DRAFT RECOMMENDATIONS ONSITE WATER AND WASTEWATER

INTRODUCTION

Most Anchorage Hillside residents use onsite wells and onsite wastewater systems (OWS). It is estimated that 6,800 of the area's 8,930 residences draw approximately two million gallons of water per day from Hillside aquifers. Much of this water is recharged to the aquifer system as OWS effluent.

In general, onsite water and wastewater systems on the hillside are meeting regulatory standards and serving the community interest. Water samples collected from most Hillside wells, except for a few naturally occurring contaminants, comply with state and federal standards for drinking water quality. There is no evidence of an area-wide threat to public health.

Well sampling data indicate nitrate concentrations in localized areas higher than what can be attributed to natural sources. Nitrate levels in some wells are trending upward. OWS effluent, fertilizer, and manure are known human-related sources of groundwater nitrates. Consequently, nitrate increases in a growing residential community raise the concern that development is affecting ground water quality. Another concern with such trends is whether other OWS-associated contaminants are also on the increase. (MOA COSA database, 2007; Bristol, 1997; Montgomery Watson, 2000; LCG/COWC 2007)

Sanitation professionals and public health authorities concur that properly designed, installed, and maintained OWS can perform equal to, or exceed, centralized sewer treatment systems on a long-term basis. They are capable of delivering high levels of treatment that are protective of the environment and suitable for onsite recharge to area aquifers. The conjunctive use of onsite wells and wastewater systems represent a viable, practical, long-term water supply and treatment solution for Hillside residents--provided they are adequately located, designed, installed, maintained, and managed.

One objective of the Hillside District Plan (HDP) is to facilitate an effective combination of individual, neighborhood, and public water and sewer service to protect public health, the environment, and public interest in perpetuity. Consistent with this objective, and 2020 Plan growth projections of an additional 4,000 to 6,000 housing units within the HDP boundary, recommendations of the Onsite Study Team are as follows.

- **Continue to conjunctively utilize onsite wells and wastewater systems in areas of the Hillside east of the existing Anchorage Water and Wastewater Utility (AWWU) water service area boundary.**
- **Assume the responsibility of protecting Hillside groundwater as an essential public resource.**

Groundwater protection is vital to the community because it is far more cost effective to prevent contamination than to clean up or replace ground water sources. Therefore, as residential growth on the Hillside continues, and in consideration of the risk and cost

associated with a compromised water supply, it is proposed that a comprehensive, ongoing program be implemented to protect groundwater quality.

GROUNDWATER PROTECTION PROGRAM

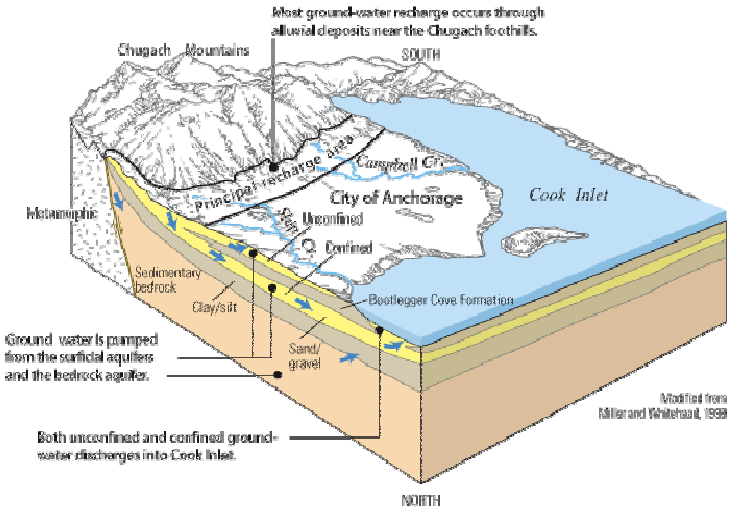
Incumbent with the right to draw from and discharge into the aquifer is the responsibility to protect area groundwater.

Contamination of local aquifers is a nationwide concern, affecting communities of all sizes. When groundwater contamination reaches the point to where drinking water quality is impaired, aquifer cleanup is seldom feasible. In most cases, the water supply of those affected is either treated or replaced at considerable expense.

