resampled to determine if long term trends can be identified.

RANKING	ELEMENT
2	The water quality of stormwater outlets during storm events should be monitored where these outlets discharge to ground water and creeks.
2	The location of commercial and residential USTs needs to be identified to determine the extent and type of ground water contamination.
2	Data collated by Ecology, the SKCHD Local Hazardous Waste Management Program, and King County on hazardous waste generators' impacts on ground water quality needs to be monitored.
2	The location of improperly constructed or abandoned wells needs to be identified to determine impacts on ground water contamination.
2	Collect samples from selected high vulnerability wells and analyzed for regulated volatile organics to verify the presence or absence of methylene chloride and chloroform.
2	Coordinate the transfer to regulatory compliance monitoring data at all public water supply wells within the study area for incorporation with regional and King County databases.
2	If significant water table declines are observed in a specific aquifer, studies of the aquifer system shall be indicated (by King County or the water utility) to determine the reasons for the decline and recommendations made to prevent further declines or restore predeclined levels. The evaluation should correlate areas with observed declines with land use map changes, rainfall, zoning, water demand, etc.
2	Monitor ground water quality (chloride levels) of new and existing wells along coastline for seawater intrusion.
2	The computerized database management system should be expanded in the following areas: Integrate with the King County databases through the assessors parcel numbering system. Develop procedures for processing water use information. Expand the data reporting capability to provide better access to the data that is stored in the systems. Develop procedures to facilitate linkage between water utility data stored within PCSTORET with the physical data contained within the database management system. Develop procedures for storing and manipulating stream flow and precipitation data. Ensure ongoing training and support is provided so that the database and the King County AutoCAD mapping system are effectively used.

RANKING	ELEMENT Continued
3	The types and quantities of fertilizer and pesticide applications, including roadside spraying, golf courses and agricultural activities need to be monitored for their impacts on ground water quality.
3	The water quality and quantity of ground water wells near sand and gravel mines should be monitored.
3	All wells within the monitoring network should be accurately located and have accurate elevations located using the Global Positioning System. This task has been completed
DES MOINES UPLAND	
1	Water level data collected by the Highline well field area for Seattle Public Utilities needs to be forwarded to King County for incorporation into the Ground Water Management Area database.
2	The King County Water District No. 49 (23N/04E-19B01) should be incorporated into the monitoring network.
2	Locate wells in the southern portion of Des Moines area that could be used for dedicated monitoring.
2	Maintain the existing stream gauging station - 42A at Miller Creek
2	Establish a new stream gauging station near the mouth, downstream from existing stations 11A and 11B at Des Moines Creek.
3	The lower portion of Des Moines Creek would be the preferred area for additional monitoring; particularly within the Qc(3) and Qc(4) aquifers where there is a greater potential for sea water intrusion. Sea water intrusion parameters such as conductivity, total dissolved solids, and chloride should also be monitored in the deeper wells in this area.
3	A site should be drilled for exploratory needs west of SeaTac Airport in the Qc(3) and Qc(4) aquifers approximately 200 feet below sea level; also in the west Seattle area at a depth of 100 to 200 feet below sea level and south of Des Moines and east of Salt Water State Park into the Qc(3) and Qc(4) aquifers.
GREEN RIVER VALLEY	
1	The City of Renton collects considerable amount of water level data from a network of dedicated monitoring wells in the Cedar River Valley and north Green River Valley area (Township 23N, Range 5E, Sections 17-18). Efforts should be made to establish procedures for periodically transferring of this data to King County.

RANKING	ELEMENT Continued
1	Recent water level declines in the Qal and Qvr aquifers in the Auburn vicinity needs to be monitored closely. Pumpage patterns in the area need to be examined and correlated to the water level declines. Approximately three to five years of additional monitoring data will be needed to assess the significance of these declines.
1	The United States Geological Stream Gauging Survey Station No. 113000 on the Green River near Auburn should continue to be monitored.
2	New monitoring sites should be drilled east of the City's development in Auburn for water level and water quality in the upgradient direction. This task has been completed
2	A new well west of Auburn Well No. 1 site should be drilled into the Qvr aquifer to provide seasonal and long-term water level trends. This task has been completed
2	Exploratory drilling should be undertaken at the Valley's East Hill to establish the relationship of valley wall to valley fill at Pacific and to define production potential of valley wall material.
2	Well(s) should be drilled upgradient of Coal Springs to obtain water quality data. This task has been completed
2	Very little monitoring is occurring in the central and northern portions of the Green River Valley. Additional sites should be identified in the valley sediments in the vicinity of Kent (Township 22N, Range 4E, Sections 23-36).
2	Deep exploratory/monitoring wells are needed in the central and north valley area (Kent vicinity and north to Renton).
FEDERAL WAY UPLAND	
1	Lakehaven Utility District collects water level data for a number of wells that are not included in the South King County Ground Water Management Area monitoring network (e.g. Wells 2, 8, 9, 10, 10A, 15, 15A, 16, 18, 20A, 23, and 23A.) Data for these sites should be forwarded to King County for inclusion into the project database.
2	Install and monitor the staff gauges at Mirror Lake, Panther Lake and Brook Lake.
3	A stream gauging station should be established in the upper reaches of Hylebos Creek to define baseflow conditions.
3	Exploratory drilling should be conducted to 1,000 feet at Brook Lake for deep aquifer definition.

RANKING	ELEMENT Continued
COVINGTON UPLAND	
1	The water level monitoring network for the Covington Upland should be expanded to incorporate more sites within the areas west of Lake Youngs (Section 3, 4, 9, 10 of Township 22N, Range 5E) and the lower Soos Creek area (Section 9-16, Township 21N, Range 5E).
1	Recent water level declines in the Qvr and Qc(2) aquifers in the East Covington area need to be examined and correlated to the water level declines. Approximately three to five years of additional monitoring data will be needed to assess the significance of these declines.
1	Equip and maintain the stream gauging stations at Big Soos Creek (54A), Covington Creek (09A), Jenkins Creek (26A), Panther Creek (03A) and Springbrook Creek (03B).
2	Establish a stream gauging station on Martinez Creek downstream from the private trout farm near the railroad bridge at Kent Springs.
2	Install and monitor a staff gauge at Lake Morton, Lake Wilderness and Lake Meridian. At Lake Sawyer generate a site/discharge curve for the outfall weir and monitor the discharge through the weir. At Lake Youngs perform a water balance on the lake to assess seepage losses and recharge to the aquifer system.
2	In the south service area of Covington Water District, drill a well at a site near Getty Oil test well.
2	Drill a well to test the production potential of the recently discovered aquifer near Kangley.
2	Conduct exploratory drilling to define the shallow aquifer systems east of Lake Sawyer.
2	Conduct exploratory drilling in an as yet undetermined location east of Wilderness Lake.
2	Conduct exploratory drilling near Lake Nielson in the southwest portion of the Covington Water District.
2	Conduct deep explorations in the northeast and southwest corners of Section 34, Township 22N, Range 5E.
2	Conduct deep explorations at as yet unspecified sites in the southwest and southeast portions of King County Water District 111 service area.
2	Conduct deep exploration east of 212th/208th Street wells to establish the eastern extent of the aquifer system.

RANKING	ELEMENT Continued
2	Drill exploration wells to bedrock in areas that lie west and south of Lake Youngs.
2	Drill exploration well(s) in Hazelwood School area.
2	Conduct deep exploration 1,000 feet or more to explore the Qc(4) and Qcu aquifers along the Pipeline 5 alignment.
2	Conduct exploration at the quadrant well site located in Section 15, Township 21N, Range 5E
2	Conduct exploration near Lake 12 well, Section 6, Township 21N, Range 7E, under the Bonneville Power Administration powerlines.
2	Conduct exploration in Section 20, Township 21N, Range 7E, southeast of Green River near Hyde Lake.
2	Conduct exploration near Lake Devine and Shady Lake.
2	Conduct exploration near Covington Water District office or shop area.
2	Additional monitoring sites should be established within the Green River Valley upstream of Auburn. Water level trends within the valley aquifer would be useful in evaluating stream aquifer continuity and instream flow impacts. Water level monitoring in this area should be coordinated with the Muckelshoot Indian Tribe. This task has been completed
2	Water levels in many of the Water District 111 wells appear to be strongly effected by pumpage (e.g. 22N/05E-35D01). The district should make efforts to locate other wells in the area that could be used for dedicated monitoring. This task has been completed
2	Deepen the Grandon well. The site location still needs to be confirmed.

2.2.3 Ground Water Quality and Quantity Issues Associated with Storm Water Management

There have been significant changes to the water resources management approach by the department of Ecology subsequent to the development of the Plan. Additional recognition has been given to the relationship between surface waters and ground waters, including both quantity and quality issues. In addition, the listing of Chinook Salmon as an Endangered Species has resulted in both State and local governments reevaluating their stormwater programs to protect water quality and fish habit. Consequently much of the information in the following sections is no longer current.

Storm water is water which runs off surfaces when it rains. Past and present storm water management practices often cause ground water quantity and quality problems. Ground water quality may be impacted if storm water containing contaminants is recharged intentionally or inadvertently. The most serious concern over recharge of storm water is, from a public health standpoint, possible effects on the quality of drinking water. Also, the amount of precipitation that, under natural conditions, would be recharged to ground water is diverted to surface water. As a result, there is a decrease in the quantity of water recharged to ground water.

The continuity of surface and ground water is an important concept in understanding the effects of surface water contamination on ground water. It is also important in making decisions regarding the most efficient way to protect both surface and ground water. Ground water and surface water cannot be considered two separate hydrologic systems because they are inextricably entwined.

King County has experienced the effects of urbanization and deforestation. Growth of King County's urban area has resulted in more impervious surface, more runoff, stream damage, and a reduction of recharge to ground water. Deforestation, the removal of vegetation and the subsequent compaction of soil, may also reduce ground water recharge.

Storm water management facilities can be designed to maximize infiltration into the ground, thereby increasing recharge to aquifers. However, an obvious concern is the potential to contaminate ground water with pollutants carried in storm water. In the past, storm water management emphasized flood control and was not particularly concerned with water quality. More recently, however, concern has shifted to the quality of storm water and how it can impact receiving waters, including ground water. Storm water management practices include source control and treatment facilities.

Storm water management facilities vary in the degree to which these mechanisms take place. The most common methods used for both flow control and water quality improvement are detention basins, infiltration facilities, biofilters, and coalescing plate oil/water separators.

Storm Water Management Programs and Regulations

Numerous federal, state, and local programs and regulations govern the management of storm water and the control of point and nonpoint pollution. However, there are no programs and regulations which solely relate to the issue of effects of storm water management upon ground water resources.

State Programs

The Puget Sound Water Quality Authority adopted the *Puget Sound Water Quality Management Plan*, which forms the foundation of the storm water program at Ecology. The Puget Sound Water Quality Management Plan affects cities, counties, and the Washington State Department of Transportation. The Plan focuses on protection of surface water in its efforts to protect Puget Sound. Little attention is paid to the continuity of surface and ground waters. The protection of ground water afforded by the many activities fostered by the Plan is often noted but is secondary to protection of surface waters. The Puget Sound Water Quality Authority was scheduled to sunset in 1996 and their responsibilities assumed by the Ecology.

Ecology coordinates surface and ground water management in two Ecology programs, Local Planning and Management of Nonpoint Source Pollution, and Ground Water Management Programs. Local Planning and Management of Nonpoint Source Pollution requires affected counties to convene watershed ranking committees to rank watersheds in need of protection. It also encourages coordination and integration of local ground and surface water protection planning efforts by stating that: "To reduce duplication of effort, Ecology shall also be responsible for coordinating the activities of the watershed management committee with other existing water management programs (e.g. ground water). Coordination and integration of local efforts related to ground and surface water is strongly encouraged. If a joint ground water and watershed management program is established, the county shall be the lead agency for the joint program.

The law creating Ground Water Management Programs contains less specific language but does encourage coordination. However, there are several reasons why this integration at the local level seldom occurs. The state treats surface and ground water quality protection programs as separate. The programs are administered by different sections within Ecology. Grants are also managed differently.

Centennial Clean Water Funds are categorized in a way which discourages integrated plans. Because of intense competition in the nonpoint category, a proposal which emphasizes

ground water protection will be placed in the ground water category. This practice discourages joint watershed/ground water nonpoint source pollution control plans.

Ground water quality planning is usually seen as a public health issue and local public health departments usually serve as lead agency . Watershed planning is usually seen as a surface water issue and is usually addressed by a branch of public works or the planning department. Local lead agencies, faced with short timelines and limited resources, are answering to different programs at Ecology and responding to different regulations which guide their planning processes. The magnitude of the problem of trying to coordinate in the face of the confusion generated at the state level proves daunting. Lack of coordination between agencies is often the unfortunate result.
It is possible that budget cuts at Ecology and declines in the amount of money generated by the cigarette tax (Centennial Clean Water Fund) will force a resolution to inefficiencies in water quality planning at the state level. Despite staff recommendations favoring consolidation, there has not yet been concrete progress in this direction.

Another State program which relates to stormwater is the Storm Water and Combined Sewer Overflows Program. The program goal is to protect shellfish beds, fish habitat, and other resources, to prevent the contamination of sediments from urban runoff and combined sewer overflows, and to achieve standards for water and sediment quality by reducing pollutant discharges from stormwater and combined sewer overflows. Ecology is developing model ordinances, a technical manual, and numerous other guidance documents to assist cities and counties.

Ecology is also directed by the Program to 1) work with Washington State Department of Transportation on a program to control runoff from state highways in the Puget Sound Basin and 2) to develop a technical manual to assist local governments which establishes best management practices for stormwater management.

Ecology's Stormwater Management Manual for the Puget Sound Basin was developed to assist local governments in meeting the storm water management rules. This manual addresses erosion and sedimentation control, runoff control and control of pollution from urban land uses. The manual relates to impacts on ground water.

Infiltration is the preferred method of volume control and other methods are allowable only after infiltration has been ruled out for technical reasons. The Ecology manual requires that a certain volume of runoff be infiltrated or detained. This is in contrast to King County's manual which requires only that peak runoff rates not be altered by the development. This is of major significance when considering the volume of water to be potentially recharged to ground water.

Local Programs

King County Department of Natural Resources and Parks, Water and Land Resources Division has broad responsibility for management of storm water in King County. King County Water and Land Resources Division conducts routine maintenance of drainage and pollution control facilities, constructs facilities to control runoff and protect natural drainage systems, conducts needed engineering and habitat analyses, and responds to both complaints and emergencies involving flooding, erosion, and water quality. The program's goal is to minimize the personal, financial, and environmental costs associated with flooding and erosion by providing a comprehensive approach to surface water management.

An important feature of the King County's program has been its design manual. The King County Surface Water Design Manual contains requirements and standards for designing surface and storm water management systems in King County. King County requires that impacts on existing artificial and natural drainage systems be mitigated prior to permit approval for certain developments. While the Design Manual requires water quality treatment best management practices comparable to the Ecology Draft Manual, King County's Design Manual encourages infiltration where it is feasible. It is generally allowed in soils that would be considered moderately permeable. Additionally, the King County manual does not require infiltration or detention of a specific volume of water. It requires that peak runoff not be altered by new development.

King County Water and Land Resources Division and the SKCHD coordinate to some extent on planning activities but not as much as is needed to effectively avoid redundancy or conflicting goals and products. Coordination between King County and the SKCHD is far from comprehensive and the potential for conflicting goals and products exists. A thorough analysis of the existing degree of agreement between the planning processes has not been carried out.

The Department of Development and Environmental Services implements King County Code Title 21A Zoning (the zoning code) which, to some extent, regulates the degree of impervious cover allowed for developments..

The King County Department of Natural Resources and Parks has assisted jurisdictions in King County in establishing surface water utilities by providing technical information about surface water quality. Many cities have developed surface water utilities in response to local needs.

Land Use In Critical Aquifer Recharge Areas

Research has shown that nearly all land uses associated with human activity significantly affects ground water quality due to the effects of nonpoint sources of pollution. It has also been shown that the degree of contamination increases with the intensity of development. It

becomes a public policy question as to how balance land use demands with the need to protect ground water.

Studies demonstrate that certain land uses contribute to contamination of ground water from nonpoint sources. The land uses that were shown to result in the highest concentrations or detection frequencies of a variety of chemical contaminants are generally agriculture, residential (especially high density), and industrial/commercial. It is difficult to extrapolate the findings of these studies to another geographical area. However, perhaps the most valuable conclusion to the Plan is the evidence that all land uses compromise ground water quality and that the potential for contamination increases with the intensity of land use.

In order to address the land use question in these areas from a water quality basis in relation to stormwater management, an understanding of the effects on ground water quality of stormwater source controls, treatment, and infiltration is required. The effectiveness of the best management practices currently supported by experts, also needs wider support. Additional study including modeling and field testing of the best management practices (lined wet pond - lined bioswale - infiltration basin in series) is needed. Storm water strengths and constituents representative of various land uses should be tested so that, using study results, planners would be able to recommend compatible land uses to elected officials.

The Plan should address the question of appropriate land use for the most physically susceptible and recharge areas. In particular, it is important to make recommendations regarding appropriate residential densities and commercial and industrial uses. Answers to these questions are not fully available. Research into the effectiveness of storm water treatment is in early stages. Practical problems associated with the application of this technology on a wide scale are yet to be determined. Many studies of this technology are planned or underway, some of them in King County.

Infiltration technology is fraught with problems but, given Ecology's emphasis on infiltration, the effectiveness of this technology in the Puget Sound region will be demonstrated. Thus, the question of appropriate density and land use in the most physically susceptible and recharge areas should be answered with some degree of validity soon. Until such time, it may be the best policy to maintain low densities in these areas to avoid irreversible adverse impacts. It is possible that water quality and source controls will prove to be inadequate by themselves to address concerns for ground water quality. In this case, low density and limited land uses may be the only feasible alternative.

GOAL

To promote stormwater management practices that provide the greatest amount of recharge while protecting ground water quality.

3/31 w/ Steve Foley

ISSUES

Issue 1 - Runoff Versus Recharge

LID BMPs intended to reduce volume of runoff

The King County Surface Water Design Manual does not limit runoff volumes. Rather, the Manual requires that there be no increase in peak runoff rates. Potential ground water recharge is lost to runoff causing depletion of aquifers. Many cities in Ground Water Management Areas have adopted or use the King County Manual for reference in their stormwater management programs and are, therefore, likely following the same policy towards infiltration.

Infiltration is now the preferred option. Some financial incentives as well.

ST-1 Runoff Versus Recharge - King County and cities will amend/adopt surface water design manuals to require that runoff be infiltrated when site conditions permit except where potential ground water contamination cannot be prevented by pollution source controls and stormwater pretreatment. The objective is to achieve a policy of no net reduction of recharge in any new development or redevelopment in high recharge areas.

Discussion - Impacts from development on ground water can be partially mitigated by infiltrating stormwater rather than discharging it to surface water bodies. This practice partially compensates for the loss of natural recharge caused by impermeable surfaces. Some areas of King County with glacial outwash soils are particularly suited to infiltration. In these areas, infiltration should be used to mimic the natural recharge patterns present prior to development as closely as possible. This recommendation follows the 2000 King County Comprehensive Plan policy E-150: "King County should protect ground water recharge quantity by promoting methods that infiltrate runoff where site conditions permit, except where potential ground water contamination cannot be prevented by pollution source controls and stormwater pretreatment." Also, policy E-117 reflects this position: "Development should occur in a manner that supports continued ecological and hydrologic functioning of water resources. Development should not have a significant adverse impact on water quality or water quantity..." "Also, policy E-126 supports this action: "Stormwater runoff shall be managed through a variety of methods, with the goal of limiting impacts to aquatic resources, protecting and enhancing the viability of agricultural lands and promoting ground water recharge..."

In the Urban Area, methods which are land consumptive will need to be balanced with the need to protect the supply of developable land. "Infiltration of stormwater presents a threat to ground water quality. Storm water should not be infiltrated where the risk of ground water pollution cannot be mitigated by pollution source controls and stormwater pretreatment. Ecology provides guidance in regard to adequate source control and pretreatment in regard to specific development types in the Storm Water Management Manual for the Puget Sound Basin. Some local jurisdictions are developing similar manuals that are at least as stringent as the Ecology Manual. Ground water quality concerns associated with the infiltration of stormwater are addressed further in Issue 2.

Infiltration of roof runoff, while allowed in King County and presumably cities, could be used more extensively or required in appropriate settings including single-family residential development. Consideration should be given to water quality before adopting requirements to infiltrate roof runoff. Certain roofing materials and associated treatments to retard moss growth could result in the introduction of hazardous substances to ground water. In addition, roof runoff may be too contaminated to infiltrate without treatment in highly urbanized areas subject to relatively heavy air pollution. These issues should be more thoroughly explored by King County and the cities as they develop specific requirements for infiltration. The King County manual does not presently contain any restrictions on infiltration of untreated roof runoff other than limiting the soils in which infiltration is allowed.

If the South King County Ground Water Advisory Committee (GWAC) decides to take no action it is probable that King County and cities will gradually increase the use of infiltration technology because of the emphasis placed on it by the Storm Water Management Manual for the Puget Sound Basin (the Ecology Manual).

Development is, however, proceeding rapidly and many opportunities to use infiltration technology may be lost. It may result in more rapid implementation of the Ecology Manual's provisions if the GWACs request early action in favor of the use of infiltration whenever possible in all jurisdictions in the Ground Water Management Areas.

Implementation:

Task(s): Amend/adopt surface water design manuals.

Who:	King County and cities.
When:	The Management Committee will develop an implementation schedule.
Cost:	Costs will be determined by the Management Committee.
Funding:	By participating agencies.

Issue 2 - Ground Water Quality Concerns

- It has been demonstrated by numerous studies that nonpoint source pollution is a major contributor to ground water degradation. Water quality controls of stormwater will increasingly be used to reduce nonpoint source pollution effects upon both surface and ground water resources. Technology associated with these practices is in the early stages of development and long term effects on ground water quality are unknown. While water quality controls will improve the quality of the water discharged to the ground, the increasing emphasis on infiltration poses risks.

Infiltration will be employed most often in areas with glacial and alluvial soils associated with aquifer recharge areas. Regardless of the comprehensiveness of new requirements, treatment systems will sometimes fail for a variety of reasons and they cannot be expected to function

optimally at all times. Additionally, nonpoint source pollution that is not borne by stormwater will infiltrate and reach ground water regardless of stormwater management techniques.

The GWAC recommends that actions are adopted to ensure that high potential aquifer recharge areas are protected from nonpoint source pollution to the greatest extent feasible, that stormwater infiltration best management practices are used, and that further information is sought on the long-term effects of this practice upon ground water quality.

ST-2A Ground Water Quality Concerns - Zoning - King County and cities within the GWMA will maintain rural and open space in the most physically susceptible and recharge areas where more intensive land uses have not already been zoned.

a. Environmental standards for urban development should emphasize ways to allow maximum permitted densities and uses of urban land. Mitigating measures should be encouraged to serve multiple purposes, such as drainage control, ground water recharge, stream protection, open space, cultural and historic resource protection and landscaping. When technically feasible, standards should be simple and measurable, so they can be implemented without lengthy review processes.

a. In the rural areas, ground water should be protected by:

    i. Preferring land uses that retain a high ratio of permeable to impermeable surface area and to maintain or augment the infiltration capacity of natural soils; and

    i. Requiring standards for maximum vegetation clearing limits, impervious surface limits, and where appropriate, infiltration of surface water.

    i. Rural development standards should be designed to protect the natural environment by addressing seasonal and maximum clearing limits, impervious surface limits, surface water management standards that emphasize preservation of natural drainage systems and water quality, ground water protection, and best management practices for resource-based activities.

ST-2B Ground Water Quality Concerns - Facility Requirements - King County and cities within the GWMA will require that all types of stormwater facilities use best management practices outlined in Ecology's approved design manuals. The GWAC supports the changes to the surface water design manuals to meet the State's requirements to protect ground water quantity and quality.

ST-2C Ground Water Quality Concerns - Study - King County, cities and special purpose districts will jointly sponsor research on the long term impacts of the infiltration of

pretreated stormwater on ground water quality. This research will be supported by monitoring of the discharge from a pretreatment system and other appropriate variables in areas where the facility is installed and operating.

Discussion - ST-2A is proposed because of the sensitivity of the most physically susceptible and recharge areas to contamination, the increasing importance of protecting drinking water aquifers, and the difficulty, if not impossibility, of cleaning up contaminated aquifers.

The King County Comprehensive Plan recognizes this in policies U-109 (Urban), E-152 (Environment) and R-231 (Rural), which state, respectively, that:

> U-109: Development standards for urban areas should emphasize ways to allow maximum permitted densities and uses of urban land while not compromising the function of critical environmental areas. Mitigating measures should serve multiple purposes, such as drainage control, ground water recharge, stream protection, open space, cultural and historic resource protection and landscaping. When technically feasible, standards should be simple and measurable, so they can be implemented without lengthy review processes.
>
> E-152: King County should protect ground water in the Rural Area by:
>
> a. Preferring land uses that retain a high ratio of permeable to impermeable surface area and that maintain or augment the infiltration capacity of the natural soils; and
>
> a. Requiring standards for maximum vegetation clearing limits, impervious surface limit, and where appropriate, infiltration of surface water. These standards should be designed to provide appropriate exceptions consistent with Policy R-231.
>
> R-231: Rural development standards shall be established to protect the natural environment by addressing seasonal and maximum clearing limits, impervious surface limits, surface water management standards that emphasize preservation of natural drainage systems and water quality, ground water protection, and best management practices for resource-based activities.

Management of stormwater, even if done according to best management practices, will not be perfect. Indeed, considerable difficulty has been experienced with stormwater infiltration facilities. It should be expected that systems will sometimes fail for structural, maintenance, or weather-related reasons.

King County already requires lined treatment facilities in excessively permeable soils but does not require conveyance systems that preclude infiltration. Cities in King County who have adopted all or part of the King County Manual, have similar requirements.

King County Water and Land Resources Division also expects that water quality treatment best management practices will continue to evolve. Effective methods will periodically be incorporated into the Surface Water Design Manual. Water quality treatment methods should match the risk to ground water quality.

Ecology also approves surface water design manuals for specific entities in the GWMA which have unique soil conditions requiring special infiltration methods. These methods will continue to evolve.

Even as new requirements are instituted, stormwater managers do not have adequate information to determine long term effects of new requirements on ground water quality. Monitoring the new facilities and additional study will enable us to determine whether long term effects are acceptable using best management practices. Before any new study is undertaken, existing information will be reviewed to determine if additional study is needed.

The Center for Urban Water Resources Management at the University of Washington or King County may be possible coordinators of a multi-jurisdictional study. The Center was formed, in part, to address questions regarding appropriate management of stormwater. Numerous local jurisdictions are financial contributors to the Center's operations, including King County.

The Center has expressed interest in doing the type of study described in ST - 2C and feels it is warranted. The Center serves as a facilitator for local governments interested in solutions to common problems. If, for example, King County were to propose a study, the Center would then contact its members to determine if they would support it.

A study should be designed which will benefit all Puget Sound jurisdictions who are both responsible for ground water protection under the GMA and the Ground Water Quality Standards (Chapter 173-200 WAC) and for requiring infiltration of stormwater per the Ecology Manual. The study should determine whether certain land uses make stormwater infiltration particularly threatening to ground water quality. For example, the study should compare rural and urban uses of land with regard to the potential for safe infiltration of stormwater. Residential and commercial uses of land should also be compared.

Implementation - There is no cost associated with King County and cities maintaining specific zoning designations in the most physically susceptible and recharge areas.(ST-2A)

The cost of using the best management practice described in ST-2B will be borne by developers and, ultimately, consumers.

Funding for ST-2C should come from the agency funds. King County will seek support to monitor stormwater infiltration facilities (ST - 2C). It is anticipated that the monitoring can be done under existing budgets. King County should monitor a minimum number of facilities and provide reports on facility effectiveness.

Task 1: Require stormwater facilities to incorporate best management practices. (ST-2B)

Task 2: Sponsor study. (ST-2C)

Task 3: Monitor some facilities and report (ST-2C). King County Surface Water Management Division's participation is predicated on assessment of existing monitoring priorities, fund sources and needed technology.

Who:	King County, tasks 1 - 5, Cities, tasks 1 - 4.
When:	The Management Committee will develop an implementation schedule.
Cost:	Costs will be determined by the Management Committee.
Funding:	By participating agencies.

Issue 3 - Education

Considerable effort has been invested to educate the public regarding the prevention of nonpoint pollution and improper disposal of hazardous materials. Agencies or jurisdictions involved include King County, the SKCHD, Cooperative Extension, cities, Puget Sound Water Quality Authority, Ecology, King Conservation District, Soil Conservation Service, public and private schools, special purpose districts and others.

The GWAC recommends that King County, Cities and Special Purpose Districts, jointly carry out a ground water education program. In regards to stormwater management, this effort will ensure that educational activities are adequate to communicate to the public: 1) how ground water may become contaminated via surface water pollution, and 2) ways in which ground water recharge may be encouraged.

ST-3A Education - Review - King County will review applicable educational efforts underway to determine whether the protection of ground water is emphasized. King County will seek the cooperation of the parties involved to include ground water information and concerns in the educational programs.

ST-3B Education - Reporting - King County will report to the Management Committee on the adequacy of existing educational programs to address ground water concerns. This report will include proposed changes as a result of review and discussions carried out in ST-3A.

ST-3C Education - Develop Program - King County will develop a supplemental educational program to address deficiencies identified above, if necessary, and present it to the Management Committee for review and adoption.

ST-3D Education - Coordinate Program - King County will coordinate implementation of the program which may involve actions by King County, other agencies and other jurisdictions.

Discussion - Prevention of pollution is the best approach from the standpoints of cost and environmental impact. Education is the best prevention because it creates an awareness and concern in individuals which accompanies them throughout their lives. This awareness and concern prevents pollution in countless small and large ways as individuals make everyday decisions. King County will seek the cooperation of the parties involved to include ground water information and concerns in the educational programs.

Developing an independent educational program to address this issue would probably be largely redundant. It would not likely be supported financially by elected officials in a time of lean budgets. Funding for staff at the King County is necessary to carry out the review, coordination, report, and development of a supplemental program, if needed. It is possible that enhancing existing programs will require that funds be provided to the relevant agency or jurisdiction.

Implementation:

Task 1: Review educational programs.

Task 2: Report to Management Committee.

Task 3: Develop program.

Task 4: Coordinate/implement.

Who:	King County, Cities, and Special Purpose Districts
When:	The Management Committee will develop an implementation schedule.
Cost:	Costs will be determined by the Management Committee.
Funding:	By participating agencies.

Issue 4 - Coordination Between Surface and Ground Water Planning Efforts

Surface and ground water planning efforts should be effectively coordinated in order to make the best use of limited resources. The GWAC adopted the following series of actions that promote optimal coordination between surface and ground water resource planning efforts.

ST-4A Coordination Between Surface and Ground Water Planning Efforts: Ecology Programs - Ecology will assess surface and ground water quality planning programs to determine how they could be combined or coordinated in a way which is both scientifically justified and which provides for greater efficiency.

ST-4B Coordination Between Surface and Ground Water Planning Efforts: Puget Sound Water Quality Authority - The Puget Sound Water Quality Authority recognizes that surface and ground water form a continuous and dynamic system which must be comprehensively protected. The Puget Sound Water Quality Management Plan will be revised to address all water quality issues in the Puget Sound drainage basin, including ground water.

ST-4C Coordination Between Surface and Ground Water Planning Efforts: King County-King County, cities and special purpose districts will assess their water resource planning efforts to determine how to effectively coordinate them to provide the best possible protection of water resources.

Discussion - State law encourages coordination of nonpoint and ground water protection plans. In reality, this has been difficult for local governments to achieve. There are many underlying reasons why this integration at the local level often doesn't occur:

- Administration of surface and ground water protection grants by different sections at Ecology;
- Separate state regulations guiding planning processes;
- More favorable funding rules with the Centennial Clean Water Fund for planning processes that do not address water quantity issues, a crucial element of a ground water plans;
- Lack of recognition of the need to protect surface and ground water concurrently as part of a continuous dynamic system;
- Planning processes carried out by different lead agencies at the local level;
- Lack of a proactive program to coordinate at the local level.

By adopting these management strategies the GWAC expresses its concerns regarding this issue to the three major entities involved in multi-jurisdictional surface and ground water planning: Ecology, the Puget Sound Water Quality Authority and King County.

Legislation is not needed to make administrative changes at Ecology. Relevant regulations addressing ground and surface water planning already encourage coordinated or joint efforts. How the regulations are implemented will be one determining factor in whether water resource protection planning processes continue to diverge on somewhat separate tracks. The Puget Sound Water Quality Authority's priorities should continue to be those issues which have the greatest impact upon the quality of Puget Sound waters. The Authority

should explore, however, the importance of the ground water contribution to Puget Sound. It is encouraging that ground water protection is listed in the Plan's Unfinished Agenda. GWAC input may be enough to cause a shift in perspective at the Authority and thereby move ground water protection up the scale of priorities.

Changes at the state level would necessitate close cooperation with local governments currently involved in planning activities. Innovation should be encouraged in implementing water resource plans in order to alleviate redundancies which may exist between surface and ground water planning efforts.

On the local level, coordination will result in more efficient use of scarce resources for environmental protection. Conflicting planning documents that could serve to interfere with the implementation of one or both can be avoided. More importantly, integrated approaches that could result in better protection and more efficient use of resources can be developed.

County staff, developers, and the public have difficulty determining County policy when there are several incomplete planning processes addressing the same issues in the same geographic area. Coordination, if successful, will help everyone to understand both existing policy and policy in the developmental stages.

While a coordinating process will initially be time consuming it will save resources in the long run. It will also help local lead agencies to meet more closely the coordination provisions of state regulations. This recommendation follows the King County Comprehensive Plan policy E-118, which states "Watershed plans shall integrate marine, freshwater, surface water, ground water, drinking water and wastewater planning to provide efficient water resource management" and F-323 "To reduce flooding, erosion and sedimentation, prevent and mitigate habitat loss, enhance ground water recharge and prevent water quality degradation, the surface waters of King County shall be managed through plans, programs and regulations developed by King County in cooperation with affected jurisdictions whenever possible." King County agencies responsible for planning could jointly evaluate existing water resource planning efforts to determine how they might be streamlined and made more effective. Agencies involved should include at least King County Department of Natural Resources and Parks Water and Land Resources Division, and the Department of Development and Environmental Services.

Implementation:

Task 1: Assess programs (ST-4A).

Task 2: Revise Plan (ST-4B).

Task 3: Assess Planning efforts (ST-4C).

Who:	Task 1. Ecology.
	Task 2. Puget Sound Water Quality Authority.
	Task 3. King County, Cities and Special Purpose Districts.
When:	The Management Committee will develop an implementation schedule.
Cost:	Costs will be determined by the Management Committee.
Funding:	By participating agencies.

Issue 5 - Assessment of Existing Storm Water Facilities

Existing stormwater management facilities (or the lack of facilities) in the most physically susceptible and recharge areas and Wellhead Protection Areas may pose a risk to ground water quality and the population served by public water systems. Some facilities were constructed when there was little concern about ground water quality. Of particular concern are dry wells used in commercial and industrial areas. Alternatively, there are areas in which no stormwater facilities were constructed to accompany development other than ditches. This situation may be found in areas with highly permeable soils that were developed prior to current regulations. Storm water enters ditches in these areas and rapidly infiltrates without benefit of treatment.

ST-5 Assessment of Existing Storm Water Facilities - King County and cities will assess the adequacy of stormwater facilities in the most physically susceptible and recharge areas and Wellhead Protection Areas to protect ground water quality and to give these areas high priority for water quality facility retrofit as required by NPDES as warranted.

Discussion - Many jurisdictions are preparing for the new stormwater management requirements by inventorying their existing stormwater facilities. This is an advantageous time to bring to the attention of local authorities the GWAC's concerns regarding ongoing threats to ground water quality from antiquated stormwater management facilities. Dry wells are of particular concern because they are used in very permeable soils, they bypass any treatment afforded by near-surface soils, they are most often used in urban areas subject to significant contamination, and they are often not fitted with water quality controls.

Many jurisdictions will be required to address existing water quality problems. Unless the GWAC brings the matter to the attention of stormwater managers that ground water quality is as great a concern as surface water, our concerns may be overlooked in setting priorities for water quality retrofit. Emphasis on the most physically susceptible and recharge areas is recommended because of aquifer sensitivity. Wellhead Protection Areas are emphasized because of the immediacy of the use of the aquifer for public drinking water supplies.

Implementation:

Task 1: Inventory facilities in areas

Task 2: Assign ranking depending on facility type

Task 3: Identity which facilities should be retrofitted and develop schedule.

Who:	King County and cities.
When:	The Management Committee will develop an implementation schedule.
Cost:	Costs will be determined by the Management Committee.
Funding:	By participating agencies.

Issue 6 - Roadway Runoff

The State Highway Runoff Program provides for improved water quality and quantity controls for stormwater runoff from new and existing state highways. The King County Surface Water Design Manual requires water quality and quantity controls for new roadways in King County. It is expected that many cities have similar requirements. However, state and local programs may not address quality and quantity problems associated with existing roadways. Existing contamination problems may be identified via Basin Plans developed by King County Surface Water Management in cooperation with cities and via other processes to identify needed capital improvements. King County and cities then address the problems identified as funding allows.

ST-6 Roadway Runoff - King County and Cities will;

- direct their public works departments to give highest priority to the most physically susceptible and recharge areas and Wellhead Protection Areas when identifying and correcting water quality problems associated with existing roadways;

- Develop a program to retrofit existing structure, as required by the National Pollutant discharge Elimination System (NPDES), which will require stormwater quality and quantity controls comparable to new regulations when doing major renovation or widening of roads.

Discussion - This action could influence local stormwater management jurisdictions within the GWMA to give a higher priority to the most physically susceptible and recharge areas and Wellhead Protection Areas when addressing stormwater quality and quantity problems. The benefit of corrective actions would be increased by focusing them in the areas that are most susceptible to ground water contamination or are important because they are located within the zone of contribution to a public water supply well or wellfield.

County and city public works departments have a tremendous task ahead to meet all of the requirements posed by new and upcoming stormwater management regulations. Many will be addressing existing water quality problems as a result of new requirements depending on the degree of comprehensiveness of the stormwater management program required or opted for.

Implementation:

Task 1: Public Works Departments assign high priority to Wellhead Protection Areas and the most physically susceptible and recharge areas.

Task 2: Require new regulatory controls.

Who:	King County and cities.
When:	The Management Committee will develop an implementation schedule.
Cost:	Costs will be determined by the Management Committee.
Funding:	By participating agencies.

Issue 7 - Soil Amendment

Glacial till soils impede the infiltration of precipitation and are associated with relatively high runoff volumes subsequent to clearing of natural vegetation. Appropriately used pesticides and nutrients used in landscaping may be carried off site with runoff instead of being retained in the soil where they can be utilized or broken down by natural processes. Contaminated runoff is carried to physically susceptible areas where it may contribute to ground water contamination. Glacial outwash soils also present problems in relation to pesticides and other contaminants. These chemicals may penetrate well beyond the root zone due to poor attenuation capability of the soil. Contamination of shallow aquifers can result.

ST-7 Soil Amendment - King County, Cities and Special Purpose Districts will jointly evaluate the ground water quality and quantity benefits of soil amendment. Soil amendment requirements shall be implemented if the proposed research proves to be a practical method of improving water quality, increasing infiltration, and reducing stormwater runoff.

Discussion - Soil amendment in this context refers to the process of adding materials to the soil to increase moisture and nutrient retention. Amendments which could be used include composted yard waste and biosolids, commercial topsoil, and sand. The benefit of soil amendment is that nutrients, pesticides, and other pollutants from generalized sources would be less likely to run off of the site or rapidly move through excessively permeable soils to reach shallow, unprotected aquifers typical of physically susceptible and recharge areas.

Soil amendment may be a valuable means to protect both ground and surface water. Additional information is needed about this topic in order to determine whether the benefits warrant further action. A study of this sort might logically be coordinated by the Center for Urban Water Resources Management with the cooperation of King County, cities and Special Purpose Districts.

Implementation:

Task: New program, unknown costs.

Who:	King County, cities, special purpose districts, Center for Urban Water Resources, University of Washington.
When:	The Management Committee will develop an implementation schedule.
Cost:	Costs will be determined by the Management Committee.
Funding:	By participating agencies.

2.2.4 Ground Water Education Program

Providing citizens with information on the ground water resource and protection may be a particularly effective protection method. Understanding, caring, and commitment are needed to protect a resource that is found almost everywhere and is impacted by a wide variety of activities. Although regulations may help, groups of informed citizens actively caring for their own backyard may be more effective. Providing technical assistance will not address all the concerns but will empower some community members to take individual action.

Currently there are a number of education programs focused on individual sources of ground water contamination. However, no comprehensive ground water education program focuses on the following tasks:

- Help engender understanding and concern in order to protect the resource.
- Aid in developing resource protection messages that are consistent regardless of the specific education program.
- Coordinate with other resource protection programs that focus on a specific issue, such as solid waste, hazardous waste or stormwater management.
- Develop specific education activities and materials for point and nonpoint sources of contamination that do not have their own individual programs.
- Support research on the ground water resource.
- Encourage and promote conservation.

