Chapter 5. Water and Wastewater: Public and On-site Systems

Overview

Eighty percent of the Hillside District uses on-site water and wastewater (private wells and septic systems). Since public health is a primary responsibility of local government, the Municipality evaluated the viability of current and future reliance on on-site wastewater systems on the Hillside. The available information indicates that so long as there is proper siting, design, construction, operation, and maintenance of these systems, on-site systems work well today and offer a viable, practical, long-term water and wastewater solution for the Hillside. Because the Hillside is expected to grow from 8,500 to 14,000 dwelling units, it will be important to monitor water quality to ensure that on-site wastewater systems continue to operate effectively and continue to protect the quality of Hillside water resources.

This chapter presents five major strategies to address current and future challenges related to Hillside water and wastewater, with the broad goal of maintaining high water quality into the future:

1. **Neighborhood Wastewater Systems:** These systems offer an alternative to more costly public water and sewer systems where traditional on-site systems are not viable. New procedures and standards are needed to ensure that, where such systems are used, they are well designed, well managed, and work successfully over the long term.
2. **Strategies to Address Lots with On-site Problems:** Action may be needed in specific areas of the Hillside where some on-site systems have a history of challenges.
3. **Well Water Protection Program:** This research and monitoring program will provide more complete, current, and accurate information about Hillside water quality, and a proactive program to educate users on system operations.
4. **On-site Wastewater System Standards:** Improved standards are needed for the installation and operation of on-site septic systems.
5. **Recommended Changes in the Maximum Perimeter of Public Sewerage:** In response to changes outlined in the Land Use Chapter, the perimeter boundary in the upper Potter Valley area will be reduced.

Pictured above, pipes rising from a backyard on-site wastewater system; pictured below, water pipes that were installed near Abbott Loop Road in 2007 by the Anchorage Water and Wastewater Utility. As a whole, Hillsiders are happy with their on-site water and wastewater systems, and most view the prospect of public water and sewer with concern about costs and lifestyle changes.

Water Use on the Hillside

It is estimated that up to 6,800 Hillside residences draw approximately two million gallons of water per day. This represents less than five percent of the 41 MGD (million gallons per day) of surface and subsurface flow from Hillside aquifers estimated in a 1975 U.S. Geological Survey study (cited below). Figure 5.1 (reprinted from the 1975 USGS study) shows the water budget of the Hillside area underlain by sedimentary aquifers.

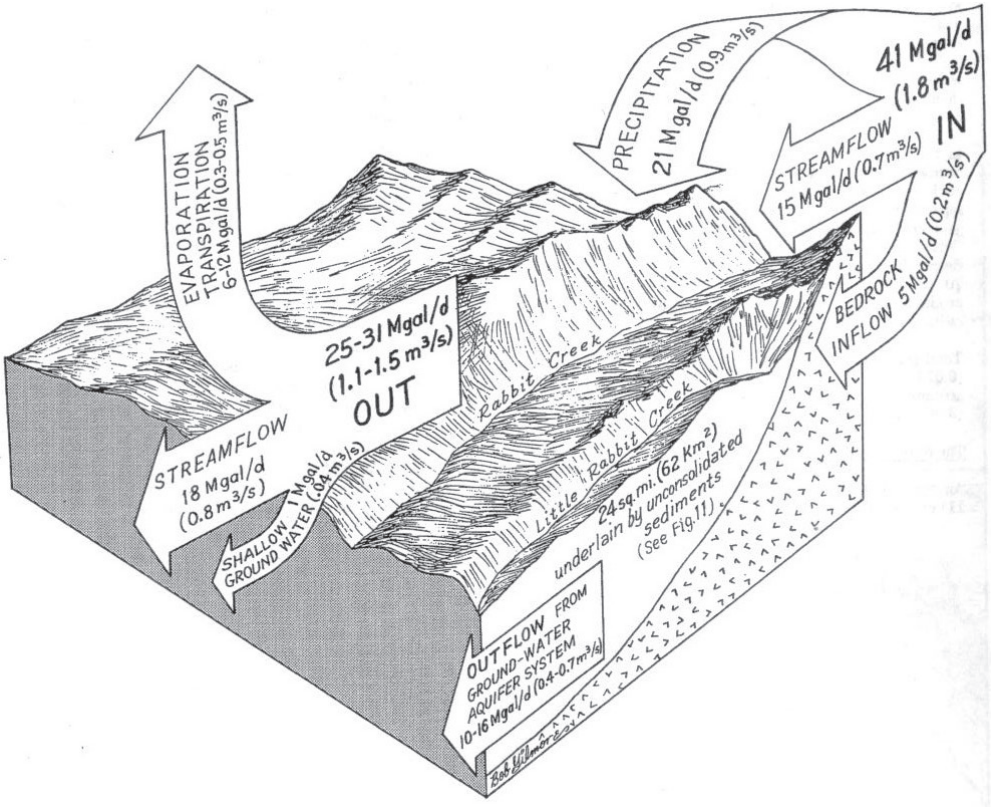
Dearborn and Barnwell (1975), Hydrology for Land Use Planning: The Hillside Area, Anchorage, Alaska: U.S. Geological Survey Open File Report 75-105.

Context: Planning Issues Summary

Public Comments

Public comments received during the planning process clearly indicate that the majority of Hillside residents strongly prefer to continue using on-site water and wastewater systems. The community survey conducted as part of this planning process produced similar findings, with the large majority (77 percent) of local residents stating that they are satisfied with their on-site systems. Local support for continued reliance upon on-site systems is driven by two considerations. First, extending public water and sewer into the area would be very costly (from tens to hundreds of thousands of dollars per home). Second, on-site systems require large lots to function properly. Public water and sewer do not have this limitation. The availability of public water and sewer would create pressures to develop or redevelop at the higher residential density, risking the loss of the rural residential environment that is highly valued by most Hillside residents.

Figure 5.1
Water Budget of the Area Underlain by Sedimentary Aquifers



Science
Evidence regarding the current state of Hillside on-site wastewater systems and groundwater quality show that water quality is good, most on-site wastewater systems are well managed, and continued reliance upon them is safe and effective.

Water
There are many aquifers on the Hillside tapped by residential wells. These aquifers are recharged primarily from rain and snowfall in the mountains, but there is also recharge from shallow groundwater, especially in the middle and upper part of the Hillside. Studies show that current use amounts to approximately five percent of groundwater flow through the Hillside (for a more detailed explanation, see the Hillside Issues, Goals and Choices Report, referenced in the list of Hillside District Plan Supporting Documents, Appendix A).