In Washington state, the State Department of Ecology in its *1999 Report on Groundwater Contamination that Affects Drinking Water in Washington State* describes 20 cases where wells were impacted by human-caused contamination. In one, the contaminant concentration in water reaching the wells eventually dropped off to where it was no longer considered a threat. Another case, affecting 500 homes, is awaiting regulatory action. Four resulted in construction of water treatment plants to clean up the contaminated water or drilling replacement wells. The remaining fourteen cases were resolved by providing bottled water or extending public (piped) water to residents in the affected areas (Ecology, 1999).

A study of groundwater quality in the Cook Inlet basin by the US Geological Survey (USGS) found nitrate concentrations to be the highest in Anchorage and surmised the cause to be human-related (Glass, 1999).

The Anchorage Hillside occupies a significant portion of the region's recharge area. Water percolating through Hillside aquifers moves down gradient to the west, feeding streams, wetlands, and wells between the study area and Cook Inlet. Consequently, Hillside groundwater, in varying degrees, affects the quality of water serving wildlife habitat as well as most homes and businesses in the Anchorage metropolitan area.



It is recommended that the Municipality of Anchorage (MOA) develop and implement an effective, long-term Groundwater Protection Program (GPP) for the Hillside area. This is intended as a proactive approach to reduce high risk activities and to provide early detection capability to prevent a groundwater emergency. This approach will allow decision-making based on real time data. Contamination prevention is far more cost-effective than contamination cleanup. The purpose of the recommended Groundwater Protection Plan is to prevent this from happening on the Hillside.

Specific recommendations for the GPP fall into the following categories.

- **Improved Understanding of Conditions in Hillside Aquifers**
- **Water Quality Protection Measures – Hillside Property Owners**
- **Water Quality Protection Measures – Community**

Aquifer Conditions. Sound policy and planning decisions require fact-based analysis and evaluation of subsurface conditions affecting the area's aquifers. This requires current and relevant data. In that the existing system of water quality sampling and recording has significant deficiencies, these recommendations are designed to improve the quantity and quality of information in order to make timely, defensible choices.

Property Owners. Hillside property owners have a high degree of stakeholder interest in local groundwater quality. Additionally, the cumulative care and personal stewardship of individual property owners have significant potential for adverse impacts. Therefore, property owner support and cooperation is essential.

Community. Although it is recommended that the MOA take the lead in this effort, the participation of public entities at federal, state, and local levels is key to an effective GPP.

IMPROVED UNDERSTANDING OF AQUIFER CONDITIONS

Objective – Problem Statement

A fundamental objective with implementing a viable GPP is to gather, review, and deliver factual, representative information as a basis for sound, long-term public policy and land planning decisions. This requires accurate, real time data and unbiased analysis to reliably characterize subsurface water quality and recognize trends at an early stage. Advanced warning capability is essential to making timely adjustments and thereby averting a costly groundwater emergency. It is therefore recommended that measures be taken to improve the community's real-time understanding of water quality conditions in Hillside aquifers.

There is presently no comprehensive program for directly monitoring in-situ water quality within Hillside aquifers. Nearly all of the water quality data assembled to date is from well samples collected under a number of programs. Although the current system of well sampling has provided a sizeable quantity of data, it has limitations, as listed below.

- Under-utilization of data
- Limited number of water quality parameters analyzed
- Potential for contamination at the wellhead
- Distribution and frequency of sampling
- Lack of sampling/reporting quality control

Data Under-utilization. At present, individual wells are monitored by MOA's Onsite Water and Wastewater Program, public wells are regulated by ADEC's Division of Drinking Water, hydrologic and hydrogeologic data are collected by USGS, and various studies are conducted by the University of Alaska Anchorage (UAA) and private interests. Most water quality information is collected, evaluated in-house, and filed away. Although a considerable effort was expended recently to digitize records, create databases, and plot data; no centralized system has been established where Hillside data is systematically collected and organized into a more useable form.

Limited Water Quality Parameters. For individual wells on the Hillside, the following parameters are required to be tested and reported to MOA.

- Arsenic
- Fecal Coliform
- Total Coliform
- Nitrates

For public water system wells, all parameters listed by state and federal drinking water regulations are tested and reported. Although this list includes nitrates and coliform bacteria, most OWS effluent-associated contaminants are not tested.