A comprehensive program would coordinate existing environmental education programs to develop consistent messages about the ground water resource and ground water protection. This component would be done by briefing environmental educators about King County's ground water system, and supporting joint programs. The program would respond to local ground water quality and quantity concerns that are not already covered by other programs. This program would provide assistance for local planning efforts and other ground water protection projects.

Providing information to citizens involved in community planning projects would be another aspect of this program. Increasingly, citizens are taking an active part in neighborhood planning and are concerned about resource protection. As they develop these plans, whether they are addressing school siting, transportation routes, or zoning, they may need information about the ground water system. This knowledge will assist citizens in addressing ground water protection measures within the context of their planning process.

Educational programs have been shown to be an effective method to protect natural resources. The development of the ground water management program included a public education component. During the GWAC's consideration of the potential threats to ground water, several specific educational program elements were adopted. These elements need to be consolidated into one comprehensive program.

GOAL

To increase individual participation in protecting the ground water resource by educating agencies, jurisdictions, businesses and citizens about ground water, the threats to quantity and quality, and ways they can reduce those threats.

ISSUES

Issue 1 - Existing Education

Considerable effort is underway to educate the public regarding the prevention of nonpoint pollution, conservation, well construction and improper disposal of hazardous materials. Agencies or jurisdictions involved include King County, cities, Puget Sound Water Quality Authority, Ecology, King Conservation District, Soil Conservation Service, public and private schools, special purpose districts and others.

ED-1 Existing Education - King County, cities and special purpose districts will jointly carry out a ground water education program which will review existing education activities and make use of these programs when applicable. King County will review applicable educational efforts underway to determine whether the protection of ground water is emphasized. King County will seek the cooperation of the parties involved to include ground water information and concerns in the educational programs.
The specific elements of the program are:

- Existing educational program content will be reviewed for agreement with the Plan policies and goals. King County will review the current educational programs of Soil Conservation Service, Cooperative Extension and others to ensure that the Plan goals and policies are reflected. (From PF-3B).

- The Hazardous Waste Management Program in King County will coordinate with the Household Hazardous Waste Education Committee to include information about the

risks to ground water associated with the disposal of household hazardous wastes to on-site sewage systems as part of their household hazardous waste educational activities (From OS-3A Household Hazardous Wastes).

- King County, cities and water utilities will work with local nurseries, the Washington State University Cooperative Extension Service and the Conservation Districts to promote the availability of appropriate seed stocks, plants and materials to achieve xeriscaping (use of low-water use plants). (From WQ-4B1)

- The Education Program will support conservation education efforts in the schools. (From WQ-4B2)

- King County will educate residents about landscaping practices that promote aquifer recharge through an informational brochure prepared by the Cooperative Extension and King County. (From WQ-4B3)

- There is a lack of general public knowledge about the public health significance of the requirements for well construction, operation, maintenance and abandonment. The Plan Education Program will coordinate with and support Ecology's well identification, well construction, proper well maintenance, contamination sources and well abandonment projects. (From WC-4)

Discussion - Prevention of pollution is the best approach from the standpoints of cost and environmental impact. Education is the best prevention because it creates an awareness and concern in individuals which influences their decisions and actions. Developing a comprehensive independent educational program to address ground water protection would probably be redundant. Scarce resources can be used efficiently by building upon existing programs.

King County will seek the cooperation of the parties involved to include ground water information and concerns in the educational programs. This review will ensure that the Plan goals and policies are reflected. The Cooperative Extension and others have several educational efforts underway. They integrate ground water protection information where possible, and are agreeable to including more. The Cooperative Extension, Soil Conservation Service and others could include the Plan concerns in their educational material.

Specific elements will address specific GWAC concerns:

- King County will coordinate measures to increase public awareness concerning the potential impacts of discharging household chemical products to an on-site sewage system. Such measures would be an extension of activities scheduled as part of the Local Hazardous Waste Management Plan.

- Educational efforts would complement and combine with current efforts of King County, Cooperative Extension and the Conservation District. This information could be disseminated through the Master Gardener and other programs of Cooperative Extension. Awareness of the problem of reduced aquifer recharge may increase responsibility and concern for physically susceptible and recharge areas in the community. Education programs on how landscaping practices can affect aquifer recharge could be coupled with education on the effects of pesticide and herbicide use on ground-water quality. A discussion of proper disposal of household hazardous wastes could be included. Landscaping tips should include a discussion of native vegetation and its role in facilitating infiltration of moisture.

- Informed and involved well owners and other community members are probably more likely to comply with the well construction and abandonment regulations than they would be otherwise. Ways to inform and involve well owners might include distributing a questionnaire about wells to homes in the community; developing and distributing an educational brochure for homeowners; and supplementing the brochure with community educational programs. The questionnaire should be designed to elicit the number of wells on each property, the construction methods used, and the number of wells that require abandonment. The brochure should include recommended practices and legal requirements for well construction and abandonment. It should also include the reasons why practices such as sealing the well are both advisable and required by law so that homeowners are knowledgeable before they make plans to construct or abandon a well. The education program should cover the same information, and provide the public with an opportunity to ask individual questions.

Implementation:

Issue 1 – Implementation

Issue I Implementation is discussed under Issue 2.

Issue 2 - New Educational Elements

There are several issues that do not have any existing education program upon which to build. These have been identified through the GWAC consideration of Ground water protection issues.

ED 2 - New Educational Elements - King County, cities and special purpose districts will jointly carry out a ground water education program which will develop specific education activities and materials for sources of contamination. The Management Committee will determine the adequacy of existing educational programs to address ground water concerns. King County will develop a supplemental educational program to address deficiencies identified, if necessary, and present it to the Management Committee for review and adoption. (ST-3C).

New educational programs will be developed and implemented per the adopted GWAC actions below:

- King County will develop and carry out a public education program intended to increase the awareness of proper on-site sewage system operation and maintenance, including the risks associated with disposal of hazardous wastes in such systems. The landlord will provide the renter with information on septic tank maintenance. (OS-3B)

- King County and cities will jointly educate homeowners and exempt tank owners regarding tank abandonment requirements of the Uniform Fire Code through the Plan Education Program. (UST-3C)

- The public may not be aware of the relationship between land filling solid waste and the threat to ground water quality. Recycling (removal of usable components from the waste stream) reduces the amount of solid waste that must be land filled. Include information about the relationship between solid waste disposal and ground water in the education program. (SW-8)

Discussion - During the development and consideration of the issues that affect Ground water quantity and quality, the GWAC found that several issues could be addressed through educational efforts. However, this education was not being conducted by any other agency. Therefore, the adopted actions contained new educational elements. These are:

- The existing public information pamphlet concerning on-site sewage system maintenance and operation will be amended to provide instructions concerning proper household hazardous waste disposal practices prior to any scheduled reprinting.

- King County and the GWAC will establish a committed and trained speakers corp comprised of volunteers who will, provide an education resource for local schools, community groups and the public at large, on issues concerning ground water.

- Responsibilities of these volunteers will include but not be limited to:

    - Acquiring a basic understanding of hydrology, geology, and public health issues affecting ground water quality and quantity.

    - Assisting King County staff in identifying available educational resources, materials and programs that address ground water issues and either coordinate with, incorporate or direct people to these programs.

- Assisting King County in developing a basic curriculum guide to be used by the speakers which is kept up to date with the current theories and practices of ground water management.

- Meet with King County staff, local water district staff and local government on a regular basis, bi-yearly or quarterly to identify new concerns and current issues concerning water quality and quantity

- Including home heating oil tanks in the overall Plan Education Program will help address the low level of compliance with the requirements for home heating oil tank abandonment. Homeowners are unaware of their responsibilities under the Uniform Fire Code, probably because there are no programs on proper maintenance and abandonment. By providing educational material to tank owners, an increase in the community knowledge about the problem, and, hopefully, an increase in the numbers of tank owners that comply with the regulations would result. Also, by increasing community awareness, it is expected that home purchasers would require information on tank status be disclosed.

- Providing information about recycling and educating residents about reducing the waste stream may reduce the amount of waste going into the landfills and the amount of hazardous products that people buy.

Other new program aspects may be developed under direction of the Management Committee. Some possible tasks are:

- Support schools or individual teachers with an interest in ground water protection. Such support could include providing education materials, or developing school skits.

- Working with neighborhood groups on neighborhood ground water protection efforts.

- Developing and installing interpretive signs, for example, signs explaining Wellhead Protection Areas.

- Development of a video on water resources for cable television and distribution to local video outlets.

- Sponsoring informational booths at local fairs; booth displays at local libraries or bank lobbies.

Implementation:

Task 1: Review applicable educational efforts.

Task 2: Establish a committed and trained speakers corp. of volunteers under the direction of a King County staff person.

Task 3: Foster cooperation of other environmental education efforts.

Task 4: Report to Management Committee on the adequacy of existing educational programs to address ground water concerns. This report will include proposed changes as a result of the above review and discussions.

Task 5: Develop a supplemental educational program to address deficiencies identified above and present it to the Management Committee for review and adoption.

Task 6: Coordinate implementation of the program.

Who:	King County in conjunction with applicable agencies under the direction of the Management Committee.
When:	The Management Committee will develop an implementation schedule.
Cost:	Costs will be determined by the Management Committee.
Funding:	By participating agencies..

2.3 PROGRAMS RELATED TO GROUND WATER QUALITY

2.3.1 Ground Water Protection Issues Associated with Hazardous Materials Management

Substances that are hazardous to public health and the environment are a by-product of industrialization. As society becomes more industrialized, materials become more prevalent and hazardous. There are myriad industrial and commercial processes that produce and use these substances. The use of hazardous materials is not, however, limited to industries and businesses. These materials are widely available and used by almost everyone to some degree. The impact of these substances on our environment, particularly ground water, is determined by the management practices of the businesses and individuals who use them.

Ground water contamination can occur when hazardous materials migrate through the soil. Ground water contamination can also occur when hazardous materials are spilled into surface water features that are in hydraulic continuity with ground water. Human health threats occur when contaminated ground water reaches aquifers used for drinking water supplies. The clean up of contaminated aquifers is difficult, costly, time-consuming, and may not be successful.

The threat of ground water contamination by hazardous materials is currently being addressed by a number of federal, state and local statutes. These laws address particular activities

associated with hazardous materials. The remainder of the discussion will be divided into three sections commensurate with the way hazardous materials are regulated. The three sections are:

- Hazardous waste management
- Hazardous waste contamination sites
- Hazardous material spill prevention and emergency response.

Hazardous Waste Management

Hazardous waste is discarded hazardous materials. The Uniform Fire Code of 1988 defines hazardous materials as those chemicals or substances which are physical hazards or health hazards as defined in Article 80, whether the materials are in usable or waste condition.

The statutes and regulations addressing the protection of ground water from hazardous waste are:

1. *The Resource Conservation and Recovery Act* which requires the EPA to regulate generators that produce hazardous waste.

2. *The Hazardous Waste Management Act (RCW Chapter 70.105)* designates Ecology as the state agency to implement the Resource Conservation and Recovery Act. The Act describes many key features of Ecology's hazardous waste management program including:

    - Establishing a permit system for land based treatment, storage, and disposal facilities.

    - Developing standards for the safe transportation, treatment, storage and disposal of hazardous wastes.

    - Establishing a manifest system to track hazardous waste. Establishing reporting, monitoring, records keeping, labeling and sampling requirements.

    - Inspecting, monitoring and sampling.

3. *The Dangerous Waste Regulations (Chapter 173-303)* were adopted by Ecology as authorized by the Hazardous Waste Management Act for the purpose of implementing its provisions. The purpose of the regulations are:

    - Designation of dangerous and extremely hazardous wastes

    - Surveillance and monitoring of these wastes.

    - Provision of forms and rules to establish a system for manifesting, tracking, reporting, monitoring, record keeping, sampling and labeling hazardous wastes.

- Establishment of siting, design, operation, closure, post-closure, financial, and monitoring requirements for hazardous waste transfer and land based treatment, storage, and disposal facilities and a permit system.
- Encourage recycling, reuse, reclamation and recovery to the maximum extent possible.

A Dangerous Waste Management Unit is a contiguous area of land on or in which dangerous waste is placed e.g. a surface impoundment, a waste pile, a land treatment area, a landfill cell, an incinerator, a tank and its associated piping and underlying containment system, and a container storage area (Chapter173-303-040 WAC).

The Hazardous Waste Management Act requires the development of a statewide Hazardous Waste Plan that is to be updated every 5 years. The plan must include but not be limited to:

- State inventory and assessment of capacity of existing facilities to treat, store, dispose of or otherwise manage hazardous waste.
- Forecast of future hazardous waste generation.
- A description of Ecology studies to determine appropriate waste management methods.
- A public information and education plan coordinated with local government efforts.
- Public involvement.

The plan contains seventy separate issues and recommendations. Some of the most important or relevant are:

- Ecology is understaffed to carry out inspection and enforcement activities.
- Staff turnover rates within the permit section was near sixty percent over the last several years, severely limiting Ecology's ability to process applications.
- Penalties for violations are based on environmental or human health risk. Economic gain by the violator may be sufficient to offset the penalty.
- The issuing of land based treatment, storage, and disposal facilities permits is extremely resource intensive.
- The existing permit application guidance is very general and non-technical. There is no standardized permit application format.

Under the Hazardous Waste Reduction Act, Ecology adopted the Pollution Prevention Planning Regulations where generators and users of more than threshold quantities of hazardous waste must prepare Pollution Prevention Plans for reducing use of hazardous

waste. Annual implementation progress reports must be submitted to Ecology. The Hazardous Waste Management Act declares that local government is the appropriate level for planning and carrying out programs to manage moderate risk waste with Ecology's assistance. In 1991, jurisdictions in King County developed and adopted the Local Hazardous Waste Management Plan with support of a state grant. The goal of the plan is to protect public health and the environment from the adverse effects of improper handling and disposal of hazardous wastes by Small Quantity Generators and households. Small quantity generators are those businesses that produce moderate risk waste, i.e. less than 220 pounds of hazardous waste and/or less than 2.2 pounds of extremely hazardous waste per month. (or which accumulates on-site no more than these amounts at any time.)

Ground water protection is discussed as a component of educational and enforcement activities during implementation of the plan. Of particular concern is the risk of ground water contamination associated with the disposal of hazardous wastes in on-site sewage disposal systems. The Local Hazardous Waste Management Program in King County intends to emphasize this concern in its education activities.

GOAL

Hazardous Waste Management - To ensure that ground water is not contaminated due to improper management of hazardous wastes.

ISSUES

Issue 1 - State Hazardous Waste Plan

The Washington State Hazardous Waste Plan has identified many deficiencies in the existing state program to regulate hazardous waste. These problems were identified by an Ecology-sponsored advisory committee made up of business leaders, government agency staff and elected officials, environmentalists, consulting firms, and educators over a period of two years. Ecology has stated in the Plan that it is committed to carrying out the recommendations developed by the committee. Implementation of the recommended strategies is necessary in order for the state to manage hazardous wastes in a manner that will protect ground water.

HM-1 State Hazardous Waste Plan - Implementation - The GWAC adopts the following resolution: "The GWAC supports the findings and recommendations of the Washington State Hazardous Waste Plan. The GWAC requests that Ecology and the Washington Legislature fund and carry out the provisions of the Plan with a sense of urgency in recognition of the threat posed to ground water from hazardous wastes." The GWAC will communicate this resolution to the Director of Ecology, the Assistant Director for Waste Management, and to the Washington Legislature.

Discussion - The Hazardous Waste Plan identifies problems and recommends solutions for Hazardous Waste Management. The 1994 update of the Plan stated that 40 of the 59 recommendations either have been or are being implemented, and that 11 of the 19 not yet implemented were scheduled for implementation during 1994-1998. The GWAC can effectively communicate its concerns for ground water protection from hazardous waste to Ecology and the Legislature by supporting the Plan. The GWAC's resolution will be communicated to Ecology via the Plan review and certification process. Letters could also be sent to Ecology and the appropriate committee chairs at the Legislature.

Implementation:

The request to carry out the solutions recommended by the Hazardous Waste Plan is communicated to Ecology during the review and certification process for the Plan. Additional letters will need to be written.

Task 1:	Support recommendations of the Hazardous Waste Plan.
Who:	King County.
When:	The Management Committee will develop an implementation schedule.
Cost:	Costs will be determined by the Management Committee.
Funding:	By participating agencies.

Issue 2 - Dangerous Waste Management Unit

The Dangerous Waste Regulations require a setback from the dangerous waste management unit to the aquifer of beneficial use. However, no setback is required from the unit to ground water, in general. In effect, the regulations indicate that the dangerous waste management unit may be located in ground water that is not being put to beneficial use. In addition, the siting regulations do not take into consideration the horizontal setback distances required in the Wellhead Protection Program.

HM-2 Dangerous Waste Management Unit - Siting of the dangerous waste management unit. Ecology should amend the Dangerous Waste Regulations (Chapter 173-303WAC) to require vertical separation from the seasonal high ground water level.

Discussion - Lack of separation by a layer of unsaturated soil increases the chances that hazardous waste leaks could get into ground water before detection and remedial action. Although discussions with Ecology staff indicate that location in ground water would probably not be allowed, nowhere is such a prohibition stated in the Dangerous Waste Regulations. At best, this inconsistency creates a lack of confidence in the siting criteria among concerned citizens and confusion upon the part of proponents and reviewers. At worst, a facility could be inappropriately sited increasing the possibility of ground water contamination.

The GWAC, by requesting an amendment, will bring this matter to the attention of Ecology administrators and will precipitate a change in the regulations if Ecology agrees to it. The GWAC should be aware, however, that Ecology went through an arduous process to adopt these rules over a period of several years. At least 53 public hearings and workshops were held. Ecology may be reluctant to open the regulations to change at this time. If that is the case, the GWAC concerns will at least be registered and may be entered in a list of future changes. In addition, staff will be alerted to the inconsistency.

Implementation:

The request to modify the setback from ground water is communicated to Ecology during the review and certification process for the Plan. No additional action is needed.

Issue 3 - Hazardous Waste Facilities Zones

King County has not designated zones in which hazardous waste storage and treatment facilities may be considered. Failure to designate zones will result in preemption by Ecology of local government jurisdiction over interpretation of zoning codes for the purposes of siting such facilities. This preemption is not permanent and local jurisdiction is returned upon designation of hazardous waste facility zones.

Discussion - The designation of zones will result in better waste management practices. It will recognize and facilitate the State "Close to Home Policy" aimed at encouraging on-site waste management including waste reduction and recycling. This policy also encourages communities who benefit most directly from businesses who generate hazardous wastes to accept some of the associated risk. On-site waste management also reduces the risks associated with transporting wastes. The waste generator may realize reduced costs for waste disposal by pursuing waste reduction and waste management alternatives.

Given that the state legislature determined that local government land use authority would be preempted to a large degree, it is probably better for King County to designate the zones in which, by its own interpretation, hazardous waste may be treated, stored and disposed of rather than have the State do it. It is not known if all of the cities in the GWMA have designated zones yet. The GWAC can raise this issue with the cities during the concurrence process for the South King County Ground Water Management Program.

Hazardous Waste Contamination Sites

Hazardous waste contamination sites are sites where hazardous waste has been spilled, leaked or disposed of into the ground.

The statutes which regulate hazardous waste contamination sites include:

The Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) established a trust fund commonly referred to as "Superfund" for the clean up of abandoned

or uncontrolled waste sites. The EPA has primary responsibility for clean up and enforcement under the CERCLA.

The Comprehensive Environmental Response, Compensation and Liability Act established a new agency within the U.S. Public Health Service called the Agency for Toxic Substances and Disease Registry to carry out health related authorities of the CERCLA. The Agency for Toxic Substances and Disease Registry functions as a branch of the U.S. Public Health Service concerned with health effects of toxic substances in the environment. The Agency for Toxic Substances and Disease Registry conducts "human health assessments" at hazardous waste sites listed on the national priority list, the most serious hazardous waste sites in the nation.

The Washington Model Toxics Control Act (MTCA)(RCW 70.105D), passed by Washington voters supplements the CERCLA. The stated purpose of the MTCA is to raise sufficient funds to clean up all hazardous waste sites and to prevent future hazards due to improper hazardous waste disposal (RCW 70.105.010.) The Toxic Control Accounts, both state and local, are created that may be used to carry out the MTCA. The MTCA establishes a program for Ecology to identify, investigate and clean up sites where hazardous substances have been released into the environment. Under the Act, Ecology adopted the Model Toxic Control Act Cleanup Regulations Chapter 173-340 WAC to develop a program to carry out the Act.

The Washington State Department of Health Office of Environmental Health has a role in hazardous waste site management that corresponds to the Agency for Toxic Substances and Disease Registry on the federal level. The Washington Department of Health Office of Environmental Health has a contract with the EPA to conduct health assessments for National Priority List sites in Washington for which the responsible parties do not include the federal government.

The Washington Department of Health Office of Environmental Health is also involved in locating and informing the EPA and Ecology of sites not on the National Priority List or the Hazardous Site List. The Washington Department of Health Office of Environmental Health has sought the assistance of local health departments in this task both by letter and newsletter but, to date, has not had much response state-wide. The importance of local participation is emphasized by the Washington Department of Health Office of Environmental Health because there are often sites of possible concern that only local health officials are aware of. Both federal and state officials indicate that more involvement by local health departments in site discovery and public outreach is needed.

Local governments are not subject to any legal requirements to regulate hazardous waste sites. They are involved in hazardous waste site cleanup primarily either as a responsible or affected party. The SKCHD is involved in any aspect of cleanup actions that is subject to its regulatory programs. Landfill closure is the main facet of clean up actions that the SKCHD regulates.

GOAL

Hazardous Waste Contamination Sites. To assist federal and state cleanup programs in discovering hazardous waste disposal sites in King County, and communicating to the public, the health risks associated with ground water pollution at those sites.

ISSUES

Issue 4 - Hazardous Waste Contamination Sites - Site Referral and Public Education

The Washington State Department of Health seeks a cooperative relationship with local health departments in the following areas: 1. referral of possible hazardous waste disposal sites, illness clusters, incidences of contaminated drinking water supplies, and related concerns to the Washington State Department of Health Office of Environmental Health; 2. assistance in gathering data in regard to these referrals; and 3. public education oriented towards health concerns in relation to hazardous waste sites, including those which may involve contaminated ground water.

HM-4 Hazardous Waste Contamination Sites - Site Referral and Public Education - King County will include the following in the duties of the SKCHD in regard to hazardous waste contamination sites:

- Assistance to the DOH in site discovery including collection of information regarding site history.
- Assistance to the DOH in public health information and referral regarding hazardous waste sites.

Discussion - Although hazardous waste site cleanup programs have a long way to go to remedy existing sites, it does not appear that regulatory involvement is needed on the local level. However, existing programs may not adequately address public health concerns in King County in regard to known or as yet undiscovered hazardous waste sites that may involve ground water pollution. Action HM-4 will bring the matter to the attention of King County. If King County agrees with the concern, it may instruct the SKCHD to enter into discussions with the Department of Health regarding the appropriate role for the local health department. This would be a role that would complement the federal and state roles, rather than duplicate them. Local knowledge, not available in any written record, would be taken advantage of in locating possible sites of concern. Local health departments could be of assistance to the DOH in obtaining a site history, given better knowledge and access to local land use records and residents who may have information. The SKCHD could assist the DOH in determining needs for public health information and in disseminating such information to the public at risk.

Implementation:

Task 1: Provide assistance to DOH.

Who:	SKCHD.
When:	The Management Committee will develop an implementation schedule.
Cost:	Costs will be determined by the Management Committee.
Funding:	By participating agencies.

Hazardous Material Spill Prevention and Emergency Response

This section addresses the prevention of and the emergency response to hazardous material spills both at facilities and during transport.

Spill prevention at facilities - Fire services in King County play a major role in prevention of hazardous material spills from fixed facilities. This role derives from the fire services responsibility to implement the Uniform Fire Code.

Each city in King County is responsible for its own fire protection and operates according to its own ordinances. Fire protection in King County is accomplished both by the King County Fire Marshall and fire districts. The County Fire Marshall's Office is the regulatory agency that implements the Uniform Fire Code including hazardous materials provisions. Fire districts, on the other hand, have responsibility for fire fighting and other emergency response including hazardous material spills. Fire districts do not have authority to adopt or enforce fire codes.

The Uniform Fire Code is developed by the International Fire Code Institute. The intent of the Uniform Fire Code is to prescribe requirements consistent with nationally recognized practices for safeguarding life and property from the hazards of fire and explosion associated with various practices, one of which is storage, handling, and use of hazardous materials.

There is no federally adopted version of the Uniform Fire Code. States are free to adopt a version of the Uniform Fire Code, amend it, or adopt none of it, although, in practice, all states adopt some version of the Uniform Fire Code. The 1994 version of the Uniform Fire Code became effective July 1995.

Chapter 19.27 RCW, The State Building Code, creates the Washington Building Code Council. This statute gives the Council the authority to adopt and revise the State Building Code including the Uniform Fire Code.

Article 80 of the Uniform Fire Code provides requirements for the prevention, control, and mitigation of dangerous conditions related to hazardous materials and provides for information needed by emergency response personnel. The Uniform Fire Code prohibits persons and businesses from using, storing, dispensing, or handling hazardous materials in quantities over a specified amount without a permit.

Inspections are performed by fire services to ensure compliance. These inspections are coordinated by the King County Fire Marshal in unincorporated King County. Storage areas must be constructed according to requirements including approved secondary containment facilities for some chemicals. Modifications to and closures of storage facilities must be done under permit.

With a few exceptions, such as the appropriate use of pesticides, the Uniform Fire Code prohibits release of any hazardous material to sewers, storm drains, surface waters, the ground, or to the air except under permit from appropriate agencies.

The King County Fire Marshal has discretionary authority to require commercial or industrial facility operators to prepare Hazardous Materials Management Plans and Hazardous Materials Inventory Statements prior to issuance of an operating permit. These documents are important tools that assist the fire services in implementing Article 80.

The Washington Building Code Council has adopted an amended version of the Uniform Fire Code. Two amendments that weaken the Uniform Fire Code in Washington may be of concern to the GWAC:

- Hazardous Materials Management Plans and Hazardous Materials Inventory Statements are not required from businesses regulated under the federal Emergency Planning and Community Right To Know Act (Chapter 51-24-80103 WAC); and

- An entire category of hazardous materials has been exempted from storage regulations under the Uniform Fire Code. This category is denoted in the 1991 Uniform Fire Code as "Carcinogens, irritants, sensitizers, and other health hazard solids, liquids and gases" (Chapter 51-24-80315WAC).

It was concluded by the Building Code Council that the Hazardous Materials Management Plans and Hazardous Materials Inventory Statements duplicate planning requirements under Emergency Planning and Community Right To Know Act. Some hazardous materials experts disagree with the Council and contend that fire services were left with less than adequate information for the facilities that they must respond to in an emergency.

The exemption of a category of hazardous materials from storage regulations is of concern for several reasons. The category exempted contains some of the substances that are of the greatest concern to those who are working to protect ground water quality. The section from which an exemption is granted includes a requirement for secondary containment for both indoor and outdoor storage of the materials included in the hazard class. No agency has the broad authority that the Uniform Fire Code grants to fire services nor are other agencies on site for inspections as frequently. The lack of regulation of storage practices for this hazard class at local businesses by the fire services could substantially weaken the effort to prevent the release of these materials to the environment and, ultimately, ground water.

Local governments may adopt the Uniform Fire Code as adopted by the state or may adopt a more stringent version. The version of the Uniform Fire Code adopted by local governments is important to ground water protection in that weaknesses inherent in the state version can be compensated for. King County adopted the Uniform Fire Code as written.

While the Uniform Fire Code prescribes the issuance of permits and periodic inspections, local governments establish the level at which the Uniform Fire Code is implemented. Staffing and level of involvement in hazardous materials regulation varies. Some fire departments haven't developed expertise in hazardous materials regulation nor have staff been dedicated to the task. King County has enforced the 1988 expanded version of the Uniform Fire Code.

While there is some overlap in regulatory authority, each of the agencies involved in spill prevention has a different emphasis. In many cases, the agencies can help each other to gain compliance or to maintain contact with businesses. Regulatory requirements added together provide better protection of both the environment and public safety than any regulation standing alone. While fire services have made great strides in implementing Article 80 of the Uniform Fire Code, the programs of local governments are not yet fully developed.

Hazardous Material Spills during Transport

The risk of ground water contamination posed by truck or rail transport of hazardous materials is determined by many factors including the nature and quantity of the materials transported, precautions taken in packaging and transport, safety factors including speed limits, congestion, highway or railway design and maintenance, and sensitivity of the area in which a spill occurs.

Many highways and roads in King County that are frequented by trucks carrying hazardous materials bisect areas which are geologically susceptible to ground water contamination or near municipal wells.

Risk assessments for transportation spills have not been done for King County, in general, although individuals may have done such studies to address particular concerns such as EPA review. Public water systems have included an assessment of risk associated with transportation spills in their wellhead protection programs.

Numerous federal and state agencies are responsible for the enforcement of the laws that are designed to prevent spills of hazardous materials from commercial carriers:

- The U.S. Department of Transportation, Federal Highway Administration, Office of Motor Carriers enforces regulations for interstate motor carriers contained in 49 Code of Federal Regulations Parts 100 - 199. Parts 171-180 are commonly referred to as the Hazardous Materials Regulations.

- The Federal Railroad Administration under the Washington State Department of Transportation regulates rail construction and safety as well as shipment of hazardous materials by rail.
- The Washington Utilities and Transportation Commission, the Washington State Patrol, the Washington Department of Transportation, and Ecology are all involved in preventing spills of hazardous materials from commercial motor carriers on the state level.
- Ecology has a role in regulation of transport of hazardous waste under WAC 173-303 Dangerous Waste Regulations which are more stringent than the Washington State Department of Transportation hazardous materials rules.

The consensus of the persons interviewed for the section on transportation spill prevention is that the system is working well and getting better. Regulations and programs governing packaging and transportation of hazardous materials are generally felt to be good and will become more effective with recent updates.

Emergency Response to Hazardous Material Spills

Emergency response to hazardous material spills that threaten the environment is the responsibility of many agencies. This section will discuss spill reporting, spill response, and emergency planning.

Spill reporting is required under the Washington Dangerous Waste Regulations, the federal Emergency Planning and Community Right to Know Act, the Department of Transportation's Hazardous Materials Regulations, Washington's UST Regulations and the Uniform Fire Code.

Spill response is unique to each spill. First responders to hazardous materials spills threatening life and property are usually the Hazardous Materials Units of local fire services.

The Emergency Planning and Community Right to Know Act - (42 U.S. Code Section 11045) was enacted by Congress in 1986. It was contained within the Superfund Amendments and Reauthorization Act, Title 3 and its provisions are often referred to informally as "SARA Title 3 requirements" although it is codified separately (not a part of Comprehensive Environmental Response, Compensation and Liability Act). The Emergency Planning and Community Right To Know Act requires emergency response planning for federal, state and local government with the participation of industry. It includes "right-to-know" provisions that provide communities with access to information on facilities in their locales. The Emergency Planning and Community Right To Know Act also requires emergency and toxic release reporting.

The emergency planning provisions of Emergency Planning and Community Right To Know Act require states to establish a State Emergency Response Commission, Emergency Planning Districts and Local Emergency Planning Committees. Local Emergency Planning Committees

must develop and facilitate the implementation of Local Emergency Management Plans in cooperation with the facilities who use, produce, or store "extremely hazardous substances".

King County has a basic Local Emergency Management Plan in place. Those industries that are subject to Emergency Planning and Community Right To Know Act regulations are required to participate in the preparation of the Local Emergency Management Plan. One of the ways in which they have participated is to provide emergency response plans for their own facilities. These have been incorporated into the Local Emergency Management Plan. Protection of people and property has been the primary emphasis of the Local Emergency Management Plan to date.

Some problem areas observed with the Local Emergency Management Plan are:

- Most industries subject to the Emergency Planning and Community Right To Know Act reporting requirements have not provided their emergency response plans to King County for incorporation into the Local Emergency Management Plan and
- King County should be collecting information from all fire services within the planning area regarding hazardous materials facilities and entering it into a database compatible with databases used by other jurisdictions within the county. King County has a database program but lacks the information needed to enter it into the database system.

It is generally recognized that the King County Local Emergency Management Plan needs significant improvement. There is also guarded optimism that the situation is about to improve.

A map of areas susceptible to ground water contamination from transportation spills of hazardous materials and the vulnerability assessment could be the basis for the Local Emergency Planning Committees to consider such issues as the routing and timing of extremely hazardous material shipments through the community, particularly physically susceptible areas. Highway design factors and speed limits could also be considered.

Another matter that may be of concern to the GWAC can be addressed by the Local Emergency Management Plan. In other areas of the nation, it has been found that fire fighting techniques in sensitive areas should be considered in advance of an emergency.

GOAL

Hazardous material spills - Ensure that spills of hazardous materials are prevented as much as possible, and adequately prepare to respond to spills of hazardous materials so that ground water contamination is minimized.

ISSUES

Issue 5 - Implementation of the Uniform Fire Code:

Article 80 of the Uniform Fire Code is a valuable tool to prevent hazardous material spills in business, industrial, and institutional settings. There are obstacles to comprehensive implementation of Article 80:

- Many jurisdictions within the GWMA have not fully developed their hazardous materials programs due to lack of adequate staff, training, and enforcement tools necessary to implement Article 80.
- The State Building Code Council has adopted a less stringent version of Article 80 that exempts important hazardous materials from full regulation by the fire services. In addition, some businesses and industries have been exempted from the requirement for Hazardous Materials Management Plans and Hazardous Materials Inventory Statements. Some local jurisdictions within the GWMA have not passed ordinances to retain the original scope of Article 80.

HM-5 Implementation of the Uniform Fire Code. King County and cities within the GWMA will:

- Commit staff and funding to comprehensive implementation of Article 80 in both new and existing facilities using both educational and regulatory approaches;
- Propose ordinances for adoption, if they have not already done so, that provide adequate enforcement tools to ensure compliance with Article 80 and that restore the requirements for:
    1. Hazardous Materials Management Plans;
    2. Hazardous Materials Inventory Statements;
    3. Storage requirements for "Carcinogens, irritants, sensitizers, and other health hazard solids, liquids and gases" found in the Uniform Fire Code 80.315; and
    4. Emphasize regulatory attention and educational activity in the most physically susceptible and recharge areas.

Discussion - The Uniform Fire Code does not prescribe penalties. Rather, it contains an ordinance format that may be used for the purpose of setting penalties. Local jurisdictions may or may not adopt a schedule of penalties. The County has a cumbersome civil penalty procedure that can be used to gain compliance. Only by commitment to an active program to implement Article 80 will its benefits be realized. GWAC, by requesting a commitment to program development will bring to the attention of local jurisdictions the importance of good hazardous materials management programs on the local level and will improve existing programs.

Because aquifers cross jurisdictional boundaries, less vigorous spill prevention in one jurisdiction can have a deleterious effect on the aquifer used by an adjacent jurisdiction. It is important, therefore, to seek consensus between all of the jurisdictions in the GWMA regarding the importance of prevention of spills of hazardous materials.

Article 80 as originally written does not incorporate an enforcement program. Each jurisdiction adopting the Uniform Fire Code must develop and adopt its own enforcement program. Many jurisdictions do not have authority to issue citations for violations of the Uniform Fire Code. The GWAC can express both its support for educational approaches and request better enforcement tools in the interest of better hazardous materials management.

Several key sections of Article 80 were altered or deleted by the State Building Code Council. Certain chemicals were exempted from storage requirements and some businesses were exempted from the requirements for Hazardous Materials Management Plans and Hazardous Materials Inventory Statements. Restoration of the original wording is important for ground water protection.

It would be beneficial if fire services could focus attention on physically susceptible and recharge areas (Wellhead Protection Areas) since contamination introduced in these areas presents the greatest risk to drinking water wells.

Implementation:

Initially, this action is implemented via the concurrence process. By concurring with the request, local governments will be committed to implementation of Article 80 of the Uniform Fire Code.

King County will develop criteria for evaluating the hazardous materials management programs of fire services and include an annual evaluation in its regular reports to the South King County Management Committee. King County will continue to encourage program development and implementation on an ongoing basis.

Task 1: Hazardous materials program development.

Task 2: Hazardous materials program implementation.

Who:	King County Fire Marshal and cities.
When:	The Management Committee will develop an implementation schedule.
Cost:	Costs will be determined by the Management Committee.
Funding:	By participating agencies.

Task 3: Evaluation of hazardous materials programs.

Who:	King County.
When:	The Management Committee will develop an implementation schedule.

Cost: Costs will be determined by the Management Committee.
Funding: By participating agencies.

Issue 6 - Implementation of the Emergency Planning and Community Right-to-Know Act

Most experts conclude that the King County Local Emergency Management Plan does not adequately address coordination issues essential for responding to regional disasters including large chemical spills. Most of the facilities that have extremely hazardous substances on the premises in large quantities that are regulated by Emergency Planning and Community Right To Know Act have not yet submitted emergency response plans for inclusion in the Local Emergency Management Plan. A centralized database has not been developed that would facilitate data sharing between jurisdictions who may need to jointly respond to large scale incidents. The Local Emergency Management Plan has not, to date, considered the locations of sensitive areas such as most physically susceptible and recharge areas in developing emergency response measures in part because of the lack of information. The EPA has enforcement authority and will use it to assist the County in obtaining compliance with the Emergency Planning and Community Right To Know Act but because of the lack of a centralized database and referral system, the EPA is not receiving referrals for enforcement.

HM-6 Implementation of the Emergency Planning and Community Right-to-Know Act - King County for the Local Emergency Management Plan, and cities will seek a permanent source of funding to provide staff and resources necessary to complete a comprehensive Local Emergency Management Plan that includes the following:

- Emergency response plans for all industries that have more than threshold quantities of extremely hazardous substances on premises;
- A centralized, current, database with 24-hour access containing information regarding the locations and amounts of hazardous materials in King County including both Emergency Planning and Community Right To Know Act-regulated facilities and those that are regulated only under the Uniform Fire Code;
- Provisions for adequate coordination between agencies and jurisdictions that might be involved in responding to a major chemical spill;
- Provisions for community outreach so that new businesses are brought into the system;
- A hazard analysis that takes into consideration the locations of most physically susceptible and recharge areas, Wellhead Protection Areas, Sole Source Aquifers and public water systems utilizing ground water sources;
- Fire-fighting techniques and emergency response techniques that favor ground water protection in physically susceptible and recharge areas

- Referral of facilities that fail to meet Emergency Planning and Community Right To Know Act requirements to the EPA for enforcement;
- Provisions for regular testing of the emergency response plan.

Discussion - The requested improvements above reflect the concerns related to a Local Emergency Management Plan as described by federal guidelines.

The King County Office of Emergency Management coordinates the activities of the Local Emergency Planning Committee. The Local Emergency Planning Committee contains representatives of cities and fire districts in King County. This Committee determines what is in the Local Emergency Management Plan, and how each agency will coordinate with the others.

Maps of physically susceptible and recharge areas and Wellhead Protection areas will provide emergency planners with the necessary information to plan for appropriate response to spills in these areas. Fire fighting and emergency response techniques that are as protective of ground water as possible should be considered.

EPA will provide the last resort to obtain compliance from facilities that have been uncooperative with educational approaches. This is needed because local emergency response officials do not have enforcement authority under the Emergency Planning and Community Right To Know Act.

The Local Emergency Management Plan must be continually updated and tested to be effective. Community outreach is needed so that new businesses are brought into the system. The database should be dynamic and rapidly incorporate information taken from routine inspections done by local fire services. In this way, emergency planners, elected officials, and resource protection planners can assess the threat to the environment and public health from hazardous materials in the community on an ongoing basis.

Implementation:

For implementation of the Plan, King County will:

- Provide maps of physically susceptible and recharge areas and Wellhead Protection Areas, and well location maps to the King County Office of Emergency Management.
- Provide information regarding emergency response techniques necessary to protect aquifers and wells for Local Emergency Planning Committee consideration, and incorporation into the Local Emergency Management Plan.
- Review existing literature and determine the need to contract for a consultant with expertise in this area.

- Develop recommendations in conjunction with the office of Emergency Management as coordinator of the Local Emergency Plan Committee. It is recommended that King County work through the Local Emergency Management Plan.

King County will discuss funding to implement this action with the King County Office of Emergency Management Manager and city fire departments. The goal of this discussion is to determine whether implementation can be funded by an industry supported program.

Task 1: Develop and implement an improved Local Emergency Management Plan.

Who:	King County (Office of Emergency Management) in cooperation with city and other members of the Local Emergency Planning Committees.
When:	The Management Committee will develop an implementation schedule.
Cost:	Costs will be determined by the Management Committee.
Funding:	By participating agencies.

Task 2: Communicate the locations of physically susceptible and recharge areas and wells to emergency responders.

Who:	King County.
When:	The Management Committee will develop an implementation schedule.
Cost:	Costs will be determined by the Management Committee.

Task 3: Prepare a report for the office of Emergency Management concerning fire fighting and emergency response techniques that are protective of ground water for consideration by the Local Emergency Planning Committee.