Although growth from 8,500 to 14,000 dwelling units (most with on-site systems) will significantly increase the amount of withdrawal from these aquifers, it will also increase the recharge from on-site systems. Water shortage has not been raised as a real issue for the expected build-out of the Hillside.

Wastewater
Wastewater treatment by on-site systems is a two-step process. The first step is primary treatment (the removal of sinking and floating solids), which is done in the tank of a septic system; the second step, which is done in the drainfield of a septic system, is aerobic treatment in four feet of unsaturated acceptable soil (converting the effluent through aeration and microbial action into treated wastewater suitable for discharge back into the groundwater). Properly designed, installed, and maintained, septic systems do this efficiently and effectively and can last indefinitely. In contrast, disposal of wastewater through Anchorage municipal sewerage eliminates the potential for local groundwater contamination from substandard on-site systems or poor maintenance practices. Municipal wastewater receives primary treatment, and the effluent is disinfected with chlorine and discharged into Cook Inlet, in accordance with Environmental Protection Agency permit requirements as prescribed by the Federal Clean Water Act.

History of Problems
In the past, although they met code requirements in effect at the time of platting, some lots in subdivisions were approved that were undersized or unsuitable for wet soils, making the

The front range of the Chugach including the Hillside is a major contributor to the Anchorage's groundwater system. Water percolating through Hillside aquifers moves down gradient, feeding wells, wetlands, and streams within and beyond the study area (Figure 5.2).

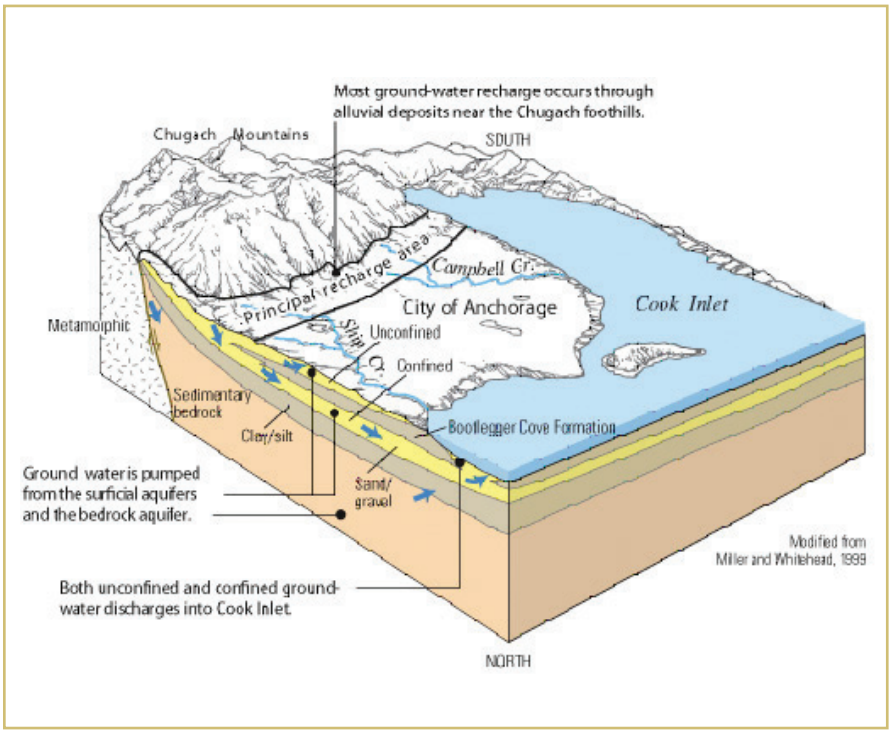
construction and functioning of an on-site wastewater system problematic. Current regulations, procedures, and enforcement preclude this situation from happening again. Most of these substandard lots presently have functioning systems, due to technological advances, diligence in monitoring and regulation, and increased understanding by the homeowners. A few of these lots may not be developable, or if already developed, may eventually have to convert to a holding tank absent alternative solutions, such as neighborhood systems. (Holding tanks are not favored; they are very expensive to maintain, and responsible maintenance can be a problem.) Future development of the Hillside should not see approval of more substandard lots, but ongoing attention must be paid to existing difficult lots.

Well water quality problems can be gauged using indicators such as nitrates and coliform bacteria. The presence of nitrates often correlates to the presence of other organic pollutants. Nitrates may be caused by natural sources and/or human sources, including manure, use of nitrate-based fertilizers, or wastewater effluent leaching into the groundwater.

A few of the public well water systems on the Hillside show upward nitrate trends. Experience shows that improper well seals are often the source of this problem. Improper well seals can be repaired by grouting the wells, which separates the aquifer from surface water and shallow groundwater. Monitoring and maintaining both wells and septic systems is the proper way to maintain high water quality. An improved, more current and comprehensive well water database is needed, drawing from several sources of testing information and using a more structured testing protocol. (See the Well Water Protection Program for details.)

More detail on these issues is contained in supplemental on-site water and wastewater reports to the Framework Plan referenced in the list of Hillside District Plan Supporting Documents, Appendix A.

Figure 5.2
Hillside District and
Anchorage Bowl Aquifers



Background

Water Quality and On-site and Public Water and Wastewater Treatment on the Hillside Today

On-site Water and Wastewater Systems

More than 80 percent of the Hillside homes rely on on-site wells and wastewater systems. In general, these systems are adequately designed and installed, but maintenance of the systems can be hampered by a small-diameter opening to the septic tank. Current wastewater treatment standards in Anchorage are basic compared to the complexity of standards in many other states in the nation. For example, larger-diameter access pipes (manhole-sized), which will improve monitoring and maintenance of on-site systems, are commonly required in other parts of the United States.

On balance, Hillside on-site wells and wastewater systems are working well, although in some areas there has been evidence of poor function due to small lots and/or physical site constraints such as poor soils, shallow bedrock, shallow groundwater, and steep slopes.