Potential for Contamination at the Wellhead. Significant potential exists for surface runoff to contaminate wells under one or more of the following conditions: permeable near-surface aquifer; shallow well; ponded water around or near the wellhead; faulty well seal or other construction deficiencies; cracked or broken well casing; unsanitary well maintenance activities; and onsite storage of chemicals, animal wastes, or other deleterious substances. It is reported that several Hillside wells with high initial nitrate readings, after being rehabilitated, yielded water samples with significantly lower nitrate levels.

Sampling Distribution/Frequency. There are an estimated 4,000 to 5,000 individual wells and 39 public water system wells on the Hillside. Most individual wells are located in developed sectors of the study area, east of the AWWU service area boundary. Under current MOA regulations, testing for fecal coliform and nitrates in an individual well is only required when the well is first drilled, or is sold. Consequently, no water quality test results are available from individual wells pre-dating the current ordinance that are still under original ownership. In contrast, wells on properties that have exchanged hands several times contribute multiple data points. Public water system wells are similarly unevenly distributed in the study area. These are tested more frequently than individual wells, however, and therefore provide a more consistent data base over time.

Quality Control. As part of MOA's Certificate of On-site Systems Approval (COSA) process, water samples for individual wells are generally collected by the property owner's representative and submitted to an approved water quality laboratory for analysis. The laboratory then furnishes the results to the property owner, who in turn is to report them to MOA's Onsite representative. Samples testing positive for coliform bacteria require that the well be disinfected and the sampling repeated. Samples found with elevated arsenic or nitrate concentrations may result in an advisory letter or COSA denial. This arrangement raises the following quality control concerns.

- Lack of training and uniformity in the collection and handling of water samples
- Conflict of interest for those collecting the samples and reporting the results to MOA authorities

Recommendations

In the interest of providing accurate, reliable aquifer-related information to guide GPP and public policy decisions for the Hillside, the following measures are recommended for consideration by the GPP lead agency.

- Coordinate with state and federal agencies, the university, private consultants, local groups, and other interested parties in developing a common, internet accessible, Hillside database. Database to include, but not be limited to: well drilling logs and pump test results for individual and public water system wells; historical and ongoing well water quality data; hydrologic and water quality studies; historical and ongoing surface flow and water quality data.
- Establish collection, processing, organization, and access protocols to facilitate efficient data utilization and analysis.
- Supplement the existing COSA-required well sampling program with yearly testing of a select group of individual wells. Well group shall be selected to represent the Hillside aquifer system. Sampling to be accomplished by trained personnel with no vested interest in a specific outcome.
- Where sample analysis of a private well exceeds 3.0 mg/L nitrate, conduct a contamination analysis of the wellhead to possibly include: site inspection; review of nitrate levels in neighboring wells; down-well videotaping; grouting evaluation; dye testing; follow up water quality testing; or other measures. Evidence of wellhead contamination, including any remedial work, should be noted in the database for the well in question.
- Coordinate sampling schedules with public water suppliers on the Hillside to reduce seasonal variables in analysis results.
- Promote additional monitoring programs and studies holding the most promise for improving the collective perception of aquifer conditions.
- Prepare an annual Hillside GPP report of relevant findings, trends, and study results.
- Develop contingency work plans to address detection of elevated or increasing groundwater contaminant levels.

Groundwater protection is far more effective than aquifer cleanup or water source replacement. GPP recommendations are designed to best utilize existing resources in striving for a data-based, proactive approach to prevent water quality degradation and provide early warning of developing problems. Public support and participation are essential ingredients to a successful GPP.

GROUNDWATER PROTECTION MEASURES – PROPERTY OWNER RECOMMENDATIONS

Awareness, Education, Motivation

A successful GPP will depend on the degree to which individual residents are aware, educated, and motivated regarding groundwater protection. Many measures are preventive in nature and take little effort. Others require more significant adjustments. Measures are more readily achieved when the individuals involved are: aware of the importance, knowledgeable of what's to be done, and sufficiently motivated to take action.

Awareness. Hillside property owners are highly invested in the study area--with much to lose from a compromised water supply. Many, however, are not cognizant of water quality issues or the cumulative impact of certain activities. A necessary first step in obtaining buy-in on groundwater protection is to raise individual awareness to a level where it becomes a conscious part of everyday living.

Education. Informed choices are based on the application of reliable information. Therefore, one function of the GPP is to facilitate an educational process whereby accurate, relevant data and recommendations are made available to property owners and members of their households.