Who:	King County.
When:	The Management Committee will develop an implementation schedule.
Cost:	Costs will be determined by the Management Committee.
Funding:	By participating agencies.

Task 4: Develop recommendations in conjunction with the King County Office of Emergency Management regarding fire fighting and emergency response techniques for inclusion in the Local Emergency Management Plan. Ensure that this information is shared with emergency responders throughout King County.

Who:	Management Committee.
When:	The Management Committee will develop an implementation schedule.
Cost:	Costs will be determined by the Management Committee.

Task 5. Report on the progress of development and implementation of the Local Emergency Management Plan in relation to GWAC concerns.

Who:	King County.
When:	The Management Committee will develop an implementation schedule.
Cost:	Costs will be determined by the Management Committee.
Funding:	By participating agencies.

Issue 7 - Prevention of aquifer contamination associated with transportation-related hazardous material spills

An assessment of the risk of aquifer contamination from transportation-related hazardous material spills in King County could provide information regarding the significance and characteristics of this problem. The information obtained could be used to identify risk reduction strategies.

HM-7A - Transportation-Related Hazardous Materials Spills-Purveyor Assessment: Purveyors of large public water systems (1000 connections or more) will;

- Assess the risk of transportation-related hazardous material spills in their wellhead protection programs;
- Develop and implement risk reduction strategies as needed.

HM-7B Transportation-Related Hazardous Material Spills - Management Committee Evaluation - The Management Committee will evaluate recommendations developed and actions taken by the Washington State Department of Health's Transportation Engineering Subcommittee in order to determine whether further actions should be taken on a county-wide basis to protect aquifers from transportation-related hazardous material spills.

Discussion - The State Wellhead Protection Program require public water system purveyors to assess contamination risks in wellhead protection areas. It is likely that assessing risks of transportation-related hazardous material spills will be one of the components. The GWAC can ensure that this matter is considered by bringing it up during concurrence with the Plan. Public water system purveyors should address problems unique to their wellhead protection area in their Wellhead Protection Program.

The DOH convened a process to identify ways in which transportation hazardous material spills could be more effectively prevented and responded to. The DOH plans to pursue changes on a state level if appropriate. Participants included the DOH, Ecology, Transportation, Federal Highway, Federal Railroad and chemical and transportation industries. The GWAC could take advantage of this existing process and defer the matter to the Management Committee for further resolution.

Implementation:

The Management Committee will review this issue according to its priorities and will address it prior to the plan update.

Task 1: Assess the risk of transportation-related hazardous material spills in wellhead protection areas.

Who:	Public water system purveyors (1000 connections or more).
When:	The Management Committee will develop an implementation schedule.
Cost:	Costs will be determined by the Management Committee.
Funding:	By participating agencies.

Task 2: Develop and implement risk reduction strategies as needed.

Who:	Public water system purveyors (1000 connections or more).
When:	The Management Committee will develop an implementation schedule.
Cost:	Costs will be determined by the Management Committee.
Funding:	By participating agencies.

Task 3: Review and comment on draft proposals and evaluate recommendations/actions of the Department of Health's Transportation Engineering Subcommittee and determine whether further action should be taken on a county-wide basis to protect aquifers from transportation-related hazardous material spills.

Who:	Management Committee.
When:	The Management Committee will develop an implementation schedule.
Cost:	Costs will be determined by the Management Committee.

Task 4: Prepare a brief evaluation of progress made by purveyors in addressing this issue for the GWAC and the Management Committee.

Who:	King County.
When:	The Management Committee will develop an implementation schedule.
Cost:	Costs will be determined by the Management Committee.
Funding:	By participating agencies.

2.3.2 Ground Water Concerns Associated with Underground Storage Tank Management

Commercial Underground Storage Tanks

Commercial underground petroleum and chemical storage tanks represent a significant potential threat to ground water quality in South King County. Leakage from underground storage tanks (USTs) and associated piping often occurs without detection and even relatively small amounts of certain compounds can have serious adverse impacts on ground water quality. Once released from an UST, some volatile organic compounds and petroleum products can rapidly migrate through the soil profile to ground water.

The precise number of USTs that are located in King County is not known. However, Ecology estimates that at least 6,550 such tanks are currently in operation, not including home heating oil tanks.

USTs are regulated by federal, state, and local governments. Private sector pressures from insurance and lending institutions also bring increasing pressure to bear upon owners and operators of USTs to install and maintain systems in a manner which reduces liability risks by avoiding spills. A summary of each level of governmental regulation is provided below.

Federal Program - Federal regulations (Technical Standards and Corrective Action Requirements for Owners and Operators of USTs, 40 CFR 290 Part 280) have been developed by the EPA under Subtitle of the Resource Conservation and Recovery Act. The EPA regulations contain provisions for delegation of the federal UST Program to the states.

State Program - Chapter 90.76 RCW (1989) directs Ecology to develop an USTs program designed, operated, and enforced in a manner that meets the requirements for delegation of the federal UST Program. Chapter 90.76 RCW provided Ecology with authority to adopt rules for management of all USTs that are governed under the EPA regulations. Accordingly, Ecology adopted the state UST Regulations (Chapter 173-360 WAC) in November 1990. These comprehensive regulations incorporate the minimum requirements of the federal USTs Program. Certain classes of USTs are exempt from regulation under both the Ecology and EPA UST programs. These classes include tanks of less than 1100 gallons that store heating oil and farm and residential motor fuel tanks of up to 1100 gallons.

Local Programs Under Chapter 90.76 RCW - Under Chapter 90.76 RCW, Ecology is encouraged to delegate portions or all of the state USTs Program responsibilities to cities, towns, or counties. The annual fees collected by Ecology will be apportioned between Ecology and the city, town, or county assuming responsibility for the program or a portion of the program. However, local governments seeking delegation of the entire program would be undertaking a heavy commitment with funding options available.

Local jurisdictions may establish UST programs more strict than the state program if they do so to protect an "Environmentally Sensitive Area." Under Chapter 90.76 RCW, local UST regulations that are more stringent than those contained in Chapter 173-360 WAC can be implemented, subject to approval by Ecology, in an Environmentally Sensitive Area. Environmentally Sensitive Areas are geographic areas that possess physical characteristics that make them especially vulnerable to releases from USTs. A city, town, or county can request Ecology to designate an area within its jurisdiction as an Environmentally Sensitive Area. If a single Environmentally Sensitive Area is located within more than one political jurisdiction, such as two different cities or one city and a county, the jurisdictions can jointly request that Ecology designate the area as sensitive.

An area can qualify as an Environmentally Sensitive Area in one of two ways:

1) if the area has already been granted special environmental status under another state or federal statute or regulation for the purpose of protecting ground water or surface water from pollution, or

2) the local jurisdiction must demonstrate that ground water is vulnerable to pollution because of site specific hydrogeological characteristics (Chapter 173-360-520 WAC).

An Environmentally Sensitive Area designation under authority of Chapter 90.76 RCW is not synonymous with an Environmentally Sensitive Area designation under Chapter 197-11-908 WAC of SEPA; however, a single area could be designated as an Environmentally Sensitive Area under both Chapter 90.76 RCW and SEPA. Designation under Chapter 90.76 RCW affects only the construction and operation of USTs while designation under SEPA can affect a much broader range of land-use activities.

Local Programs Under Uniform Fire Code - Local fire protection agencies must regulate USTs under the provisions of the Uniform Fire Code (Article 79 Uniform Fire Code). Chapter 51-16 WAC, State Building Code adopts the Uniform Fire Code by reference. Local governments must enforce the provisions of the Uniform Fire Code as adopted and modified by the state. Local jurisdictions may adopt more stringent requirements.

It should be noted that some cities in King County do not believe that the Uniform Fire Code authorizes them to regulate heating oil tanks. King County Fire Marshal's office, however, does regulate heating oil tanks under Article 79 of the Uniform Fire Code. The July 1995 version of the Uniform Fire Code included regulations for heating oil tanks. The King County Fire Marshal's office annually inspects all known hazardous material storage use or handling facilities, including USTs.

King County is legally responsible for permitting and inspecting the installation and removal of USTs within unincorporated areas regardless of whether the area is in a Fire District. Fire Districts are responsible for the fire fighting function while the King County Fire Marshal's office is responsible for technical tasks such as construction plan review for compliance with fire safety codes and hazardous materials storage including plan review for new USTs. The Fire Marshal's office is a section of the Department of Development and Environmental Services. City fire departments carry out both the fire fighting and permitting tasks.

USTs of 10,000 gallons or larger in size must undergo environmental review under SEPA. The SEPA section of the King County Environmental Division, Department of Development and Environmental Services routinely requires secondary containment for USTs of this size in Ground Water Management Areas upon review of permit applications referred by the Fire Marshal's office. It is not known whether city SEPA reviewers are requiring secondary containment.

Leaking Underground Storage Tank Management - Section 205 of the Superfund Amendments and Reauthorization Act of 1986 created an UST Trust Fund intended to pay

for the cleanup of releases of hazardous substances, including petroleum products, from USTs. The fund is administered by the SEPA Office of USTs.

The fund is intended to support cleanup of leaking USTs in cases where no financially solvent owner/operator can be identified, where the owner/operator refuses or is unable to promptly respond to the problem, or where an imminent hazard to public health or the environment exists. The fund also provides financial assistance to state governments for development of state leaking UST response programs. Ecology developed this state's Leaking UST Program through this fund. Releases of hazardous substances from USTs in this state are currently addressed by Ecology through oversight of voluntary cleanup actions by tank owners or through enforcement actions.

Underground Home Heating Oil Tanks

Leaking underground home heating oil tanks may also present a threat to ground water quality. Both federal and state regulations adopt a less aggressive approach to regulation of heating oil tanks, however, because of differences in the constituency and migration in the soil of fuel oils.

Potential problems associated with home heating oil tanks include leakage from operating tanks and releases from improperly abandoned tanks containing residual product. Many of the existing home heating oil tanks within King County are likely to be bare steel tanks without cathodic protection and, as such, a large percentage may be leaking or will leak in the future.

The number of underground home heating oil tanks in operation within King County is unknown, primarily because the number and locations of such tanks is considered proprietary information by the heating oil industry. The King County Department of Assessments has information regarding the heat source for residences excluding mobile homes. The information is not necessarily accurate, however, because it is often not updated when oil to gas conversions occur. The frequency of underground home heating oil tank abandonment has been estimated at 20 percent over the last decade.

The Uniform Fire Code requires that tanks which have remained unused for a period of one year must be abandoned in a manner prescribed by Article 79, which generally involves removal and proper disposal of the tank. The tank may be abandoned in place at the discretion of the fire chief (or in the case of King County) by the Fire Marshal. Whether removed or abandoned in place, the remaining product must be removed and disposed of properly. The tank must be filled with concrete or other approved substance if abandoned in place.

Compliance with Uniform Fire Code requirements has been historically very low according to the King County Fire Marshal's office. There are many home heating oil tank owners that are unaware of their responsibilities under the Uniform Fire Code. Tank owners that are aware of their responsibilities are often reluctant to undertake proper tank abandonment because of the

relatively high cost, about $2,000 per tank. This cost could double or more, if soil sampling and removal of contaminated soil are required.

GOAL

To ensure that underground chemical and fuel storage tanks and piping systems are managed adequately to prevent contamination of ground water.

ISSUES

Issue 1 - Augment State Underground Storage Tank Program

The UST management program administered by Ecology does not have resources to field check and monitor for compliance with regulations.

UST-1A Augment State Underground Storage Tank Program - Inspection- King County and cities will enhance current inspection of UST and piping system installation and removal in accordance with the requirements of Chapter 173-360 WAC - UST Regulations.

Discussion - Designation of Environmentally Sensitive Areas in King County by Ecology will give local jurisdictions an opportunity to build upon the Ecology program. Ecology has already indicated that their program will not involve field inspections of each individual UST. Many of the compliance activities associated with the Ecology rules will be conducted through the mail. Ecology anticipates that their UST program will stress a self-policing approach. Preventing contamination of some of the more highly vulnerable aquifers in King County from the operation of USTs may require a more comprehensive management program than that currently envisioned by Ecology. An enhanced program may be developed and implemented commensurate with the importance of the physically susceptible areas as areas contributing recharge to important public water supplies.

Designation of the entire GWMA would create workable boundaries for administrative purposes and is supportable from a protection standpoint since the GWMA boundaries are based on ground water divides. Chapter 173-360-510 WAC provides that Ground Water Management Areas may be readily designated as Environmentally Sensitive Areas.

Funding sources for state and local activities are connected. Ecology charges an annual tank fee to all UST owners. If an Environmentally Sensitive Area is established, Ecology may charge a supplemental fee for tanks in the area. Ecology may pass through some of this supplemental fee to local programs, however, Ecology must retain a sufficient portion of the fees necessary for operation of the state program. This may be the entire fee, since the fee set by the legislature is very low. Local jurisdictions are prohibited by Chapter 90.76 RCW from assessing additional annual tank fees. Local programs may assess a permit fee in Environmentally Sensitive Areas to support local program activities.

Therefore, State and local governments are limited in their ability to assess industry for program costs. Local governments that are interested in developing enhanced UST programs should determine which aspects of the state program need enhancement and offer possibilities for adequate funding, given the prohibitions against increased annual tank fees contained in Chapter 90.76 RCW and the small possibility of a portion of the supplemental Environmentally Sensitive Area fees.

Tank installation and removal are critical steps in the management of USTs. Removal is particularly important because of the opportunity to detect and clean up previous spills. These are activities that are already inspected for compliance with the Uniform Fire Code. This action offers the possibility of expanding the existing inspection program to include relevant requirements of the UST Regulations. Increased permit fees to offset inspection costs would not violate the prohibition against raising the annual tank fee. Staff training is an aspect of the program that could be funded by pass-through monies collected by Ecology based upon status of the Ground Water Management Areas as Environmentally Sensitive Areas.

Feasibility of an enhanced inspection program will rest upon resolution of a number of issues by state and local government:

- Each of the existing Ground Water Management Areas except Vashon Island includes one or more incorporated communities. Decisions regarding the nature of an enhanced local program must be jointly made by all of the affected jurisdictions.

- Local governments will need to develop a proposal and submit it to Ecology. Ecology will determine whether the proposal meets the requirements of laws and regulations governing designation of Environmentally Sensitive Areas and provisions for stricter local programs. The amount of money collected by Ecology and available for passing through to the local program will have to be negotiated.

- A key local decision involves delegation of the new responsibility. Both fire protection agencies and the SKCHD, could logically carry out the program. Fire protection agencies offer the advantage of current involvement in an existing inspection program. On the other hand, the SKCHD may be the most appropriate agency to implement the program because it has legal standing in all incorporated and unincorporated communities in King County. It may be much simpler and offer consistency if a King County Board of Health rule were to establish a County-wide program such as that in existence for on-site sewage disposal. It is unknown whether a King County Board of Health rule could be implemented by the fire protection agencies but that possibility could be explored. At least one neighboring county has a joint program for tank removal inspection. The Tacoma-Pierce County Health Department inspects for environmental concerns while the fire protection agencies continue to inspect for fire code requirements. This arrangement is reported to be

working well with good cooperation between the two entities involved. The joint program offers the benefit that fewer personnel must be trained to do inspections.

- Staff must be trained in the installation and removal requirements of the UST Requirements. Funds are needed to pay for this activity. A possible source is the supplementary annual tank fee Ecology collects in Environmentally Sensitive Areas. It is planned that this money will be turned over to local governments for the purpose of carrying out enhanced local programs in Environmentally Sensitive Areas.

- A fee for the installation of new USTs will be needed to offset the costs incurred by the agency responsible for plan review and on-site inspections associated with the design and installation of new USTs. Plan review and on-site inspection costs can be quite high.

- Expansion of the enhanced program to other cities or unincorporated areas of the County should be considered. However, supplemental annual tank fees would not be available to train staff. It is possible that training could be provided to all jurisdictions in the County for the same cost as to those in Ground Water Management Areas. This possibility should be considered.

Implementation:

Task 1: Prepare and submit petition to designate the GWMA as an Environmentally Sensitive Area. After Environmentally Sensitive Area designation, there may be additional work, such as publicity, mapping, and notifying affected agencies.

Task 2: To enhance current inspection program of UST installation and removal in Environmentally Sensitive Areas to include the relevant requirements of Chapter 173-360 WAC - UST Regulations, the following steps are needed:

- Determine local regulatory authority.

- Develop elements of an enhanced program, including training and evaluation.

- Determine role of local agencies in implementation. For example, King County Fire Marshal's office and local fire service jurisdictions could assume responsibility for UST management, provided that they have the capacity or interest.

- Amend ordinances as necessary to implement the program.

Task 3: Develop and implement a training program for inspectors regarding additional requirements of the UST Regulations in order to carry out the inspections referred to in Task 2. The Management Committee must decide who is to provide this training. This program includes determining the additional training needed,

identifying inspectors in need of this training, and train all inspectors within a given time frame.

Task 4: Determine how to modify local program based upon:

- Ecology's annual reports evaluating the state UST program;
- Annually reviewing effectiveness of local programs. Need to develop evaluation methods.

Who: King County, cities, and the Management Committee.
Cost: Costs will be determined by the Management Committee.
Funding: By participating agencies.

UST-1B Augment State Underground Storage Tank Program - Ordinance: King County will prepare an ordinance regarding underground tanks containing the following requirements:

- Disclosure at the time of sale of any real property in King County of the number, location, and legal status of existing USTs to the purchaser and to King County; and
- Secondary containment of all new tanks.

Discussion - Requiring disclosure of any tanks on a piece of property would provide a source of information for the database on tank location. This would enable King County to provide information on a specific property to anyone in need of the information. This would also provide the Fire Marshal's Office information on heating oil tanks. The education program could include these properties for direct mail or other educational activities.

Requiring secondary containment for new tanks would close a gap in the current federal and state regulations. Federal and state regulations do not require secondary containment of USTs. This measure would help prevent ground water from becoming contaminated. Current regulations only require leak detection, which may not alert tank operators until after ground water is contaminated. Secondary containment is where the primary tank is enclosed within a second impermeable barrier, with some provision for all or partial containment of the tank volume. Combining secondary containment with interstitial monitoring can detect leaks before they escape into the environment.

Implementation:

Task 1: Prepare King County ordinance.

Who: King County.
When: The Management Committee will develop an implementation schedule.
Cost: Costs will be determined by the Management Committee.
Funding: By participating agencies.

Issue 2 - Exempt Tanks

Chapter 173-360 WAC UST Regulations are reactive in some respects. The regulations focus on monitoring and post-leak detection, rather than prevention of leaks. Certain classes of USTs are partially or completely exempt from federal and state regulation.

UST-2A Exempt Tanks - Secondary Containment - King County will prepare an ordinance requiring secondary containment for new underground chemical storage tanks as defined by Chapter 173-360-120 WAC and for new installations of heating oil tanks of all sizes and motor fuel tanks of 1100 gallons or less.

Discussion - Current state regulations focus on monitoring and post-leak detection, rather than prevention of leaks. They provide for leak detection methods which may not alert tank operators until ground water is already contaminated.

Requiring secondary containment would enhance current regulations by providing a method to prevent leaks. Secondary containment offers the best protection from contamination of the environment from leaks from USTs. It is both economically and technically feasible.

Secondary containment refers to the practice of enclosing the primary tank within a second impermeable barrier. The secondary vessel may be a separate container or it may be an integral component of the primary tank. Leak detection monitoring is provided in the space between the tanks.

The primary reason to consider secondary containment is because it offers the best prevention of leaks that contaminate soil and ground water. It is the only method that detects the potential for spills before the spill is introduced into the environment.

King County could reduce the possibility of future contamination of ground water in a major way by requiring that this precaution be taken. The industry widely recognizes the advisability of secondary containment and most commercial installations now incorporate it.

The smaller, exempt tanks could also benefit from secondary containment. Most existing exempt tanks lack corrosion protection and many are probably leaking. Exempt tanks are home and farm tanks of 1100 gallons or less that store motor fuel for consumptive use on the premises and heating oil tanks of 1100 gallons or less; Also, heating oil tanks over 1100 gallons in size are exempt from some of the requirements of federal and state regulations. Secondary containment equipment is available for small tanks as well as large and is economically feasible.

Fire protection agencies already have programs to review plans for above and underground tanks that are fee-supported. A requirement for secondary containment or above-ground storage would have major impact on the existing inspection programs.

Implementation:

Task 1: The Management Committee should determine who would enforce this ordinance. It may not be feasible to have King County pass an ordinance that the Fire Marshal enforces.

Task 2: Prepare an ordinance for King County (or other appropriate body) consideration requiring secondary containment for USTs (as in Chapter 173-360-120 WAC) and for exempt tanks.

Who:	King County with Management Committee coordination.
When:	The Management Committee will develop an implementation schedule.
Cost:	Costs will be determined by the Management Committee.
Funding:	By participating agencies.

UST-2B Exempt Tanks - Testing - King County will prepare an ordinance for King County consideration regarding USTs requiring that all underground storage tanks without secondary containment, that are in use and exempt from the state UST Regulations, must be tested at regular intervals for integrity by qualified personnel (certified as per Chapter 173-360 WAC). The results of the testing must be reported to the King County Fire Marshal and King County. Companies that deliver product to these tanks must report lapsed certification to the King County Fire Marshal and King County.

Discussion - Requiring that exempt tanks are tested and tagged would ensure that leaking tanks don't receive more product. This would also help address the question whether ground water is being contaminated from these tanks. These tank locations could be added to the database for analysis. This is a stringent requirement that would provide a lot of information. A future problem that would need to be addressed is what would be done with the information, and if there would be any follow-up.

Implementation:

Task 1: Prepare an ordinance for King County's consideration.

Who:.	King County.
When:	The Management Committee will develop an implementation schedule.
Cost:	Costs will be determined by the Management Committee.
Funding:	By participating agencies.

Issue 3 - Heating Oil Tanks

Home heating oil tanks may not be maintained and properly abandoned. Homeowners often are unaware of requirements for the proper operation and abandonment of underground heating oil tanks. There are currently no programs in place to educate citizens or provide

incentives for proper operation and abandonment. Also, homeowners are reluctant to abandon tanks properly and under permit due to the expense associated with remediating a site with contaminated soil.

Also, the extent of the threat to ground water associated with underground heating oil tanks, including those serving single family residences, is unknown. Locating these tanks would help in determining the potential threat. It is unknown how many of these tanks are in the GWMA or where they are located.

UST-3A Heating Oil Tanks: Abandonment and Maintenance - King County will prepare an ordinance for King County's consideration regarding underground tanks containing the following provisions for home heating oil tanks:

- Proof from the Fire Marshal or fire chief that the underground heating oil tank was abandoned in accordance with regulations prior to final approval of any permits associated with energy conversions (gas piping, electrical, etc.), and

- Require underground heating oil tanks that are abandoned in place are filled in a manner that precludes further storage of any chemical in the tank.

Discussion-Requiring disclosure of any tanks on a piece of property would provide a source of information for the database on tank location. This would enable King County to provide information on a specific property to anyone in need of the information. This would also provide the Fire Marshal's Office information on heating oil tanks. The education program could include these properties for direct mail or other educational activities.

Requiring secondary containment for new tanks would close a gap in the current federal and state regulations. Federal and state regulations do not require secondary containment of USTs. This measure would help prevent ground water from becoming contaminated. Current regulations only require leak detection, which may not alert tank operators until after ground water is contaminated. Secondary containment is where the primary tank is enclosed within a second impermeable barrier, with some provision for all or partial containment of the tank volume. Combining secondary containment with interstitial monitoring can detect leaks before they escape into the environment.

Requiring proof that the underground heating oil tank was properly abandoned before any permits associated with energy conversions (gas piping, electrical, etc.) are issued will provide a method to ensure that fewer tanks are improperly abandoned upon energy conversion. This would require an additional check to be reviewed by the permit issuing agency, but a standard form could be developed to provide this information.

There is a potential problem with the current requirement for material used to fill tanks. If for some reason the tank cannot be removed, the tank must be filled with inert material, generally interpreted to mean concrete or other approved substance. However, sand and other porous

material is allowed. This type of material would allow storage of some liquid product, which could be another contamination source for ground water. The local regulation of abandoning tanks in place could require that the material used to fill tanks be concrete or other material that would not allow storage of any other material in the tank.

Requiring that exempt tanks are tested and tagged would ensure that leaking tanks don't receive more product. This would also help address the question whether ground water is being contaminated from these tanks. These tanks location could be added to the database for analysis. This is a stringent requirement that would provide a lot of information. A future problem that would need to be addressed is what would be done with the information, and if there would be any follow-up.

Implementation:

Task 1: Prepare an ordinance for King County's consideration.

Who:	King County.
When:	The Management Committee will develop an implementation schedule.
Cost:	Costs will be determined by the Management Committee.
Funding:	By participating agencies.

UST-3B Heating Oil Tanks: Location - King County and cities will jointly explore ways to quantify the problem within King County including the development of a database which provides the location, status and other appropriate information for these tanks.

Discussion: A database of UST locations could be used to help analyze the threat to ground water from tanks, and to provide a client list for educational activities. The database could include information gathered from all of the above activities, and other sources. This information could be compared to sensitive areas and leaking tank reports from Ecology and analyzed by the Management Committee and King County to determine if the current program meets the ground water protection goal. This information could also be used to help deliver information from the Education Program to tank owners.

Implementation:

Task 1: Develop a database on tank location by collecting and entering information (existing and new);

Task 2: Maintain database;

Task 3: Analyze periodically;

Task 4: Provide location information to Education Program, other users such as Ecology.

Who:	King County, and cities, under Management Committee direction.
When:	The Management Committee will develop an implementation schedule.
Cost:	Costs will be determined by the Management Committee.
Funding:	By participating agencies.

UST-3C Heating Oil Tanks: Education - King County and cities will jointly educate homeowners and owners of exempt tanks regarding tank abandonment requirements of the Uniform Fire Code through the Plan Education Program.

Discussion- Including home heating oil tanks in the overall Plan Education Program will help address the low level of compliance with the requirements for home heating oil tank abandonment. Homeowners are unaware of their responsibilities under the Uniform Fire Code, probably because there are no programs on proper maintenance and abandonment. By providing educational material to tank owners, an increase in the community knowledge about the problem, and, hopefully, an increase in the numbers of tank owners that comply with the regulations would result. Also, by increasing community awareness, it is expected that home purchasers would require information on tank status be disclosed.

Implementation:

This will be included in the Education Program.

2.3.3 Ground Water Quality Issues Relating to On-Site Sewage Treatment and Disposal System Use

Ground water contamination associated with domestic on-site sewage system effluent can involve a number of contaminants including nitrate, bacteria, viruses, and trace organic chemical compounds. Nitrate is often considered the most significant contaminant associated with domestic wastewater since it is highly resistant to removal from treatment mechanisms present in the soil profile. Bacteria and viruses can be attenuated during migration through a few feet of fine to medium textured soils provided unsaturated flow conditions can be maintained. However, coarse textured, excessively permeable soils are ineffective in removing bacteria and viruses. Also, domestic effluent often contains volatile and semi-volatile organic compounds at very low levels. These organic chemicals are generally residues from household cleaning and paint products, and are known as household hazardous wastes. If on-site sewage systems are improperly designed or constructed, installed in inadequate soils, used at too high of a development density, or used to dispose of non-domestic wastewater, they can adversely impact surface and ground water quality as well as public health.

There is an extensive regulatory system currently in place at the state and local level to prevent adverse public health and environmental impacts from the use of on-site sewage treatment and disposal systems. During development of this Plan, the GWAC identified the need to revise the state on-site regulations to meet the intent of the Water Quality Standards for Ground Water (Chapter 173-200 WAC). The state regulations were modified and

implemented on January 1, 1995. This modification served to strengthened the ground water protection provisions of applicable on-site sewage system regulations and standards. For example, state regulations allow only approved septic tank additives to be used after January 1, 1996.

In addition to the regulatory programs, the King County Comprehensive Plan contains several policies about on-site systems:

F-244: On-site wastewater treatment systems in the Rural Area and Natural Resource Lands should be designed, built and operated as permanent methods of sewage disposal.

F-245: King County should monitor on-site systems that have shown evidence of failure or potential for failure. The data should be used to correct existing problems and prevent future problems. King County should analyze public funding options for correcting on-site wastewater system failures which may include, where feasible and otherwise consistent with this Plan, conversion to community sewage systems or installation of public sewers.

Improved design criteria in the revised regulations appear to have further reduced the threat to ground water quality posed by new individual residential on-site systems. However, within the GWMA, there may be existing high density developments served by conventional on-site sewage systems. To date, water quality problems associated with such developments have not been documented. Also, extensive ground water monitoring efforts to identify problems associated with on-site sewage systems have not been undertaken.

GOAL

To promote on-site sewage treatment and disposal practices that are effective in protecting ground water resources from possible adverse impacts.

ISSUES

Issue 1 - Nitrate Concerns

The designs of most on-site sewage treatment and disposal systems installed in Type 1 soils prior to April 1987, the implementation date of King County Board of Health Title 13, did not incorporate enhanced treatment technology. These systems often support development densities that exceed one residential unit, or equivalent, per acre. The poor treatment efficiency of conventional on-site sewage systems installed in coarse textured soils suggests a potential for nitrate contamination of underlying ground water, especially in areas where the density of on-site sewage systems is relatively high. Nitrate concentrations may build up in the zone of contribution to public water systems to unacceptable levels resulting in contamination and potential loss of drinking water supplies.

OS-1 Nitrate Concerns - The GWAC requests that the following be considered by the Management Committee:

1. Require that Wellhead Protection Programs for systems serving over 1000 connections incorporate nitrate loading analysis in determining the level of risk to public water supplies associated with on-site sewage treatment and disposal systems and other sources of nitrate; and

2. Work with land use authorities to require alternative methods of sewage disposal where nitrogen levels are found to be unacceptable (more than 5 mg/l).

Discussion - Taking no action would continue to expose the public to potential contamination or loss of its drinking water supplies. The extent of the risk, however, would remain unknown if nitrate loads are not measured, modeled, and predicted. It is possible because of a lag time in the travel of nitrate to wells that by the time the problem is detected it would be too late to remedy the situation.

Public water system purveyors are required to delineate Wellhead Protection Areas and develop Wellhead Protection Programs. Wellhead Protection Areas include the surface and subsurface area surrounding a well or wellfield that supplies a public water system through which contaminants are likely to pass and eventually reach the well(s). Wellhead protection areas must be managed by a community in order to protect ground water based drinking water supplies. Research has shown that, when median nitrogen levels are 6 mg/l or greater, 10 percent of nitrate samples will be greater than the 10 mg/l maximum contaminant level. Many communities in the nation have set a limit of 5 mg/l to provide a margin of error and safety.

An analysis of current and future loading will enable planners and public officials to make informed decisions regarding land use and water use. Where current nitrate levels threaten public water supplies, decisions regarding future water supply will need to be made. Such alternatives as a new drinking water source or the extension of public sewers to the community can be considered. The nitrate loading analysis will also enable planners and public officials to make decisions regarding future land use in the Wellhead Protection Area.

Implementation:

Task 1: Require that Wellhead Protection Programs for systems serving over 1000 connections incorporate nitrate loading analysis in determining the level of risk to public water supplies associated with on-site sewage treatment and disposal systems and other sources of nitrate;

Who:	Management Committee.
When:	The Management Committee will develop an implementation schedule.
Cost:	Costs will be determined by the Management Committee.
Funding:	By participating agencies.

Task 2: Work with land use authorities and special purpose districts to require alternative methods of sewage treatment and disposal where nitrogen levels are found to be unacceptable (more than 5 mg/l).

Who:	Management Committee.
When:	The Management Committee will develop an implementation schedule.
Cost:	Costs will be determined by the Management Committee.
Funding:	By participating agencies.

Issue 2 - Hazardous Materials

Because some types of commercial, industrial, and institutional facilities use or store hazardous materials in their day to day operations or dispose of hazardous wastes, there may be an opportunity for hazardous materials or wastes to be inadvertently or intentionally discharged to on-site sewage treatment and disposal systems serving those types of facilities.

OS-2A Hazardous Materials: Inventory, Educate and Monitor - King County should:

1. inventory commercial, industrial, and institutional facilities served by on-site sewage treatment and disposal systems which potentially use, store, or dispose of hazardous materials;

2. educate operators regarding hazardous materials management, and;

3. selectively monitor those facilities that appear to represent a significant risk to ground water quality.

Discussion - A number of important programs are being implemented as a result of the Local Hazardous Waste Management Plan for King County. However, those activities are not currently designed to emphasize the unique risks associated with hazardous materials introduced into on-site sewage systems.

Once released to the soil column, hazardous materials or hazardous wastes can potentially migrate to underlying ground water. Since low levels of some hazardous materials in drinking water can pose a high level of risk to human health, even releases of small quantities of hazardous materials to an on-site sewage system can have a profound impact on underlying ground water quality.

The inventory proposed here could enable the SKCHD Wastewater Section to identify facilities that are likely have the types and quantities of hazardous substances on the premises which would suggest a relatively high risk of a release of those substances to the on-site sewage system. Those high risk facilities should be targeted for earliest possible on-site educational activities and educational activities under the Local Hazardous Waste Management Plan. The educational activities will provide facility owners and operators with information concerning alternative products, proper hazardous substance storage, handling,

recycling, disposal, and spill containment. Should the on-site educational activities reveal any facilities where wastewater other than that of residential/domestic quality is being generated, the owner/operator would be asked to make changes in their operation. If the changes are not made, then they would be referred to the Ecology for possible regulation under the State Waste Discharge Program.

Changes in occupancy of commercial, industrial, and institutional facilities could be carefully monitored by SKCHD, and the inventory periodically updated.

The SKCHD, would develop and implement this program with the Local Hazardous Waste Management Program in King County.

This action should prove moderately effective in limiting the release of hazardous substances to on-site sewage systems serving commercial (including food service establishments), industrial, and institutional facilities.

Implementation:

Task 1: Prepare inventory.

Task 2: educate operators.

Task 3: carry out monitoring program.

Who:	SKCHD. Some education of operators is being done through the Local Hazardous Waste Management Program.
When:	The Management Committee will develop an implementation schedule.
Cost:	Costs will be determined by the Management Committee.
Funding:	By participating agencies.

OS-2B Hazardous Materials: Regulations - The SKCHD will prepare, for King County Board of Health consideration, amendments to Title 13 of the Code of the King County Board of Health to expressly prohibit the use of on-site sewage systems for disposal of any materials or substances other than domestic sewage as defined in Chapter 246-272-010 WAC.

Discussion - Under this action, the SKCHD would prepare amendments to Title 13 to prohibit the discharge of non-domestic wastewater to on-site sewage systems. Chapter 246-272-03001 WAC allows the health officer to regulate "residential sewage." The primary intent of the alternative is to emphasize the SKCHD's existing authority under the revised WAC to prevent the discharge of non-domestic wastes to on-site sewage systems, particularly wastes containing hazardous materials.

Enforcement of this provision will require careful review of site applications for on-site sewage treatment and disposal by the SKCHD. The SKCHD should consider requiring discharge monitoring reports from operators of commercial or institutional establishments.

Strengthening the regulatory authority to prevent discharges of non-domestic wastewater may assist in enforcement actions.

Implementation:

Task 1: Prepare amendments to Title 13.

Task 2: Adopt amendments.

Who:	Task 1: SKCHD.
	Task 2: King County Board of Health.
When:	The Management Committee will develop an implementation schedule.
Cost:	Costs will be determined by the Management Committee.
Funding:	By participating agencies.

Issue 3 - Household Hazardous Wastes

Household hazardous wastes can enter the wastewater stream when residues from cleaning and paint products or quantities of unwanted chemical substances are disposed of in a sink or toilet. When discharged to an on-site sewage system, household hazardous wastes may pass through the system and migrate to underlying ground water. While wastes from any single residence are not likely to have detectable impacts on underlying ground water, the cumulative effects of many residences may be significant. Many people are unaware that common household products often contain chemical compounds that can present an environmental or even public health hazard if improperly handled.

OS-3A Household Hazardous Wastes: Onsite Disposal Risks - The Local Hazardous Waste Management Program in King County will coordinate with the Household Hazardous Waste Education Committee to include information about the risks to ground water associated with the disposal of household hazardous wastes to on-site sewage systems as part of their household hazardous waste educational activities.

Discussion - The SKCHD will undertake measures to increase public awareness concerning the potential impacts of discharging household chemical products to an on-site sewage system. Such measures will be an extension of activities scheduled as part of the Local Hazardous Waste Management Program in King County.

Implementation:

Task 1: Conduct educational activities.

Who:	The SKCHD.
When:	The Management Committee will develop an implementation schedule.
Cost:	Costs will be determined by the Management Committee.
Funding:	By participating agencies.

OS-3B Household Hazardous Wastes: Educational Program - King County will develop and carry out a public education program intended to increase the awareness of proper on-site sewage system operation and maintenance, including the risks associated with disposal of hazardous wastes in such systems.

Discussion - This will be included in the overall Plan education program. One item that has been identified to be done for this action is that prior to any scheduled reprinting, the existing public information pamphlet concerning on-site sewage system maintenance and operation will be amended to provide instructions concerning proper household hazardous waste disposal practices.

Implementation:

As per the Education Section.

Issue 4 - Operation and Maintenance - Homeowners and businesses may not be aware of the location and proper operation and maintenance of on-site sewage treatment and disposal systems.

OS-4 Operation and Maintenance - The SKCHD will prepare amendments to Title 13 of the Code of the King County Board of Health, for King County Board of Health consideration, to require that the as-built on-site sewage treatment and disposal system plan be recorded with the property deed in order that it be transferred with the title at the time of property transfer. In addition, information concerning the relationship between on-site system maintenance and operation practices and ground water protection should be added to the standard as-built plan form.

Discussion - This action is supported by King County Comprehensive Plan policy F-245: "King County should monitor on-site systems that have shown evidence of failure or potential for failure. The data should be used to correct existing problems and prevent future problems. King County should analyze public funding options for correcting on-site wastewater system failures which may include, where feasible and otherwise consistent with this Plan, conversion to community sewage systems or installation of public sewers." An as-built plan is a scale drawing of an on-site sewage treatment and disposal system as it is actually installed at a construction site. It is submitted to the SKCHD by the designer after construction is completed.

The as-built plan serves the important function of demonstrating the location and configuration of the on-site sewage system at a site. The standard as-built form of the SKCHD also provides information concerning general maintenance and operation of the system such as recommended frequency of septic tank pumping. That information could be expanded to include information concerning household hazardous waste disposal practices.

Currently, there is no requirement for the home or business builder or first owner to provide the as-built plan to subsequent owners of a home or business. By requiring the as-built to be

recorded with the deed, the as-built will be provided automatically to subsequent owners with the title report.

This action should be highly effective in ensuring that critical information concerning the location and configuration of the on-site sewage system is transferred to a home or business purchaser. It also affords an opportunity to transmit information concerning proper on-site sewage system maintenance and operation. Recording of the as-built will result in nominal cost to the initial home or business owner. No significant obstacles to implementation are anticipated.

Implementation:

Task 1: Prepare amendments to King County Board of Health Title 13

Task 2: Adopt amendments

Who:	Task 1: SKCHD.
	Task 2: King County Board of Health.
When:	The Management Committee will develop an implementation schedule.
Cost:	Costs will be determined by the Management Committee.
Funding:	By participating agencies.

2.3.4 Ground Water Quality Issues Related to the Use of Pesticide and Fertilizer

Pesticides and fertilizers are used for the control of plant and animal pests and promotion of plant growth. Pesticides are a large and varied group of substances that are specifically designed to kill biological organisms including weeds, insects and rodents. Fertilizer is used to promote plant growth. Pesticides and fertilizers are in everyday use all around us. The major categories of use are agriculture, home, forestry and rights-of-way maintenance. Pesticides and fertilizer have the potential to contaminate ground water when they are used improperly.

Home use accounts for approximately 20 percent of pesticide use in the Puget Sound region. Unlike licensed pesticide users, home or business owners are not trained in proper application procedures or in diagnosing whether a particular pesticide is needed, and may use them improperly. The use of fertilizer and pesticides by non-agricultural users will likely increase as King County's population continues to grow.

In rural areas, agricultural activities are likely to have presented the greatest threat to ground water quality. Past activities, before current federal and state regulations were in place, may have contaminated ground water. In addition, current agricultural practices, especially by small farms, may not adequately protect ground water.

A variety of entities use herbicides for right-of-way maintenance. These include county public works, electric companies, state Department of Natural Resources, railroads, natural gas companies and oil pipeline companies. Right-of-way maintenance consists of a combination of herbicide use and physical methods such as mowing. For example, Puget

Sound Energy maintains low-growing plant communities under their power lines by using a combination of physical and chemical plant maintenance techniques. Also, King County uses selective chemical weed control on road shoulders.

The current regulations and programs may be enough to protect ground water. There has not been a reported incident of ground water contamination related to these practices in King County. However, close examination of ground water quality in King County has not yet been accomplished. Ground water contamination related to pesticide and fertilizer use may not have been reported because, in the past, no one looked in the right places for it, the expense for this analysis has been prohibitive, and laboratories did not have the capability to analyze for these components. Monitoring and research programs are difficult to design because there is little accurate information about the types of compounds used in the region and the patterns of use. The South King County Ground Water Management Program included pesticide and fertilizer components in the ground water quality sampling program to characterize the aquifer(s). Additional work through an ongoing monitoring program is needed to evaluate the long-term effect of pesticides and fertilizer on ground water.