Statistics from water quality data collected at 39 public well water systems on the Hillside indicate that nitrate concentrations are well below federal drinking water standards. However, well sampling data within some localized areas show nitrate concentrations above what is typically attributed to natural sources. Between one-third and one-half of these well water systems exhibit a gradual upward trend in nitrate concentrations over time. Increased nitrate levels may be caused by natural sources, and/or human sources, including manure, use of nitrate-based fertilizers, surface contamination from improper well seals, and wastewater effluent leaching into the groundwater. Nitrate levels are important because they are potential indicators of effluent reaching well water. The water quality protection program, presented in HDP Policies 13 G-K of this chapter, addresses this and related topics of interest to ensure the protection of Hillside drinking water.

AWWU is a rate-based (user-funded) utility, meaning that AWWU's primary source of revenue comes from customers not property taxes. To minimize impacts to existing customer rates, AWWU operates under the business principal that the "cost causer is the cost payer." Property owners that wish to receive AWWU service are expected to pay a fair share of the original costs of water and sanitary sewer main construction.

Public Water and Sewer Systems in the Hillside District

The Hillside is served by several types of public water and sewer systems. Public systems serve large numbers of people with water from a single source or collect and convey sewage to a central treatment location.

Public Water Systems

Public water systems can be classified into either community or non-community systems. The Anchorage Water and Wastewater Utility (AWWU) and Potter Creek Water Company, which serve the western edge of the Hillside study area, are examples of community systems. Institutional and large nonresidential users like Huffman Elementary School, Amazing Grace Church, the Alaska Zoo, and the Anchorage Golf Course are examples of two categories of non-community systems.

There are 39 public well water systems in the Hillside District: 19 community systems and 20 non-community systems.

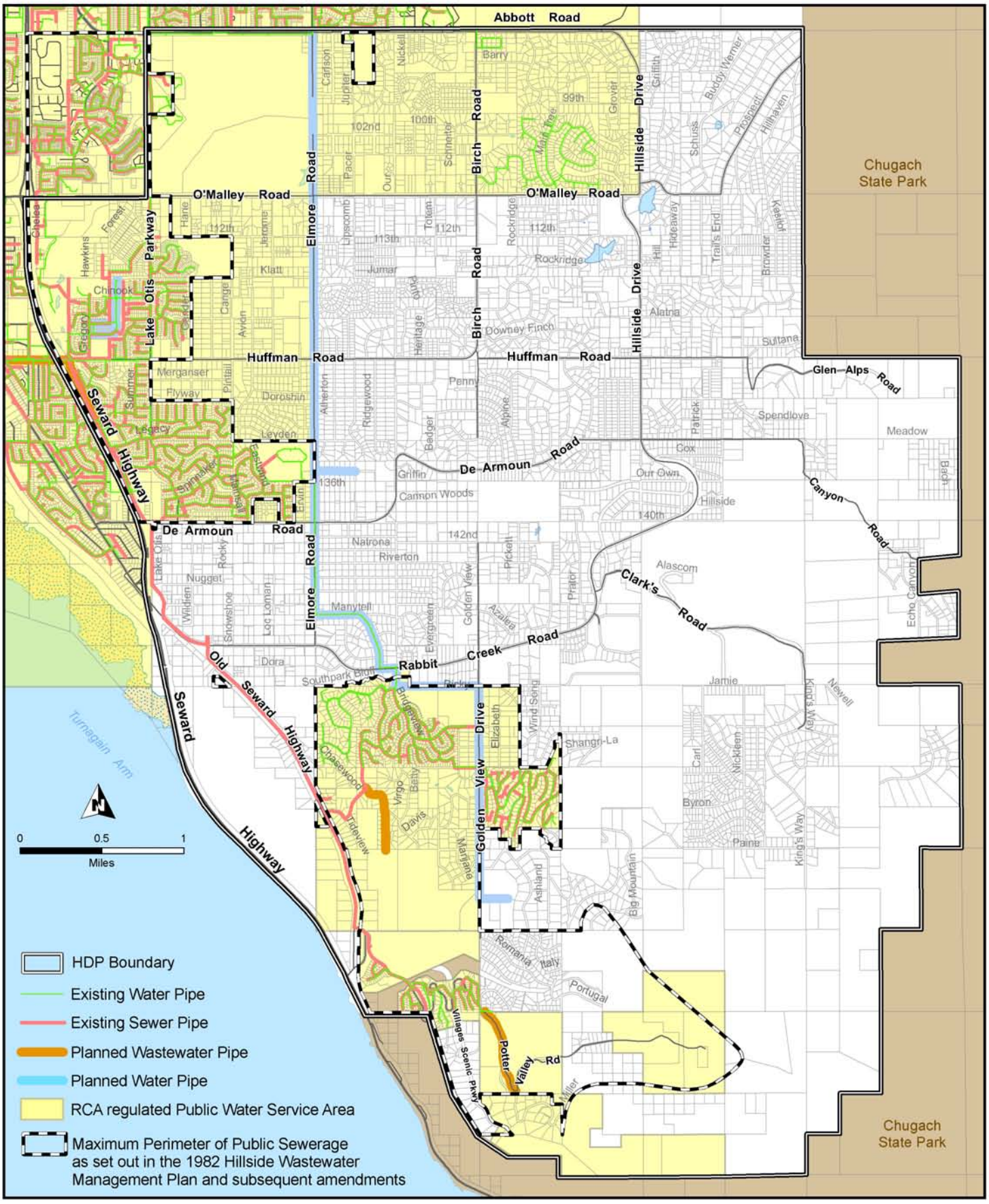
The Anchorage Water and Wastewater Utility is working on several projects identified in its water master plan for the lower Hillside. Known collectively as South Anchorage Water Improvements, they include water transmission piping and water reservoirs designed to provide enhanced water volume and pressure for fire fighting and domestic use within the existing AWWU service area. The master plan projects are shown in Map 5.3.

Public Sewer Systems

Sewer systems serving the public include utilities (such as AWWU) and non-utility systems that provide service to public gathering places. In general, the AWWU public sewer system serves the northwestern portion of the study area and several subdivisions in the vicinity of Golden View Drive and in the lower Potter Valley. The 20 non-utility public sewer systems serve churches, schools, or other public venues located north of Rabbit Creek Road and west of Hillside Drive. Non-utility public systems are not piped and use either holding tanks or on-site wastewater systems to dispose of wastewater.

Anchorage Water and Wastewater Utility Service Area

AWWU and other public utilities are regulated by the Regulatory Commission of Alaska (often referred to as the RCA). This state commission has authorized the utility to provide water service to the area generally west of Elmore Road, north of DeArmoun Road and at the south end of Golden View Drive.


