



KITSAP COUNTY DEPARTMENT OF COMMUNITY DEVELOPMENT

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Critical Aquifer Recharge Areas – BAS Review

The attached materials will provide a basis for discussion of Best Available Science relative to Critical Aquifer Recharge Areas at the next Technical Review Committee Meeting scheduled for December 3, 2003.

I. Introduction

The Growth Management Act identifies “critical aquifer recharge areas” (CARAs) as one of six types of critical areas that local jurisdictions must protect under their critical area regulations. The CARA section (Section 600) of Kitsap County’s Critical Area Ordinance was most recently updated in 1998 based upon comments from a group of local experts, including the Kitsap Public Utilities District (KPU) and Kitsap County Health District.

CARA ordinances should

“protect groundwater quality and ensure that sufficient aquifer recharge occurs to maintain the quantities necessary to support ground water’s use as a potable water source (Ecology, 2000).

CARA Ordinances are necessary to

“provide a mechanism by which to classify, designate, and regulate those areas deemed necessary to provide adequate recharge and protection to aquifers used as sources of potable water” (Ecology, 2000).

The first step is to classify/designate recharge areas; the second step is to spell out what land use activities can/cannot be put in those areas.

The following facts should be taken in to account when developing a CARA ordinance:

- a) All groundwater is vulnerable to contamination; however some areas, due to hydrogeologic conditions, have a greater potential to pollute aquifers.
- b) A CARA is best delineated based on *vulnerability*. Vulnerability is based upon susceptibility combined with a contaminant’s ability to enter and move within an aquifer. (*Susceptibility* is the ease with which contaminants can enter an aquifer based upon soils and subsurface materials.) In the absence of data related to contaminants, it is prudent to take a conservative approach and base CARAs on susceptibility alone.
- c) All available hydrogeologic characterizations and water quality studies should be used to determine where a CARA may exist.
- d) Protection of ground water quality in CARAs should not be done to the detriment of ground water recharge.
- e) To the extent possible, CARA ordinances should be coordinated to the greatest extent possible with the requirements of the Water Pollution Control Act, Water Resource Act

of 1971, Ground Water Quality Standards, and Washington State's anti-degradation policy (i.e. at a minimum, all groundwater should be protected as a potential source of potable water).

II. Classifying/Identifying CARAs

Background

GMA requires the County classify CARAs. How they are classified is left up to the County. Ecology recommends basing the classification on susceptibility (unless vulnerability assessments are available and can be incorporated).

The three major factors determining susceptibility are:

1. Overall permeability of unsaturated zone material. This includes both the permeability of the soil (from the Soil Survey) and the permeable of the material underlying (more difficult to determine, can be based on well log data).
2. Thickness of the unsaturated zone (this is depth to water in unconfined conditions).
3. The amount of recharge available (precipitation minus evapo-transpiration).

Often rating systems which take into consideration these elements (at a minimum) are an acceptable "first cut" at identifying CARAs. King County uses a rating system to identify CARAs; DRASTIC is another model. Exclusive use of the Soil Survey to determine susceptibility is not technically valid and does not meet the BAS requirement.

Determination of Wellhead protection areas (WHPAs) is required for all Class A water systems in Washington. The WHPA is determined based upon the time of travel of a water particle from its source to the well. The time of travel depends upon such factors as the permeability of the saturated and unsaturated zones, and the pumping rate.

WHPAs can be used to refine local aquifer susceptibility within CARAs and/or differential priority areas within larger CARAs. Various analytical and numeric modeling techniques can be used to delineate WHPAs; each method is limited in its capabilities and accuracy.

Kitsap County's Existing Classification

General factors considered within the CAO are:

1. Permeability of soils (based on Soil Survey) (Category II).
2. Permeability and thickness of unsaturated zone (Represented as Areas above shallow principal aquifers that lack an impermeable layer) (Category II).
3. Wellhead protection areas (1 year time of travel; and 5 year time of travel if within in #2) (Category I).
4. Special circumstances
 - a. Hansville Aquifer Recharge Area (Category I)
 - b. Areas with high concentrations of Group B and exempt wells (Category II)

III. Regulating Land Use within CARAs

Background

It is necessary to evaluate future land uses in order to determine what potential they may have to impact both current and future beneficial uses of the resource. Federal and/or state regulations address land uses which have the greatest potential to impact groundwater.