Small farms may need help to ensure that their practices do not contaminate ground water. National and local programs which have addressed this problem have found that a cooperative effort between agriculture, educators and regulators is the best approach.

The main local effort for this is through the King Conservation District. The District's goal is technical assistance, education and cooperation for the agriculturist. The District works with landowners to train and instruct them on best management practices to improve water quality and to increase productivity, provides technical assistance to landowners who are developing farm management plans on their own initiative or who have been referred by Ecology prior to taking enforcement action, and develops local education and information programs on soil and water conservation. The District boundaries include all unincorporated King County and any incorporated areas that have been annexed into the District. The Conservation District depends on funding from outside sources, such as King County, Ecology, Washington Conservation Commission and private groups.

The Conservation District helps part-time farmers manage small acreage. Management practices can be implemented as individual practices or as components of integrated farming systems, known as Farm Conservation Plans. A Farm Conservation Plan is a comprehensive plan for managing farm resources to protect the quality of the environment and maintain economic viability of the farm. Farm Plans integrate best management practices to protect ground water quality into a comprehensive resource protection plan designed for the individual farm. Each Plan is made to fit a particular farm, by the person who runs the farm, with the help of a soil conservationist from the Conservation District. Different ways to overcome problems and take advantage of opportunities to make better use of the soil, water and plant resources are covered in the farm plan. The landowner makes all of the implementation decisions. This is primarily a voluntary educational approach, since Farm Plans are developed with the farmers input, and are not mandatory.

In the Puget Sound Water Quality Management Plan, Non-Point Source Pollution Program (see below), the Authority states tbat the use of farm conservation plans is the preferred approach to controlling pollution from both commercial and noncommercial farms (the Conservation District's farm conservation planning and practices documents for farm conservation plans are the recommended standard).

The Washington State Department of Agriculture is the state agency with primary authority over pesticide and fertilizer sale and use through the following regulations:

- Chapter 15.54 RCW *Fertilizers, Agricultural Minerals and Limes* requires that commercial fertilizer distributors must report twice a year to the Washington State Department of Agriculture on the net tons of fertilizer they distribute in Washington.

- Chapter 15.58 RCW *Washington Pesticide Control Act* requires that pesticide dealers and private and public pest control consultants must be licensed. Licensees must demonstrate knowledge of pesticide laws, hazards, and the safe distribution, use and application and disposal of pesticides, and they may be required to keep records, including quantity of pesticide, date of shipment and receipt, name of consignor and consignee, and any other information requested by the Washington State Department of Agriculture.

- Chapter 17.21 RCW *Washington Pesticide Application Act* authorizes the Department of Agriculture to regulate pesticide applicators. This law provides authority for licensing and record keeping for pesticide applicators, including farmers.

- Chapter 16-228 WAC *Rules Relating to General Pesticide Use* require record keeping by pesticide dealers on the sale of restricted use pesticides, on the distribution of pesticides, except those labeled for home and garden use only, and on distribution of state restricted use pesticides. Certified applicators must keep records on application sites. These records must be given to the Director of the Department of Agriculture upon request.

The Washington State Department of Agriculture conducted the Record Database Pilot Project to explore the feasibility of using pesticide application records in a State geographic information system (GIS). This approximated requesting and cataloguing the information that commercial pesticide dealers and certified applicators are required to keep. Because the data request was voluntary, the data received was not a complete summary of all pesticides applied in the areas for the year. Several major applicators, such as railroad, rights-of-way, and a few commercial farms did not submit records. Most homeowner use in urban areas also was not part of the database as record-keeping is not required of these individuals. In general, the Washington State Department of Agriculture found that a general application data request was very expensive and time consuming. Those individuals and businesses that have had record keeping requirements for some time were able to complete the information required fairly accurately. Small hobby farms and individuals who have not been required to keep

records in the past had difficulty. Most records submitted needed staff time to analyze before the data could be entered. Approximately six or seven records per hour could be entered into the computer geographic information system. Since major record requests can involve thousands of applications, present staffing could not effectively handle the data. The GIS and database were shown to be feasible if the initial data request is limited to specific sites or specific pesticides.

The Washington State University Cooperative Extension Service is part of the state educational system. They develop and implement a broad range of educational programs and resource materials. Specific programs are developed relating to pest and nutrient management for homeowners, recreational areas, and crop and livestock production. They provide technical assistance in selecting and implementing "Best Management Practices (BMP)" and integrated pest management systems for specific sites and circumstances. They also provide training to private and commercial pesticide applicators to prepare for licensing and recertification exams.

The Pesticide Reduction Program is a grant project by the Washington State University Cooperative Extension Service. This prevention education program emphasizes proper diagnosis of plant problems and advocate alternatives and reduced pesticide use. The Program targeted residents and businesses in the Green-Duwamish and Cedar River watersheds during January 1992 to December 1994. This project could be applied to the GWMA, if it is found to be effective in reducing pesticide and fertilizer impacts on ground water.

Ecology has coordinated a multi-jurisdictional effort to address the impacts of pesticide and fertilizer use on ground water. This effort has produced Protecting Ground Water: A Strategy for Managing Agricultural Pesticides and Nutrients. April 1992, which is referred to as the "State Strategy." The Strategy is intended to provide support and direction to agencies and the agricultural community in their efforts to protect and preserve ground water quality in rural areas.

The focus of the Strategy is on protection of ground water, rather than remediation. It identifies and supports activities and programs to prevent contamination, and will allow both the agricultural community and involved agencies to make best use of resources.

The Puget Sound Water Quality Authority has adopted the comprehensive Puget Sound Water Quality Management Plan. The 1991 Plan update includes: the addition of monitoring for pesticides in Puget Sound; additions to the household hazardous waste program to incorporate educational opportunities for urban and suburban residents about pest management alternatives and the proper application of pesticides; and two new elements in the non-point source pollution section addressing water quality impacts from pesticides. These additions are reflected in the following policies:

- Non-point Source Pollution Program: NP-16 Pesticide Usage Surveys in Selected Watersheds. Cooperative Extension will be the lead to design pilot pesticide usage survey for selected watersheds in the Puget Sound Basin. Cooperative Extension shall

include appropriate agencies, scientists and local governments in designing and conducting the surveys. The surveys should define spatial and temporal use patterns; focus specifically on pesticides of concern in the watershed; include information from all major users, including homeowners; and identify storage and disposal practices.

- Non-point Source Pollution Program: NP-17 Puget Sound Pest Management Information Program. Cooperative Extension will be the lead to establish this Program by designing and implementing program activities with an advisory group. The program will work through existing programs and groups, to conduct research and education on integrated and targeted pest management, promoting conservative use of pesticides particularly by local governments and homeowners.

Educational activities although currently extensive, may not correctly reflect the threat to ground water from the use of pesticide and fertilizer and the ways to reduce that threat. A variety of education programs are currently underway, which could be evaluated and augmented with information on the relationship with pesticide and fertilizer use and ground water. This includes the extensive activities of the Washington State University Cooperative Extension Service. The Puget Sound Water Quality Authority Plan contains two policies for Cooperative Extension:

- Household Hazardous Waste Program: HHW-2 Information and Education on Less-Toxic Alternatives for Household Products. Cooperative Extension will work with others to make information and training available to promote targeted and proper use and disposal of pesticides as part of the implementation of the local hazardous waste plans. Cooperative Extension will consult with other groups on the type of information and program needed.

- Non-point Source Pollution Program: NP-17 Puget Sound Pest Management Information Program. Cooperative Extension shall act as the lead to establish a Puget Sound Pest Management Information Program. Cooperative Extension will design and implement program activities with an advisory group. The program will work through existing programs and groups, including the King County Roads Division program on integrated pest management, to conduct research and education on integrated and targeted pest management, promoting conservative use of pesticides particularly by local governments and homeowners.

In summary, more control of pesticide and fertilizer impacts on ground water is possible. This would involve utilizing current technology to target the areas that could benefit most from increased education or regulation. Current technology is available in King County to determine ground water susceptibility and vulnerability to pollution. Susceptibility depends upon the overlying soil characteristics. Vulnerability depends on the presence of contaminants at the surface. It is also possible to match the chemical characteristics of pesticide and fertilizer to the soils capability to absorb and break them down, thereby identifying possible ground water contamination sources. Ground water monitoring

parameters could then be designed to include the predicted pesticide and fertilizer components. The various educational efforts could be augmented with information on the impacts on ground water from the use of pesticide and fertilizer.

GOAL

To prevent ground water contamination from the use of pesticide and fertilizer.

ISSUES

Issue 1 - Pesticide and Fertilizer Use

Use of pesticide and fertilizer may pose a threat to ground water quality.

PF-1A Pesticide and Fertilizer Use: Farm Plans - King County and cities will encourage and support the King Conservation District to maintain expertise needed for development of Farm Plans using Best Management Practices (BMPs) for any agricultural user of pesticide and fertilizer in physically susceptible areas. Water purveyors may contract with the Conservation District to develop Farm Plans in physically susceptible and recharge areas.

Discussion - The cumulative impact from large numbers of small farms can be substantial. As more land is developed on the border between urban and rural zones, more small or hobby farms are created. Various agencies provide training on best management practices, and integrated pest management, but hobby farms are not required to attend, and often do not have the time, or do not know about opportunities to learn about best management practices and integrated pest management. Farm plans include best management practices and integrated pest management for a variety of farm practices, including pesticide and fertilizer use. This would provide a mechanism for direct education of the hard-to-reach pesticide and fertilizer users.

Probably NOT done

After the physically susceptible and recharge areas are identified, water purveyors may decide to contract with the King Conservation District to identify and contact all of the small farms that would be affected, and work with them to develop Farm Plans. King Conservation District has the administrative framework in place for Farm Plans. However, they do not have unassigned funding for this type of task. This work would need additional funding from water purveyors.

Implementation:

Task 1: Estimate how many farm plans are needed and how much funding is needed.

Task 2: Contact farms and prepare farm plans.

Who:	King County Conservation District
When:	The Management Committee will develop an implementation schedule.
Cost:	Costs will be determined by the Management Committee.

Funding: By participating agencies.

Task 3: Provide funding for Farm Plan development. Funding will be provided by participating agencies.

PF-1B: Pesticide and Fertilizer Use: Pesticide Reduction Program - King County, cities and water purveyors will evaluate the Cooperative Extension Pesticide Reduction Program for effectiveness for protecting ground water and applicability to the GWMA.

Discussion - The Cooperative Extension Pesticide Reduction Program emphasizes proper diagnosis of plant problems and advocate alternatives and reduced pesticide use. It targeted homeowners, commercial pesticide applicators and nursery operators in the Green-Duwamish and Cedar River watersheds, during January 1992 to December 1994. King County and cities should evaluate its effectiveness and possible applicability for implementation in other areas in the county to determine if this program would be useful for ground water protection. This evaluation would be done with Cooperative Extension. The Management Committee must also determine funding needs and sources. A potential funding source could be from development fees as a mitigation for non-point source pollution.

Implementation:

Task 1: Evaluate Program.

Task 2: Determine if program is applicable to the GWMA.

Task 3: Determine funding sources.

Task 4: Design and implement program in the GWMA.

Who: Management Committee.
When: The Management Committee will develop an implementation schedule.
Cost: Costs will be determined by the Management Committee.
Funding: By participating agencies.

PF-1C Pesticide and Fertilizer Use: Vegetation Maintenance Practices - King County, Cities and Special Purpose Districts will use non-chemical vegetation maintenance practices or will use only chemicals which, when approved application methods are used, do not pose a threat to ground water.

King County and cities will determine if maintenance practices by others in the GWMA needs to be restricted to non-chemical methods or chemicals which, when approved application methods are used, do not pose a threat to ground water. The GWAC encourages the Washington State Department of Transportation, Washington State Parks and Recreation Commission and public and private companies to follow these maintenance practices.

Discussion - Vegetation management chemicals readily leach into soils and could have a detrimental effect on ground water. Some public and private agencies are decreasing or eliminating use of leaching chemicals, and are actively researching alternative methods. For example, King County developed and implemented an integrated pest management program. However, some agencies have not followed this trend. These agencies are not easily reached through existing educational programs. This would be a preventative, not remedial action, as there has been no documented case of ground water pollution from these practices.

This action is supported by King County Comprehensive Plan policy, E-157 which states "Environmentally sound methods of vegetation control should be used to control noxious weeds."

Research into use would involve a variety of agencies and companies, including the State Department of Transportation, State Parks and Recreation Commission and public and private companies.

Implementation:

Task 1: Adopt ordinance/policy that only non-chemical vegetation maintenance or non-leaching chemicals be used for right-of-way maintenance.

Who:	King County and cities.
When:	The Management Committee will develop an implementation schedule.
Cost:	Costs will be determined by the Management Committee.
Funding:	By participating agencies.

Task 2: Research practices by other organizations.

Task 3: Determine if prohibition is needed based upon research.

Who:	Tasks 2, 3: King County, cities and Special Purpose Districts.
When:	The Management Committee will develop an implementation schedule.
Cost:	Costs will be determined by the Management Committee.
Funding:	By participating agencies.

Issue 2 - Education and Proposed Programs

Many issues concerning the use of fertilizers and pesticides are best addressed by the State Strategy and the Puget Sound Water Quality Authority Plan and various educational efforts. Implementation of many of the programs outlined in the Strategy and the Plan depend upon public support and funding from the Legislature and other sources. Existing educational efforts may not address ground water protection policies and goals of the Plan.

PF-2A Education and Proposed Programs: Strategy - The GWAC supports the strategies in "Protecting Ground Water: A Strategy for Managing Agricultural Pesticides and Nutrients.

April 1992" and the 1991 Puget Sound Water Quality Authority Plan (Household Hazardous Waste Program: HHW-2 Information and Education on Less-Toxic Alternatives for Household Products and Non-point Source Pollution Program: NP-17 Puget Sound Pest Management Information Program) to help insure that small farmers and homeowners receive adequate information about pesticide and fertilizer use.

Discussion - The State Strategy and the Puget Sound Water Quality Authority Plan address statewide use of pesticide and fertilizer. Since they are statewide strategies, they are not specific to King County, but attempt to attain similar ground water protection goals. They provide an overall backdrop to development of local programs. They contain state-wide proposals, yet provide guidance to developers of local non-point plans, wellhead protection strategies, and ground water management plans. These strategies would benefit from recognition and support in the Plan.

Implementation:

Task 1: The Plan states that the State Strategy and the 1991 Puget Sound Water Quality Authority Plan will be supported.

Who:	Ground Water Management Committee
When:	The Management Committee will develop an implementation schedule.
Cost:	Costs will be determined by the Management Committee.

PF-2B Education and Proposed Programs: Review - The existing educational program content will be reviewed for agreement with the Plan policies and goals. King County will review the current educational programs of the Soil Conservation Service, Cooperative Extension and others to ensure that the Plan goals and policies are reflected. This will be done as part of the Plan education program.

Discussion - Prevention of pollution is the best approach from the standpoints of cost and environmental impact. Education is the best prevention because it creates an awareness and concern in individuals, which influences their decisions.

King County will seek the cooperation of the parties involved to include ground water information and concerns in the educational programs. This review will ensure that the Plan goals and policies are reflected. The Cooperative Extension and others have several educational efforts underway. They integrate ground water protection information where possible, and are agreeable to including more. The Cooperative Extension, the Soil Conservation Service and others could include the Plan concerns in their educational material.

Developing an independent educational program to address this issue would probably be largely redundant. It would not likely be supported financially by elected officials in a time of lean budgets. Funding for staff at the SKCHD is necessary to carry out the review, coordination, report, and development of a supplemental program, if needed.

Implementation:

As per the Education Program.

2.3.5 Ground Water Quality Issues Related to Well Construction and Decommissioning

Wells provide a link between an aquifer and the earth's surface. Modern wells consist of a well casing that extends downward from the ground surface to the aquifer within a cylindrical bore hole. Chapter 173-160 Washington Administrative Code (WAC), Minimum Standards for Construction and Maintenance of Wells, requires that the space between the casing and the wall of the bore hole be sealed to prevent vertical movement of water along the outside of the casing. If this space is not adequately sealed, it may serve as a conduit by which contaminated surface or subsurface water may travel into an aquifer.

Under Chapter 173-160 WAC, any well that is unusable, whose use has been permanently discontinued, which is in such disrepair that its continued use is impractical, or is an environmental, safety, or public health hazard, must be decommissioned. The principal objective of proper decommissioning procedures is to restore, as far as possible, the original hydrogeologic conditions at the well site. Proper decommissioning procedures entail sealing the well in such a way that water is excluded from the well and no vertical movement of water is possible. An improperly decommissioned well may serve as a conduit for contaminated ground or surface water, permit continued flow of water to the surface from an artesian aquifer, alter the pressure conditions within a confined aquifer, or present a physical hazard at the surface.

Resolving the issue of potential aquifer contamination by improper well construction and decommissioning involves ensuring that existing regulations pertaining to construction and decommissioning are followed. Ecology is the agency responsible for regulating well construction and decommissioning by administering the State standards. However, Ecology has sufficient work force and budget to inspect only a fraction of the wells constructed and decommissioned each year. Because of Ecology's budgetary limitations, well construction and decommissioning is largely self-policed by well owners and contractors. Also, prior to 1973, Ecology did not require well contractors or owners to submit well logs. As a result, an unknown number of wells exist in the state without any record and therefore cannot be evaluated for compliance with regulations.

In response to these and other concerns, Ecology was authorized to delegate to local health districts or counties the authority to administer and enforce the well sealing and decommissioning portions of the water well construction program. Utilizing the expertise and work force of the local health jurisdictions may help in ensuring that wells are constructed and decommissioned properly.

GOAL

To protect the quality of ground water in the GWMA by ensuring that proper well construction and decommissioning procedures are followed.

ISSUES

Issue 1 - State Program

Existing regulations for well construction and decommissioning are not adequately enforced.

WC-1 State Program - King County and Ecology will develop a local health department program for implementation of the delegated portion of the well construction and decommissioning program in King County.

Discussion - Delegation of part of a program to the local Health Department has been demonstrated to be dynamic method of ensuring that public health concerns are safe-guarded, as shown by the local health department/Washington State Department of Health programs for on-site sewage disposal and small public water systems. A partnership between local and state government could provide a greater degree of protection for the public health than what is currently in effect, because local Health Departments are closer to the public and see more problems on a day-to-day basis than does Ecology.

The SKCHD would work with Ecology to develop a program. This will include showing how King County meets the requirements and adding the program to the SKCHD's budget. The local program would include identification tagging as part of the program. Ecology would continue to perform the administrative aspects of the program, such as well driller licensing and instruction; well log review and record-keeping; providing technical information and training to the local health department; and completing enforcement procedures, when necessary.

Implementation:

Task 1: Develop and implement program.

Who:	Ecology and the SKCHD.
When:	The Management Committee will develop an implementation schedule.
Cost:	Costs will be determined by the Management Committee.
Funding:	By participating agencies.

Issue 2 - Well Identification

Wells need to be identified so that Ecology may implement their programs to protect the ground water resource. There is no method to systematically identify wells in King County. Wells that were drilled prior to 1973 were not required to submit well logs to Ecology, and there is no program to identify wells that should be decommissioned.

WC-2A Well Identification: Disclosure - King County should pursue legislation to require sellers of real property to disclose to buyers the existence of used or unused wells on the property.

Discussion - King County estimates that, on the average, a residence is sold every five years. This disclosure could identify a significant number of unknown wells. Buyers will be notified using a coordinated disclosure form which could encompass other environmental, health and safety concerns in addition to well decommissioning and identification. The form will notify buyers that unused or unusable wells, or wells presenting an environmental, safety or public health hazard are required to be decommissioning according to procedures outlined in Chapter 173-160 WAC. It will also state that wells are legally required to be tagged with a well identification number. The disclosure form will indicate whether decommissioning has been performed according to requirements.

Identification numbers for wells on the property, if available, will be provided on the form. The cost for this evaluation would be borne by the parties to the transaction.

This would result in Ecology, the Washington State Department of Health and the SKCHD responding to the reported wells. This response could be slow, given the current funding of their programs. Ecology would oversee the decommissioning of wells or delegate this to the SKCHD. The Washington State Department of Health (DOH) and the SKCHD would enforce existing regulations on any unapproved public water supplies that were found.

Implementation:

Task 1: Prepare ordinance or policies which will require sellers to disclose to buyers the existence of used or unused wells on the property.

Who:	King County and cities.
When:	The Management Committee will develop an implementation schedule.
Cost:	Costs will be determined by the Management Committee.
Funding:	By participating agencies.

WC-2B Well Identification: Permits - King County and cities will require that applicants establish the location and status of wells on the property in question during SEPA review and land use permit actions. King County and cities will provide this information to Ecology.

Discussion - One reason that well identification is needed is to determine if a well should be decommissioned. Proper decommissioning procedures entail sealing the well in such a way that water is excluded from the well and no vertical movement of water is possible. By having applicants provide information as to status, more wells could be evaluated. Status means whether the well is currently in use, what it is used for, and apparent construction method.

King County involvement in identifying wells in need of proper decommissioning is already in effect on an informal basis. This alternative would formalize the involvement while also

encouraging community involvement and education. The discovery of unused wells during land development is fairly common. Granting of land use approvals or permits would be contingent upon unused wells being properly decommissioned and active wells being tagged with an identification number and entered into Ecology's well inventory. By requiring that applicants for land use actions and permits demonstrate that the property has been examined for wells and that existing wells are in compliance with the standards specified in Chapter 173-160 WAC, King County and cities could help narrow a regulatory gap. The cost of these requirements would be passed on to the applicants for land use actions and permits. Follow up on the status report would be through the SKCHD delegation program.

Implementation:

Task 1: Develop ordinance or policy/procedure change as needed for each application type.

Task 2: Implement policy/procedure and new regulations.

Task 3: Provide this information to Ecology.

Who:	King County and cities.
When:	The Management Committee will develop an implementation schedule.
Cost:	Costs will be determined by the Management Committee.
Funding:	By participating agencies.

Task 4: Enter new information into records.

Who:	Ecology.
When:	The Management Committee will develop an implementation schedule.
Cost:	Costs will be determined by the Management Committee.
Funding:	By participating agencies.

Issue 3 - Decommissioning Cost

Improperly decommissioned wells may become a channel for contamination to the aquifer. The decommissioning cost may prevent property owners from disclosing improperly decommissioned wells.

WC-3A Decommissioning Cost: Funding Mechanism - King County will explore the possibility of creating a funding mechanism, for decommissioning of wells identified through the property owner disclosure program.

Discussion - The Management Committee will decide if the agency funds could support this and if to include it in the work program. King County will provide a report to the Management Committee on the feasibility and cost. The King County report will be based on the disclosure information collected through other actions.

Implementation:

Task 1: Report to Management Committee on feasibility of providing money for well decommissioning.

Task 2: Determine if the agency funds could support this, and to what level.

Task 3: Revise the Plan if necessary.

Who:	Tasks 1, 2, and 3: Management Committee.
When:	The Management Committee will develop an implementation schedule.
Cost:	Costs will be determined by the Management Committee.
Funding:	By participating agencies.

WC-3B Decommissioning Cost: Alternate Procedures - Ecology, during WAC revision, will consider alternatives to present requirements for well decommissioning procedures that are cost effective and would protect public health.

Discussion - There is interest for Ecology to consider alternatives to the current regulations for well decommissioning, which may be costly for some well owners. Ecology may consider alternatives during revision of Chapter 173-160 WAC, which details the required decommissioning methods.

Implementation:

Task 1: Consider alternatives to current decommissioning procedures.

Who:	Ecology.
When:	The Management Committee will develop an implementation schedule.
Cost:	Costs will be determined by the Management Committee.
Funding:	By participating agencies.

Issue 4 - Education

There is a lack of general public knowledge about the public health significance of the requirements for well construction, operation, maintenance and decommissioning.

WC-4 Education - The Plan education program will include information on well identification, well construction, proper well maintenance, contamination sources and well decommissioning.

Discussion - Informed and involved well owners and other community members are probably more likely to comply with the well construction and decommissioning regulations than they would be otherwise. Ways to inform and involve well owners might include distributing a questionnaire about wells to homes in the community; developing and

distributing an educational brochure for homeowners; and supplementing the brochure with community educational programs. The questionnaire should be designed to elicit the number of wells on each property, the construction methods used, and the number of wells that require decommissioning. The brochure should include recommended practices and legal requirements for well construction and decommissioning. It should also include the reasons why practices such as sealing the well are both advisable and required by law so that homeowners are knowledgeable before they make plans to construct or decommission a well. The education program should cover the same information, and provide the public with an opportunity to ask individual questions.

Implementation:

This will be included in the Education Section.

2.3.6 Ground Water Concerns Associated with Sewer Pipes

Sewage collection and treatment in King County, other than by on-site sewage system, is provided by King County, cities, and water and sewer districts. Wastewater is carried from homes and businesses through a system of side sewers, which are connected to a system of tributary sewers (or "trunk sewers") within the drainage area. Trunk sewers are connected to interceptors that transport the wastewater to treatment plants. In King County, there are approximately 3,000 miles of sewer pipe with approximately 150 million gallons of wastewater received at wastewater plants throughout the county each day.

Currently, all new sewer pipes in King County are strong durable materials that are virtually leak-free. However, prior to the use of current materials, sewer pipes were made from materials such as concrete, brick and clay. Joints were more susceptible to leaking with the use of these materials. Many of these older pipes are still in use today.

Infiltration is defined as ground water entering sewer pipes, both as runoff during storm events or as base flow from other sources. Inflow refers to direct flow of stormwater into sewer pipes through hookups such as roofs and footing drains. Because sources of infiltration and inflow are not easily distinguished by sewer authorities, they are commonly considered under the single heading, "I and I". Infiltration generally occurs in the joints of older pipes made of concrete, brick, etc.

If ground water infiltrates into sewer pipes during periods when the water table is high, then it is conceivable that waste water is discharged into the ground when the water table is lowered. Exfiltration (wastewater leaking from sewer pipes) is not considered a problem by the utilities contacted in King County.

Numerous utility officials consider side sewers on private property more of a threat to ground water quality than the sewer mains themselves. For example, in a Kent study in an older neighborhood, side sewers were determined to contribute 75 percent of the infiltration to Kent sewers.

In 1987, King County completed an infiltration study for the Renton Treatment Plant. The conclusion of the study was that it was cheaper to treat the wastewater at the plant than repair the leaking pipes. However, with new technologies for pipe repair, it now appears less costly to correct infiltration and inflow problems than to enlarge the plant. King County's Renton plant treats approximately 60 million gallons per day in summer. From a study conducted at this plant, it was determined that approximately 20 million gallons per day of infiltration was occurring. Thirty-three percent of the total treatment volume is infiltration.

Currently, data on the extent and magnitude of this potential problem is unavailable. There have been no studies conducted on exfiltration of wastes from sewer lines, and their impacts on ground water quality in King County.

GOAL

Prevent the degradation of ground water which may be caused by waste water leaking from gravity sewer pipes and side sewers, and the loss of water through infiltration to gravity sewer pipes and side sewers.

ISSUES

Issue 1 - Sewer Infiltration and Exfiltration

Infiltration of ground water into gravity sewer pipes may be causing export losses of ground water from the GWMA. Exfiltration of sewage from leaking sewer pipes may be causing contamination of ground water.

SP-1A Sewer Programs - Encourage King County, cities and sewer utilities to continue or to adopt regularly scheduled leak detection and repair programs and public education programs to protect ground water aquifers in the GWMA.

Discussion - King County and the utilities are conducting maintenance and pilot programs in King County to replace leaking sewer pipes for reduction of "I and I" at wastewater treatment plants. This is reducing exfiltration from sewer pipes and infiltration of ground water into sewer pipes. For ground water protection from contamination and depletion, King County and the utilities should be encouraged to replace leaking sewer pipes in the GWMA and to educate homeowners in properly maintaining their side sewers.

Implementation:

Task 1: Support the need for public education programs and leak proof sewer pipes in the GWMA.

Who:	King County.
When:	The Management Committee will develop an implementation schedule.
Cost:	Costs will be determined by the Management Committee.

Funding: By participating agencies.

SP-1B Leakproof Piping - King County should amend the Comprehensive Land Use Plans and King County Code 13.24 to require the following:

- New sewer piping installed in physically susceptible and recharge areas be leakproof; and
- Existing leaking sewer pipes including side sewers will be replaced as soon as possible with leakproof piping in physically susceptible and recharge areas according to a schedule contained in the Sewer Utility Comprehensive Plans.

Discussion - By amending the Comprehensive Plan, King County can require leak-proof piping for new installations or replacement of leaking sewer pipes in physically susceptible and recharge areas when reviewing sewer utility plans. King County Code 13.24 states that utility plans must be consistent with the King County Comprehensive Plan . By requiring leak-proof sewer piping in physically susceptible and recharge areas, ground water in those areas will be protected from depletion and contamination.

Implementation:

Task 1: Support provision of new and existing leakproof sewer piping in the GWMA.

Who: King County.
When: The Management Committee will develop an implementation schedule.
Cost: Costs will be determined by the Management Committee.
Funding: By participating agencies.

Issue 2 – Ground Water Depletion

Sewer pipes installed on sloping ground could provide a conduit for ground water, depleting valuable ground water reserves from a specific area.

SP-2 Ground water depletion - Backfill - Ecology will consider amendments to sewer construction specifications which stops the transmission of ground water along pipe alignments. Such transmissions take place in the required granular backfill used as pipe support. These provisions shall include best management practices for backfill materials and/or the use of impermeable seals at appropriate intervals.

Discussion - The use of granular sand as backfill for pipe support in new sewer construction or repair allows for the transmission of ground water along the pipe alignments. This may cause a depletion in ground water levels or a depletion in the quantity of ground water available for drinking water purposes in a specific area. Back-fill materials used in pipe construction and repair need to be constructed of materials that do not permit this ground

water transmission. Ecology needs to develop best management practices for sewer trenches on sloping ground for gravel based bedding or similar materials, or the use of impermeable seals at appropriate intervals to stop ground water transmission and loss.

Implementation:

Task 1: Support best management practices for bedding materials and/or impermeable seals at appropriate intervals for sewer trenches on sloping ground in physically susceptible and recharge areas.

Who:	King County.
When:	The Management Committee will develop an implementation schedule.
Cost:	Costs will be determined by the Management Committee.
Funding:	By participating agencies.

2.3.7 Ground Water Quality Issues Related to Solid Waste Landfills

A landfill is a disposal facility at which solid waste is permanently placed in or on land. A mixed municipal landfill can accept all waste except hazardous wastes. Other landfills are used for limited purposes, such as construction/demolition waste, inert waste and wood waste.

There are environmental impacts associated with landfills, including leachate and gas production. Leachate is water or other liquid that has been contaminated by dissolved or suspended materials due to contact with solid waste or gases from the solid waste. Landfills may pose a threat to ground water quality due to leachate production. Ground water that has been contaminated by leachate may affect the people's health. Ground water that is not currently being used for drinking water also needs to be protected from leachate contamination, as it may become a drinking water source in the future.

Regulations

There are many regulations that affect landfill operations. The significant state and local regulations are described below:

Water Quality Standards for Ground Water of the State of Washington (Chapter 173-200 WAC) - establishes ground water quality standards which provide for the protection of the environment and human health and protection of existing and future beneficial uses of ground water. These regulations are administered by Ecology.

The Criteria for Municipal Solid Waste Landfills (Chapter 173-351 WAC) (referred to here as the Criteria) establishes minimum state-wide standards for municipal solid waste landfills so that jurisdictional health departments can enact ordinances equally as or more stringent than the WAC and to have jurisdictional health departments implement such ordinances through a permit system. The Criteria applies to new municipal solid waste landfills, existing

municipal solid waste landfills and lateral expansions. It does not apply to inert and demolition waste, wood waste, industrial solid wastes, other types of solid waste disposed of in limited purpose landfills, which are regulated under the Minimum Functional Standards for Solid Waste Handling (Chapter 173-304 WAC).

The Criteria include restrictions on municipal solid waste landfill locations relating to flood plains, wetlands, seismic impact zones and unstable areas (Chapter 173-351-130 WAC). This section also notes that Wellhead Protection Programs, Ground Water Management Programs and Special Protection Areas may impose additional locational restrictions. It also restricts new municipal solid waste landfills or lateral expansions from being located over a designated sole source aquifer, unless it can be demonstrated that the sole source aquifer is not vulnerable to potential ground water contamination from the active area (Chapter 173-351-140 WAC).

The Criteria (Chapter 173-351-140 WAC) also include restrictions on the separation between ground water and the liner for a new municipal solid waste landfill or lateral expansion. The Criteria states that the bottom of the lowest liner must be ten feet above the seasonal high level of ground water in any water bearing unit which is horizontally and vertically extensive, hydraulically recharged and volumetrically significant. An exception can be made if a demonstration, during the permit process, is made that a hydraulic gradient control system or the equivalent can be installed to control ground water fluctuations and maintain a five foot separation between the controlled seasonal high level of ground water in the identified water-bearing unit and the bottom of the lowest liner.

Chapter 173-351-300 WAC contains design criteria for new municipal solid waste landfills and lateral expansions. It states that these shall have a composite liner and a leachate collection system. The Criteria also include requirements for: ground water monitoring systems and corrective action; ground water monitoring system design; ground water sampling and analysis; ground water reporting; statistical methods for ground water monitoring; and a detection monitoring program. (Chapters 173-351-400, -405, -410, -415, -420 and –430 WAC) Chapters 173-351-480 and 173-351-490 WAC contain requirements for ground water modeling and the hydrogeologic report contents.

Chapter 173-351-200 WAC also contains municipal solid waste landfill operating criteria, including procedures for excluding the receipt of dangerous waste. It states that the owner or operator must implement a program at the facility for detecting and preventing the disposal of regulated dangerous wastes.

The Code of the King County Board of Health, Title 10, "King County Solid Waste Regulations." - The Seattle-King County Board of Health has adopted the Minimum Functional Standards as the local regulation for governing design, construction, operation, and closure of solid waste facilities in King County. The SKCHD enforces Title 10, which was revised during 1992. Among other changes, demolition disposal sites now must meet siting criteria for mixed waste landfills.

These regulations on design, operation, maintenance and closure have many standards that help ensure that ground water will not be contaminated by leachate. There are some gaps in the current regulations, which can be closed by ensuring consistency with the state ground water quality standards and revising state and local regulations. These changes will help ensure that existing landfills are operated using the best ground water protection methods.

In addition to these regulations, the King County Comprehensive Plan contains this policy: "F-247 Solid waste should be handled and disposed of in environmentally sound ways that protect the quality of air, water and public health."

Abandoned landfills may pose a threat to ground water quality. An abandoned landfill is any site completed prior to the requirement of obtaining a closure permit. A permit allows solid waste activities to be performed at a specific location. A permit also includes specific conditions for facility operations, including closure requirements.

Not enough is known about abandoned landfills to determine their possible impact on ground water quality. King County has identified a number of abandoned landfills and is investigating these sites.

Recycling reduces the amount of waste that must be landfilled, by reusing waste materials and extracting valuable materials from the waste stream. Encouraging King County's recycling efforts may also help protect ground water quality.

GOAL

To prevent the occurrence of ground water contamination problems associated with the operation of solid waste disposal facilities in King County.

ISSUES

Issue 1 - Standards

Solid Waste Management standards can be improved to provide better ground water protection.

SW-1 Standards - The SKCHD will prepare amendments to Title 10 to adopt Chapter 173-351 WAC by reference.

Discussion - Adoption, by reference, would complete the intent of Chapter 173-351 WAC, which is to enable the local health jurisdiction to enact ordinances as, or more stringent, than the WAC, through a permit system. Adoption by reference would ensure that the ground water protection measures required in Chapter 173-351 WAC will be implemented in King County.

Implementation:

Task 1: Amend Title 10 to adopt Chapter 173-351 WAC by reference.

Who:	The SKCHD.
When:	The Management Committee will develop an implementation schedule.
Cost:	Costs will be determined by the Management Committee.
Funding:	By participating agencies.

Issue 2 - Abandoned sites

Abandoned solid waste disposal sites may pose a threat to ground water.

SW-2 Abandoned sites -The SKCHD will evaluate the remediation efforts of King County on abandoned sites and make a report to the Management Committee.

Discussion - The SKCHD prioritized the abandoned sites based on the potential for ground water contamination as indicated in the Abandoned Landfill Survey. The SKCHD reviews proposed ground water monitoring plan(s), sampling data and remediation plan(s) for the abandoned sites. The investigation program by King County assesses the existence of contamination in ground water. If potential for contamination is found, the site may be referred to Ecology for follow-up as per the Model Toxics Control Act (MTCA). However, this evaluation is requested to show King County that this issue is of importance to the GWAC and to ground water quality.

Implementation:

Task 1: Continue investigation of the abandoned sites.

Who:	King County.
When:	The Management Committee will develop an implementation schedule.
Cost:	Costs will be determined by the Management Committee

Task 2: Evaluate and report on progress.

Who:	King County.
When:	The Management Committee will develop an implementation schedule.
Cost:	Costs will be determined by the Management Committee.
Funding:	By participating agencies.

Issue 3 - Education

The public may not be aware of the relationship between landfilling solid waste and the threat to ground water quality.

SW- 3 Education - Include information about the relationship between solid waste disposal and ground water in the education program.

Discussion - Providing information about recycling and educating residents about reducing the waste stream may reduce the amount of waste going into the landfills and the amount of hazardous products that people buy.

Implementation:

See Education Program in this chapter.

2.3.8 Ground Water Concerns Associated with Burial of Human Remains

Cemeteries are found throughout King County and it is possible that, under certain hydrogeologic conditions, burial practices have affected or are affecting local ground water quality. About 40 percent of King County residents rely on ground water for their potable water source. Currently, there are 70 cemeteries in King County ranging in size from 20 burial sites to 140,000 burial sites. Nothing is known about the existing or potential effect of decomposing corpses and caskets on ground water.

The threat to ground water from decomposing corpses and caskets includes chemicals, bacteria, viruses, and metals. The embalming process uses formalin, (formaldehyde, methanol, glycerin, borax, and water). Approximately 1/2 gallon of formalin is used to embalm each body. Bacteria and viruses are not a concern since nutrients and oxygen are not present for the bacteria to survive and multiply. Viruses in both embalmed and non-embalmed bodies will eventually die out because they require a host to reproduce.

Similar to body decomposition, the rate of a casket's decomposition depends on materials used and soil conditions. Materials used include hardwood, softwood, metals and a magnesium bar placed along the middle of the casket to prevent hydrolysis of the metals. It is unknown if these metals have leached into and are contaminating ground water.

Ground water may be in contact with corpses and caskets. Concrete burial liners and vaults are not waterproof. Embalming fluids and other materials may infiltrate ground water depending on such factors as soil type, topography, the geology encountered as water travels to an aquifer and the depth to the water table. Soils and geologic materials vary in their ability to attenuate or remove contamination by chemical, biological and physical processes. Generally, the deeper the water table, the more opportunity exists for contaminant removal by soil and geologic deposits.

In King County, there is ample opportunity for cemetery graves to come in contact with water. Many cemeteries are located in areas where the water table is believed to be very shallow, within 10 feet of land surface. Rainfall ranges from 20 to 50 inches per year throughout the Puget Sound lowlands, with an average value of approximately 35 inches per year. Additionally, the grounds of most operational cemeteries are heavily irrigated in the summer months. In instances where vaults are not used, or do not keep water out, either ground water or recharge water could come into contact with the grave, hastening decomposition and transporting decomposition and embalming products to the ground water system.

Attempts to gather information pertaining to ground water contamination have produced no useful citations. Considerable information does exist on the transitional and end products of decomposing human bodies, residual body wastes and chemicals that are used in the process of embalming bodies. Data are also available on the composition of residues of disintegrating caskets and associated materials. However, little is known about the effects of these products on ground water.

The GWAC concluded that ground water impacts from cemeteries was not a concern in the GWMA. No further action is warranted at this time. If future monitoring reveals impacts, action will be instigated.

2.3.9 Ground Water Quality Issues Related to Sand and Gravel Mining

It is not unusual for productive sand and gravel mines to be located over vulnerable aquifers. Mining activities in these areas can increase ground water vulnerability to contamination both from the extraction process and from site reclamation.

The primary "effluent" discharged at a gravel site is turbid rinse water. Generally, operators are required to collect the wastewater on-site in retention and settling ponds where the fine sediment settles out. The collected water is then allowed to infiltrate back to the water table.

Often the excavation pit is also a component of the treatment system. Any chemical contaminants that are allowed to enter the excavation pit via the wash water or spills in the area would have increased access to the aquifer. Possible contaminants found at a mining site include lubricants and fuels, which may be from the site or from road and work area runoff.

Beyond the risks associated with active mining, one of the largest threats to ground water appears to be the excavation pit itself. Excavation pits have been used both legally and illegally as dump sites for a variety of wastes. In many cases the material used to fill the pits would today be classified as a dangerous waste.