Abbott Road
O'Malley Road
Huffman Road
De Armoun Road
Rabbit Creek Road
Clark's Road
Canyon Road
Glen Alps Road
Seward Highway
Old Seward Highway
Elmore Road
Birch Road
Hillside Drive
Golden View Drive
Lake Otis Parkway
Chugach State Park
Turnagain Arm
0 0.5 1 Miles
HDP Boundary
Existing Water Pipe
Existing Sewer Pipe
Planned Wastewater Pipe
Planned Water Pipe
RCA regulated Public Water Service Area
Maximum Perimeter of Public Sewerage as set out in the 1982 Hillside Wastewater Management Plan and subsequent amendments

AWWU is authorized by the commission to provide wastewater service to the entire Hillside District. However, the Municipality of Anchorage, through the 1982 Hillside Wastewater Management Plan, restricts AWWU-piped sewer service to the area generally near and west of Lake Otis Parkway and north of DeArmoun Road and to several subdivisions along Golden View Drive and in the Potter Valley area. This area, labeled the Maximum Perimeter of Public Sewerage, and the AWWU sewer collection system are shown on Map 5.3.

Costs and Obligations to Connect to Municipal Water and Sewer

AWWU is a rate-based (user-funded) utility, meaning that its primary source of revenue comes from customers, not from property taxes. To minimize impacts to existing customer rates, the utility operates under the business principal that the "cost causer is the cost payer." Property owners who are within the AWWU service area and who wish to acquire AWWU services are expected to pay a fair share of the original costs of water and sanitary sewer main construction.

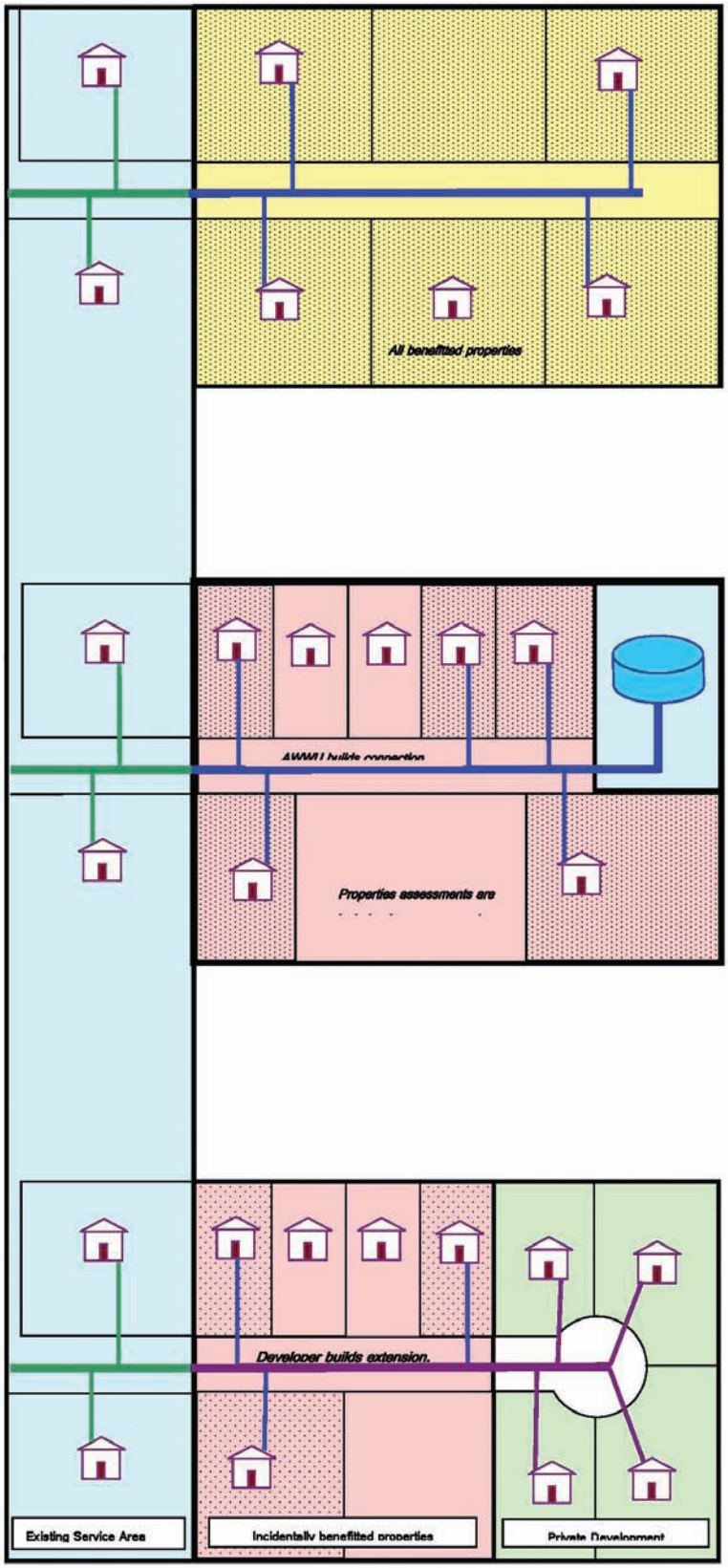
Water and sanitary sewer mains can become available to a property within the AWWU service area by any one of the three following extension programs:

- Special Assessment Improvement District
- Mainline Extension Agreement (Private Development)
- Utility Capital Improvements

Figure 5.4 gives a general picture of options for extending water and sewer and the costs allocated for this action.

More detailed information on the three extension programs may be found in the document Hillside District Plan Alternatives: A Framework for Public Discussion, referenced in the list of Hillside District Plan Supporting Documents, Appendix A.

Figure 5.4
Three Programs for Extending Municipal Water and Sewer Service



Special Assessment Improvement District. Property owners petition AWWU to provide service and vote to assume the costs of construction. AWWU administers balloting, design, and construction. The cost is recovered by special assessment assigned to each parcel in the district (shaded lots). Connection is not required, but all properties are assessed if the ballot passes, regardless of whether an individual connection is made.

Utility Capital Improvements AWWU extends a pipe to address a service requirement for existing customers (for example, a reservoir site). Homes along the route are incidentally benefitted by the construction, and are notified of the availability and estimated cost of hookup. Properties are assessed a Levy-Upon-Connection (LUC) only when the property owner chooses to connect (shaded lots).