Some activities have such a high risk of contamination that they should be **banned**: Landfills, injection wells, mining, wood treatment facilities. Additionally activities that would significantly reduce the recharge to aquifers or to baseflow of a regulated stream should be considered for prohibition. These activities are defined as actions that would (a) further reduce infiltration available to potable groundwater sources within a ground water basin of 10% or more, or (2) cause a violation of established instream flows. (Ecology, 2000).

Generally, activities that pose a moderate risk to groundwater quality can be **allowed with mitigation** measures. When considering permitting a conditional activity, the jurisdiction should require the proposed activity employ AKART (all known, available, and reasonable treatment). Mitigation measures may include physical structures and/or modification to facility-specific operations.

Residential uses of pesticides, show in King County to be the largest contributor to ground water degradation, provides a difficult situation for local jurisdictions.

On site septic systems can be a significant contributor to groundwater contamination, depending upon design, soils, construction and maintenance. Generally, a maximum of one system per acre is sufficient to avoid groundwater contamination (Ecology, 2000).

Activities within CARAs that were put in place prior to the adoption of the CARA may continue provided they do not pose a significant threat to public health or the environment. When existing uses are expanded or otherwise require a permit, it is advised the jurisdiction require AKART.

Site Specific Evaluation

CARA Ordinances should include a provision whereby a proposed facility with a CARA can conduct a site-specific evaluation to ascertain whether mitigation measures can be put in place that would allow approval of the facility. Elements of a basic report should include:

- Site characterization (soil type/depth, permeability of the unsaturated zone, location of nearby wells (within ¼ mi), WHPAs, and critical areas (within 3 miles); depth to groundwater and flow direction; precipitation)
- Potential impacts of the facility (potential contaminants released by the facility)
- Mitigation measures that would result in the project not degrading water quality and recharge. (BMPs, contingency plan)
- Required monitoring

If a facility is to be sited within a more susceptible area, the report should also include:

- Background water quantity (at least one year's worth)
- Contaminant transport modeling (area potentially affected by pollution)
- Modeling of groundwater withdrawals
- Geologic and hydrogeologic characteristics (well logs, geologic maps)
- Monitoring plan provision

Kitsap County's Existing Development Standards

The CARA Ordinance does not ban outright any land uses. Within Category I areas all requests for activities that potentially threaten groundwater (Table 5) must have a hydrological report that considers a credible, worst-case scenario. Within Category II areas, such activities may require a hydrogeological report.

Kitsap's Hydrogeological Report requires the applicant to address the impact of the proposed land use will have on both the quality and quantity of the water transmitted to the aquifer.

Elements of the report include:

- Site characterization (soil type and geologic setting; location of nearby wells, streams, lakes and springs (within 1,000 feet); depth to groundwater and flow direction;)
- Effects of the on water quality and the groundwater resource in general
- Recommended mitigation measures that would result in the project not degrading water quality. (BMPs, contingency plan)
- Sampling schedules required to assure water quality
- Available groundwater and surface water quality data
- Other information as requested by the Health District.

The report shall be completed by a professional geologist/hydrologist or a qualified soils scientist with 5+ years of experience.

IV. Best Available Science Literature Review

The following information is most applicable best available science for CARAs:

- Guidance Document of the Establishment of Critical Aquifer Recharge Area Ordinances, Ecology 2000.
- King County BAS review – Chapter 6: Critical Aquifer Recharge Areas (includes an extensive list of references)
- Series of reports by USGS about Sub Base Bangor (1995, 1997, 2001, 2002)
- Series of reports by Golder Associates for WRIA 15 Planning Unit:
 - Level 1 Assessment, 2001
 - Water Quality Assessment, 2003
 - Instream Flow Assessment (Step A, 2002; Step B, 2003).
- Initial Basin Assessment, KPUD, 1997