Sand and gravel mining operations are subject to permitting at both the local and state level. One of two types of land use permits must be obtained in King County to mine sand and gravel. The first type is a conditional use permit that is required to mine in a mining zone. As implied by the title, conditions are attached to the permit. The conditions are established during environmental review under Chapter RCW 43.21 State Environmental Policy Act. The second type is an unclassified use permit that is required to mine in areas not zoned for mining. This is a temporary permit lasting for five years and is also subject to conditions established during environmental review.

Applications for the above permits incorporate the reclamation plan for the site and provide information showing how provisions of Chapter 21.42 Q-M, Quarrying and Mining classifications, will be met.

King County also requires a grading permit for excavations of sand and gravel with a volume exceeding 500 cubic yards. The applicant must demonstrate that the conditions regarding operation and reclamation of the site are met. Grading permits are renewed annually allowing King County to institute new conditions as regulations change. Ground water protection is one of the conditions of the permit. This section is very general and does not address ground water concerns. The source of fill being used in reclamation is specified in the initial permit and upon annual updates. Applicants must provide fill approved by Ecology if the fill comes from a previously developed site. Soil must be tested for contamination in order to obtain Ecology approval. Certification is not required if fill comes from an undeveloped site.

The King County Comprehensive Plan, contains these policies related to mineral resources:

> **R-561**: The periodic review process for mineral extractive and processing operations shall include sufficient public notice and comment opportunities. The purpose of the periodic review process is to provide opportunities for public review and comment on the mineral resource facility's fulfillment of state and county regulations and implementation of industry-standard Best Management Practices, and for King County to modify, add or remove conditions to address new circumstances and/or unanticipated project-generated impacts. The periodic review process is not intended to reexamine the appropriateness of the mineral resource use, or to consider expansion of operations beyond the scope of existing permitted operations since that review would be accomplished through the county's permitting process. The periodic review is intended to be part of King County's ongoing enforcement and inspections of mineral resource sites, and not to be a part of the County's permitting process.
>
> **R-562**: Conditions and mitigation for significant adverse environmental impacts associated with mining operations should be required especially in the following areas: ... b. Environmentally sensitive and critical areas, such as surface and ground water quality and quantity, wetlands, fisheries and wildlife habitats....

R-563: King County should work with the state and federal governments to ensure that proposals for underground mining, oil and gas extraction, and surface coal mining are reviewed with consideration of local land use and environmental requirements.

R-564: King County should work with the Washington State Department of Natural Resources (WSDNR) to ensure that mining areas are reclaimed in a timely and appropriate manner. Where mining is completed in phases, reclamation also should be completed in phases as the resource is depleted.

State permits for sand and gravel mining are required both from both the Washington State Department of Natural Resources (WSDNR) and Ecology. Applicants generally apply for the WSDNR permit concurrently with the King County grading permit. The WSDNR Resources permits sand and gravel mines over 3 acres in size. King County works closely with the WSDNR to ensure that each is approving the same operating plans.

Chapter 78-44 RCW, places a high priority on ground water protection. Specific contents of the bill include that the WSDNR will regulate mine reclamation with the county reviewing applications with the WSDNR considering the county comments. The WSDNR cannot approve fill for reclamation of site without County Health Department approval of fill first. This does not correlate with Ecology's general permit requirements where Ecology approves of fill material. The minimum reclamation standards discuss how the WSDNR will protect ground water and surface water. by working with the operator to ensure that the reclaimed mine provides for water quality protection in the future.

In 1991, Ecology, the WSDNR and several local authorities identified some best management practices for sand and gravel operations. Originally, Ecology planned to adopt best management practices as either guidelines or formal rules for industry to follow in order to comply with the requirements of Chapter 173-200 WAC, Water Quality Standards for Ground Waters of Washington State. After further evaluation, Ecology concluded to protect both surface and ground water quality through a general permit titled: "General Permit for Processed Water and Storm Water Associated with Sand and Gravel Operations, Rock Quarries, and similar mining operations, including Stockpiles of Mined Materials, Concrete Batch Operations and Asphalt Batch Operations." This general permit issued by Ecology supersedes surface and ground water permits that Ecology requires.

The goal of the general permit is to enforce state and federal standards that apply to the quality of water discharged to either surface water or ground water from certain types of mines. All discharges from sand and gravel mines must meet the Ground Water Quality Standards (Chapter 173-200 WAC) and the Surface Water Standards (Chapter 173-201A WAC).

For this permit, the discharge of water includes both surface water discharge (National Pollutant Discharge Elimination System) and discharge to ground water (State Waste discharge) such as through infiltration ponds.

The method of compliance with the general permit may include the implementation of recently developed best management practices and wastewater treatment facilities.

Permittees will be required to monitor discharges to both surface water and ground water. All facilities covered under the general permit will collect and report their monitoring data annually to Ecology. Ecology will use the monitoring data obtained in the first three years to determine permit effluent limits for potential contaminants and the scope of monitoring required in the re-issued general permit (after 5 years).

GOAL

To ensure that regulatory programs are adequate to prevent adverse effects upon ground water quality attributed to sand and gravel mining operations.

ISSUES

Issue 1 - Regulatory Modifications

Sand and gravel mining operations can cause changes in a site or include activities which increase the potential for contamination of important aquifers.

SG - 1. Regulatory Modifications. King County and cities should comply with the NPDES Permit Program and Ecology's "General Permit" requirements.

Discussion - For the general Ecology permit, sand and gravel facilities are required to manage, treat and discharge their wastewater in a manner consistent with the Ground Water Quality Standards and NPDES Permit Program. This general permit includes the implementation of best management practices and monitoring of discharges to ground water with annual reporting of the monitoring data to Ecology. The General Permit provides positive controls to protect both surface water and ground water from contamination.

King County should work with both state and federal governments to ensure that mining operations are not having an adverse impact on ground water quality and quantity.

Implementation:

Task 1: Use Ecology's best management practices (BMPs).
Task 2: Include the BMPs in the requirements for grading permits.

Task 3: Meet General Permit and NPDES requirements for King County or city owned sand and gravel sites.

Who:	King County and cities.
When:	The Management Committee will develop an implementation schedule.
Cost:	Costs will be determined by the Management Committee.
Funding:	By participating agencies.

Issue 2 - Aquifer Impacts and Regulation

Sand, gravel, and rock quarry mining can cause changes in the site or include activities which increase the potential for contamination of important aquifers. Major changes have occurred at the state level regarding general permitting of sand, gravel, and rock quarry mining operations. Ecology is requiring performance standards as part of the general permit for all mines in King County. All discharges from sand, gravel, and rock quarry mines must meet the Ground Water Standards (Chapter 173-200 WAC) and the Surface Water Standards (Chapter 173-201A WAC). The final General Permit for sand, gravel, and rock quarry operations is now available. There may be changes as a result of oversight or problems of coordination between it and local zoning or policies found in the King County Comprehensive Plan.

SG-2A Ground Water Protection: Support changes which would provide better protection of ground water.

SG-2B Aquifer Impacts and Regulation: The SEPA guidance document should include the following best management practices for sand, gravel and rock quarries:

1. For sites with a planned excavation depth lower than the ground water table a detailed hydrologic report should be filed. This may be a part of a complete Environmental Impact Statement or be an appendix to a SEPA checklist.

2. Where possible, mining sites should utilize internal drainage, in order to support continued ground water recharge and minimize off-site discharges.

3. When ground water is exposed during the mining operation and resulting impoundment is larger than three acres, ground water should be monitored for both water level (monthly) and water quality (quarterly to semi-annually) over the life of the operation. Water level and water quality monitoring should also be considered when depth to seasonal high water is reduced to five feet or less.

4. Associated activities such as concrete, asphalt or other batch processing plants shall not be located immediately adjacent to exposed ground water.

5. Truck and equipment wash runoff should be routed to an approved retention and treatment facility, equipped with an oil-water separator prior to its release to retention ponds.

6. Fuel (oils) storage and handling facilities should be located some distance from the main sediment and wash water retention facility. All such facilities should be equipped with approval containment, monitoring and collection systems.

   Fuel storage should be above-ground. These sites should be lined and bermed with sufficient capacity to accommodate spills and leaks. Runoff from these surfaces should be routed to a retention pond that can be monitored and cleaned in the event of a spill.

7. All sites should maintain a fuel/hazardous waste management plan. This would be maintained by the operator and be available on the site at all times.

8. At closure of the site, after accidental spills, or at the request of the WSDNR/Ecology, all contaminated material will be removed and disposed of with approved methods and at approved disposal sites. This material will not be used as fill at the site.

9. In general, impoundments of greater than three acres should not be filled. These sites should be stabilized as lakes and ponds and the surrounding area revegetated to insure stability of the site. Future land-use decisions should reflect increased ground water vulnerability at the site. Individual sites may be filled if it can be demonstrated that sufficient inert material can be obtained to serve as fill. Impoundments of less than three acres should not be filled if there is doubt as to quality or supply of inert fill.

10. Excavation pits should not be used as landfill disposal sites for unclassified or none-inert wastes. In general municipal landfills are not an appropriate use of gravel sites located over semi-confined and unconfined ground waters.

11. Pits with standing water that are slated to be filled may use only approved inert earth materials (native fill/overburden) to fill the area up to the high water table. The remaining fill should meet the conditions described in 10 and 11.

12. Future land use should reflect the increased vulnerability of ground water at the site and the change in the water balance of the area.

Discussion: Regulatory changes of some kind are inevitable. Between revisions to state statues and the availability of best management practices, improvements in regulatory activity will probably be made which will relate to ground water protection. There is a risk,

that changes beneficial to ground water protection will be deleted or will not be supported by legislative bodies.

By supporting these changes, the GWAC draws attention to the ground water management program and helps to remind regulators and legislative bodies of the importance of ground water protection. Letters of support and emphasis could be sent to agencies preparing regulatory changes. Support could also be provided by GWACs as key issues come before legislative bodies. This support could be in the form of a letter from the GWAC or could consist of many letters and phone calls for individual GWAC members or both.

This support would need to be given as circumstances dictate. This alternative is cost-effective, feasible, timely, and is consistent with the goal.

The goal of SEPA should be to assure that: 1) There is no net loss of recharge due to sand and gravel operations, that is, the pre- and post-development recharge rates should remain the same, and 2) the net recharge of the site is increased in order to enhance the beneficial uses of ground water.

This action provides a means for the County to develop guidance documents and informational materials for optimal environmental review. The purpose is to raise the level of understanding of aquifers among environmental reviews.

Implementation:

Task 1: Support Ecology, Washington State Department of Natural Resources, and King County regulations protecting ground water.

Who: GWAC chair and Management Committee.
When: The Management Committee will develop an implementation schedule.

Task 2: Keep informed regarding legislative actions; alert GWAC chair and Management Committee Members when support is needed.

Who:. King County.
When: The Management Committee will develop an implementation schedule.

Task 3: Prepare letter of support and/or phone contact when legislation is considered.

Who: GWAC chair and Management Committee Members.
When: The Management Committee will develop an implementation schedule.

Task 4: Develop guidance to assist environmental reviewers.

Who: King County for the approval of the Management Committee.

When: The Management Committee will develop an implementation schedule.
Cost: Costs will be determined by the Management Committee.

Issue 3 - Land use of inactive or reclaimed mines

Subsequent land use of reclaimed sand and gravel mining sites should reflect any increased susceptibility of aquifers to contamination. Currently there is no formal requirement that these permitted uses be give special consideration.

SG-3A - Reclaimed sand and gravel mines - King County and cities will amend their Comprehensive Plans to include a policy which provides that land use of reclaimed sand and gravel mines be carefully evaluated in light of any increased susceptibility of aquifers to contamination due to mining activities.

Discussion: Land use is generally a matter of local control. The Comprehensive Plans (Plans) provide overall guidance for land use decisions. It would be appropriate for the Plans to address subsequent land use of reclaimed sand and gravel sites, thereby influencing subsequent policy decisions, regulation revisions, and day-to-day decisions. King County would probably be receptive to this recommendation because it does not preclude particular land uses but requires special consideration for gravel mining sites. This alternative is consistent with the goal in that it would help to ensure that regulatory agencies adequately protect ground water quality. The alternative is also timely and requires no funding. Concurrence with the Plan by King County Council and affected cities would constitute agreement to implement this alternative.

Implementation:

King County and the cities will amend their Comprehensive Plans at the next revision following concurrence with the Plan.

Funding:
There is no funding necessary for this action.

SG-3B - Zoning Code - Reclamation Plans - King County and cities will provide comments to the State Department of Natural Resources on mine reclamation plans proposed within the GWMA. Additionally, consistent with King County Comprehensive Plan policy, King County, cities and other affected jurisdictions will develop BMPs for mining operations.

Discussion - Chapter 21.A.22, *Development Standards, Mineral Extraction, Section 446 Reclamation,* requires that a reclamation plan shall be submitted for each rezone application that addresses the subsequent land uses of the reclaimed lands anticipating reclassification of zones; and a time schedule indicating how and when reclamation will occur during and after extractive operations. This section is general and does not address ground water quality and

quantity impacts from land uses proposed in the reclamation plan. These sites consist of gravel type soil and there is ready access to ground water from the excavation pit prior to site reclamation. The development and implementation of BMPs will provide additional safeguards for ground water in the vicinity of the operations.

Implementation:

Task 1: Provide comments on mine reclamation plans and develop BMPs to protect ground water in reclaimed sand and gravel mining operations.

Who:	King County and cities.
When:	The Management Committee will develop an implementation schedule.
Cost:	Costs will be determined by the Management Committee.
Funding:	By participating agencies.

Task 2: Review Chapter 78.44 RCW, and the WSDNR's role in protecting ground water during and after mine reclamation. Draft letter to WSDNR supporting ground water protection as needed.

Who:	King County.
When:	The Management Committee will develop an implementation schedule.
Cost:	Costs will be determined by the Management Committee.
Funding:	By participating agencies.

2.3.10 Ground Water Concerns Associated with Land Application of Municipal Wastewater Treatment Plant By-Products: Biosolids and Sewage Effluent

Biosolids

Biosolids are the treated and primarily organic sewage solids generated from wastewater treatment plants. Biosolids were formerly referred to as sewage sludge. Biosolids may be utilized for various beneficial uses including: compost and fertilizer production, agricultural and silvicultural land application, land reclamation, and the manufacture of various construction materials. The biosolids generated in King County are low in pollutants, rich in nutrients and organic matter, and are highly suitable for recycling as a result of extensive pretreatment efforts. Research results and operating experiences over the past 25 years have greatly expanded our understanding of the risks and benefits of using or disposing of biosolids.

Currently, nearly all of the biosolids generated in King County are utilized for silviculture, composting, soil improvement, or other agricultural and landscaping purposes. Properly managed uses of biosolids pose little threat to health or the environment. The rate of biosolids application at land application sites is matched to the agronomic rate of the sites

vegetation to avoid off site nitrogen mobilization and eliminate risks to underlying ground water resources.

As required by the Clean Water Act Amendments of 1987, the EPA developed a new regulation to protect public health and the environment from any reasonably anticipated adverse effects of certain pollutants that might be present in biosolids. This regulation became effective in 1993 and is titled *The Standards for the Use or Disposal of Sewage Sludge*, Title 40 of the code of Federal Regulations, Part 503. Many of the requirements of the Part 503 rule are based on the results of an extensive multimedia risk assessment. This risk assessment for the Part 503 rule was more comprehensive than for any previous Federal Biosolids rule making effort. Development of the Part 503 rule began in 1984. During this extensive effort and risk assessment, the EPA addressed pathogens and 25 pollutants using 14 exposure pathways. The EPA's multimedia risk assessment was reviewed and approved by the EPA's Science Advisory Board. Detailed information describing the risk assessment and technical basis of the Part 503 standards is contained in the Preamble to the part 503 rule published in the Federal Register on March 22, 1993.

The Part 503 rule includes five subparts: general provisions, land application, surface disposal, pathogen and vector attraction reduction, and incineration. The regulations also include pollutant limits, management practices, operational standards, and requirements for the frequency of biosolids monitoring, record keeping, and reporting of results. For the most part, the requirements of the Part 503 regulations are self-implementing and must be followed even without the issuance of a permit.

The Part 503 rule includes several options for land applying biosolids, all of which are equally protective of human health and the environment. These options include:

- Exceptional Quality Biosolids: Biosolids that meet limits for pollutants and vector attraction potential, and Class A pathogen reduction (virtual absence of pathogens) are considered a product that is virtually a fertilizer and is unregulated for use, whether used in bulk or distributed in bags or other containers.

- Pollutant Concentration Biosolids: These biosolids meet the same low pollutant concentrations as an Exceptional Quality biosolids, but only meet Class B pathogen reduction criteria. Unlike Exceptional Quality biosolids, Pollutant Concentration biosolids may only be applied in bulk and are subject to additional requirements and management practices such as public access restrictions and environmental monitoring.

All biosolids currently distributed or land applied in King County meet the Exceptional Quality Biosolids or Pollutant Concentration Biosolids criteria.

Ecology drafted regulations to allow delegated enforcement authority from the EPA for the Part 503 regulations. The SKCHD currently enforces existing state regulations through Title 10 of the King County Board of Health, Solid Waste Regulations. Currently, the SKCHD

requires permits for biosolids treatment facilities and land application sites. The permitting process includes: review of biosolids quality, site specific project design and operations, inspections, and environmental monitoring. The SKCHD does not require permits for sites that utilize biosolids meeting the Part 503 rule criteria for an Exceptional Quality Class A biosolids such as composts and dried biosolids fertilizers. The SKCHD has approximately 1/4 full-time equivalent (FTE) assigned to the permitting and monitoring of biosolids land application projects. The SKCHD has found that this level of staffing is adequate to allow for sufficient regulation of current and future expected projects.

Reclaimed Water

Reclaimed Water is the liquid part left after sewage has settled. This liquid may be untreated, or it may be further settled, filtered, and disinfected, depending on final use. Reuse of effluent is regulated by the State Water Pollution Control Act (Chapter 90.48 RCW) administered by Ecology.

Currently, reuse of sewage effluent by land application is not widely practiced in King County because of precipitation, which limits the application period. However, interest in effluent reuse has increased.

GOAL

To provide assurance that the ground water in King County will not be contaminated by the reuse of wastewater effluent.

ISSUES

Issue 1- Guideline Revision

Recently, an increased need for conservation of water resources has focused interest in reuse of treated effluent. The effluent guidelines need to comply with the State Ground Water Standards.

BSE-1 Guideline Revision - The GWAC encourages Ecology to include ground water protection in guidelines for reuse of effluent. Such guidelines may need to include constraints for reuse of effluent in the most physically susceptible and recharge areas.

Discussion - The potential for effluent reuse by a variety of organizations appears to be increasing. Some effluent reuse application sites may be in the most physically susceptible areas. The revision to the guidelines should anticipate this, and address this potential problem.

Implementation:

Task 1: Revise effluent reuse guidelines, include aquifer recharge protection concerns

Who: DOH and Ecology.

2.4 PROGRAMS RELATED TO GROUND WATER QUANTITY

The ground water resource is the result of geology and climate. The geology of King County allows for water to be contained in a variety of soils. The climate provides fairly dependable rainfall and recharge to the ground water. Natural recharge occurs only through relatively undisturbed permeable soils. Aquifer and surface water levels are maintained by preserving recharge. Impetus for ground water resource management comes from a variety of sources. Population growth creates an increasing demand on limited natural resources, including ground water. State law dictates how water may be appropriated. The State of Washington has attempted to balance the needs of the citizens with maintaining the water resource. Ecology administers laws dealing with water appropriations and allocations. Allocation to new users must not conflict with existing use, however, the information needed to make allocation decisions is faulty. Some areas have experienced the effects of unwise use of aquifers, such as water level declines and sea water intrusion. Parties involved in water use are developing and using innovative techniques to decrease water use and increase water availability, such as conservation and artificial recharge. Recent interest in maintaining surface water resources has spotlighted the interaction of ground water and surface water. Future ground water resource management must include consideration of this interaction.

2.4.1 State

Ecology must make decisions on water rights, water level declines, ground water reservations, sea water intrusion and artificial recharge. These decision are difficult, because of the lack of adequate data upon which to make decisions.

To evaluate water right applications, Ecology must determine how much water an aquifer system is capable of yielding on a sustained basis. This is difficult to do because of the lack of accurate pumpage figures. Ecology has issued water rights in the past using standard, but informal, water usage rates for various land uses when precise information was not available. Technically and legally, water use should approximate water right totals. This is seldom the case due, in part, to the lack of a State-wide systematic water usage data management program and outdated water rights records. Staffing limitations and inefficient reporting frequently restrict staff efforts to priority areas experiencing significant problems. Consequently, estimates based on field inventory, random sampling, or personal contacts are frequently the best available figures.

It has been the general position of Ecology that aquifer systems could be fully utilized to the capacity of the aquifer to yield water on a sustained basis as long as the water table did not decline below a reasonable or feasible pumping lift, known as a decline limit. In order for Ecology to determine if a water table is declining, a long record of water level data is required.

Most of King County does not have sufficient water level data to make confident statements about the regional response to withdrawal of ground water.

Ecology also evaluates ground water reservation petitions. As part of an acceptable petition, Ecology must make a finding of general availability of unappropriated water to reserve. This finding depends upon known appropriation, which may not reflect actual use.

The threat to ground water from seawater intrusion (migration of salt water into fresh water aquifers due to pumping of ground water) is an emerging concern along the coast. When ground water is pumped from aquifers that are in hydraulic connection with Puget Sound, the gradients that are set up may induce a flow of salt water from Puget Sound toward the well. The lack of information on the extent of ground water resources and ground water use compounds the problem of determining where seawater intrusion could exist. In response to these concerns, Ecology and the DOH produced the Seawater Intrusion Policy. The goal of the policy is to prevent seawater intrusion in areas where it has not occurred and to control seawater intrusion where the problem already exists.

Artificial recharge often refereed to as aquifer storage and recovery (ASR) is an innovative method to augment the ground water resource. The main function of artificial recharge is to replenish aquifers during winter months when stream flows exceed minimum instream flow requirements. Replenished aquifers could be pumped during summer periods to meet local peak demands. This would reduce seasonal demands placed on the system during the summer and late fall months.

Currently, Ecology does not have the comprehensive ground water information needed to evaluate water right applications, water level decline, and sea water intrusion. The DOH and Ecology are responsible for water usage and water rights data respectively.

The DOH requires conservation plans from larger water purveyors and has guidelines for these plans (Water Use Efficiency Act of 1989 RCW 43.20.230 and Interim Guidelines for Public Water Systems Regarding Water Use Reporting, Demand Forecasting Methodology, and Conservation Programs). In addition to these requirements, the adopted coordinated water supply plans include specific conservation program elements. Source and service meters, common conservation methods, are routinely installed for the larger public water systems.

However, the smaller water systems with 2 - 9 connections do not currently have this requirement. These systems are regulated by the King County Board of Health Title 12 and administered by the SKCHD.

2.4.2 King County

In King County, the most physically susceptible and recharge areas are primarily protected through policies in the King County Comprehensive Plan, individual community plans and ordinances in the Zoning Code. Basin plans may also direct how development occurs to

protect recharge. King County relies on community plans to implement and augment through zoning the aquifer protection policies outlined in the King County Comprehensive Plan (Comprehensive Plan). The Comprehensive Plan contains several policies that relate to ground water protection and recharge:

- **U-109**: Development standards for urban areas should emphasize ways to allow maximum permitted densities and uses of urban land. Mitigating measures should be encouraged to serve multiple purposes, such as drainage control, ground water recharge, stream protection, open space, cultural and historic resource protection and landscaping. When technically feasible, standards should be simple and measurable, so they can be implemented without lengthy review processes.

- **E-117:** Development shall support continued ecological and hydrologic functioning of water resources and should not have a significant adverse impact on water quality or water quantity. On Vashon Island, development should maintain base flows, natural water level fluctuations, ground water recharge in Critical Aquifer Recharge Areas and fish and wildlife habitat.

- **E-149:** King County should protect the quality and quantity of ground water countywide by:

    a. Implementing adopted Ground Water Management Plans;

    b. Reviewing and implementing approved Wellhead Protection Programs in conjunction with cities and ground water purveyors; and

    c. Developing, with affected jurisdictions, best management practices for new development and for forestry, agriculture, and mining operations recommended in adopted Ground Water Management Plans and Wellhead Protection Programs as appropriate. The goals of these practices should be to promote aquifer recharge quality and to strive for no net reduction of recharge to ground water quantity.

    d. Refining regulations as appropriate to protect critical aquifer recharge areas and Wellhead protection areas.

- **E-150:** King County should protect ground water recharge quantity by promoting methods that infiltrate runoff where site conditions permit, except where potential ground water contamination cannot be prevented by pollution source controls and stormwater pretreatment.

- **E-151:** In making future zoning and land use decisions which are subject to environmental review, King County shall evaluate and monitor ground water polices, their implementation costs, and the impacts upon the quantity and quality of ground water. The depletion or degradation of aquifers needed for potable water supplies

should be avoided or mitigated, and the need to plan and develop feasible and equivalent replacement sources to compensate for the potential loss of water supplies should be considered.

- **E-152:** King County should protect ground water in the Rural Area by:

  a. Preferring land uses that retain a high ratio of permeable to impermeable surface area and that maintain or augment the infiltration capacity of the natural soils; and
  b. Requiring standards for maximum vegetation clearing limits, impervious surface limit, and where appropriate, infiltration of surface water. These standards should be designed to provide appropriate exceptions consistent with Policy R-231

- **R-231:** Rural development standards shall be established to protect the natural environment by addressing seasonal and maximum clearing limits, impervious surface limits, surface water management standards that emphasize preservation of natural drainage systems and water quality, ground water protection, and best management practices for resource-based activities.

Recently, several policies were proposed that would enhance recharge in the county for community plans, basin plans and changes to the zoning code.

King County Code Title 21 Zoning regulates the degree of impervious cover allowed for developments and therefore effects the amount of recharge. The existing code contains maximum lot coverage by building and limitations on impervious cover for development. These limitations were established to provide for accurate sizing of stormwater facilities to manage future runoff. They also would prevent extreme cases of lot coverage by impermeable surfaces. They are considered a clarification of the previous code and are representative of existing coverage with impermeable surfaces in King County. Therefore, it should not be interpreted that these revisions to the zoning code provide a significant reduction in the amount of impermeable surfaces allowed.

Another method to protect ground water recharge is through the evaluation required by SEPA. A number of proposed land uses require completion of a checklist that indicates potential environmental impacts prior to permitting by regulatory agencies. If the proposed activities are judged to represent a significant environmental impact, an environmental impact statement is completed. The review process is implemented by King County Environmental Division, SEPA section. The checklist includes sections on surface, ground, and runoff water, but does not ask specifically whether the proposed activities will be conducted in physically susceptible or recharge areas, whether they are likely to affect the quantity of recharge on-site, or to what degree the quantity of recharge is likely to be affected. In recharge related questions, however, the applicant is asked how much dredging or filling of wetlands is planned, whether water will be discharged to ground water, and how runoff will be generated

and handled. Additional information may be requested by the SEPA section if the reviewers decide that the information provided in the checklist is not sufficient or if another agency or group has indicated that the proposed site of the land use is an area that requires extra attention. The State Environmental Protection law allows exemption of certain activities from SEPA review. The SEPA ordinance at the county level may be amended to include these activities if it is found that they could create adverse environmental impacts.

NOTE: Chapter 173-100 WAC Ground Water Management Areas and Program contains guidelines on program content which were to be adapted to the particular needs of a Ground Water Management Area. Included in the program content was a section on alternatives, which was to outline various land and water use management strategies that address each of the ground water problems discussed in the problem definition section. It states that the alternative management strategies would address water conservation, conflicts with existing water rights and minimum instream flow requirements, programs to resolve such conflicts, and long-term policies and construction practices necessary to protect existing water rights and subsequent facilities installed in accordance with the Ground Water Management Area program and/or other water right procedures. This issue section does not address these topics directly, except for conservation.

Several new state programs have begun since the WAC was written which provide programs to resolve conflicts with existing water rights and minimum instream flow requirements, and long-term policies. The GWAC determined that the best way to address these issues and to support the new programs is to develop and implement a long-term monitoring and data collection program to provide the decision makers the necessary information so that they can make better decisions. This is addressed in this issue and in the data collection and management issue.

GOAL

To manage the ground water resources to optimize the preservation and enhancement of the quantity of ground water available to South King County.

ISSUES

Issue I - Policies and Ordinances

The SEPA checklist does not address the impacts on ground water quantity (e.g. population growth with paving over of recharge areas, etc.).

WQ-1 Policies and Ordinances: Cities, King County and other reviewing agencies will consider impacts on the quantity of aquifer recharge during SEPA checklist review.

Discussion: Revising the SEPA checklist would reflect a growing concern for protection of ground water resources in general and the most physically susceptible and recharge areas in particular. The cost of addressing the expanded SEPA checklist would be carried primarily

by the developers. Additional costs could arise from the increased work load for the SEPA checklist reviewers at King County and cities, possibly necessitating addition of staff associated with SEPA checklist review, which would be offset by related review fees.

Implementation:

Task 1: Impacts on the quantity of aquifer recharge during SEPA checklist review will be considered.

Who:	Cities, King County and other reviewing agencies.
When:	The Management Committee will develop an implementation schedule.
Cost:	Costs will be determined by the Management Committee.
Funding:	By participating agencies.

Issue 2 - Data Needs

There are many needs for a complete characterization of the ground water resource. This information is needed by water resource management agencies for water rights application analysis, surface water/ground water interaction determination, possible ground water reservation and other resource management concerns. To date, the generation of technical data has not been adequate to meet management needs.

WQ-2A Data Needs - King County, cities, and special purpose water districts will design and implement a ground water data collection management program which would enable those who make land and water use decisions to make water resource decisions based on more complete information.

Discussion - The Plan started the development of data necessary for ground water resource characteristics, including resource capability. However, a two - three year study is not long enough to collect all of the data necessary upon which to base good decisions. Ecology, King County and utilities need this information for a variety of ground water resource management purposes. If this information is not obtained, then decisions will be based on incomplete or inaccurate data. Specific information about the data needed will be in the Data Collection and Management Program, and will be based upon the needs identified by the state Data Management Task Force.

Implementation:

Task 1: Ground water data collection management program will be designed and implemented.

Who:	King County, cities, and special purpose districts through the Management Committee.
When:	The Management Committee will develop an implementation schedule.
Cost:	Costs will be determined by the Management Committee.
Funding:	By participating agencies.

WQ-2B Policies and Ordinances - The GWAC supports Ecology's Sea Water Intrusion Policy.

Discussion - Sea water intrusion may be a problem, or become a problem, in the coastal areas of the GWMA. Support for the Sea Water Intrusion Program and collecting chloride data in the Data Collection and Management Program will help in implementing the program in King County in the future.

Implementation:

> **Task 1:** Include a statement of support in the Final Plan. There is no additional cost for this action.

Issue 3 - Water rights

Water rights records do not necessarily accurately reflect actual pumpage rates and current use of the ground water resource.

WQ-3 Water rights - Upon request, utilities will provide pumping data to Ecology, as per the recommended program in the "Five Year Water Resource Data Management Plan".

Discussion - Water right records could be a much better tool in ground water management if the individual water rights more clearly reflected actual use and if unused rights were voluntarily or involuntarily relinquished and eliminated from the records. Utility records of water rights need to be updated and reported to Ecology to influence policy decision. The Five Year Water Resource Data Management Plan's "Activity 10.2 Standardize Water Use Reporting" will provide for a standard method for organizations that report water use.

This activity will specify the data to be collected, acceptable methods of data collection, and frequency of collection. This Plan is designed to address the needs of Ecology, King County and utilities for a variety of ground water resource management purposes. If this information is not obtained, then decisions will be based on incomplete or inaccurate data.

Implementation:

> **Task 1:** Pumping data will be provided to Ecology upon request as per the Five Year Water Resource Data Management Plan.

Who:	Water purveyors.
When:	The Management Committee will develop an implementation schedule.
Cost:	Costs will be determined by the Management Committee.
Funding:	By participating agencies.

Issue 4 - Conservation

Conservation has been shown to have a positive impact on ground water resources. There are some conservation methods that could be implemented to enhance current programs. The draft King County landscaping ordinances have been proposed, but they may not be adopted. King County Board of Health regulations for small water systems do not include conservation elements.

WQ-4A Conservation: Landscaping - King County should consider the proposed landscaping ordinance which encourages conservation for new commercial and residential development. Landscaping plans should incorporate native growth areas, use of plant species which are drought tolerant, water efficient irrigation technologies, soil amendments, and limitations on the amount of turf. Cities will consider adopting a similar ordinance.

WQ-4B Conservation: Group B Systems - The SKCHD will propose a revision to regulations for existing, new or expanded Group B Small Public Water Systems to cover water conservation goals and measures for the King County Board of Health's consideration.

Issue 5 - Education

Education has also been shown to have a positive impact on ground water resources. These educational activities need to be included in the Education Section:

WQ-5A Education: Low Water Use Plants - King County, cities and water utilities will work with local nurseries, the Washington State University Cooperative Extension Service and the Conservation Districts to promote the availability of appropriate seed stocks, plants and materials to achieve xeriscaping (use of low-water use plants).

WQ-5B Education: Schools and General Public - The education program will support conservation education efforts in the schools, and for the general public as described in the Interim Guidelines (Interim Guidelines for Public Water Systems Regarding Water Use Reporting, Demand Forecasting Methodology, and Conservation Programs). These would include, but not be limited to, the items listed under Public Education in Section IV of the Implementation Guidelines.

WQ-5C Education: Aquifer Recharge - King County will educate residents about landscaping practices that promote aquifer recharge through an informational brochure prepared by Cooperative Extension and King County.

WQ-5D Education: Individual Systems - The education program will include conservation information for individual water system owners.

Issue 6 - Artificial recharge (ASR)

Artificial recharge (ASR) is a new technique that is being tried in this area. However, not enough is known about the possibility for long-term artificial recharge.

WQ-6 Artificial recharge - Purveyors should investigate artificial recharge programs.

Discussion for Actions WQ-4 through WQ-6 - Support for appropriate resource management methods would increase the effectiveness of the Plan.

Ground water may be conserved through implementation of effective demand reduction techniques. Conservation of water supplies is essential to the proper management of ground water resources.

Including conservation measures in the landscaping ordinance will ensure that water conservation is considered during the planning of a development. Otherwise, subsequent owners may have to retrofit conservation measures.

Revising the Small Public Water System Regulations would include requiring water source meters and other items listed under the Interim Guidelines for Public Water Systems Regarding Water Use Reporting, Demand Forecasting Methodology and Conservation Programs. Existing Group B Small Public Water Systems could be required to retrofit with meters (Source and Individual) within 5 years of regulation adoption. New and expanding Group B systems could have to comply with requirements upon creation, or completion of expansion.

Educational efforts would complement and combine with current efforts of the SKCHD, Cooperative Extension and the Conservation District. This information could be disseminated through the Master Gardener and other programs of Cooperative Extension. Awareness of the problem of reduced aquifer recharge may increase responsibility and concern for physically susceptible and recharge areas in the community. Education programs on how landscaping practices can affect aquifer recharge could be coupled with education on the effects of pesticide and herbicide use on ground-water quality. A discussion of proper disposal of household hazardous wastes could be included. Landscaping tips should include a discussion of native vegetation and its role in facilitating infiltration of moisture. This type of information, as well as conservation measures, could be provided to individual water system owners.

The main function of ASR is to replenish aquifers during winter months when stream flows exceed minimum instream flow requirements. Replenished aquifers could be pumped during summer periods to meet local peak demands. This would reduce seasonal demands placed on the system during the summer and late fall months. The South King County Grant No. 1 report identified potential sites in Federal Way, Auburn, and the Covington Upland. Site specific investigations are required before suitability is established. The Seattle Water Department's Highline Project may serve as a model for other programs.

Implementation:

Task 1. Adopt/consider landscaping ordinance. (4A).

Who:	King County, and cities. (WQ-4A)
When:	The Management Committee will develop an implementation schedule.
Cost:	Costs will be determined by the Management Committee.
Funding:	By participating agencies.

Task 2. Propose and consider changes to Title 12. (4B).

Who:	SKCHD
When:	The Management Committee will develop an implementation schedule.
Cost:	Costs will be determined by the Management Committee.
Funding:	By participating agencies.

WQ-5 Education -

To be implemented as per Education section.

WQ-6 Artificial Recharge -

Task: Investigate ASR opportunities

Who:	Public water purveyors.
When:	The Management Committee will develop an implementation schedule.
Cost:	Costs will be determined by the Management Committee.
Funding:	By participating agencies.

CHAPTER 3

RECOMMENDED IMPLEMENTATION

South King County
Ground Water Management Plan

July 2003

CHAPTER 3 RECOMMENDED IMPLEMENTATION PROCESS FOR THE GROUND WATER MANAGEMENT PROGRAM

3.1 INTRODUCTION

The ground water management planning process has been funded by Centennial Clean Water Fund grants administered by the Ecology and contributions from King County and RWA. However, implementation of the Ground Water Management Program (GWMP) depends upon long term funding and appropriate assignment of responsibility. It is recommended that implementation of the Plan be through a voluntary cooperative program of local governments within the planning area. The level of funding will be tailored to meet local needs. Executive and legislative branches of government and other public and private interests have important roles in the implementation of the GWMP to protect ground water quality and quantity. The recommended implementation process described in this chapter assigns roles and tasks and proposes a source of funding. Topics addressed include:

3.2 Legislative authority
3.3 Funding
3.4 Washington Department of Ecology (Ecology)
3.5 Ground Water Management Committee (GWMP)
3.6 Ground Water Advisory Committee
3.7 Lead agency
3.8 Implementation Plan
3.9 Process for evaluation and revision of the GWMP

Summary tables (Section 3.8) list actions to be taken during plan implementation. These tables also list priorities, who is responsible for implementation. Generally the implementation schedule and the funding will be determined by the Management Committee described later in this chapter.

Two significant developments occurred during the planning process that had a profound influence upon the GWMP. Both occurred after the scope of work for the GWMP was adopted. Both necessitated major shifts in policy development.

The first is the Growth Management Act which was passed by the Washington legislature in 1990. This act requires local governments to identify and protect areas that are critical for aquifer recharge.

The second is wellhead protection requirements mandated by the 1986 amendments to the Safe Drinking Water Act. The amendments require states to develop Wellhead Protection Programs. The Wellhead Protection Program has been developed in Washington by the

Department of Health. The program requires public water system purveyors to delineate wellhead protection areas for each public water system and develop programs to protect ground water in those areas.

Both the Growth Management Act and the Wellhead Protection Program include specific provisions that must be carried out at the local level. The GWAC has tried to accommodate and, where appropriate, incorporate the provisions of the Growth Management Act and the Wellhead Protection Program into the GWMP. For example, some GWMP recommendations are county wide in applicability rather than limited to the South King County GWMA. This is in keeping with the directive of the Growth Management Act to local governments to cooperatively protect aquifer resources on a county or regional basis. The GWMP is designed to accommodate other ground water protection activities in King County that are expected to occur in response to both the Growth Management Act and the Wellhead Protection Program.

A number of additional regionally applicable programs are envisioned that will play a role in the King County Ground Water Management Program when implemented.

3.2 LEGISLATIVE AUTHORITY

Legislative authority is needed to adopt both the GWMP and the ordinances that may be necessary to implement it. The potential legislative authorities for implementation are the King County Council, King County Board of Health, affected city councils, special purpose districts, and others.

3.2.1 Metropolitan King County Council

The Metropolitan King County Council (hereafter referred to as the King County Council) consists of 13 members. The King County Council is legislative body of the County and through legislation sets policy. The Council exercises its legislative power by adoption and enactment of ordinances; by levying taxes, appropriating revenue and adopting budgets; and other powers as described in the King County Charter Section 220.20. (King County Charter, Sections 220 - 270)

The King County Council has broader legislative authority than the King County Board of Health, although it is possible they may have to defer to the King County Board of Health on occasion. Also, the King County Council could ensure that the policies in the King County Comprehensive Plan are carried out through an ordinance enacting the implementation of the Plan, specifying the responsibilities of each agency.

3.2.2 King County Board of Health

The King County Board of Health was established based upon RCW 70.07.030, which authorizes the board of county commissioners to be the local board of health for the county. King County Ordinance #11178 established the King County Council as the Board of Health for King County.

The director of the Department of Public Health is designated as the administrative officer for the Board, and provides staff support to the Board for carrying out its duties and responsibilities. The Board has supervision on matters pertaining to the health of the people of the county. This includes:

- Supervising the maintenance of all health and sanitary measures for the protection of the public health of the county;
- Enacting such county rules and regulations as are necessary to preserve, promote and improve the public health, and provide for the enforcement thereof; and
- Establishing fee schedules for issuing or renewing permits or for such other services as are authorized; provided, that such fees or services shall not exceed that actual cost of providing any such services. Fee schedules shall be established by Board rules and regulations.

3.2.3 Affected City Councils, Special Purpose Districts and Others

City councils, elected by the citizens within the city boundaries, are legislative bodies for the incorporated cities. They have similar powers and authority as the county council: most importantly, they are the land use and policy bodies for the incorporated cities. Other administrative bodies include the Boards of Commissioners for Water Districts, Sewer Districts, Fire Districts, and Water Associations. These Boards set policies and rates for the provision of fire protection and water and sewer service within their service areas.