Mainline Extension Agreement (Private Development) A land developer establishes an agreement with AWWU to extend underground utilities. Homes along the route of the extension are incidentally benefitted and are notified of the availability and estimated cost. Property owners choosing to connect within three years of the completion of construction pay an assessment to reimburse a portion of the developer's project cost. After three years, the property owners can connect to the system without the special assessment charge.

Goal and Policy Summary

General Recommendation for Use of On-site, Public Wastewater Treatment and Neighborhood Wastewater Systems

GOAL 13. On-site, Public Wastewater Treatment, and Neighborhood Systems Provide a combination of on-site, neighborhood and public water and wastewater services in a manner that protects public health, ensures environmental quality, provides cost-effective installation and operation, and meets resident and landowner needs. Preserve the viability of on-site water and wastewater systems and the quality of domestic water supplies.	
Primary Policy	Implementation
13-A. The existing boundary of the AWWU public water and sewer service area on the Hillside, as defined by existing Maximum Perimeter of Public Sewerage, will generally stay the same as it is today, with the exception of one small area: upper Potter Valley (boundary contracts).	HDP Policies 13-B — 13-E.
Neighborhood Systems	
13-B. Permit the use of neighborhood wastewater treatment systems as a viable treatment technology for the Hillside District only outside of the Recommended Maximum Perimeter of Public Sewerage after HDP Policies 13-C, 13-D, 13-E, 13-F, 13-G, 13-H, and 13-K are implemented.	Implemented through HDP Policies 13-C – 13-H, 13 -K.
13-C. Transfer regulatory and enforcement responsibilities for oversight of neighborhood wastewater treatment systems from the Alaska Department of Environmental Conservation (ADEC) to the MOA Development Services Department, On-site Water and Wastewater Program, provided that the Municipality dedicates the resources necessary to successfully undertake its responsibilities assumed with this new authority.	MOA On-site Services Section.
13-D. Adopt (through municipal code) appropriate policies for the ownership and operation of neighborhood systems.	Contingent on HDP Policy 13-C; MOA On-site Services Section.

13-E. Contract the boundary of the AWWU Certificated Service Area in the Hillside District to match the Maximum Perimeter of Public Sewerage.	AWWU.
On-site Wastewater Problem lots	
13-F. Develop solutions to wastewater problem lots on a case-by-case basis.	MOA On-site Services Section, working with other landowners, MOA Departments, and/or AWWU.
Well Water Protection Program	
13-G. Develop and implement a Hillside Well Water Protection Program.	See HDP Chapter 6.
13-H. Develop and implement a comprehensive program to improve understanding of aquifer system conditions.	MOA On-site Services Section.
13-I. Develop and implement a program to protect water wells through actions of individual property owners.	MOA On-site Services Section.
13-J. Develop and implement a program to protect water wells through community actions.	MOA On-site Services Section, after plan adoption.
13-K. Develop a system for funding the Well Water Protection Program.	Anchorage Assembly and MOA On-site Services Section.
On-site Standards	
13-L. Revise the existing Wastewater Disposal section of the Anchorage Municipal Code to improve the construction and operation of on-site wastewater systems.	Anchorage Assembly and MOA On-site Services Section.
Maximum Perimeter of Public Sewerage	
13-M. Modify the Maximum Perimeter of Public Sewerage as shown on HDP Map 5.8.	Change made with the adoption of the Hillside District Plan.

Policies and Policy Background

GOAL 13. On-site, Public Wastewater Treatment, and Neighborhood Systems

Provide a combination of on-site, neighborhood, and public water and wastewater services in a manner that protects public health, ensures environmental quality, provides cost-effective installation and operation, and meets resident and landowner needs. Preserve the viability of on-site water and wastewater systems and the quality of domestic water supplies.

Policy 13-A

Public Sewer Boundary

The existing boundary of the AWWU public water and sewer service area on the Hillside, as defined by existing Maximum Perimeter of Public Sewerage, will generally stay the same as it is today, with the exception of one small area: upper Potter Valley (boundary contracts).

Background

As the Hillside grows, the overall water and wastewater objective is to attain an effective combination of on-site and public water and wastewater service to protect public health, the environment, and the public interest, and to do this at a cost that individuals and the community can afford. Consistent with this broad objective, it is recommended that Anchorage Water and Wastewater Utility (AWWU) continue to provide water and sewer service generally as defined by its existing Maximum Perimeter of Public Sewerage. (See Map 5.3 AWWU Water and Wastewater Master Plan.) In one location, however, changes in allowed land densities are recommended, accompanied by changes in the Maximum Perimeter of Public Sewerage. (See HDP Policy 13-M for details.)

Neighborhood Wastewater Systems

Program Overview

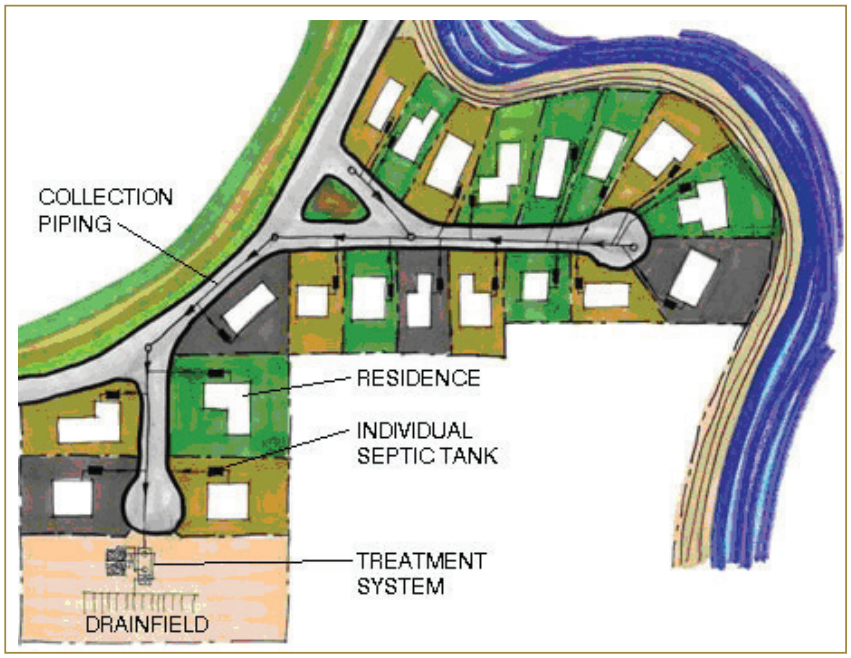
Policy 13-B

Permit the use of neighborhood wastewater treatment systems as a viable treatment technology for the Hillside District only outside of the Recommended Maximum Perimeter of Public Sewerage after HDP Policies 13-C, 13-D, 13-E, 13-F, 13-G, 13-H, and 13-K are implemented.