Motivation. Stakeholder motivation and buy-in will be influenced by a number of factors including: groundwater protection awareness, trust in the GPP process, altruistic considerations, regard for others, self interests, and perceived ability to achieve a successful outcome. Such factors must be incorporated into the design and deployment of a successful GPP. Tax incentives could be implemented for homeowners willing to participate.

The community recommendations listed in the following section are intended to raise awareness, deliver educational opportunities, and provide incentives for property owners on the Hillside.

Household Activities

A number of common property owner activities and individual habits can adversely affect OWS performance and/or the quality of effluent reaching the groundwater supply. These primarily involve patterns of water usage and discharge of high strength wastes or deleterious substances. Although advisory information on this subject is presently available through MOA's On-site Water and Wastewater Program, it is recommended that it receive additional emphasis as part of the GPP.

OWS Location, Design, Operation, Management, and Maintenance

OWS siting and design are, appropriately, the responsibility of certified design professionals. Property owners, however, typically make significant decisions affecting OWS siting, design, and performance. Such decisions may include: selection of the OWS designer and the level of treatment desired; choice of building size; site features; household water usage and waste disposal; and overall site layout and grading. It is therefore recommended that groundwater protection principles be emphasized throughout the platting and building permitting process.

OWS operation, management, and maintenance are the responsibility of the property owner, although past practice for some owners has been to neglect their system.

It is recommended, as part of the GPP, that all OWS be operated, managed, and maintained by trained and certified operators. Property owners opting to manage and maintain their

own systems can be trained and certified to do so. Training should emphasize the economic and groundwater protection benefits of good maintenance practices.

Property Management Practices

Other than the OWS and drainage issues discussed previously, commonly cited sources of contamination to local water supplies in rural/residential areas include fertilizer, animal wastes, herbicides, and pesticides. These are also present on the Hillside with the potential for adversely impacting surface streams and groundwater.

- Fertilizer. It is recommended that best management practices pertaining to application rates and procedures, handling and storage, and watering practices be adopted by property owners to reduce the potential for nitrate-contaminated leechate or surface runoff.
- Animal Wastes. It is recommended that best management practices be applied by Hillside livestock owners. It is further recommended that MOA review its large animal ordinance from the perspective of surface and groundwater protection. Special consideration should be given to allowable numbers of animals per acre, ground cover, slopes and surface water runoff, and waste management.
- Herbicides/Pesticides. It is recommended that best management practices pertaining to application rates and procedures, handling and storage, and watering practices adopted by property owners to reduce the potential for chemical-contaminated leechate or surface runoff.

GROUND WATER PROTECTION MEASURES – COMMUNITY

Policy Development

It is recommended that MOA implement and administer public policies to effectively accomplish the following objectives.

- Recognize area groundwater as an essential public resource.
- Establish ground water protection as an ongoing public priority.
- Amend Title 15, Title 21 or other land use ordinances, as appropriate.
- Create a viable ongoing Groundwater Protection Program (GPP).
- Designate an agency/department responsible for its implementation and management.
- Delineate funding split among stakeholder groups.
- Commit resources necessary to a successful GPP.
- Engage other key stakeholders for participation, including State of Alaska, AWWU, Community Councils and Homeowners Associations.
- Use GPP data to make sound policy decisions to protect public health, the environment, and the public interest.

Public Awareness and Communication with Stakeholders

Awareness of the value of groundwater protection and the benefits of participation are key to public support. This can be accomplished through a number of communication channels to include, but not necessarily be limited to, the following:

- Press Releases and Interviews with Local Media
- A GPP Website Link (in concert with the MOA Onsite web page)
- Public Addresses by MOA Officials
- Billing Stuffers and Flyers
- Outreach Programs in Schools and with Neighborhood Groups

The tangible community benefits of groundwater protection, and the importance of individual participation, are essential messages for all stakeholders.

Data Collection and Dissemination

A considerable amount of hydrogeologic and water quality data pertaining to Hillside aquifers have been collected by the US Geological Survey (USGS), US Environmental Protection Agency (USEPA), the academic community (UAA), State ADEC, MOA, their predecessor agencies, and private interests. In addition, well water quality testing is carried out by numerous entities, including individual well owners. Data is collected and stored in different locations by various agencies. Additionally, concerns regarding uniformity of area coverage, sampling bias, handling procedures, localized contamination at the wellhead, and quality control have not been fully addressed.