3.2.4 Recommendations

The GWAC recommends that legislative authority for adoption and implementation of the GWMP be shared between the King County Council, the King County Board of Health, affected city councils, special purpose district boards, and other implementing agencies. Each legislative body is needed to implement their portion of the plan because it encompasses actions that are specific to their jurisdiction. King County Board of Health is particularly important because it allows for the adoption of ordinances that are effective in both the

unincorporated areas and in the cities of King County. Roles of each legislative authority are recommended as outlined below:

1. ***King County Council***

   - Recommend the GWMP to Ecology.
   - Adopt the GWMP after it has been certified by Ecology;
   - Adopt ordinances necessary for the implementation of the GWMP including the following features:
     - Designate their representative on the Management Committee;
     - Adopt a funding mechanism to support King County's participation in the implementation of the Plan;
     - Address such matters as land use, zoning, and regulations governing the activities of county agencies;
     - Adopt revisions to the GWMP.

2. ***King County Board of Health***

   - Adopt ordinances necessary for the implementation of the GWMP.

3. ***City Councils***

   - Adopt the GWMP after it has been certified by Ecology;
   - Adopt ordinances as needed to implement the GWMP within city limits;
   - Adopt a funding mechanism to support City participation in the implementation of the Plan;
   - Designate their representative on the Management Committee; and
   - Adopt revisions to the GWMP.

4. ***Special Purpose District's and Other Implementing Agencies***

   - Adopt the GWMP after it has been certified by Ecology;

- Adopt measures as needed to implement the GWMP within their jurisdiction;
- Adopt revisions to the GWMP;
- Adopt a funding mechanism; and
- Designate their representative on the Management Committee.

3.3 FUNDING

An adequate source of long term funding should be developed in order to implement the GWMP. This source of funding would be augmented by grants and any specific use or service fees. Several potential funding options would include:

1. There are a variety of methods to provide a funding source. These include establishing an Aquifer Protection Area under Chapter 36.36 RCW. The King County Board of Health could adopt a Rule and Regulation to establish fees on a variety of water users or potential contaminators. The King County Council could adopt an ordinance to provide property-based taxes. Water purveyors could establish funding through increasing their rates or other methods. An unexplored method for emergency or long-term funding, could be through the "Sewerage, Water, and Drainage Systems (County Services Act)" Chapter 36.94 RCW.

Aquifer Protection Area (APA). The purpose of an APA is to establish a funding base for ground water protection, preservation, and rehabilitation programs. If voters approve the APA, the county can collect ground water and septic system user fees.

Surface Water Utility Agency Fees. Some members of the GWAC felt that the surface water utilities have a responsibility to fund some of the actions because they are a "user" of the resource. However, not all jurisdictions have a surface water utility. Also, some undeveloped properties are not assessed, or undeveloped properties are assessed at lower rate. Assessments are generally based on an estimated amount of runoff.

Special Purpose Districts and Cities with Water Utilities could fund regional and individual components of the adopted ground water plan through their water rates. Each utility would agree to a share of the regional costs annually when the budget group meets to determine funding for the recommended implementation activities from the Management Committee.

Through a series of individual interlocals and/or an interlocal with the SKRWA, the regional aspects of the plan and King County participation could be funded along with individual utility responsibilities.

Chapter 36.94 RCW. The County Council may act under the emergency provisions granted to it under Chapter 36.94 RCW to float a short term bond providing operating funds for the implementation of the ground water management program. This option needs more research to determine if it is feasible in King County.

2. Part of deciding what method will provide the funding source includes determining who the funds will be collected from. This could include ground water users, contamination source owners, or all parcels in the GWMA.

Ground Water Users. The benefit to this approach is that the fee would be assessed on those that would directly benefit from the GWMP. Some may feel that this is inequitable, in that it wouldn't include contaminators of ground water. The amount of fee would need to be determined. The fee could be based on ERU (equivalent residential unit), which varies by water district, or by gallons as this is already estimated by purveyors for large systems. Small systems could be assessed at one ERU for each connection. Under this proposal, the individual systems would not be included, because of perceived smaller amount of water use associated with these systems, and lack of an existing fund collection mechanism.

Contamination Source Owners. The benefit to this approach is that it would assess a fee on those that may contaminate ground water. Most stationary contamination sources can be identified. However, those that pass through the area cannot be readily identified. Identification and location may take an enormous effort. Also, some sources are already being charged for the Local Hazardous Waste Management Plan in King County, or other fees such as for transportation of hazardous materials (through Washington State Department of Transportation). Another concern is how to equitably assess fee among source owners? Does one source rate a higher fee, and how to determine that?

All Parcel Owners. The benefit to this approach is that it would include those that benefit and those that may contaminate. Any assessment of vacant parcels would need to be a policy decision. The assessment could be as simple as dividing the total dollars needed by the number of parcels. However, this doesn't consider business vs. residential, or the amount of water used. This approach also doesn't include transient users.

Non-Residential Well Users with Water Rights, which use ground water for irrigation, or other industrial process such as cooling water. The benefit to this approach is that it would capture those that benefit, but that are not billed though existing water utilities. This method should be considered if the fee per ERU collected through water utilities method is used.
Developing methods to capture other uses, such as this and individual wells, should come after the structure for fee per ERU is in place. Ground water rights and property owners would need to be identified, and a method to collect the fee developed and implemented.

Assessment of water system customers through increased rates to fund the regional and local aquifer protection strategies as identified annually in the plan. The level of funding and allocation of funds to various program elements would be voluntary and negotiated during the annual budget meetings on funding with the utility rates adjusted as required.

3. Another decision is how to physically collect the funds. This could be through existing or new billing systems, or through the property tax collection system.

Assess Individual, Irrigation and Industrial Process Ground Water Users Based upon ERU. This would be done after the collection method for the other users is in place, and it is determined how much of the fee would be assigned to these users (a cost/benefit analysis). The funds could be collected through individual billings.

These two methods provide an equitable fee distribution to those that use water and an easier determination of fee than other methods. However, most water districts and cities don't want to add more fees to their customers. Also, individual, irrigation and industrial process users may be hard to identify and a collection method difficult to develop. Water rights, property owners vs. water system service connections, etc. would need to be analyzed to determine who falls into this category.

Assess Fee on Contamination Source Owners. This approach has many problems, such as how to collect the funds.

All Parcels, Through Property Tax Collection System. It may be possible to "piggy-back" upon the current King County property tax collection system. This method avoids having the water districts and cities collect money, then submit that to the County, then having county fund activities. Under this approach, King County would collect and distribute funds. However, more information is needed about the legality of this method.

Special Purpose Districts and City Water Utilities could collect the funds as part of the payment of their customers utility bill.

Recommendations: The GWAC recommends that users that benefit should support the GWMP. Users of the ground water resource are water utilities, water districts, water associations, small water systems, individual water systems, industries, irrigators, and (perhaps) surface water utilities. Plan implementers that have fee collection systems in place (water utilities, districts, some associations) should collect their budgeted amount from their customers. It needs to be determined if surface water utilities should be included. If they are, they should collect their portion as do water utilities. All collection of fees and participation by water utilities, districts and water associations shall be on a voluntary basis.

The GWAC recommends that plan implementers should contract with the County and each other using interlocal agreements for the amount of money to be collected and what their activities will be. Participation in the interlocal agreement would be voluntary, that is, all terms in the interlocal agreements would be agreed upon by both parties. The interlocal agreements would include fund collection and allocation, and the duties of each party in implementing the GWMP. The interlocal agreements may be re-negotiated at a frequency agreeable to the parties.

Determination of the aquifer protection fee involves several steps. First, costs of program elements are carefully estimated. Then, costs of the implementation of the annual agreed upon priorities are added together. Next, those that voluntarily choose to participate are noted. Finally, costs that can be funded by grants or special use/service fees are deducted. The resulting amount is the total that is supported by aquifer protection funds among the participating agencies.

Cost estimates for GWMP elements will be determined by the Management Committee based on the scope and schedule of the proposed elements. Each participating local government agency will retain authority to direct their funding to program elements which best meet their objectives.

3.4 WASHINGTON DEPARTMENT OF ECOLOGY ROLE

The certified GWMP will be codified in the Washington Administrative Code (WAC). As such, it is a regulation that Ecology is responsible for administering. Ecology will rely on local government cooperation to implement the Plan but may assist the lead agency, if needed, to gain compliance with provisions of the adopted Plan.

3.5 GROUND WATER MANAGEMENT COMMITTEE

Recommendations: The GWAC recommends the formation of a Ground Water Management Committee (Management Committee) that will coordinate ground water protection activities in the GWMA. The Management Committee will be advised by the GWAC, at it's discretion.

The Management Committee shall consist of one representative from: the GWAC, King County, each city in the planning area, each tribal nation in the planning area, each Group A Water Purveyor, and a private citizen. Members of the committee should be familiar with the GWMP and ground water issues. The Management Committee should meet at least annually to provide oversight to the implementation, to ensure that the budget process is performed in a fair and equitable manner, and to address the topics as assigned in the GWMP. Members of the Management Committee will be nominated by those they represent, except for the GWAC representative and the citizen who will be appointed by the other Management Committee Members.

Public Involvement: Interested public groups and individuals should be kept informed of the Management Committee work and implementation progress by inclusion on a notification list. Those on the list should receive Management Committee meeting agenda and minutes and routine updates on the GWMP progress. The Management Committee meetings should be open to the public, if they wish to attend.

Also, if the Management Committee is aware of an agency or individual that has an interest in a topic under discussion, they should be invited to attend and participate in discussions. Elected officials should also be included on the notification list. Decisions of the Management Committee should be by consensus whenever possible. (Consensus is where all members of a group find a proposal acceptable enough that they can support it, where no member opposes it.

This means that not everyone will be satisfied with every decision, but everyone can live with every decision (Scholtes, Peter R. *et al, The Team Handbook*, Joiner Associates, 1994). Procedures for resolving lack of consensus should be adopted by the committee for inclusion in its bylaws. Management Committee bylaws should include a provision stating that GWAC recommendations will be carefully and promptly considered and followed by a written response.

The Management Committee will carry out the following tasks:

- Review, and recommend an annual budget, and implementing agencies to carry out the implementation activities for the GWMP or any annual revision;

- Monitor the implementation of the GWMP;

- Review annual reports on implementation prepared by the lead agency(ies);
- Determine whether implementation is adequate and whether changes are needed in priorities, monitoring, reporting, etc., during the implementation period;

- Update the South King County Plan;
  - Act as a forum to consider new or ongoing ground water protection issues of significance to the GWMA;
  - Determine whether revisions are needed to the GWMP; and
- Perform tasks as assigned in the GWMP.

Individual members of the Management Committee will have the responsibility to coordinate internally with the entity represented. For example, a representative of a city needs to communicate and coordinate with their council and public works, planning, and building departments, and other affected departments regarding ground water management issues.

The Management Committee may make use of subcommittees to accomplish some tasks. For example, a subcommittee might address the topic of hazardous materials transport through aquifer protection areas. Federal and State agencies will be asked to serve in a technical capacity, as appropriate, on the subcommittees. The Management Committee may also make use of a representative(s) to participate with representatives from other King County Ground Water Planning Protection Areas on matters of a regional nature or common interest.

3.6 GROUND WATER ADVISORY COMMITTEE

Recommendation: The GWAC recommends that the GWAC continue to meet at the discretion of their representative on the Management Committee. The GWAC was established to develop the GWMP. After the Plan is certified by Ecology, the GWAC's duties as described in Chapter 173-100 WAC are completed. However, successful implementation of the GWMP depends upon support by the affected agencies and the community.

The GWAC should continue to have representation as described in Chapter 173-100 WAC. Replacement members for those on the GWAC who resign should come from the jurisdiction or group they represent, or by recommendation from the Management Committee.

The GWAC will review and comment upon GWMP updates, and provide technical input and information to work products developed in implementing the Plan. The GWAC shall annually or as necessary select their representative to the Management Cornmittee.

3.7 LEAD AGENCY

In general, the Management Committee will serve as the "Lead Agency." From time to time, the Management Committee may need to assign tasks for implementation of the GWMP. This may include staff to perform day-to-day tasks. This staff should be familiar with the GWMP, data base management, GWMA concerns, budget process, and be technically capable. Staff needs to provide administrative functions to the satisfaction of the Management Committee and the legislative authorities. The Management Committee should delegate an appropriate local government to serve as the lead for specific tasks as necessary, and consistent with statutory authority.

3.8 IMPLEMENTATION PLAN

The GWMP implementation priorities are listed in the Implementation Plan, included in this section as Tables 3.1 and 3.2. Prioritization enables the GWMP to ensure that ground water protection is maximized in the near term.

3.9 PROCESS FOR EVALUATION AND REVISION OF THE GWMP

Recommendation: The GWAC recommends that a process for periodic evaluation and revision of the GWMP is established in order to ensure that the goals of the GWMP are achieved efficiently under changing conditions.

The Plan Management Committee, the GWAC, and governments and agencies affected by the Plan will be involved in the evaluation and revision of the Plan. The first revision should be considered five years or more as needed from the date of Plan certification by Ecology. Subsequent revisions will be considered as needed by the Management Committee.

Table 3.1 Implementation Priorities

Management Strategy	Agency	Priority	Type
DCM - 1 Data Collection Analysis and Management	King County (lead), Cities. Purveyors, SKCHD	1	ongiong program
DCM - 2 Data Collection Analysis and Management	Ecology	1	new program
ED - 1 and ED - 2 Education.	King County (lead), Cities. Purveyors	1	ongiong program
WQ - 1 Policies and Ordinances	Cities, King County	1	regulation
WQ - 2A Data Needs	King County	1	ongiong program
WQ - 4A Conservation	Cities, Purveyors, King County	1	ongiong program
WQ - 4B Conservation	SKCHD	1	ongiong program
ST - 4C coordination between surface and ground water planning	Cities, King County, Purveyors	2	comprehensive program
WQ - 3 Water rights records	Cities	2	formal agreement
WQ - 6 Artificial Recharge	Cities, Purveyors	2	new program
WQ - 7 Decline Limits	Ecology	2	new program
SA - 1B Elimination of categorical exemptions to SEPA	Cities, King County	3	regulation
SA - 1D Enhanced environmental review to protect aquifers	Cities, King County	3	regulation
HM - 1 State Hazardous Waste Plan-Implementation	King County	4	ongoing program
HM - 3 Hazardous Waste Facility Zone Designation	Cities	4	regulation
HM - 5 Implementation of the Uniform Fire Code	King County, Cities	4	ongoing program
HM - 6 Implementation of Emergency Planning	King County, Cities	4	ongoing program
HM - 7A WHPP: assess transportation spills	Cities	4	new program
OS - 1 Nitrate levels	Cities, Purveyors, King County	4	new program
OS - 2B Hazardous Materials	SKCHD	4	regulation
OS - 3A Household Hazardous Wastes	SKCHD	4	ongoing program

Table 3.1 Implementation Priorities

Management Strategy	Agency	Priority	Type
OS - 4 Operation and Maintenance	SKCHD	4	regulation
PF - 1A Pesticide and Fertilizer Use	Conservation District	4	form agreement
PF - 1C Pesticide and Fertilizer Use	Cities, King County	4	regulation
SG - 2B Aquifer Impacts and Regulations	King County	4	regulation
SG - 3A Sand and gravel sites reclamation policy	Cities	4	regulation
SG - 3B Zoning Code - Reclamation Plans	King County	4	regulation
SP - 1B Infiltration and Exfiltration: Leakproof Piping	King County	4	new program
SP - 2 Groundwater depletion - Backfill	King County	4	new program
ST - 1 Runoff Versus Recharge	King County, Cities	4	regulation
ST - 2 Ground Water Quality Concerns - Zoning	King County, Cities	4	regulation
ST - 4A Coordination Between Surface and Ground Water Planning Efforts: Ecology Programs	Ecology	4	regulation
ST - 4C Coordination Between Surface and Ground Water Planning Efforts: King County	King County	4	regulation
ST - 6 Roadway Runoff	King County	4	regulation
ST - 7 Soil Amendment	King County	4	regulation
SW - 1 Standards	SKCHD	4	regulation
SW - 2 Waste Screening	King County	4	regulation
SW - 3 Abandoned sites	SKCHD	4	new program
UST - 1A Enhance inspection of UST	Cities, King County	4	new program
UST - 1B Augment State UST Program	SKCHD	4	regulation
UST - 2A Exempt Tanks	King County (Task 2)	4	regulation
UST - 2B Exempt Tanks	SKCHD	4	regulation

Table 3.1 Implementation Priorities

Management Strategy	Agency	Priority	Type
WC - 1A Support well decommissioning and abandonment	Cities, Purveyors, King County, Ecology	4	new program
WC - 1B State Program	SKCHD, Ecology	4	new program
WC - 2A Well Identification	SKCHD, King County	4	regulation
WC - 2B Well Identification	Ecology, King County	4	regulation
HM - 7B Transportation-Related Hazardous Material Spills-Management Committee Evaluation	King County	5	research
OS - 2A Hazardous Materials	SKCHD	5	research
PF - 1B Pesticide and Fertilizer Use	King County, Cities	5	research
SP - 1A Sewer Programs	King County	5	research
ST - 2B Ground Water Quality Concerns - Facility Requirements	King County	5	research
ST - 2C Stormwater infiltration study	King County, Cities	5	research
ST - 5 Assessment of storm water facilities	Cities	5	research
ST - 6 Road stormwater facilities	Cities	5	research
ST - 7 Soil amendment study	Cities, Purveyors	5	research
UST - 3A Heating Oil Tanks: Abandonment and Maintenance	King County	5	research
UST - 3B UST location and database	King County, Cities	5	research
WC - 3A Decommissioning cost	King County	5	research
WC - 3B Decommissioning cost	Ecology	5	research
HM - 4 Hazardous Waste Contamination Sites-Site Referral and Public Education	King County	not ranked	
SA - 1A, B SEPA Categorical Exemptions	Purveyors	not ranked	
SA - 1C, D General Policies, SEPA Guidance	Purveyors	not ranked	
SA - 1E Mapping	Cities, Purveyors	not ranked	

Table 3.1 Implementation Priorities

Management Strategy	Agency	Priority	Type
SA - 2 WHPP strategies	Purveyors	not ranked	
SG - 1 Regulatory Modifications	King County	not ranked	
SG - 1 Meet NPDES requirements	Cities	not ranked	
ST - 5 Stormwater Assessment	King County, Purveyors	not ranked	

Table 3.2 Implementing Agencies

Agency	Management Strategy	Priority	Type
King County	DCM - 1 Data Collection Analysis and Management	1	ongiong program
King County	ED - 1 and ED - 2 Education.	1	ongiong program
King County	WQ - 1 Policies and Ordinances	1	regulation
King County	WQ - 2A Data Needs	1	ongiong program
King County	WQ - 4A Conservation	1	ongiong program
King County	ST - 4C coordination between surface and ground water planning	2	comprehensive program
King County	SA - 1B Elimination of categorical exemptions to SEPA	3	regulation
King County	SA - 1D Enhanced environmental review to protect aquifers	3	regulation
King County	HM - 1 State Hazardous Waste Plan-Implementation	4	ongoing program
King County	HM - 5 Implementation of the Uniform Fire Code	4	ongoing program
King County	HM - 6 Implementation of Emergency Planning	4	ongoing program
King County	OS - 1 Nitrate levels	4	new program
King County	PF - 1C Pesticide and Fertilizer Use	4	regulation
King County	SG - 2B Aquifer Impacts and Regulations	4	regulation
King County	SG - 3B Zoning Code - Reclamation Plans	4	regulation
King County	SP - 1B Infiltration and Exfiltration: Leakproof Piping	4	new program
King County	SP - 2 Groundwater depletion - Backfill	4	new program
King County	ST - 1 Runoff Versus Recharge	4	regulation

Table 3.2 Implementing Agencies

Agency	Management Strategy	Priority	Type
King County	ST - 2 Ground Water Quality Concerns - Zoning	4	regulation
King County	ST - 4C Coordination Between Surface and Ground Water Planning Efforts: King County	4	regulation
King County	ST - 6 Roadway Runoff	4	regulation
King County	ST - 7 Soil Amendment	4	regulation
King County	SW - 2 Waste Screening	4	regulation
King County	UST - 1A Enhance inspection of UST	4	new program
King County	UST - 2A Exempt Tanks	4	regulation
King County	WC - 1A Support well decommissioning and abandonment	4	new program
King County	WC - 2A Well Identification	4	regulation
King County	WC - 2B Well Identification	4	regulation
King County	HM - 7B Transportation-Related Hazardous Material Spills-Management Committee Evaluation	5	research
King County	PF - 1B Pesticide and Fertilizer Use	5	research
King County	SP - 1A Sewer Programs	5	research
King County	ST - 2B Ground Water Quality Concerns - Facility Requirements	5	research
King County	ST - 2C Stormwater infiltration study	5	research
King County	UST - 3A Heating Oil Tanks: Abandonment and Maintenance	5	research
King County	UST - 3B UST location and database	5	research
King County	WC - 3A Decommissioning cost	5	research

Table 3.2 Implementing Agencies

Agency	Management Strategy	Priority	Type
Cities	DCM - 1 Data Collection Analysis and Management	1	ongiong program
Cities	ED - 1 and ED - 2 Education.	1	ongiong program
Cities	WQ - 1 Policies and Ordinances	1	regulation
Cities	WQ - 4A Conservation	1	ongiong program
Cities	ST - 4C coordination between surface and ground water planning	2	comprehensive program
Cities	WQ - 3 Water rights records	2	formal agreement
Cities	WQ - 6 Artificial Recharge	2	new program
Cities	SA - 1B Elimination of categorical exemptions to SEPA	3	regulation
Cities	SA - 1D Enhanced environmental review to protect aquifers	3	regulation
Cities	HM - 3 Hazardous Waste Facility Zone Designation	4	regulation
Cities	HM - 5 Implementation of the Uniform Fire Code	4	ongoing program
Cities	HM - 6 Implementation of Emergency Planning	4	ongoing program
Cities	HM - 7A WHPP: assess transportation spills	4	new program
Cities	OS - 1 Nitrate levels	4	new program
Cities	PF - 1C Pesticide and Fertilizer Use	4	regulation
Cities	SG - 3A Sand and gravel sites reclamation policy	4	regulation
Cities	ST - 1 Runoff Versus Recharge	4	regulation
Cities	ST - 2 Ground Water Quality Concerns - Zoning	4	regulation

Table 3.2 Implementing Agencies

Agency	Management Strategy	Priority	Type
Cities	UST - 1A Enhance inspection of UST	4	new program
Cities	WC - 1A Support well decommissioning and abandonment	4	new program
Cities	SP - 1A Sewer Programs	5	research
Cities	ST - 2C Stormwater infiltration study	5	research
Cities	ST - 5 Assessment of storm water facilities	5	research
Cities	ST - 6 Road stormwater facilities	5	research
Cities	ST - 7 Soil amendment study	5	research
Cities	UST - 3B UST location and database	5	research

Table 3.2 Implementing Agencies

Agency	Management Strategy	Priority	Type
Purveyors	DCM - 1 Data Collection Analysis and Management	1	ongiong program
Purveyors	ED - 1 and ED - 2 Education.	1	ongiong program
Purveyors	WQ - 4A Conservation	1	ongiong program
Purveyors	ST - 4C coordination between surface and ground water planning	2	comprehensive program
Purveyors	WQ - 6 Artificial Recharge	2	new program
Purveyors	OS - 1 Nitrate levels	4	new program
Purveyors	WC - 1A Support well decommissioning and abandonment	4	new program
Purveyors	ST - 7 Soil amendment study	5	research

Table 3.2 Implementing Agencies

Agency	Management Strategy	Priority	Type
SKCHD	DCM - 1 Data Collection Analysis and Management	1	ongiong program
SKCHD	WQ - 4B Conservation	1	ongiong program
SKCHD	OS - 2B Hazardous Materials	4	regulation
SKCHD	OS - 3A Household Hazardous Wastes	4	ongoing program
SKCHD	OS - 4 Operation and Maintenance	4	regulation
SKCHD	SW - 1 Standards	4	regulation
SKCHD	SW - 3 Abandoned sites	4	new program
SKCHD	UST - 1B Augment State UST Program	4	regulation
SKCHD	UST - 2B Exempt Tanks	4	regulation
SKCHD	WC - 1B State Program	4	new program
SKCHD	WC - 2A Well Identification	4	regulation
SKCHD	OS - 2A Hazardous Materials	5	research

Table 3.2 Implementing Agencies

Agency	Management Strategy	Priority	Type
Ecology	DCM - 2 Data Collection Analysis and Management	1	new program
Ecology	WQ - 7 Decline Limits	2	new program
Ecology	ST - 4A Coordination Between Surface and Ground Water Planning Efforts: Ecology Programs	4	regulation
Ecology	WC - 1A Support well decommissioning and abandonment	4	new program
Ecology	WC - 1B State Program	4	new program
Ecology	WC - 2B Well Identification	4	regulation
Ecology	WC - 3B Decommissioning cost	5	research
Conservation District	PF - 1A Pesticide and Fertilizer Use	4	form agreement

ACKNOWLEDGEMENTS

South King County
Ground Water Management Plan

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ACKNOWLEDGEMENTS

SOUTH KING COUNTY GROUND WATER ADVISORY COMMITTEE

The following individuals have contributed to the GWMP development as former members, alternates or in some other capacity:

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*Denotes Alternative

GLOSSARY

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GLOSSARY

Acronyms and Abbreviations

µg/L	micrograms per liter
ac-ft	acre feet
ADD	Average day demand/service
af/yr	acre-feet per year
APWA	American Public Works Association
ASR	aquifer storage and recovery
ASTM	American Society for Testing and Materials
AWWA	American Water Works Association
Bgs	below ground surface
BMPs	Best Management Practices
CARA	Critical Aquifer Recharge Areas
cf	cubic feet
ccf	100 cubic feet
cfs	cubic feet per second
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CDC	Center for Disease Control and Prevention
CFR	Code of Federal Regulations
CIP	Capital Improvement Program
CT	Census Tract
CWSP	Coordinated Water Supply Plan
D/DBP	Disinfectants/Disinfection Byproducts
DOE	Washington Department of Ecology
DOH	Washington State Department of Health
DWSRF	Drinking Water State Revolving Fund
Ecology	Washington State Department of Ecology
EPA	U.S. Environmental Protection Agency
ERU	equivalent residential unit
ESWTR	Enhanced Surface Water Treatment Rule

FAZ	Forecast Analysis Zone
GIS	geographic information system
GMA	Growth Management Act
gpcd	gallons per capita per day
gpd	gallons per day
gpm	gallons per minute
GWI	ground water under influence of surface water
GWAC	South King County Ground Water Advisory Committee
GWMA	South King County Ground Water Management Area
GWMP	South King County Ground Water Management Plan
HDPE	high-density polyethylene
IOC	inorganic chemical
KCDNR	King County Department of Natural Resources and Parks
KCWD	King County Water District
LF	Linear Feet
LID	Local Improvement District
MCL	maximum contaminate level
MDD	maximum day demand/service
MG	million gallons
Mg/l	milligrams per liter
mgd	million gallons per day
MID	Maximum Instantaneous Demand
MTCA	Washington Model Toxics Control Act
NMFS	National Marine Fisheries Service
NPDES	National Pollutant Discharge Elimination System
NTU	nephalametric turbidity units
OFM	Office of Financial Management
O&M	Operations and Maintenance
OSHA	Occupational Safety and Health Administration
PAA	Potential Annexation Area
pCi/L	picoCuries per liter

PE	Professional Engineer
PHD	peak hourly demand
ppb	parts per billion
ppm	parts per million
PRV	pressure reducing valve
psi	pounds per square inch
PSRC	Puget Sound Regional Council
PWTF	Public Works Trust Fund
Qa	Annual Quantity of water in acre feet
Qi	Instantaneous Withdrawal of water in gpm
RCW	Revised Code of Washington
RWA	South King County Regional Water Association
SARA	Superfund Amendments and Reauthorization Act, Title 3
SCADA	Supervisory Control and Data Acquisition
SKCHD	Seattle King County Health Department
SMA	satellite management agency
SOC	synthetic organic chemical
SPU	Seattle Public Utilities
TOT	time of travel
TTHM	total trihalomethanes
UBC	Uniform Building Code
UFC	Uniform Fire Code
UGA	Urban Growth Area
ULID	Utility Local Improvement Districts
UPC	Uniform Plumbing Code
USGS	United States Geological Survey
UST	Underground Storage Tank
VOC	volatile organic chemical
WAC	Washington State Administration Code
WDOE	Washington State Department of Ecology
WDOH	Washington State Department of Health

WFI	Water Facilities Inventory
WHPA	Wellhead Protection Area
WHPP	Wellhead Protection Program
WSDNR	Washington State Department of Natural Resources
WSDOT	Washington State Department of Transportation
WSP	Comprehensive Water System Plan

Terms

ALLUVIAL. Pertaining to or composed of alluvium or deposited by a stream or running water.

ALLUVIUM. A general term for clay, silt, sand, gravel, or similar unconsolidated material deposited during comparatively recent geologic time by a stream or other body of running water as a sorted or semisorted sediment in the bed of the stream or on its floodplain or delta, or as a cone or fan at the base of a mountain slope.

AQUIFER. A soil or geologic formation, group of formations, or part of a formation that contains sufficient saturated permeable material to yield economical quantities of water to wells and springs.

AQUIFER SYSTEM. A body of permeable and relatively impermeable materials that functions regionally as a water-yielding unit. It comprises two or more permeable units separate at least locally by confining units that impede ground-water movement but do not greatly affect the regional hydraulic continuity of the system. The permeable materials can include both saturated and unsaturated sections.

AQUIFER TEST. A test involving the withdrawal of measured quantities of water from or addition of water to a well, and the measurement of resulting changes in head in the aquifer both during and after the period of discharge or addition, e.g., a bailer or pump test. (These are withdrawal tests)

AQUITARD. An essentially impermeable geologic formation, group of formations, or part of a formation through which virtually no water moves.

AREA OF INFLUENCE. Area surrounding a pumping well within which the water table or potentiometric surface has been changed due to the well's pumping or recharge.

ARTESIAN WELL. A well deriving its water from a confined aquifer in which the hydraulic water level stands above the ground surface; synonymous with flowing artesian well.

ATTENUATION. The general process of reducing the amount and concentration of contaminants in water. Includes physical, chemical and biological processes as well as dilution.

AVERAGE DAILY DEMAND (ADD). The annual demand divided by the number of days per year, expressed in million gallons per day (MGD).

BASALT. A general term for dark-colored iron- and magnesium-rich igneous rocks. It is the principal rock type making up the ocean floor and is easily seen in exposed cliffs in Eastern Washington.

BASE FLOW. That part of stream discharge not attributable to direct runoff from precipitation or snowmelt, usually sustained by ground-water discharge.

BEDROCK. A general term for the rock, usually solid, that underlies soil or other unconsolidated material.

BENTONITE. A colloidal clay, largely made up of the mineral sodium montmorillonite, [a hydrated aluminum silicate] used in sealing the annular space to create a surface or sanitary seal.

CAPILLARY ACTION. The movement of water within the interstices of a porous medium due to the forces of adhesion, cohesion, and surface tension acting in a liquid that is in contact with a solid.

CAPILLARY FRINGE. The zone at the bottom of the vadose zone where groundwater is drawn upward by capillary force.

CARBONATE. A sediment formed by the organic of inorganic precipitation from aqueous solution of carbonates of calcium, magnesium, or iron.

CHLORIDE. A compound of chlorine with one other positive element or radical.

CLEAN WATER ACT. Basic federal legislation regulating surface water quality.

COLIFORM BACTERIA. Bacteria (*E. coli*) associated with human and warm-blooded animal waste.

CONE OF DEPRESSION. A depression in the groundwater table or potentiometric surface that has the shape of an inverted cone and develops around a well from which water is being withdrawn. It defines the area of influence of a well.

CONFINED AQUIFER. A formation in which the groundwater is isolated from the atmosphere at the point of discharge by impermeable geologic formations; confined groundwater is generally subject to pressure greater than atmospheric.

CONFINING BED. A geologic unit with low permeability (hydraulic conductivity) which restricts movement of water into or out of the aquifer. See also aquiclude, aquitard.

CONTAMINATION. The degradation of natural water quality as a result of anthropogenic activities.

CROSS CONNECTION. A physical arrangement connecting a public water system, directly or indirectly, with anything other than another potable water system, and capable of contaminating the public water system.

CROSS-SECTION. A schematic representation of geologic layers as seen in a side view.
DISCHARGE. Ground water that flows out of an aquifer into an adjacent aquifer or to the surface into a spring or river.

DISCHARGE AREA. An area in which there are upward components of hydraulic head in the aquifer. In the discharge area ground water flows toward the surface, and may escape as a spring, seep, or base flow, or by evaporation and transpiration.

DISPERSION. The spreading and mixing of chemical constituents in groundwater caused by diffusion and mixing due to microscopic variations in velocities within and between pores.

DRAINAGE BASIN. The land area from which surface runoff drains into a stream channel or system of channels, or to a lake, reservoir, or other body of water.

DRAWDOWN. The distance between the static water level and the top surface of the cone of depression during pumping of a well.

DRILLERS LOG. A record of the geologic and aquifer conditions encountered by a driller during drilling of a water supply well. The State of Washington requires that a log be completed for each well.

DRINKING WATER STANDARDS. Federal or state water quality regulations that limit the contaminant levels of certain compounds for drinking water.

DYNAMIC EQUILIBRIUM. A condition of which the amount of recharge to an aquifer equals the amount of natural discharge.

EFFLUENT. Liquid waste discharged from a manufacturing or treatment process, in its natural state or partially or completely treated, that discharges into the environment.

EQUIVALENT RESIDENTIAL UNITS (ERU). The amount of water consumed by a typical full-time single family residence. Used for converting users other than single family residence into an equivalent number for the purpose of demand forecasting, system analysis and facility sizing.

EROSION. The general process or group of processes whereby the materials of the Earth's crust are moved from one place to another by running water (including rainfall), waves and currents, glacier ice, or wind.

EVAPOTRANSPIRATION. Loss of water from a land area through transpiration of plants and evaporation from the soil.

FLOODPLAIN. The surface or strip of relatively smooth land adjacent to a river channel, constructed by the present river and covered with water when the river overflows its banks.

It is built of alluvium carried by the river during floods and deposited in the sluggish water beyond the influence of the swiftest current.

FLOW LINES. On a hydraulic gradient diagram, the lines indicating the direction followed by groundwater toward points of discharge. Flow lines are perpendicular to equipotential lines.

FLOW RATE. The volume of flow per time (e.g., gallons per minute).

FLOWING ARTESIAN WELLS. Wells which tap confined aquifers which flow at ground surface without the necessity of pumping.

FRANCHISE AREA. A designated area within which the utility system is permitted, by franchise, to own, operate and maintain facilities within public rights-of-way.

GEOLOGIC MAP. A map showing the aerial distribution of geologic units and the altitude or structure of those units.

GLACIAL DRIFT. A general term for unconsolidated sediment transported by glaciers and deposited directly on land or in the sea.

GLACIOFLUVIAL. Pertaining to the meltwater streams flowing from melting glacier ice and especially to the deposits and landforms produced by such streams.

GLACIOLACUSTRINE. Deposits created in lake environments from glacial silts and clays.

GROUND WATER. All water that is located below the ground surface; more specifically, subsurface water below the water table.

GROUND-WATER DIVIDE. A ridge in the water table, or potentiometric surface, from which ground water moves away at right angles in both directions.

GROUND-WATER MODEL. A simplified conceptual or mathematical image of a ground-water system, describing the feature essential to the purpose for which the model was developed and including various assumptions pertinent to the system. Mathematical ground-water models can include numerical and analytical models.

GROUNDWATER TABLE. The surface between the zone of saturation and the zone of aeration; the surface of an unconfined aquifer.

HARDNESS. A property of water causing formation of an insoluble residue when the water is used with soap. It is primarily caused by calcium and magnesium ions.

HAZARDOUS WASTE. Regulated waste that is ignitable, corrosive, reactive, or toxic.

HYDRAULIC CONDUCTIVITY. The rate of flow of water in gallons per day through a cross section of one square foot under a unit hydraulic gradient, at the prevailing temperature (gpd/ft).

HYDRAULIC CONNECTION. The condition in which two water-bearing layers or bodies may freely transmit water between them.

HYDROGEOLOGIC. Those factors that deal with subsurface waters and related geologic aspects of surface water.

HYDROLOGIC CYCLE. The cyclical movement of water from the oceans to atmosphere to the land and back to the oceans.

HYDROSPHERE. All waters of the Earth, as distinguished from the rocks (lithosphere), living things (biosphere), and the air (atmosphere).

HYDROSTRATIGRAPHY. The assemblage of layers of aquifers and aquitards.
IGNEOUS. A type of rock solidified from molten material.
IMPERMEABLE. An adjective used to describe rock, soils, or sediments that impede the flow of water.

INFILTRATION. The downward movement of rain water or surface water into soil.

LACUSTRINE. Referring to a lake environment.

LAMINATED. The layering or thin bedding in sedimentary rocks.

LANDFILL. A general term indicating a disposal site of refuse, and dirt from excavations.

LEACHATE. The liquid that has percolated through solid waste and dissolved soluble components.

MAXIMUM CONTAMINANT LEVEL (MCL). The maximum permissible level as required by the Safe Drinking Water Act regulations, of a contaminant in water that is delivered to the users of a public water system.

MAXIMUM DAILY DEMAND (MDD). The Highest water demand anticipated for any given day, expressed in MGD.

MAXIMUM INSTANTANEOUS DEMAND (MID). The maximum rate of water use, excluding fire flow which has occurred or is expected to occur within a defined service area at any instant in time.

METAMORPHIC. A rock that has been physically and/or chemically changed from an original texture and/or composition, usually by very high temperatures or pressures below the earth's surface.

MG/L. Milligrams per liter; a unit of concentration in water equivalent to a part per million or 0.0001 percent.

MICROORGANISMS. Microscopic organisms such as any of the bacteria, protozoans, or viruses.

NITRATE. A compound commonly associated with domestic and agricultural waste, and formed by nitrogen.

OUTWASH. Stratified sand and gravel removed or washed out from a glacier by meltwater streams and deposited in front of or beyond the end moraine or the margin of an active glacier. The coarser material is deposited nearer to the ice.

OUTWASH PLAIN. A broad, gently sloping sheet of outwash.

PEAT. A non-compacted deposit of organic material commonly developed from bogs or swamps.

PERCOLATE. The act of water seeping or filtering through soil without a defined channel.

PERMEABILITY. The property or capacity of a porous rock, sediment, or soil for transmitting a fluid; it is a measure of the relative ease of fluid flow under unequal pressure.

pH. A measure of the acidity or alkalinity of a solution, numerically equal to 7 for neutral solutions, increasing with increasing alkalinity and decreasing with increasing acidity. Originally stood for "potential of hydrogen".

PLUME. A contaminated portion of an aquifer extending from the original contaminant source.

POLLUTION. When the contamination concentration levels restrict the potential use of groundwater.

POROSITY. The percentage of the bulk volume of a rock or soil that is occupied by interstices, whether isolated or connected.

POTABILITY. Ability to be used as drinking water.

POTENTIOMETRIC SURFACE. The surface to which water will rise in an aquifer under hydrostatic pressure.

PPM. Parts/per million. A unit of concentration equivalent to 0.0001 percent.

RECHARGE. The addition of water to the zone of saturation; also, the amount of water added.

RECHARGE AREA. Area in which water reaches the zone of saturation by surface infiltration.

RUNOFF. That part of precipitation flowing overland to surface streams.

SANDSTONE. A sedimentary rock composed of abundant rounded or angular fragments of sand set in a fine-grained matrix (silt or clay) and more or less firmly united by a cementing material.

SEAWATER INTRUSION. The entry of seawater into a fresh water aquifer.

SEDIMENTARY ROCKS. Rocks resulting from the consolidation of loose sediment that has accumulated in layers.

SERVICE AREA. The recognized area within which a provider of water purveyor intends to serve.

SHALE. A fine-grained sedimentary rock, formed by the consolidation of clay, silt, or mud. It is characterized by finely laminated structure and will not fall apart on wetting.

STORAGE COEFFICIENT. The volume of water released from storage per unit-volume of porous medium per unit change in head.

STRATIGRAPHIC. Pertaining to the composition and position of layers of rock or sediment.

TERTIARY. A period of earth's history estimated to have occurred between 65 and 2 million years ago.

TILL. Predominantly unsorted and unstratified drift, generally unconsolidated, deposited directly by and underneath a glacier without subsequent reworking by meltwater, and consisting of a heterogeneous mixture of clay, silt, sand, gravel, and boulders ranging widely in size and shape.

TOPOGRAPHIC. Pertaining to the general configuration of a land surface.

TOTAL DISSOLVED SOLIDS (TDS). A term that expresses the quantity of dissolved material in a sample of water, either the residue on evaporation, dried at 356°F (180°C), or, for many waters that contain more than about 1,000 mg/l, the sum of the chemical constituents.