Background

The concept of a neighborhood wastewater system is simply the collection of multiple on-site wastewater system discharges, to be treated and discharged through a shared subsurface drainfield in one or more locations, away from the source of the wastewater. Pressurized, gravity, or vacuum-assisted sewerage can be used to gather wastewater contributions from within a neighborhood for conveyance to the treatment and disposal site. This site can be located remotely from the wastewater source.

Figure 5.5
Illustrative Neighborhood Wastewater Treatment System



Wastewater flows to septic tanks at individual homes, effluent is then piped to a centralized secondary treatment point, and treated effluent then goes into a neighborhood drainfield.

Neighborhood systems are an important option for the Hillside for several reasons. They offer the possibility of a relatively affordable wastewater alternative to public sewer in areas where existing on-site systems face challenges. These systems provide the option to convey effluent from where it was generated to a different location with appropriate soil conditions. They also offer a means to cluster housing units in order to preserve undeveloped open space. At the same time, a number of issues need to be resolved before these systems can come into widespread use on the Hillside, including standards and responsibilities for regulatory oversight, ownership, siting, design, construction, operation, and system maintenance.

Throughout the United States, and in other parts of the world, neighborhood systems have been in operation since the mid 1970s and have proven to function well. The combination of selecting the most suitable land for the drainfield, incorporating improved design standards, and requiring professional management has made local neighborhood wastewater systems a viable and economical alternative to regional wastewater systems.

There are neighborhood wastewater systems planned or already in use in Alaska, including the Werre Subdivision in Chugiak (9 units at full development), a system on the Hillside within the Grecian Hills Subdivision that could serve up to 12 units, and a 23-unit system in Big Lake in the Call of the Wild Subdivision.

One early attempt to operate neighborhood systems in Alaska

Where Are Neighborhood Systems Allowed?

The plan recommends that neighborhood systems be allowed only outside of the AWWU Service area, and that the AWWU certificated service area be reduced on the Hillside to match a new Maximum Perimeter of Public Sewerage, as updated in this Hillside District Plan. Beyond the Maximum Perimeter of Public Sewerage, AWWU would be absolved from responsibility for the operation and maintenance of wastewater systems.

Any extension of municipal sewerage beyond the Maximum Perimeter of Public Sewerage would be allowed only by specific approval of the Anchorage Assembly and the Regulatory Commission of Alaska (RCA), with formal amendment to the Maximum Perimeter and AWWU certificated service area. Costs for such extensions would not be borne by AWWU or its existing ratepayers.

was less than successful. A 1985 development in southwest Anchorage, at Country Lane Estates, was developed with a relatively rudimentary design and not constructed in accordance with the design documents. It also was not properly maintained by the homeowners association. The system failed in a short time and its owners subsequently opted to rebuild the wastewater collection system and petitioned AWWU to provide wastewater service.

These systems have the potential to be used in any Hillside development where the property owner wishes to use this technology given specific requirements:

- The site must have the physical characteristics that will support the subsurface disposal of treated effluent.
- There must be adequate land available to locate shared drainfields.
- The site must meet the conditions to be established by a future neighborhood wastewater systems regulatory authority.

The Municipality of Anchorage On-site Systems Technical Review Board has considered the application of neighborhood wastewater systems in the Hillside District. The board recommended neighborhood systems as a potentially effective solution for wastewater disposal for small groups of residences for which neither on-site soil absorption nor connection to existing municipal sewer infrastructure is technically practical or economically feasible.

The AWWU Authority Board also considered the application of neighborhood wastewater systems in the Hillside District. The AWWU Board cautions that while neighborhood systems have been implemented successfully in regions of the Lower 48 with well-drained and uniform soil conditions, their broad application on the Anchorage Hillside is questionable because of the district's complex site conditions, including steep topography, variable soils, and often shallow groundwater and bedrock.

The AWWU Authority Board approved a Board Resolution that discourages neighborhood wastewater systems within the Municipality of Anchorage except where an extreme need has been demonstrated and adequate safeguards are in place to protect public health and safety.

The Hillside District Plan recommends two such safeguards. One is to establish regulatory and enforcement functions within the MOA Development Services Department, On-site Water and Wastewater Program. The second is to establish an appropriate set of construction, ownership, and operation standards for the installation and ongoing use of these systems. More on these strategies follow.

Oversight

Policy 13-C

Transfer regulatory and enforcement responsibilities for oversight of neighborhood wastewater treatment systems from the Alaska Department of Environmental Conservation (ADEC) to the MOA Development Services Department, On-site Water and Wastewater Program, provided that the Municipality dedicates the resources necessary to successfully undertake its responsibilities assumed with this new authority.

Background

Active management of neighborhood systems is essential to their long-term success. Currently, the Alaska Department of Environmental Conservation has oversight responsibilities for neighborhood systems on the Hillside. This plan recommends switching this authority to the MOA Development Services Department, On-site Water and Wastewater Program (On-site Services Section), which would have full authority, responsibility, and resources for the oversight of neighborhood cluster systems.

A range of perspectives exists regarding the application of neighborhood systems in the Hillside District, ranging from encouraging to discouraging their use. Through this planning process, the Municipality has considered their potential application on the Hillside and concluded that such systems are appropriate if they are correctly regulated, owned, operated, and maintained. Specific options are described in more detail in the document Hillside District Plan Alternatives: A Framework for Public Discussion, referenced in the list of Hillside District Plan Supporting Documents, Appendix A. The following section explains the terminology used in describing the recommended approach to neighborhood systems management.

Regulation is the governmental control of the ownership, operation, and maintenance of the system through laws and regulations. An authorized governmental agency normally performs the function of regulating and permitting the system. (If we use a car as an example, John can own a car but it is licensed and regulated as a taxi; for example, by the Municipality of Anchorage.)