It is recommended that the GPP develop a process to improve the quality and relevance of groundwater-related information and to facilitate its availability for use by interested parties.

Development Standards

General

As the Hillside population continues to grow, updated development standards that prominently feature groundwater protection serve a dual purpose of improving infrastructure quality and raising consciousness of the local community. It is recommended that MOA, as both GPP lead agency and development jurisdictional authority, adopt and enforce updated development standards to accomplish the following objectives.

- Allow advanced technology and/or neighborhood OWS to improve treatment of household waste entering drainfield.
- Require trained OWS personnel for system management and maintenance.
- Require local retention/detention of storm runoff to onsite or local containment areas that will not affect OWS drainfield operation.
- Promote limited application of fertilizer, pesticides, herbicides, other chemicals.

- Avoid concentration of animal wastes and reduce manure-contaminated runoff.
- Grade individual lots and common areas to: ensure surface drainage away from wellheads; reduce velocity of surface runoff; increase flowpath lengths; promote percolation in vegetated areas.
- Reduce footprint of disturbed area and impacts from construction activity (sediment, spills, waste disposal).
- Encourage preservation of natural areas and buffer zones, particularly along drainage ways and steep slopes.

Onsite Wastewater Systems

- Adopt the concept of an OWS 'Toolbox' with proven technologies to be utilized in areas with challenging site constraints, rather than regionalizing 'build' and 'no-build' areas of the Hillside.
- Consider amending Municipality of Anchorage Wastewater Disposal Regulations, Chapter 15.65, as recommended in the Onsite Wastewater Supplementary Report.
- Consider allowing holding tanks as an alternative to drainfield systems. Require that property owners opting for holding tanks pay for 100% of the increased inspection and verification costs of the system.
- Consider designating 'Areas' of Special Concern' that are particularly sensitive to OWS nutrients and contaminants. Require secondary treatment or other appropriate measures to protect such areas.
- Require all individuals operating and maintaining OWS to be trained and certified through the MOA or a training course approved by MOA..
- Furnish training, certification, monitoring and maintenance guidelines, and checklists for property owners opting to perform their own monitoring and maintenance.

Neighborhood Systems-Administrative

- Revise the Limited Wastewater Assessment-Service District requirements to allow implementation of neighborhood OWS for new subdivisions.
- Establish a framework for ownership, management, operation and funding.
- Agree on a single agency to control neighborhood OWS permitting and regulatory oversight.
- Create specific development regulations for neighborhood systems design.
- Develop operation, maintenance and management guidelines or regulations.
- Initiate system operation oversight procedures.
- Audit system operation, sampling, testing and maintenance records.

Neighborhood Systems-Technical

- Require secondary treatment standards for all neighborhood OWS

- Require effluent to be disinfected prior to discharge
- Require that the engineer provide: upslope and downslope impact study and groundwater mounding study for drainfield area.
- Require that the engineer write a comprehensive operations, monitoring, and maintenance manual for specific system.

Stakeholder Incentives

It is recommended that MOA, as GPP lead agency, look to create incentives for participation and support from numerous stakeholder perspectives. Incentives should be selected that generate win-win outcomes benefiting both the individual participant and the greater stakeholder community. As an example, it may be advisable to relax some requirements for properties installing secondary treatment systems. The MOA might also consider encouraging participation of local universities (both graduate & undergraduate studies) to assist with development and monitoring of the GPP database for extended research projects and grant studies to help cultivate real time data acquisition and multivariate trend analysis.

Funding

A rough order-of-magnitude estimate places the ongoing cost of an effective GPP at $300,000 annually—less than $35 per year for each of the area's residences. The benefits of Hillside groundwater protection, however, extend beyond the local area and it is recommended that the greater Anchorage community and State or Federal agency stakeholders share in the cost.

In consideration of contamination risks posed by- and benefits received from- a protected groundwater supply, it is recommended that the following stakeholders share Hillside GPP costs.

- Hillside residents and property owners
- Greater Anchorage community
- Municipal and State Agencies

It is recognized that numerous subgroups are contained within these broad categories and that each subgroup represents its own set of groundwater risks and protection benefits. Therefore, it is suggested that MOA work with the Hillside community, its own constituents, and the Alaska Department of Environmental Conservation (ADEC) to establish a fair, risk/benefit-based allocation of financial responsibility.

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