TRANSMISSIVITY. The rate at which water is transmitted through a unit width of an aquifer under a unit hydraulic gradient. Transmissivity values are given in gallons per minutes through a vertical section of an aquifer one foot wide and extending the full saturated height of an aquifer under a hydraulic gradient of 1 in the English Engineering

system; in the International System, transmissivity is given in cubic meters per day through a vertical section of an aquifer one meter wide and extending the full saturated height of an aquifer under a hydraulic gradient of 1.

TRANSPIRATION. The process by which water absorbed by plants, usually through the roots, is evaporated into the atmosphere from the plant surface.

TURBULENT FLOW. Water flow in which the flow lines are confused and heterogeneously mixed. It is typical of flow in surface-water bodies.

UNCONFINED AQUIFER. An aquifer where the water table is exposed to the atmosphere through openings in the overlying materials.

UNSATURATED ZONE. The subsurface zone containing both water and air. The lower part of the unsaturated zone (capillary fringe) does not actually contain air, but is saturated with water held by suction at less than atmospheric pressure.

VADOSE ZONE. The zone containing water under pressure less than that of the atmosphere, including soil water, intermediate vadose water, and capillary water. This zone is limited above by the land surface and below by the surface of the zone of saturation, that is, the water table.

VISCOSITY. The property of a substance to offer internal resistance to flow. Specifically, the ratio of the shear stress to the rate of shear strain.

WATER TABLE. The surface between the vadose zone and the groundwater, where the pressure is equal to that of the atmosphere.

WEATHERING. The destructive process(es) by which the atmosphere and surface water chemically change the character of a rock.

ZONE OF CONTRIBUTION. The area surrounding a pumping well that encompasses all areas or features that supply ground-water recharge to the well.

ZONE OF INFLUENCE. The area surrounding a pumping well within which the water table or potentiometric surfaces have been changed due to ground-water withdrawal.
Sources:

- Groundwater Wells, Driscoll, F. Johnson Division, 1986.
- Groundwater Resource Protection, King County Planning Division/State of Washington/ Department of Ecology.
- Redmond-Bear Creek Ground Water Management Program Draft Hydrogeologic Characterization Report by EMCON Northwest, Inc., November 1992.
- Northern Thurston County Ground Water Management Plan, February, 1992.

APPENDICES

South King County
Ground Water Management Plan

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APPENDIX A

Environmental Check List & DNS

South King County
Ground Water Management Plan

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APPENDIX A

ENVIRONMENTAL CHECKLIST & DETERMINATION OF NONSIGNIFICANCE

DETERMINATION OF NONSIGNIFICANCE

South King County Ground Water Management Plan

Description of Proposal: The South King County Ground Water Management Plan (SKC-GWMP) was developed by the South King County Ground Water Advisory Committee (SKC-GWAC) to meet the ground water protection needs of the area. The goal of the SKC-GWMP is to protect the quality and quantity of ground water within the area for present and future use, and to provide for effective and coordinated management of this essential resource. With expected increases in population and the populations' reliance on ground water it is clear that a comprehensive ground water plan tailored to the specific needs of the area is necessary to protect the ground water supply. Ground water provides most of the water used in the South King County Ground Water Management Area (SKC-GWMA) for private, municipal, industrial, and agricultural needs.

Proponent: The South King County Regional Water Association on behalf of the South King County Ground Water Advisory Committee.

Location of Proposal: The South King County Ground Water Management Area is a 260 square mile area in the southwest portion of King County, Washington. The Duwamish and Cedar Rivers bound the area on the north, on the east by the Black Diamond area, on the south by the Green River and Pierce County, and on the west by Puget Sound (see Fig. 1).

Lead Agencies: The South King County Regional Water Association and the King County Department of Natural Resources and Parks.

Under Chapter 173-100 WAC, the proposed ground water management program is subject to review pursuant to the State Environmental Policy Act. The lead agency is responsible for reviewing the environmental checklist and issuing a determination based upon the checklist. The lead agencies recognize that elements of the proposed ground water management plan may change during the concurrence process when implementing agencies review the SKC-GWMP in its entirety for implementation feasibility.

The South King County Regional Water Association acting as the lead agency for this proposal, has determined that the proposed SKC-GWMP does not have a probable significant adverse impact on the environment. An environmental impact statement is not required under Chapter 43.21C.030(2)(c) RCW. This decision was made after review of a completed environmental checklist and other information on file with the lead agency. This information is available to the public on request.

This Determination of Nonsignificance is issued under Chapter 197-11-340(2) WAC: the lead agency will not act on this proposal for 15 days from the date below. Comments must be submitted by August 22, 2003.

Responsible official:

Donald C. Wright
Administrator
South King County
Regional Water Association

Phone:

253-639-0779

Address:

South King County
Regional Water Association
27224 144th Avenue SE
Kent Washington 98042

Date: August 7, 2003 **Signature:** _____

ENVIRONMENTAL CHECKLIST

A. BACKGROUND

1. **Name of the proposed project:**

   South King County Ground Water Management Plan

2. **Name of Applicant:**

   South King County Regional Water Association on behalf of the South King County Ground Water Advisory Committee.

3. **Address and telephone number of applicant and contact person:**

   Donald C. Wright
   Administrator
   South King County Regional Water Association
   27224 144th Ave. S.E.
   Kent, WA 98042

   (253) 639-0779

4. **Date checklist prepared:**

   June 1995 – Reviewed April 2003

5. **Agency requesting checklist:**

   This checklist was prepared pursuant to Department of Ecology regulations (Section 110 Chapter 173-100 WAC) which state that proposed Ground Water Management Programs are subject to review under the State Environmental Policy Act (SEPA) (Chapter 43.21C RCW).

   The agency requesting the checklist is the South King County Regional Water Association. Donald Wright, Administrator is the Responsible Official under SEPA for this project.

6. **Proposed timing or schedule (including phasing, if applicable):**

   The Concurrence Draft South King County Ground Water Management Plan (GWMP) will be submitted to the Department of Ecology (Ecology) and affected agencies for review and concurrence in August 2003. Ecology will hold a public hearing for the purpose of taking public testimony on the Plan. Within 90 days following submittal of the Concurrence Draft South King County Ground Water Management Plan (GWMP), Ecology and each local government affected by the program must prepare findings. This period may be extended by Ecology for an additional 90 days. Local governments must either express concurrence or non-concurrence with the Concurrence Draft South King County Ground Water Management Plan (GWMP) within this specified time period.

Statements of non-concurrence should be resolved by the South King County Ground Water Advisory Committee (GWAC), possibly involving revision of the Concurrence Draft South King County Ground Water Management Plan (GWMP). The South King County GWMP will then be resubmitted to Ecology for final certification.

Once Ecology certification is granted, implementation of individual program elements will begin. Implementation of the program elements will proceed as resources for implementation become available.

7. **Plans for future additions, expansion, or further activity related to or connected with this proposal:**

Periodic updates of the South King County GWMP may be necessary in the future. However, update of the South King County GWMP will be initiated based on a determination of need for update by the Ground Water Management Committee.

8. **Environmental information that has been prepared, or will be prepared, directly related to this project:**

All information is contained within the Concurrence Draft South King County GWMP, Supplement 1, Area Characterization Report, Grant No. I - Volumes 1 and II and Grant No. 2, technical reports, and technical appendices. Refer to those documents for a complete description of the plan elements.

9. **Applications that are pending for governmental approvals or other proposals directly affecting the property covered by the proposal:**

Pursuant to the requirements of the Growth Management Act (Chapter 36.70A RCW), comprehensive land use plans have been developed or are being updated by King County and the Cities of Algona, Auburn, Black Diamond, Burien, Covington, Des Moines, Federal Way, Kent, Normandy Park, Pacific, Renton, Sea-Tac, Seattle and Tukwila. Such plans must consider the adequacy of public water supplies to support additional development and must contain provisions for protection of critical aquifer recharge areas.

10. **List of governmental approvals or permits that will be needed for the proposal:**

The draft South King County GWMP must be submitted to the Washington State Department of Ecology (Ecology) for certification. Prior to certification, the South King County Regional Water Association will circulate the draft South King County GWMP to affected local governments for their concurrence. The affected local governments within the South King County GWMA include the Cities of Algona, Auburn, Black Diamond, Burien, Des Moines, Federal Way, Kent, Normandy Park, Pacific, Renton, Sea-Tac, Seattle and Tukwila and King County.

11. **Brief description of the proposal and project name:**

The South King County Ground Water Management Plan (GWMP) was developed by the South King County Ground Water Advisory Committee (GWAC) to meet the ground water protection needs of the area. The goal of the South King County GWMP is to protect the quality and quantity of ground water within the area for present and future use, and to provide for effective and coordinated management of this essential resource. With expected increases in population

and the populations' reliance on ground water it is clear that a comprehensive ground water plan tailored to the specific needs of the region is necessary to protect the ground water supply. Ground water is the primary source of municipal and potable water used in the South King County Ground Water Management Area. This includes water for private, municipal, industrial, and agricultural needs.

This South King County Ground Water Management Plan represents a community consensus on the most practical ground water protection measures to safeguard quality and ensure continued availability of this finite resource. The South King County GWMP recommends that local and state agencies develop regulations and programs necessary to protect ground water.

The South King County Ground Water Management Plan is based on state law. In 1985, the state legislature recognized the need for greater ground water protection by adopting legislation that directed the Washington State Department of Ecology (Ecology) to establish a process for designating and developing plans for ground water management areas (Chapter 90.44 RCW).

The South King County Ground Water Management Area (GWMA) was designated a GWMA by Ecology on October 7, 1986. In accordance with guidelines in Chapter 173-100 WAC, Ecology approved the membership of the South King County Ground Water Advisory Committee, consisting of a broad cross section of interests with representatives from many groups. The South King County Regional Water Association and the Seattle-King County Health Department (SKCHD) were selected to be the co-lead agencies by Ecology. The Seattle-King County Health Department has jurisdiction throughout the South King County GWMA and also has a regulatory role in water systems, on-site sewage systems, solid and hazardous waste, and general environmental health concerns. On January 1, 1996, the King County Department of Natural Resources and Parks assumed the role of co-lead agency for this study from the SKCHD.

Based upon careful study and deliberation about possible and effective ground water protection measures, the South King County GWAC adopted the following recommendations for ground water management.

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Special Area Designations to Enhance Ground Water Protection

The South King County GWAC adopted the following goal: To use available special area designations in conjunction with local regulations and policies to enhance ground water protection efforts in the South King County GWMA. The proposed management strategies include: designating Ground Water Management Areas as Environmentally Sensitive Areas; so that categorical exemptions to SEPA, once determined by King County, cities and special purpose districts, may be eliminated; and providing guidance to SEPA document reviewers so that they can identify proposed developments that may significantly impact ground water, recognize and require adequate information to assess impacts upon ground water, and recognize and propose effective mitigation; promoting King County and cities to adopt general aquifer protection policies including best management practices for development, preferring infiltration where feasible, and wellhead protection and sustainable use of ground water in the GWMA is an important element in the long term water supply planning; area policies; and promoting King

County and cities to place a priority on implementation of the proposed Ground Water Management Plan management strategies in physically susceptible and recharge areas to ground water contamination.

Data Collection and Management Program

Long-term collection of data on ground water quality and quantity, precipitation, and stream flow is necessary for management of the ground water resource to refine characterization of aquifers and to continue developing a conceptual characterization of ground water hydrology within the Ground Water Management Area.

The South King County GWAC adopted the following goal: Protect ground water quantity and quality by developing and implementing a data collection and management program.

The proposed management strategies are developing and implementing a data collection and management program that builds on the existing program to collect the needed data, enter the data into the ground water management program database, and analyze the data to provide useful information to decision makers; and that Ecology should input local ground water management area data into it's database.

Stormwater Management

The most serious public health concern regarding the recharge of stormwater is the possible impacts to ground water quality used as a drinking water source. Ground water quality may be impacted if stormwater containing contaminants recharges into ground water intentionally or inadvertently. In addition, precipitation run-off may be diverted to a surface water body that otherwise would naturally recharge ground water. This results in a decrease in the quantity of ground water recharge.

The South King County GWAC adopted the following goal: Promote stormwater management practices that provide the greatest amount of recharge while protecting ground water quality.

The proposed management strategies include: to preserve ground water quality, require that runoff be infiltrated when site conditions permit, except where potential ground water contamination cannot be prevented by pollution source controls and stormwater pretreatment; and require all types of stormwater facilities to use best management practices outlined in Ecology's approved design manuals. The treatment components and conveyance system must be lined to preclude infiltration and King County and cities should maintain rural and open space in the most physically susceptible and recharge areas where more intensive land uses have not already been zoned.

Education Program

Currently there is no comprehensive ground water education program. A comprehensive approach is needed to help engender understanding and concern in order to protect the resource; aid in developing resource protection messages that are consistent regardless of the specific education program; coordinate with other resource protection programs that focus on a specific issue (e.g., hazardous waste); and develop specific education activities and materials for point and non-point sources of contamination that do not have their own individual programs.

The proposed management strategy is to develop and implement an education program that builds upon existing education efforts and adds specific elements as identified in the various management programs.

Hazardous Materials Management

Ground water contamination can occur when hazardous materials migrate through the soil, or when hazardous materials are spilled into surface water features that are in hydraulic continuity with ground water. Human health threats occur when contaminated ground water reaches aquifers used for drinking water supplies. The clean up of contaminated aquifers is difficult, costly, time-consuming, and may not be successful.

The South King County GWAC adopted this goal: Ensure that ground water is not contaminated due to improper management of hazardous wastes.

The proposed management strategies include supporting current state plans, the Washington State Hazardous Waste Plan, and to request that Ecology and the Washington Legislature fund and carry out the provisions of the Hazardous Waste Plan; to enhance existing regulations, Ecology should amend the Dangerous Waste Regulations (Chapter 173-303 WAC) to require setbacks from the seasonal high ground water level; and King County and cities should designate zones for hazardous waste storage and treatment. King County and cities within the South King County GWMA should implement Uniform Fire Code Article 80 in both new and existing facilities using both educational and regulatory approaches; and King County, and cities should seek a permanent source of funding to provide staff and resources necessary to complete a comprehensive Local Emergency Management Plan; and to provide future protection, purveyors of large public water systems should assess the risk of transportation-related hazardous material spills in their wellhead protection areas.

Underground Storage Tank Management

Commercial underground petroleum and chemical storage tanks represent perhaps the most significant potential threat to ground water quality in the South King County GWMA. Leakage from underground storage tanks and associated piping often occurs without detection. Once released from an underground storage tank, some volatile organic compounds and petroleum products can rapidly migrate through the soil profile to ground water. Leaking underground home heating oil tanks may also present a threat to ground water quality. Both federal and state regulations adopt a less aggressive approach to the regulation of heating oil tanks, however, because of the differences in the constituency and migration through the soil column.

The South King County GWAC adopted this goal: Ensure that underground chemical and fuel storage tanks and piping systems are managed adequately to prevent contamination of ground water.

The proposed management strategies include enhancing existing regulations by designating Ground Water Management Areas as Environmentally Sensitive Areas under Chapter 90.76 RCW Underground Storage Tanks; King County and cities should enhance current inspections of underground storage tank installation and removal in Environmentally Sensitive Areas; the King County Department of Natural Resources should prepare an ordinance for the Metropolitan King County Council's consideration requiring disclosure at the time of sale of the number, location and legal status of existing underground tanks; and secondary containment for exempt or

deferred tanks such as heating oil tanks of all sizes, and motor fuel tanks of 1100 gallons or less; proof from the Fire Marshall or fire chief that the underground heating oil tank was abandoned in accordance with regulations prior to release of any permits associated with energy conversions (gas piping, electrical, etc.); that underground heating oil tanks abandoned in place are filled with a material that precludes further storage of any chemical in the tank; and that all underground chemical storage tanks without secondary containment that are in use and exempt from the state Underground Storage Tank Regulations are tested at regular intervals for integrity by qualified personnel and tagged to either allow or prohibit future product delivery.

Also to provide education, King County and cities should jointly educate homeowners and exempt tank owners regarding tank abandonment requirements of the Uniform Fire Code through the Ground Water Management Plan Education Program.

On-Site Sewage Treatment and Disposal System Use

If on-site sewage systems are improperly designed or constructed, installed in inadequate soils, used at too high of a development density, or used to dispose of non-domestic wastewater, they can adversely impact surface and ground water quality as well as public health. Ground water contamination associated with domestic on-site sewage system effluent can involve a number of contaminants including nitrate, bacteria, viruses, and trace organic chemical compounds. Also, domestic effluent often contains volatile and semi-volatile organic compounds at very low levels. These organic chemicals are generally residues from household cleaning and paint products, (known as household hazardous wastes).

The South King County GWAC adopted this goal: Promote on-site sewage treatment and disposal practices that are effective in protecting ground water resources from possible adverse impacts.

The proposed management strategies include: evaluating the effect of on-site systems on ground water and to propose residential densities that would keep nitrate concentrations at safe levels; King County should inventory facilities served by on-site sewage disposal systems which potentially use, store, or dispose of hazardous materials; educate operators regarding hazardous materials management, and selectively monitor those facilities that appear to represent a significant risk to ground water quality.

Seattle-King County Department of Public Health (SKCHD) should prepare amendments to Title 13 of the King County Board of Health Code to expressly prohibit the use of on-site sewage systems for disposal of any materials or substances other than domestic sewage as defined Chapter 246-272-010 WAC for King County Board of Health consideration.

SKCHD should coordinate with the Household Hazardous Waste Education Committee to include information about the risks to ground water associated with the disposal of household hazardous wastes to on-site sewage systems as part of their household hazardous waste educational activities. King County should develop and carry out a public education program intended to increase the awareness of proper on-site sewage system operation and maintenance including the risks associated with disposal of hazardous wastes in such systems.

To inform households about the risk to ground water from improper disposal of hazardous materials, the Seattle-King County Health Department should prepare amendments to Title 13 of the King County Board of Health Code for the Board's consideration to require that the as-built

on-site sewage disposal system plan be recorded with the property deed in order that it be transferred with the title at the time of property purchase.

Pesticides and Fertilizers

The major categories of pesticides and fertilizer use are agriculture, home, forestry, and rights-of-way maintenance. Pesticides and fertilizers have the potential to contaminate ground water when they are used improperly.

The South King County GWMA adopted this goal: Prevent ground water contamination from the use of pesticide and fertilizer.

The proposed management strategies include providing immediate protection for ground water by promoting King County and cities to use non-chemical vegetation maintenance practices or only chemicals which, when approved application methods are used, do not pose a threat to groundwater. King County and cities should determine if maintenance practices by others in the South King County GWMA needs to be restricted to non-chemical methods, or chemicals which, when approved application methods are used, do not pose a threat to ground water.

To provide for future protection, King County and cities should evaluate the Cooperative Extension Pesticide Reduction Program for the effectiveness of protecting ground water, and the applicability to the South King County Ground Water Management Area.

Well Construction, Decommissioning and Abandonment

Modern wells consist of a well casing that extends downward from the ground surface to the aquifer within a cylindrical bore-hole. If this space is not adequately sealed, it may serve as a conduit by which contaminated surface or subsurface water may travel into an aquifer. Under state law, any well that is unusable must be decommissioned. An improperly decommissioned well may also serve as a conduit for contaminated ground or surface water.

The South King County GWAC adopted this goal: Protect the quality of ground water in the GWMA by ensuring that proper well construction and decommissioning procedures are followed.

The proposed management strategies include providing proper oversight and implementation of the existing regulations by pursuing sufficient funding for the well construction and decommissioning program, and developing a local health department program for implementation of the delegated portion of Ecology's well construction and decommissioning program.

To identify and catalog wells, King County and cities should require sellers to disclose the existence of used or unused wells on the property and require that applicants establish the location and status of wells present on the property in question during SEPA review, rezone, and land use permit applications. This information should be provided to Ecology.

To ensure proper decommissioning of wells, assistance should be provided to those needing to decommission wells, such as funding or alternative methods.

To provide education about well construction and decommissioning, the Ground Water Management Plan Education Program should coordinate with and support Ecology's efforts in

well identification, well construction, proper well maintenance, contamination sources, and well decommissioning.

Sewer Systems and Sewer Pipes Sewer Pipes

Older sewer systems, many of which are still in use, were made from materials such as concrete, brick, clay, and ductile iron. Joints were more susceptible to leaking with the use of these materials and may be contributing to infiltration and ex-filtration problems. Infiltration is ground water entering sewer pipes. Inflow refers to direct flows of stormwater into the sewer system through hookups such as roof and footing drains or failing manholes. Ex-filtration is where the water table drops below the level of the sewer systems, causing water in pipes or manholes to leak out into the surrounding substrate.

The South King County GWAC adopted this goal: Prevent the degradation of ground water which may be caused by waste water leaking from sewer systems, and to prevent the loss of water through infiltration to gravity sewer pipes and side sewers.

The proposed management strategies include, to prevent impacts to ground water, the King County Water Pollution Control Department (formerly Metro), cities, and sewer utilities are encouraged to continue, or to adopt, regularly scheduled leak detection and repair programs as well as public education programs to protect ground water in the South King County Ground Water Management Area; King County should amend the Comprehensive Land Use Plans and King County Code 13.24 to require that new sewer piping installed in Aquifer Protection Areas be leak-proof; and Ecology should consider amendments to sewer construction specifications which stop the transmission of ground water along pipe alignments.

Solid Waste Landfills

A landfill is a disposal facility at which solid waste is permanently placed in or on land. A landfill can accept all waste except hazardous wastes. There are environmental impacts associated with landfills, including leachate and gas production. Leachate is water or other liquid that has been contaminated by dissolved or suspended materials due to contact with solid waste or gases from the solid waste. Landfills may pose a threat to ground water quality due to leachate production.

The South King County GWAC adopted this goal: Prevent the occurrence of ground water contamination problems associated with the operation of solid waste disposal facilities in King County.

The proposed management strategies include providing protection through regulations; the SKCHD should prepare amendments to Title 10 to adopt Chapter 173-351 WAC by reference for King County Board of Health's consideration; King County should evaluate the remediation efforts of abandoned landfills; and to provide education, include information about the relationship between solid waste disposal and ground water in the education program.

Burial of Human Remains

The threat to ground water from decomposing corpses and caskets includes chemicals, bacteria, viruses, and metals. For example, the embalming process uses approximately one-half gallon of

formalin for each body. Bacteria and viruses are not usually a concern since nutrients and oxygen are not present for the bacteria to survive and multiply.

The South King County GWAC concluded that groundwater impacts from cemeteries was not a concern in the South King County GWMA. No further action is warranted at this time.

Sand and Gravel Mining

It is not unusual for productive sand and gravel mines to be located over vulnerable aquifers. Mining activities in these areas can increase ground water vulnerability to contamination both from the extraction process and from site reclamation.

The South King County GWAC adopted this goal: Ensure that regulatory programs are adequate to prevent adverse effects upon ground water quality attributed to sand and gravel mining operations.

The proposed management strategies include providing future protection; King County and cities should comply with the National Pollution Discharge Elimination System Permit Program and Ecology's "General Permit" requirements; actively support changes which would provide better protection of ground water; add to the SEPA document best management practices for sand, gravel and rock quarries; King County and cities will provide comments to the State Department of Natural Resources on mine reclamation plans and development best management practices for mining and reclamation operations. Land use of reclaimed sand and gravel mines should be carefully evaluated in light of the increased susceptibility of aquifers to contamination due to mining activities; and require that reclamation plans for mineral extraction sites include measures to protect ground water quality and quantity.

Land Application of Biosolids and Wastewater Effluent

Utilization of biosolids for beneficial purposes is the environmentally preferred method of handling and disposal. Currently, nearly all the biosolids generated and disposed of in King County are utilized for silviculture, composting, soil improvement, or agricultural purposes through land application. Potential contaminants in raw biosolids include nitrogen, phosphorous, heavy metals, hydrocarbons, microorganisms, and radionuclides. Based upon present technology, properly managed land application of biosolids pose little threat to public health or the environment, nor has it been known to have caused any degradation of the underlying ground water resources. However, with the increased interest in land application, the potential impacts on the ground water resources from land application need to be considered.

Reuse of wastewater effluent by land application is not widely practiced in King County because precipitation limits the application period. However, interest in effluent reuse increased during the 1992 drought period. During that time the City of Seattle used treated waste water effluent for non-public contact uses including street washing and sewer line flushing. To increase interest in waste water effluent reuse, the Washington State Department of Health and Ecology released the Waste Water Reclamation and Reuse Interim Standards. Currently several demonstration projects are in a pilot or development stage.

The South King County GWAC adopted this goal: Provide assurance that ground water in King County will not be contaminated by the reuse of wastewater effluent.

The proposed management strategies include ensuring regulatory compliance. To provide future protection, Ecology is encouraged to include ground water protection in the revised guidelines for reuse of effluent.

Programs To Protect Ground Water Quantity

Impetus for ground water resource management comes from a variety of sources. Population growth creates an increasing demand on limited natural resources, including ground water. State law dictates how water may be appropriated through the water rights program. The State of Washington has attempted to balance the needs of the citizens with maintaining the water resource.

Ecology administers laws dealing with water appropriations and allocations. Allocation to new users must not conflict with existing use, however, the information needed to make allocation decisions is incomplete. Water users are developing and using innovative techniques to decrease their water use and increase water availability, such as conservation and artificial recharge.

The South King County GWAC adopted this goal: Manage the ground water resources to optimize the preservation and enhancement of the quantity of ground water available to South King County.

The proposed management strategies include the South King County GWAC supporting Ecology's Sea Water Intrusion Policy; King County should adopt the proposed landscaping ordinances to encourage conservation for new development; cities should consider adopting similar ordinances; to enhance existing regulations, Ecology should amend the SEPA checklist to include impacts on the quantity of aquifer recharge; utilities should update their water right records and report to Ecology as per the recommended program in the "Five Year Water Resource Data Management Plan;" and to explore new techniques for quantity enhancement, purveyors should investigate artificial recharge programs.

12. Location of the proposal, including street address, if any, and section, township, and range; legal description; site plan; vicinity map; and topographical map, if reasonably available:

The South King County GWMA is a 260 square mile area located in the south west portion of King County. The area is bounded on the north by the Duwamish and Cedar Rivers, on the east by State Route 169 and the Black Diamond Area, on the south by the Green River and Pierce County, and on the west by Puget Sound. (See Figure 1).

B. ENVIRONMENTAL ELEMENTS

1. Earth

a. General description of the site (underline):

flat, rolling, hilly, steep slopes, mountainous, other.

b. What is the steepest slope on the site (approximate percent slope)?

Elevations in the South King County GWMA range from sea level to 600 feet.

c. **What general types of soils are found on the site (for example clay, sand, gravel, peat, muck)? Specify the classification of agricultural soils and note any prime farmland.**

The South King County GWMA is overlain by recent Alluvium (principally fine grained sand, silt, clay and peat), Vashon Recessional Outwash (well sorted sand and gravel deposits), Vashon Till (gravel, boulders in gray clayey, silty sand matrix), Osceola, Mudflow, Vashon Advance Outwash (sand/gravelly sand), Lawton Clay (clay, silt, fine sand) and undifferentiated deposits. Most of the agricultural land in the South King County GWMA borders the Green River Valley. The soils here are mainly recent Alluvium with some Vashon Recessional Outwash, Third Coarse Grained unit and Vashon Till.

d. **Are there any surface indications or a history of unstable soils in the immediate vicinity? If so, describe.**

Not applicable, this is a non-project action.

e. **Describe the purpose, type, and approximate quantities of any filling or grading proposed. Indicate the source of the fill.**

Not applicable, this is a non-project action.

f. **Could erosion occur as a result of clearing, construction, or use?**

Not applicable, this is a non-project action.

g. **About what percent of the site will be covered with impervious surfaces after project construction (for example buildings or asphalt)?**

Not applicable, this is a non-project action.

h. **Describe the proposed measures to reduce or control erosion, or other impacts to the earth, if any.**

Not applicable, this is a non-project action.

2. Air

a. **What types of emissions to the air would result from the proposal (e.g. dust, automobile, odors, industrial, wood smoke) during construction and when the project is completed? If any, generally describe and give approximate quantities, if known.**

Not applicable.

b. **Are there any off-site sources of emissions or odors that may affect your proposal? If so, generally describe.**

Not applicable.

c. **Describe proposed measures to reduce or control emissions or other impacts to air, if any.**

Not applicable.

3. **Water**

a. **Surface:**

1. **Is there any surface water body on or in the immediate vicinity of the site (including year-round and seasonal streams, saltwater, lakes, ponds, and wetlands)? If yes, describe type and provide names. If appropriate, state what stream or river it flows into.**

The South King County GWMA is bounded on the north by the Duwamish and Cedar Rivers, on the south by the Green and Little and Big White Rivers and Pierce County, and on the west by Puget Sound. The Covington, Des Moines, Fauntleroy, Garrison, Hylebos, Jenkins, Longfellow, Massey, McSorley, Midway, Mill, Miller, North Gilliam, Puget, Riverton, Rock, Salmon, Seola, Springbrook, Soos, Southgate, South Gilliam, and many unnamed creeks also flow through the study area. Lakes in the South King County GWMA are Angle, Arbor, Black Diamond, Bow, Brook, Burien, Clark, Desire, Dolloff, Easter, Fenwick, Five Mile, Garrett, Geneva, George, Grass, Ham, Holm, Horseshoe, Jeane, Jolie, Jones, Kelvils, Killaney, Lora, Meridian, Mirror, Moneysmith, Morton, Mud, North, Panther, (2), Peterson, Pipe, Reba, Sawyer, Shadow, Shady, Spider, Spring, Star, Steel, Trout, White, Wilderness and Youngs. There is also Bingaman Pond located near Star Lake.

2. **Will the project require any work over, in, or adjacent to (within 200 feet) the described waters? If yes, please describe and attach available plans.**

Not applicable, this is a non-project action.

3. **Estimate the amount of fill and dredge material that could be placed in or removed from surface water or wetlands and indicate the area of the site that would be affected. Indicate the source of fill materials.**

Not applicable, this is a non-project action.

4. **Will the proposal require surface water withdrawals or diversion? Give general description, purpose, and approximate quantities, if known.**

The proposal will not require withdrawal or diversion of surface water. The South King County GWMP recommends that additional aquifer evaluations be conducted to quantify the extent of ground water resources and determine the relationship of such ground waters to surface water bodies within the area. Such information would be critical in preventing depletion of surface water instream resources that could potentially result from future ground water withdrawals.

5. **Does the proposal lie within a 100-year flood plain? If so, note location on the site plan.**

Certain parts of the South King County GWMA lie within the 100-year flood plain.

These are as follows:

1. A portion east of Seahurst Park in T23N, R4E, S18.

2. A portion of Miller Creek southeast of Lake Burien in T23, R4E, S30.

3. A portion south east of Angle Lake in T22N, R4E, S3 in the Kent Valley.

4. A portion on the coast at the Salt Water State Park in T22N, R4E, S20.

5. Along the south side of the Green River in the Kent Valley in T22N, R4E, Sections 23, 26 and 35; and T22N, R5E, S30.

6. Around the boundaries of Doloff Lake in T21N, R4E, S10.

7. Along both sides of the Green River, east of Auburn in T21N, R5E, Sections 8, 16, 17, 21, 22, 25, 26 and 27; and T21N, R6E, Sections 27, 28, 29 and 30.

8. Along Big Soos Creek west and south of Lake Youngs in T23N, R5E, Section 33; T22N, R5E Sections 4,10, 15, 22, 23, 26 and 35; T21N, R5E, Sections 2, 11 and 12.

9. Along Little Soos Creek south of Lake Youngs in T22N, R5E, Sections 12, 13, 20, 25 and 35.

10. On Jenkins Creek which flows into Big Soos Creek in T22N, R5E, S36 and T21N, R5E, S2.

11. Along Covington Creek in T21N, R5E, S13 and T21N, R6E, Sections 17 and 18.

12. Along an unnamed creek that flows south into Covington Creek at T21N, R5E, S13. The portions in the 100-year flood plain in this unnamed creek are T21N, R6E, S7 and T21N, R5E, S13.

6. **Does the proposal involve discharges of waste materials to surface waters? If so, describe the type of waste and anticipated volume of discharge.**

The South King County GWMP will not result in the discharge of waste materials to surface water. The plan does not recommend the construction of new public sewer systems or expansion of existing systems. The plan advocates changes in stormwater disposal practices.

b. Ground

1. **Will ground water be withdrawn, or will water be discharged to ground water? Give general description, purpose, and approximate quantities if known.**

   The South King County GWMP will not result in withdrawals or discharges to ground water. The program recommends that ground water resources be accurately quantified to help in the development of long-term ground water management protection and strategies.

2. **Describe waste material that will be discharged into the ground from septic tanks or other sources, if any. Describe the general size of the system, the number of such systems, the number of houses to be served (if applicable), or the number of animals or humans the system(s) is expected to serve.**

   This is a non-project action that will not result in the generation of wastewater. The South King County GWMP recommends strengthening existing on-site sewage system regulations to improve the level of protection afforded to ground water.

c. Water Runoff (including storm water)

1. **Describe the source of runoff (including storm water) and method of collection and disposal, if any (including quantities if known). Where will this water flow? Will this water flow into other waters? If so, describe.**

   Stormwater systems in the South King County GWMA are operated by the cities of Algona, Auburn, Black Diamond, Burien, Des Moines, Federal Way, Kent Normandy Park, Pacific, Renton, Sea-Tac Seattle and Tukwila and by King County Surface Water Management Division.

   The City of Algona collects the majority of its stormwater through open ditches. There are some culverts and catch basins. Stormwater is disposed of to the north and south only; to the north into the City of Auburn and eventually to Mill Creek and the Green River. In the south, stormwater is disposed of through the City of Pacific and eventually to the White River.

   The City of Auburn collects stormwater in a combination of ways--open ditches, enclosed systems, culverts, swales, and public detention facilities. The stormwater is discharged directly to the Green River, White River and Mill Creek.

   The City of Black Diamond collects stormwater through open ditches. There are plans to build a retention/detention facility. Stormwater is collected from within and outside the city limits. Stormwater is disposed of mainly into Rock Creek with some discharge to wetlands.

   The City of Burien collects stormwater in open ditches, closed pipes and culverts from seven drainage basins. Two of these basins are contained with stormwater disposed of to the ground water. The other five basins discharge stormwater to creeks. Two creeks are unnamed. Stormwater is discharged to the north to Seola Creek and Salmon Creek and

to the south to Miller Creek. Stormwater from these five basins eventually discharges to Puget Sound.

The City of Des Moines collects stormwater in the city limits and parts of Sea-Tac and the Sea-Tac airport. The city is mainly residential. Stormwater is collected mainly in open ditches with some closed systems. There is no treatment of stormwater. Stormwater is disposed of to Des Moines Creek and Massey Creek with a small portion discharged to McSorley Creek.

The City of Federal Way collects stormwater in a variety of ways--a combination of open ditches, closed pipes, culverts and detention facilities. Most stormwater is collected by detention facilities. Stormwater is disposed of to creeks and streams and eventually to Puget Sound.

The City of Kent collects stormwater in open ditches, closed pipes and culverts. New developments are required to pre-treat stormwater in detention facilities prior to discharge. Stormwater is discharged directly to the Green River or to creeks that discharge into the Green River. Some stormwater discharges to the north into either Springbrook Creek, Mill Creek or Garrison Creek, into the City of Renton and eventually into the Green River.

The City of Normandy Park collects stormwater in open ditches, closed pipes and culverts. The city also has two large detention facilities. Stormwater is discharged directly into Puget Sound.

The City of Pacific collects stormwater on the west side of Pacific in open roadside ditches. The stormwater collected in this area is discharged to State Route 167 west canal that flows to the White River. On the east side of the city, stormwater is collected in enclosed lines, covered gutters and culverts. This stormwater is discharged in a government canal to the White River on the east side of the city. The stormwater is not treated. Stormwater from the cities of Algona and Auburn flows through the west 167 canal to the south into the Puyallup Basin.

The City of Renton collects stormwater in the drainage basin boundaries. Stormwater is collected in open ditches, piped systems, detention ponds and oil and water separators. In the urban areas of the city there is more pipe collection. In the rural residential areas stormwater is collected in open ditches. Stormwater is disposed of to streams, Springbrook Creek and the Green River.

In the City of Sea-Tac, stormwater is collected within five basins. Stormwater is collected by roadside ditches, closed systems, culverts, oil and water separators and bio-filtration swales. Stormwater is discharged to Miller Creek, Des Moines Creek, the Green River, Angle Lake, Bow Lake and Lake Reba.

The City of Seattle collects stormwater in the west Seattle area by open ditches, closed systems, combined sewers, culverts, swales, wetlands and artificial wetlands. There is one oil separator facility. The city is on the process of constructing a number of swales. Stormwater is discharged to Longfellow Creek, Puget Creek, Fauntleroy Creek, the Duwamish River, Elliott Bay, and to wetlands.

The City of Tukwila collects stormwater in open ditches, closed pipes and culverts. The city has in excess of twelve detention facilities to treat stormwater prior to discharge. Stormwater is mainly discharged to the North Gilliam Creek, the South Gilliam Creek and Riverton Creek which flows into the Green/ Duwamish River. Some stormwater discharges to an unnamed Creek at South 180th St., and to Interstate 405 to Springbrook Creek in Renton. Some stormwater discharges to natural wetlands and artificially built wetlands when Interstates 5 and 405 were built.

The King County Surface Water Management Division has a variety of stormwater collection methods throughout the county. Stormwater is collected by storm sewers and open ditches. Stormwater is discharged by bio-filtration swales before wetlands and runoff directly into streams. In the Covington/Maple Valley area, additional treatment by lined bio-filtration facilities is required for new development because of the glacial outwash soils. For new developments, developers must follow the requirements of the King County Surface Water Management Division's Stormwater Design Manual.

2. **Could waste materials enter ground or surface waters? If so, generally describe.**

Implementation of the recommendations presented in the South King County GWMP will not result in discharges of waste to surface or ground water.

d. **Describe proposed measures to reduce or control surface, ground, and runoff water impacts, if any.**

One of the primary purposes of the draft South King County GWMP is to implement regulations, policies, and activities to control discharges of wastes, including stormwater runoff, to ground water.

4. Plants

a. **Types of vegetation found on site:**

Deciduous trees: red alder, big-leaf maple, cottonwood, salmonberry, osoberry and elderberry.

Evergreen trees: douglas fir, western hemlock, western red cedar, and grand fir.

Shrubs: red-osier, willow, spirea, straggly rhododendron, western azalea, devil's club, greenbush wood, foamflower, western trillium, trail plant, tiger lily, wood violet, saprophytes, Indian pipe, pinesap, pine drops, salmonberry, huckleberry and other less dominant species.

Grass: numerous species including reed canary

Pasture: numerous native and non-native grass and forb species.

Wet Soil Plants: alder, cottonwood, cedar, hemlock, numerous willow species, hardhack, sphagnum, labrador tea, cranberry, spirea, rushes, salmonberry, cattail, soft rush, slough sedge and other sedge species, and other less dominant species.

Water Plants: Water-parsley, yellow water lily, and other species.

b. **What kind and amount of vegetation will be removed or altered?**

Not applicable, this is a non-project action.

c. **List threatened or endangered species or critical habitat known to be on or near the site.**

Not applicable, this is a non-project action.

d. **Describe proposed landscaping, use of native plants, or other measures to preserve or enhance vegetation on site.**

Not applicable, this is a non-project action.

5. Animals

a. **Underline any birds and animals that have been observed on or near the site or are known to be on or near the site:**

Invertebrates: shellfish, insects, other

Fish: bass, salmon, trout, perch, suckers, other

Amphibians: frogs, salamanders, other

Reptiles: lizards, snakes, turtles, other

Birds: red-tail, hawks, heron, bald eagle, songbirds, ducks, water fowls, barred owls, northern saw-whet owls, woodpeckers, blue grouse, other.

Mammals: black tailed deer, black bear, elk, beaver, bobcat, cougar.

b. **List any threatened or endangered species or critical habitat near the site.**

None

c. **Is the site part of a migratory route? If so, explain.**

The South King County GWMA is part of the Pacific Flyway, as is the entire Puget Sound basin.

d. **Proposed measures to preserve or enhance wildlife, if any.**

The draft South King County GWMP does not recommend any direct actions intended to preserve or enhance wildlife or wildlife habitat. However, the South King County GWMP recommends ground water protection and management actions from which secondary benefits to surface water used for wildlife habitat may accrue.

6. **Energy and Natural Resources**

a. **What kinds of energy (electric, natural gas, oil, wood, solar) will be used to meet the completed project's energy needs? Describe whether it will be used for heating, manufacturing, etc.**

Not applicable, this is a non-project action.

b. **Would the project affect the potential use of solar energy by adjacent properties? If so, explain.**

Not applicable, this is a non-project action.

c. **What kinds of energy conservation features are included in the plans of this proposal? List other proposed measures to reduce or control energy impacts, if any.**

Not applicable.

7. **Environmental Health**

a. **Are there any environmental health hazards, including exposure to toxic chemicals, risk of fire and explosion, spills, or hazardous waste that could occur as a result of this proposal? If so, describe.**

Implementation of the draft South King County GWMP will not result in any environmental health hazards.

1. **Describe special emergency services that might be required.**

The draft South King County GWMP will not result in the need for special emergency services.