Ownership is the legal possession and responsibility for the system. A responsible management entity (public or private, including a homeowners association) could own the system. (John owns the taxi but does not necessarily operate the taxi.)

Operation is the daily running of the system, both the administrative and technical practices involved in the proper functioning of the system, including meter reading, billing, enforcement, and equipment inspection. A certified operations and maintenance company could provide the owner with the expertise to operate the system. (The Municipality regulates, John owns, but Phil drives the taxi, gasses it up, picks up and drops off fares, etc.)

Maintenance is the daily monitoring, protection, and preservation of the system's physical plant including pumping, equipment repair and replacement, etc. A certified operations and maintenance company could provide the owner with the expertise to maintain the system. (For example, John uses Ace Automotive to maintain his taxi, but Ace does not own or operate the car.)

A single Responsible Management Entity could own, operate, and maintain the neighborhood system. (It is possible that the "right John" could own, operate, and maintain the car himself, consolidating all the functions into a single entity and possibly saving money in the long run.) This could be the most efficient method of handling ownership, operation, and maintenance.

At present, only the Alaska Department of Environmental Conservation is organized to regulate the design, installation, and governmental oversight of neighborhood wastewater systems. Governmental permitting and regulatory oversight should not be confused with ownership, operation, and maintenance by a responsible party. The permitting agency will consider conceptual plans, review and permit engineered designs, and provide oversight of the party responsible for the ownership, operation, and maintenance of the neighborhood system.

The Alaska Department of Environmental Conservation is resource-limited. They have indicated a desire to delegate the regulatory oversight of neighborhood systems to a municipal agency should these systems proliferate in Anchorage. This plan recommends that regulatory oversight for neighborhood systems serving groups of residences be delegated from the Alaska Department of Environmental Conservation to the Municipality of Anchorage On-site Services, provided that the Municipality dedicates the resources necessary to successfully undertake its responsibilities assumed with this new authority. The plan also recommends ordinances to allow the overseeing agency to develop and enforce regulations.

Ownership and Operation

Policy 13-D

Adopt (through municipal code) appropriate policies for the ownership and operation of neighborhood systems.

Background

New standards and procedures are needed to ensure the safe ongoing operation of neighborhood systems. Consequently, the plan calls for the adoption (through municipal code) of technical and financial criteria for implementation such as those indicated in the "Conditions for Implementation of Neighborhood Wastewater Systems," included in the appendix of the On-site Wastewater Supplementary Report to the Framework Plan, referenced in the list of Hillside District Plan Supporting Documents, Appendix A.

Neighborhood wastewater systems must be owned by a responsible party. This entity would be accountable to the regulatory authority for operating the wastewater system to comply with environmental and other requirements, including compliance with the operating permit. This plan recommends that neighborhood wastewater systems be owned by private, for-profit or private, not-for-profit organizations with appropriate resources and expertise. Experience in other communities has shown that homeowners associations typically lack the required expertise, interest, and continuity, leading to frequent problems. Therefore, this plan recommends against vesting a local homeowners association with the responsibility and authority to own and operate the neighborhood wastewater system.

The system owner must maintain appropriate resources to service the entire system (through internal resources or external contracting). Elements that require attention include management of individual septic tanks, maintaining transmission piping to the treatment and dispersal element, and servicing the equipment at the treatment and dispersal units. Other operational elements include billing, record keeping, user compliance, and enforcement.

A private, for-profit owner is a private company that owns, operates, and manages the neighborhood system under the regulatory guidance and enforcement of the regulating agency. This type of owner makes a profit in the management of the system and encourages cost-effective decision making. An example is Tennessee Wastewater Systems, Inc. (formerly On-site Systems, Inc.), owned by the Pickney Brothers. The third largest utility

in the state, it currently manages 40 cluster systems across Tennessee.

There are currently more than 300 individual on-site secondary treatment systems in use on the Hillside, managed by private, for-profit companies. All companies have established a good record of providing guidance for the design and installation of the system, and have managed the existing active secondary treatment systems well.

Owners of neighborhood systems have the option of contracting aspects of their activities, including design, construction, operation and maintenance, collection of fees, customer service, financial management, and legal services.

AWWU Certificated Sewer Boundary

Policy 13-E

Contract the boundary of the AWWU Certificated Service Area in the Hillside District to match the Maximum Perimeter of Public Sewerage.

Background

If a neighborhood system serves more than 10-15 dwelling units, then the ownership entity would be considered a public utility. This could require certification by the Regulatory Commission of Alaska (RCA) in accordance with state law. Currently, the Anchorage Water and Wastewater Utility (AWWU) holds this certification for the entire Hillside District. The AWWU Authority Board has resolved to seek Regulatory Commission approval to withdraw from its current certificated service area where neighborhood wastewater systems are allowed to be put into service. AWWU notes that these systems do not conform to existing AWWU standards, that operation of these systems lies outside their expertise, that assuming operation of such systems would not be economic, and that extra costs associated with these systems would be unfairly borne by other ratepayers.

This plan recognizes that the owner of a neighborhood system should retain the authority and responsibility for effective operation in compliance with regulatory oversight. The plan recommends that service areas of neighborhood systems and AWWU not overlap. Where there exists a mixture of neighborhood and municipal wastewater systems, there is the potential for confusion regarding responsibilities for operations, maintenance, and emergency response to sewer backups or spills.

The plan consequently recommends that the AWWU certificated service area be reduced in the Hillside District to match a new Maximum Perimeter of Public Sewerage as described in this Hillside District Plan after its adoption by the Anchorage Assembly. Beyond the Maximum Perimeter of Public Sewerage, AWWU would be absolved from responsibility for the operation and maintenance of neighborhood wastewater systems. Any extension of municipal sewerage beyond the Maximum Perimeter of Public Sewerage would be allowed only by specific approval of the Anchorage Assembly and the Regulatory Commission of Alaska, with formal amendment to the Maximum Perimeter of Public Sewerage and AWWU certificated service area. Costs for such extensions would not be borne by AWWU or its existing ratepayers.

On-site Wastewater Problem Lots

Policy 13-F

Develop solutions to wastewater problem lots on a case-by-case basis.