2. **Describe proposed measures to reduce or control environmental health hazards.**

The draft South King County GWMP recommends various actions to reduce or control environmental health hazards. These recommended actions include enhancing hazardous materials transportation spill response capabilities and implementing the Uniform Fire Code Article 80 in both new and existing facilities using both educational and regulatory approaches.

b. **Noise**

1. **What types of noise exist in the area which may affect your project (for example: traffic, equipment operation, other)?**

Not applicable.

2. **What types and levels of noise would be created by or associated with the project on a short-term or long-term basis (for example: traffic, construction, operation, other)?**

Not applicable, this is a non-project action.

3. **Describe proposed measures to reduce or control noise impacts, if any.**

Not applicable.

8. Land and Shoreline Use

a. **What is the current use of the site adjacent to the properties?**

The area north of the South King County is partly bounded by Puget Sound/Elliott Bay with the rest by land zoned commercial (Duwamish Waterway) and residential/rural (Renton/Maple Valley). The area east of the South King County GWMA is rural/forested. The area south of the South King County GWMA is residential//commercial (City of Tacoma) on the western end and rural on the eastern end. The area on the west of the South King county GWMA is Puget Sound (see figure 1).

b. **Has the site been used for agriculture? If so, describe.**

Agricultural land is found in the Green River Valley and the Covington area. Livestock keeping and crops are the primary agricultural activities.

c. **Describe any structures on the site.**

Not applicable.

d. **Will any structures be demolished? If so, what?**

Not applicable.

e. **What is the current zoning classification of the site?**

The South King County GWMA is comprised of two land-use jurisdictions, the cities of Algona, Auburn, Black Diamond, Burien, Federal Way, Kent, Normandy Park, Pacific, Renton, Sea-Tac, Seattle and Tukwila, and King County. There are three community planning areas in the South King County GWMA. These community planning areas are: Tahoma/Raven Heights, Soos Creek and White Center. Specific land uses and accompanying area-wide zoning, consistent with King County Comprehensive Plan policies, are established in the community plans. Figure 4 shows the community development plans in the South King County GWMA.

f. **What is the current comprehensive plan designation of the site?**

See section 8.e. above.

g. **If applicable, what is the current shoreline master program designation of the site?**

Not applicable.

h. **Has any part of the site been classified as an "environmentally sensitive" area? If so, specify.**

A number of areas within the South King County GWMA are considered Critical Areas under the King County Critical Areas Ordinance and are categorically designated as environmentally sensitive areas under SEPA. These include wetlands, steep slopes, 100-year floodplains, landslide hazard areas, erosion hazard areas, seismic hazard areas, coal mine hazard areas, and stream and shoreline areas. The South King County GWMP recommends designating the Ground Water Management Area as an environmentally sensitive area under SEPA.

i. **Approximately how many people would reside or work in the completed project?**

The South King County GWMP will result in neither the creation nor loss of housing or employment opportunities within the South King County GWMA. Aquifer capacity evaluations proposed under the draft South King County GWMP may provide guidance to local governments in future land use decisions. However, aquifer capacity is one of a number of factors that must be considered in determining the spatial and temporal distribution of additional growth and development. Land use decisions must be made in the context of a wide variety of considerations such as the availability of public services, adequacy of utility infrastructure, degree of environmental sensitivity, and aesthetic qualities of an area.

j. **Describe proposed measures to avoid or reduce displacement impacts, if any.**

No impacts are anticipated; mitigation is not proposed.

k. **Describe proposed measures to ensure the proposal is compatible with existing and projected land uses and plans, if any.**

The South King County GWAC, the oversight organization for development of the draft South King County GWMP, included representation from the cities of Auburn, Federal Way, Kent, Pacific and Renton, several King County departments and special purpose districts to help ensure that the draft South King County GWMP is consistent with the existing land use plans of those jurisdictions. As ground water management alternatives are developed for the South King County GWMP, existing policies and regulations will be reviewed and incorporated into the individual plans if appropriate.

The Growth Management Act stipulates that critical aquifer recharge areas must be afforded special protection. The South King County GWMP recommends that a number of actions be taken to protect against loss or impairment of the South King County GWMA's ground water resources as a result of contaminant releases from sources in critical aquifer recharge areas. The proposed source control actions apply to on-site sewage systems, stormwater disposal systems, underground storage tanks, hazardous materials disposal, pesticide and fertilizer use, well construction and abandonment, education programs, special areas designations, sewer pipes, solid waste landfills, burial of human remains, sand and gravel mining operations, and land application of biosolids and effluent.

9. Housing

a. **Approximately how many units would be provided, if any? Indicate whether high, middle, or low-income housing.**

Not applicable.

b. **Approximately how many units, if any, would be eliminated? Indicate whether high, middle, or low-income housing.**

Not applicable.

c. **Describe proposed measures to reduce or control housing impacts, if any.**

Not Applicable.

10. Aesthetics

a. **What is the tallest height of any of the proposed structure(s), not including antennas? What is the principal exterior building material(s) proposed?**

Not applicable.

b. **What views in the immediate vicinity would be altered or obstructed?**

Not applicable.

c. **Describe proposed measures to reduce aesthetic impacts, if any.**

Not applicable.

11. Light and Glare

a. **What type of light and glare will the proposal produce? What time of day would it mainly occur?**

Not applicable.

b. **Could light or glare from the finished project be a safety hazard or interfere with views?**

Not applicable.

c. **What existing off-site sources of light or glare may affect your proposal?**

Not applicable.

d. **Describe the proposed measures to reduce or control light and glare impacts, if any.**

Not applicable.

12. Recreation

a. What designated and informal recreational opportunities are in the immediate vicinity?

Not applicable.

b. Would the proposed project displace any existing recreational uses? If so, describe.

Not applicable.

c. Describe proposed measures to reduce or control impacts on recreation, including recreational opportunities to be provided by the project or applicant.

Not applicable.

13. Historic and Cultural Preservation

a. Are there any places or objects listed on or eligible for national, state, or local preservation registers known to be on or next to the site? If so, generally describe.

Not applicable.

b. Generally describe any landmarks or evidence of historic, archeological, scientific, or cultural importance known to be on or next to the site.

Not applicable.

c. Describe proposed measures to reduce or control impacts, if any.

Not applicable.

14. Transportation

a. Identify public streets and highways serving the site, and describe proposed access to the existing street system. Show on site plans, if any.

The South King County GWMA is served by an extensive street and highway system. The major roads in the South King County GWMA are Interstates 5 and 405, State Routes 161, 164, 167, 169, 181, 509, 515, 516, 518 and 599, and Highways 18 and 99. Interstate 5 is the principal highway transportation corridor linking the Ground Water Management Area with Seattle and Tacoma. Interstate 5 is a heavily traveled passenger automobile and commercial truck transportation route.

King County maintains a network of roadways which provide local access to the unincorporated portions of the South King County GWMA. Similarly, the cities in the GWMA maintain a system of streets within their corporate boundaries.

b. **Is the site currently served by public transit? If not, what is the approximate distance to the nearest transit stop?**

Not applicable.

c. **How many parking spaces would the completed project have? How many would the project eliminate?**

Not applicable.

d. **Will the proposal require any new roads or streets, or improvements to existing roads or streets, not including driveways? If so, generally describe.**

The draft South King County GWMP will not create the need for any new roads. However, a better understanding of traffic patterns and volumes in the South King County GWMA will be necessary before there can be a significant effort to evaluate the potential risks to ground water from transportation-related spills.

e. **Will the project use (or occur in the immediate vicinity of) water, rail, or air transportation? If so, generally describe.**

Not applicable.

f. **How many vehicular trips per day would be generated by the completed project? If known, indicate when peak volumes would occur.**

Not applicable.

g. **Describe proposed measures to reduce or control transportation impacts, if any.**

Not applicable.

15. Public Services

a. **Would the project result in an increased need for public services (for example: fire protection, police protection, health care, schools, other)? If so, generally explain.**

The draft South King County GWMP will increase the workload of programs within the South King County GWMA relating to ground water contamination source control and ground water resource management efforts. Contaminant source control programs include underground storage tank management, on-site sewage disposal, solid waste disposal, hazardous waste management, stormwater management, pesticide and fertilizer use, well construction and abandonment practices, sewer pipe integrity, burial practices for human remains, sand and gravel mining operations, practices for land application of biosolids and effluent, special areas designations, and education programs.

Costs required to administer various program elements will be determined by the Management Committee during the implementation process. The Plan is based on voluntary financial support of those using ground water through the existing system of fees and charges. If adequate funding

is not available, selected program elements must be eliminated from the South King County GWMP.

b. Describe proposed measures to reduce or control direct impacts on public services.

For every recommended element of the draft South King County GWMP that will likely increase the workload of a public service agency, a source of funding is to be identified to provide that agency with the resources necessary for implementation. Should the source of funding prove inadequate, the Management Committee will modify program elements or drop them from the South King County GWMP in a subsequent revision.

16. Utilities

a. Underline utilities currently available at the site:

Electricity, natural gas, water, refuse service, telephone, sanitary sewer, septic systems, other

b. Describe the utilities that are proposed for the project, the utility providing the service, and the general construction activities on the site or in the immediate vicinity that might be needed.

The draft South King County GWMP will not create the need for direct utility services.

C. SIGNATURE

The above answers are true and complete to the best of my knowledge. I understand that the lead agencies are relying on them to make their decision.

Signature: Donald Ellingt

Date Submitted: August 5, 2003

SUPPLEMENTAL SHEET FOR NONPROJECT ACTIONS

Nonproject proposals are those that are not tied to a specific site, such as an adoption of plans, policies, or ordinances.

Because these questions are very general, it may be helpful to read them in conjunction with the list of elements of the environment. When answering these questions, be aware of the extent of the proposal, or the types of activities likely to result from the proposal, would affect the item at a greater intensity or at a faster rate than if the proposal were not implemented. Respond briefly and in general terms.

1. **How would the proposal be likely to increase discharge to water; emissions to air; production, storage, or release of toxic or hazardous substances; or production of noise?**

   The proposal will not increase discharges or emissions to any element of the environment.

   Proposed measures to reduce or respond to such increases are:

   The proposal is a Ground Water Management Plan which is intended to lessen the potential for adverse impacts on the quality of the South King County area ground waters from a variety of contaminant sources. The Plan proposes strengthening of the existing regulatory and/or administrative policy framework for the following activities:

   - Special area designations to enhance ground water protection,
   - Stormwater management,
   - Underground storage tank management,
   - Hazardous materials management,
   - On-site sewage disposal system use,
   - Education programs,
   - Pesticides and fertilizer use,
   - Sewer pipe integrity,
   - Solid waste landfills,
   - Human remains burial practices,
   - Sand and gravel mining practices,
   - Land application of biosolids and effluent practices,

- Well construction and abandonment, and
- Solid waste disposal.

Refer to Section A. Question 11 above and the South King County Ground Water Management Plan for further discussion of the recommendations.

2. **How would the proposal be likely to affect plants, animals, fish, or marine life?**

The proposal will not adversely affect plants, animals, fish, or marine life.

Proposed measures to protect or conserve plants, animals, fish, or marine life are:

The South King County GWMP supports a variety of proposed measures to protect water quality. While the major thrust of these efforts is oriented towards ground water, due to the interrelationship between ground water and surface water, ground water contaminant source control improvements may also serve to protect surface water quality. Protection of surface waters could serve to protect plants and animals which are exposed to such waters or that live within such waters. Reducing the impacts to ground water quantity may preserve Instream resources.

3. **How would the proposal be likely to deplete energy or natural resources?**

The South King County GWMP will not result in the depletion of energy or natural resources.

Proposed measures to protect or conserve energy and natural resources are:

The South King County GWMP is intended to prevent depletion of ground water resources and to prevent adverse impacts associated with localized overuse and/or contamination of ground water resources.

In promoting efficient management of the area's ground waters, the draft South King County GWMP proposes implementation of the management strategies outlined in Section A. Question 11 above and detailed in the South King County Ground Water Management Plan.

4. **How would the proposal be likely to use or affect environmentally sensitive areas or areas designated (or eligible or under study) for government protection; such as parks, wilderness, wild and scenic rivers, threatened or endangered species habitat, historic or cultural sites, wetlands, flood plains, or prime farmlands?**

The proposal will not negatively or positively affect environmentally sensitive areas or areas designated (or eligible or under study) for government protection. However, the South King County GWMP recommends designating Ground Water Management Areas as environmentally sensitive area under SEPA. Designation of these areas may provide benefits, such as a source of funds to implement ground water protection measures, enhanced eligibility for grant funds, or expanded review of development proposals.

Proposed measures to protect such resources or to avoid or reduce impacts are:

No adverse impacts are anticipated, therefore no mitigation measures are proposed.

5. **How would the proposal be likely to affect land and shoreline use, including whether it would allow or encourage land or shoreline uses incompatible with existing plans?**

The South King County GWMP does not recommend that any specific land or shoreline uses be prohibited. It does, however, recommend that tighter controls be imposed over a variety of land use activities such as on-site sewage system operation, hazardous waste disposal practices, underground storage tank operations, stormwater disposal practices, pesticides and fertilizer applications and solid waste handling. These controls may be viewed as a slight disincentive for new development, particularly commercial development, within the Ground Water Management Area.

Proposed measures to avoid or reduce shoreline and land use impacts are:

Since shoreline and land use impacts are generally viewed to be positive, no mitigation measures are proposed.

6. **How would the proposal be likely to increase demands on transportation or public services and utilities?**

Transportation. Increases in transportation demands are not anticipated as a result of implementation of the South King County GWMP.

Public Services. The South King County GWMP may increase the workload of programs within the South King County GWMA jurisdiction relating to ground water contamination source control and ground water resource management.

Utilities. If the recommendations of the draft South King County GWMP are implemented, public water purveyors will be requested to conduct more extensive monitoring of their ground water sources including water level observations, frequent water quality analyses, and production metering.

In addition, the draft South King County GWMP recommends that purveyors implement water use efficiency programs. Purveyors are recommended to conduct transportation-related hazardous material spills assessments within their wellhead protection areas.

Proposed measures to reduce or respond to such demand(s) are:

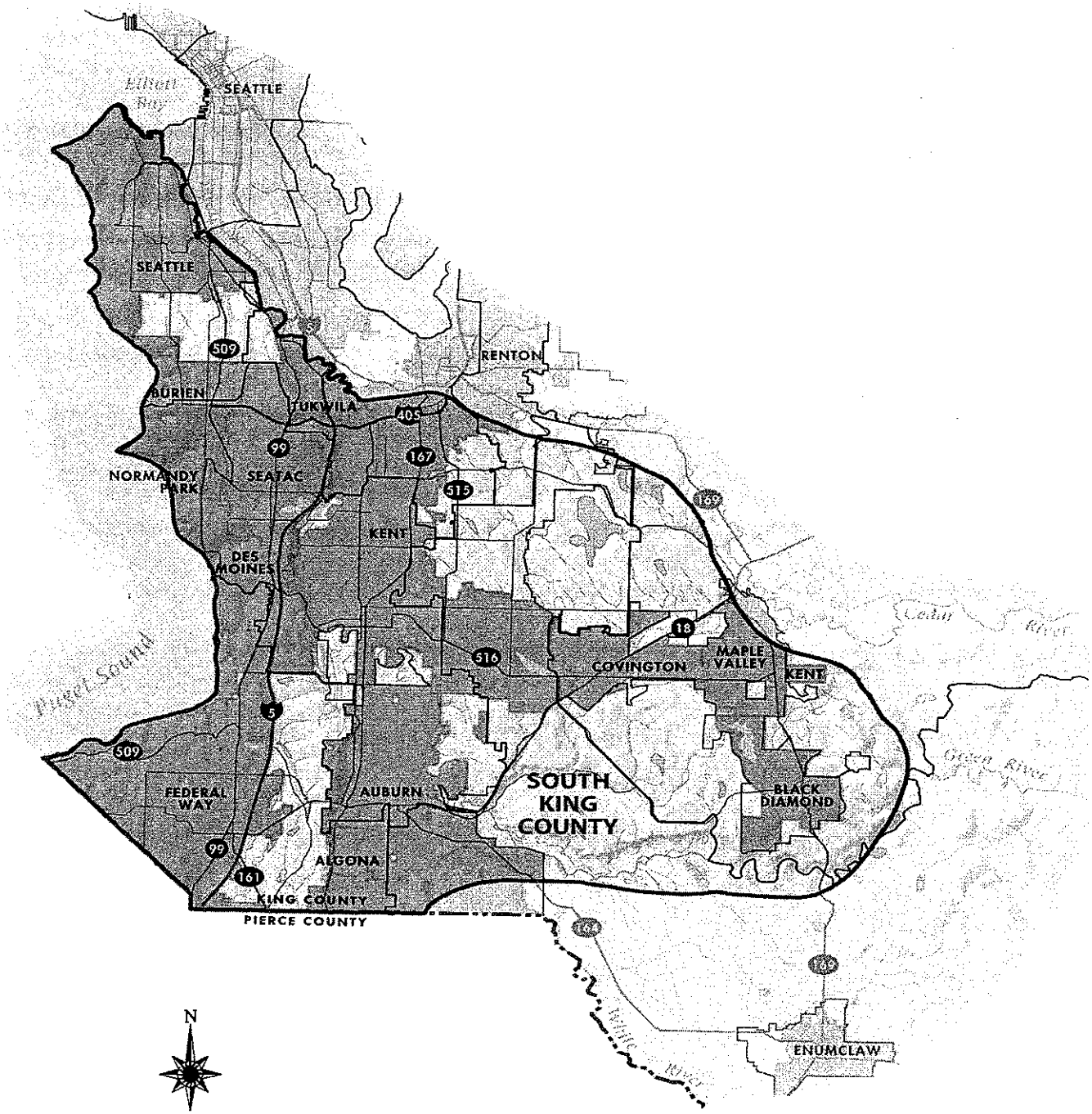
Transportation. Mitigation measures have not been proposed.

Public Services. Costs required to administer various program elements will be determined by the Management Committee during the implementation process. The Plan is based on voluntary financial support of those using ground water through the existing system of fees and charges. If adequate funding is not available, selected program elements must be eliminated from the South King County GWMP.

7. **Identify, if possible, whether the proposal may conflict with local, state, or federal laws or requirements for the protection of the environment.**

The South King County GWMP was prepared pursuant to the Ground Water Management Program provisions of Chapter 90.44 RCW, the state Regulation of Public Ground Water Act, and Chapter 173-100 WAC, Ecology's procedural regulations for Ground Water Management Areas and Programs. As

stipulated in the aforementioned state codes, the Plan was developed in full consideration of the corpus of federal, state, county, and municipal laws and regulations concerning environmental protection.



Source: King County Department of Natural Resources and Parks Groundwater Management Program, 2001 Annual Report

Groundwater Management Area Boundary

County Boundary

Major Road

River

Stream

Urban Growth Boundary

Lake or Open Water

Incorporated Area

Fig. 1

South King County Ground Water Management Area

South King County Ground Water Management Plan

July 2003

APPENDIX B

Public Comment & Lead Agency Response

South King County
Ground Water Management Plan

July 2003

APPENDIX B

PUBLIC COMMENT AND LEAD AGENCY RESPONSE
(Included after Concurrence)

APPENDIX C

Letters of Concurrence by Affected Jurisdictions

South King County
Ground Water Management Plan

July 2003

APPENDIX C

LETTERS OF CONCURRENCE BY AFFECTED JURISDICTIONS
(Included after Concurrence)

APPENDIX D

Guidelines for the Development of GWMA's & Programs

South King County
Ground Water Management Plan

July 2003

APPENDIX D

GUIDELINES FOR THE DEVELOPMENT OF GROUND WATER MANAGEMENT AREAS AND PROGRAMS (Chapter 173-100 WAC)

Chapter 173-100 WAC
GROUND WATER MANAGEMENT AREAS AND PROGRAMS

Last Update: 6/9/88

WAC SECTIONS

WAC 173-100-010 Purpose. The purpose of this chapter is to establish guidelines, criteria, and procedures for the designation of ground water management areas, subareas or zones and to set forth a process for the development of ground water management programs for such areas, subareas, or zones, in order to protect ground water quality, to assure ground water quantity, and to provide for efficient management of water resources for meeting future needs while recognizing existing water rights. The intent of this chapter is to forge a partnership between a diversity of local, state, tribal and federal interests in cooperatively protecting the state's ground water resources.

[Statutory Authority: RCW 90.44.400. 86-02-004 (Order DE 85-24), § 173-100-010, filed 12/20/85.]

WAC 173-100-020 Authority. This chapter is promulgated by the department of ecology pursuant to RCW 90.44.400, 90.44.410, 90.44.420, 90.44.430 and 90.44.440.

[Statutory Authority: RCW 90.44.400. 86-02-004 (Order DE 85-24), § 173-100-020, filed 12/20/85.]

WAC 173-100-030 Overview. This regulation establishes a process for the identification and designation of ground water management areas and for the development of comprehensive ground water management programs. From a general schedule of probable ground water management areas, the department of ecology in

cooperation with local government will designate specific ground water management areas, subareas, or depth zones within such areas and will appoint a lead agency to develop a ground water management program and an advisory committee to oversee the development of the program for each designated area. Following completion of the program and a public hearing to be held by the department of ecology, the program must be certified to be consistent with the intent of this chapter. The program will then be implemented through state regulations and local ordinances. The programs must thereafter be periodically reviewed.

[Statutory Authority: RCW 90.44.400. 86-02-004 (Order DE 85-24), § 173-100-030, filed 12/20/85.]

WAC 173-100-040 Definitions. For the purposes of this chapter the following definitions shall apply:

(1) "Aquifer" means a geologic formation, group of formations or part of a formation capable of yielding a significant amount of ground water to wells or springs.

(2) "Department" means the Washington state department of ecology.

(3) "Ground water" means all waters that exist beneath the land surface or beneath the bed of any stream, lake or reservoir, or other body of surface water, whatever may be the geological formation or structure in which such water stands or flows, percolates or otherwise moves.

(4) "Ground water advisory committee" means a committee appointed by the department to assist in the development of a ground water management program.

(5) "Ground water area or subarea" means a geographic area designated pursuant to RCW 90.44.130.

(6) "Ground water management area" means a specific geographic area or subarea designated pursuant to this chapter for which a ground water management program is required.

(7) "Ground water management program" means a comprehensive program designed to protect ground water quality, to assure ground water quantity and to provide for efficient management of water resources while recognizing existing ground water rights and meeting future needs consistent with local and state objectives, policies and authorities within a designated ground water management area or subarea and developed pursuant to this chapter.

(8) "Ground water management zone" means any depth or stratigraphic zone separately designated by the department in cooperation with local government for ground water management purposes within a ground water management area. Ground water management zones may consist of a specific geologic formation or formations or other reasonable bounds determined by the department consistent with the purposes of this chapter.

(9) "Ground water right" means an authorization to use ground water established pursuant to chapter 90.44 RCW, state common or statutory law existing prior to the enactment of chapter 90.44 RCW, or federal law.

(10) "Ground water user group" means an established association of holders of ground water rights located within a proposed or designated ground water management area.

(11) "Lead agency" means the agency appointed by the department to coordinate and undertake the activities necessary for the development of a ground water management program. Either the department or an agency of local government may be the lead

agency.

(12) "Local government" means any county, city, town, or any other entity having its own incorporated government for local affairs including, but not limited to, a metropolitan municipal corporation, public utility district, water district, irrigation district, and/or sewer district.

(13) "Local government legislative authority" means the city or town council, board of county commissioners, special district commission, or that body assigned such duties by a city, county or district charter as enacting ordinances, passing resolutions, and appropriating funds for expenditure.

(14) "Probable ground water management area" means a specific geographic area identified by the department, in cooperation with other state agencies, local government and ground water user groups, as a candidate area for designation as a ground water management area pursuant to this chapter.

[Statutory Authority: RCW 90.44.400. 86-02-004 (Order DE 85-24), § 173-100-040, filed 12/20/85.]

WAC 173-100-050 Probable ground water management areas. The department in cooperation with local government and ground water user groups shall identify probable ground water management areas.

(1) Probable ground water management areas may be proposed for identification at any time by the department upon its own motion or at the request of other state agencies, local government or ground water user groups.

(2) Probable ground water management area boundaries shall be delineated so as to enclose one or more distinct bodies of public ground water as nearly as known facts permit. Probable ground water management subareas shall be delineated so as to enclose all or any part of a distinct body of public ground water. Boundaries shall be based on hydrogeologic properties such as limits to lateral extent of aquifers, major perennial rivers, and regional ground water divides or as deemed appropriate by the department to most effectively accomplish the purposes of this chapter.

(3) The criteria to guide identification of probable ground water management areas shall include, but not be limited to, the following:

(a) Geographic areas where ground water quality is threatened;

(b) Aquifers that are declining due to restricted recharge or over-utilization;

(c) Aquifers in which over-appropriation may have occurred and adjudication of water rights has not yet been completed;

(d) Aquifers reserved or being considered for water supply reservation under chapter 90.54 RCW for future beneficial uses;

(e) Aquifers identified as the primary source of supply for public water supply systems;

(f) Aquifers underlying a critical water supply service area where the coordinated water system plan established pursuant to chapter 70.116 RCW has identified a need for a ground water management program;

(g) Aquifers designated as sole source aquifers by the federal Environmental Protection Agency;

(h) Geographic areas where the ground water is susceptible to contamination or degradation resulting from land use activities;

(i) Aquifers threatened by seawater intrusion; or

(j) Aquifers from which major ground water withdrawals have been proposed or appear imminent.

(4) The state agency, local government or ground water user group requesting probable ground water management area identification shall provide sufficient information for the department to determine if the area should be so identified. The department and other affected state and local governments and user groups may cooperate in preparing the request for identification.

(a) The request for identification shall be presented in a concise, factual report form and shall consider the guidelines and criteria set forth in subsections (2) and (3) of this section as they relate to the proposed area. It shall also contain: (i) Supporting data as to the need for such identification; (ii) a general description of and rationale for the proposed ground water management area boundary; (iii) goals and objectives for the proposed ground water management area; (iv) an estimated cost of developing the ground water management program and potential funding sources; (v) recommendations for agencies, organizations and groups to be represented on the ground water management area advisory committee; and (vi) a recommendation for the lead agency, taking into consideration the responsibilities contained in WAC 173-100-080.

(b) The recommendation for lead agency shall first be submitted to the county or counties with jurisdiction for written concurrence. Such written concurrence shall be included with the information required in (a) of this subsection. If such concurrence cannot be obtained, the department shall attempt to mediate an agreement between the parties.

(c) The agency or ground water user group initiating the request for identification shall hold at least one public meeting for the purpose of receiving comments from the public, affected local, state and tribal agencies and ground water user groups.

(d) Upon completion, the request for identification shall be submitted to the department and other affected state and local agencies and ground water user groups for their review and comment. Comments shall be submitted to the department.

(5) If the department is proposing an area for identification, the department shall prepare a report containing the information in subsection (4)(a) of this section, hold a public meeting, and submit the report to affected state and local agencies and ground water user groups for their review and comment.

(6) Based upon review of the request for identification together with any comments received and a finding that the proposed area meets the guidelines and criteria of subsections (2) and (3) of this section, the department shall identify the proposed area as a probable ground water management area, establish the general planning boundaries and appoint a lead agency. When a probable ground water management area is included within only one county and that county indicates its desire to assume lead agency status, the department shall appoint the county as lead agency. The department shall notify affected state and local agencies, ground water user groups, tribal governments and local news media of such identification.

[Statutory Authority: Chapters 43.27A and 90.44 RCW. 88-13-037 (Order 88-11), § 173-100-050, filed 6/9/88. Statutory Authority: RCW 90.44.400. 86-02-004 (Order DE 85-24), § 173-100-050, filed 12/20/85.]

WAC 173-100-060 General schedule. The department shall establish a general schedule for the designation of specific ground water management areas. The general

schedule shall guide the department in the designation of specific ground water management areas and in the allocation of the department's available water resources funding and staffing.

(1) The general schedule for designation of ground water management areas shall identify the relative priority of each of the probable ground water management areas. The relative priority of the probable ground water management areas shall be based upon:

(a) The availability of local or state agency resources to develop and implement a ground water management program;

(b) The significance, severity or urgency of the problems or potential problems described in the request for identification submitted for each area, with the highest priority given to areas where the water quality is imminently threatened;

(2) The department shall revise the general schedule as needed to comply with the intent of this chapter. After each revision the general schedule shall be published in the news media and the Washington State Register. A public hearing will be held in June of each year to receive public comment on the general schedule.

[Statutory Authority: RCW 90.44.400. 86-02-004 (Order DE 85-24), § 173-100-060, filed 12/20/85.]

WAC 173-100-070 Designation of ground water management areas for program planning purposes. The department shall designate ground water management areas by order of the department in accordance with the general schedule. The department shall hold a public hearing within the county or counties containing the probable ground water management area prior to such designation. The order shall be issued to the lead agency as well as the agency or ground water user group originally requesting identification of the areas, with copies sent to other affected state agencies, local governments, tribal governments and those parties recommended for ground water advisory committee membership. Copies of the order shall be published by the department in newspapers of general circulation within the area. The order shall contain a general description of the planning boundary for the ground water management area and shall state that the department, in cooperation with the lead agency and local government, intends to appoint a ground water advisory committee to oversee the development of a ground water management program for the area.

[Statutory Authority: RCW 90.44.400. 86-02-004 (Order DE 85-24), § 173-100-070, filed 12/20/85.]

WAC 173-100-080 Lead agency responsibilities. The lead agency shall be responsible for coordinating and undertaking the activities necessary for development of the ground water management program. These activities shall include collecting data and conducting studies related to hydrogeology, water quality, water use, land use, and population projections; scheduling and coordinating advisory committee meetings; presenting draft materials to the committee for review; responding to comments from the committee; coordinating SEPA review; executing inter-local agreements or other contracts; and other duties as may be necessary. The lead agency shall also prepare a work plan, schedule, and budget for the development of the program that shows the responsibilities and roles of each of the advisory committee members as agreed upon by the committee. Data collection, data analysis and other elements of the program development may be delegated by the lead agency to other advisory committee members.

[Statutory Authority: RCW 90.44.400. 86-02-004 (Order DE 85-24), § 173-100-080, filed 12/20/85.]

WAC 173-100-090 Ground water advisory committee. (1) The ground water advisory committee shall be responsible for overseeing the development of the ground water management program; reviewing the work plan, schedule and budget for the development of the program; assuring that the program is technically and functionally sound; verifying that the program is consistent with this chapter and with the respective authorities of the affected agencies; and formulating and implementing a public involvement plan.

(2) The membership of each ground water advisory committee shall represent a broad spectrum of the public in order to ensure that the ground water is protected and utilized for the greatest benefit to the people of the state. The committee shall include, but not be limited to, representation from the following groups:

(a) Local government legislative authorities within the designated area;

(b) Planning agencies having jurisdiction within the designated area;

(c) Health agencies having jurisdiction within the designated area;

(d) Ground water user groups within the designated area, including domestic well owners;

(e) The department;

(f) Department of social and health services;

(g) Other local, state, and federal agencies as determined to be appropriate by the department;

(h) Tribal governments, where a ground water management program may affect tribal waters;

(i) Public and special interest groups such as agricultural, well drilling, forestry, environmental, business and/or industrial groups within the area, as determined to be appropriate by the department.

(3) The department shall appoint, by letter, members and alternates to the ground water advisory committee after seeking nominations from the groups listed above. Members and alternates shall serve until the ground water management program for the area is certified. The department may appoint replacement members or alternates upon request of the appointee or the ground water advisory committee.

(4) The lead agency shall hold the first meeting of the ground water advisory committee within sixty days of the appointment of the committee. Public notice shall be given for each meeting. The lead agency shall chair the first meeting, during which the advisory committee shall determine, by general agreement, rules for conducting business, including voting procedures, and the chairperson of the advisory committee.

[Statutory Authority: RCW 90.44.400. 86-02-004 (Order DE 85-24), § 173-100-090, filed 12/20/85.]

WAC 173-100-100 Ground water management program content. The program for each ground water management area will be tailored to the specific conditions of the area. The following guidelines on program content are intended to serve as a general framework for the program, to be adapted to the particular needs of each area. Each program shall include, as appropriate, the following:

(1) An area characterization section comprised of:

(a) A delineation of the ground water area, subarea or depth zone boundaries and the

rationale for those boundaries;

(b) A map showing the jurisdictional boundaries of all state, local, tribal, and federal governments within the ground water management area;

(c) Land and water use management authorities, policies, goals and responsibilities of state, local, tribal, and federal governments that may affect the area's ground water quality and quantity;

(d) A general description of the locale, including a brief description of the topography, geology, climate, population, land use, water use and water resources;

(e) A description of the area's hydrogeology, including the delineation of aquifers, aquitards, hydrogeologic cross-sections, porosity and horizontal and vertical permeability estimates, direction and quantity of ground water flow, water-table contour and potentiometric maps by aquifer, locations of wells, perennial streams and springs, the locations of aquifer recharge and discharge areas, and the distribution and quantity of natural and man-induced aquifer recharge and discharge;

(f) Characterization of the historical and existing ground water quality;

(g) Estimates of the historical and current rates of ground water use and purposes of such use within the area;

(h) Projections of ground water supply needs and rates of withdrawal based upon alternative population and land use projections;

(i) References including sources of data, methods and accuracy of measurements, quality control used in data collection and measurement programs, and documentation for and construction details of any computer models used.

(2) A problem definition section that discusses land and water use activities potentially affecting the ground water quality or quantity of the area. These activities may include but are not limited to:

- Commercial, municipal, and industrial discharges
- Underground or surface storage of harmful materials in containers susceptible to leakage
- Accidental spills
- Waste disposal, including liquid, solid, and hazardous waste
- Storm water disposal
- Mining activities
- Application and storage of roadway deicing chemicals
- Agricultural activities
- Artificial recharge of the aquifer by injection wells, seepage ponds, land spreading, or irrigation
- Aquifer over-utilization causing seawater intrusion, other contamination, water table declines or depletion of surface waters
- Improperly constructed or abandoned wells
- Confined animal feeding activities

The discussion should define the extent of the ground water problems caused or

potentially caused by each activity, including effects which may extend across ground water management area boundaries, supported by as much documentation as possible. The section should analyze historical trends in water quality in terms of their likely causes, document declining water table levels and other water use conflicts, establish the relationship between water withdrawal distribution and rates and water level changes within each aquifer or zone, and predict the likelihood of future problems and conflicts if no action is taken. The discussion should also identify land and water use management policies that affect ground water quality and quantity in the area. Areas where insufficient data exists to define the nature and extent of existing or potential ground water problems shall be documented.

(3) A section identifying water quantity and quality goals and objectives for the area which (a) recognize existing and future uses of the aquifer, (b) are in accordance with water quality standards of the department, the department of social and health services, and the federal environmental protection agency, and (c) recognize annual variations in aquifer recharge and other significant hydrogeologic factors;

(4) An alternatives section outlining various land and water use management strategies for reaching the program's goals and objectives that address each of the ground water problems discussed in the problem definition section. If necessary, alternative data collection and analysis programs shall be defined to enable better characterization of the ground water and potential quality and quantity problems. Each of the alternative strategies shall be evaluated in terms of feasibility, effectiveness, cost, time and difficulty to implement, and degree of consistency with local comprehensive plans and water management programs such as the coordinated water system plan, the water supply reservation program, and others. The alternative management strategies shall address water conservation, conflicts with existing water rights and minimum instream flow requirements, programs to resolve such conflicts, and long-term policies and construction practices necessary to protect existing water rights and subsequent facilities installed in accordance with the ground water management area program and/or other water right procedures.

(5) A recommendations section containing those management strategies chosen from the alternatives section that are recommended for implementation. The rationale for choosing these strategies as opposed to the other alternatives identified shall be given;

(6) An implementation section comprised of:

(a) A detailed work plan for implementing each aspect of the ground water management strategies as presented in the recommendations section. For each recommended management action, the parties responsible for initiating the action and a schedule for implementation shall be identified. Where possible, the implementation plan should include specifically worded statements such as model ordinances, recommended governmental policy statements, interagency agreements, proposed legislative changes, and proposed amendments to local comprehensive plans, coordinated water system plans, basin management programs, and others as appropriate;

(b) A monitoring system for evaluating the effectiveness of the program;

(c) A process for the periodic review and revision of the ground water management program.

[Statutory Authority: RCW 90.44.400. 86-02-004 (Order DE 85-24), § 173-100-100, filed 12/20/85.]

WAC 173-100-110 SEPA review. The proposed ground water management program shall be subject to review pursuant to the State Environmental Policy Act, chapter 43.21C RCW, as required under the applicable implementing regulations.

[Statutory Authority: RCW 90.44.400. 86-02-004 (Order DE 85-24), § 173-100-110, filed 12/20/85.]

WAC 173-100-120 Hearings and implementation. (1) Upon completion of the ground water area management program, the department shall hold a public hearing within the designated ground water management area for the purpose of taking public testimony on the proposed program. Local governments are encouraged to hold joint hearings with the department to hear testimony on the proposed management program. Following the public hearing, the department and each affected local government shall prepare findings on the ground water management program within ninety days. This period may be extended by the department for an additional ninety days. The findings shall evaluate the program's technical soundness, economic feasibility, and consistency with the intent of this chapter and other federal, state and local laws. The findings shall identify any revisions necessary before the program can be certified and shall contain a statement of the agency's concurrence, indicating its intent to adopt implementing policies, ordinances and programs if required, or a statement of nonconcurrence with the program if such be the case.

(2) The lead agency will consolidate the findings and present them to the advisory committee. Statements of nonconcurrence shall be resolved by the committee and the program revised if necessary.

(3) The program shall then be submitted by the ground water advisory committee to the department which shall certify that the program is consistent with the intent of this chapter.

(4) Following such certification, state agencies and affected local governments shall adopt or amend regulations, ordinances, and/or programs for implementing those provisions of the ground water management program which are within their respective jurisdictional authorities.

(5) The department, the department of social and health services and affected local governments shall be guided by the adopted program when reviewing and considering approval of all studies, plans and facilities that may utilize or impact the implementation of the ground water management program.

[Statutory Authority: RCW 90.44.400. 86-02-004 (Order DE 85-24), § 173-100-120, filed 12/20/85.]

WAC 173-100-130 Designation of ground water areas. The procedures provided in RCW 90.44.130 may be utilized by the department to designate ground water areas, subareas, or zones for the purposes described therein either in conjunction with the procedures of this chapter or independently thereof.

[Statutory Authority: RCW 90.44.400. 86-02-004 (Order DE 85-24), § 173-100-130, filed 12/20/85.]

WAC 173-100-140 Intergovernmental agreements. In order to fully implement this chapter, the department may negotiate and enter into cooperative agreements with Indian tribal governments, adjacent states and Canadian governmental agencies when a ground

water management area is contiguous with or affects lands under their jurisdiction. Such cooperative agreements shall not affect the jurisdiction over any civil or criminal matters that may be exercised by any party to such an agreement. Intergovernmental agreements shall further the purposes of this chapter, and shall serve to establish a framework for intergovernmental coordination, minimize duplication, and efficiently utilize program resources to protect ground water resources.

[Statutory Authority: RCW 90.44.400. 86-02-004 (Order DE 85-24), § 173-100-140, filed 12/20/85.]

WAC 173-100-150 Appeals. All final written decisions of the department pertaining to designation of ground water management areas, certification of ground water management programs, permits, regulatory orders, and related decisions pursuant to this chapter shall be subject to review by the pollution control hearings board under chapter 43.21B RCW.

[Statutory Authority: RCW 90.44.400. 86-02-004 (Order DE 85-24), § 173-100-150, filed 12/20/85.]

WAC 173-100-160 Regulation review. The department of ecology shall initiate a review of the rules established in this chapter whenever new information, changing conditions, or statutory modifications make it necessary to consider revisions.

[Statutory Authority: Chapters 43.27A and 90.44 RCW. 88-13-037 (Order 88-11), § 173-100-160, filed 6/9/88.]

APPENDIX E

South King County GWMP Grant No. 1
Background Data Collection & Management Issues
Volumes I & II

South King County
Ground Water Management Plan

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APPENDIX E

SOUTH KING COUNTY GROUND WATER MANAGEMENT PLAN GRANT NO. 1 BACKGROUND DATA COLLECTION AND MANAGEMENT ISSUES VOLUMES I AND II (JUNE 1989)

(Available upon request from the South King County Regional Water Association – duplication fees may apply)

APPENDIX F

Original Issue Papers

South King County
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APPENDIX F

LIST OF ORIGINAL ISSUE PAPERS

(Available from King County Department of Natural Resources and Parks)

- Federal and State Programs (incorporated into Special Areas paper)
- Special Areas Designations to Enhance Ground Water Protection
- Data Collection and Analysis Program
- Storm water Management
- Hazardous Materials
- On-site Sewage Disposal
- Pesticides and Fertilizers
- Well Construction and Abandonment
- Leaking Sewer Pipes
- Cemeteries
- Sand and Gravel Mining
- Land Application of Waste Treatment Plan Products
- Program to Preserve Ground Water Quantity
- Geologically Susceptible Recharge Areas (incorporated into Special Areas paper)
- Education
- Solid Waste
- Underground Storage Tanks

APPENDIX G

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Appendix G

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