Background

Some property owners in the Hillside District have been challenged to build and operate an on-site wastewater system in an effective manner due to one or more of a variety of causes – poor soils, shallow groundwater, shallow bedrock, and older septic tanks not meeting current standards (Map 5.6). The lots are located in a variety of subdivisions, and not all lots in these subdivisions have problems with on-site wastewater systems. Several options are available for these lots:

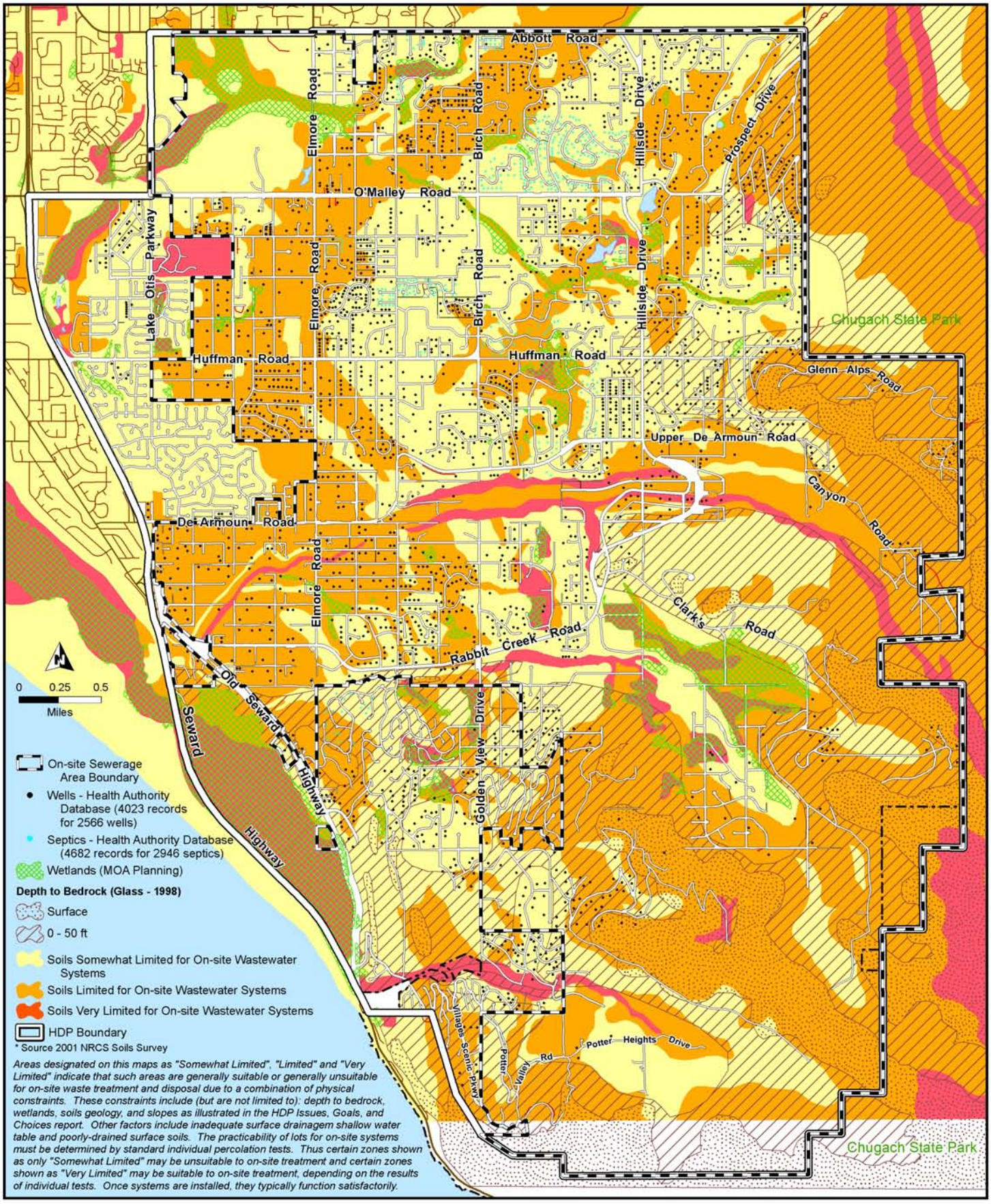
- Take no new actions.
- Improve the operation of existing, individual on-site systems.
- Install advanced, individual-lot, on-site systems.
- Develop neighborhood wastewater systems.
- In specified areas, where consistent with the boundaries of the approved AWWU service area, link to AWWU public sewer systems.

A cost evaluation was developed to provide a reference point for comparing the costs of neighborhood wastewater systems versus public sewerage systems (Table 5.7). Costs for conventional municipal water and sewer systems vary in accordance with the size of the lots in the development served and distance from

Map 5.6

Soil Types in Relation to Location of On-Site Area Boundary

Hillside District Plan



existing facilities. A subdivision of 80 one-acre lots adjacent to existing municipal sewerage service could be served with sewer service for $30,000 to $100,000 per lot, depending on the nature of the construction.

Larger-lot subdivisions would entail a greater length pipe in the ground, at a higher cost per lot. Similarly, long extensions of piped service would increase costs as well. Remote large lots of the upper Hillside, located well away from the existing sewer collection system, may find it impractical to develop municipal utility service, as costs are likely to be in excess of $200,000 per lot.

Well Water Protection Program

Program Overview

Policy 13-G

Develop and implement a Hillside Well Water Protection Program.

Background

Most water samples collected from 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 areawide threat to public health. However, well sampling results do reveal nitrate concentrations in localized areas higher than what would be expected from natural sources. Additionally, nitrate levels in a portion of public wells are trending upward. On-site wastewater system effluent, fertilizer, and manure are known human-related sources of groundwater nitrates. One possible implication of nitrate increases in a growing residential community is the possibility that development is affecting groundwater quality and that other on-site wastewater system contaminants may also be on the increase in local groundwater systems.

Incumbent with the right to draw from, and discharge into, groundwater reserves is the responsibility to protect the quality of the groundwater. This plan recommends that the Municipality develop and implement a Well Water Protection Program for the Hillside. This is intended as a proactive approach to reduce high-risk activities and to provide the Municipality with early detection capabilities in order to prevent a groundwater emergency. Prevention is much more cost-effective than cleaning up or replacing a contaminated aquifer. Specific components for the Well Water Protection Program are presented in HDP Policy 13-H.

Table 5.7
Wastewater System Cost Table

Constructed Cost Rough Estimates: Neighborhood Wastewater Systems and Public Sewerage Connection to AWWU's System								
		CLUSTER SYSTEM				PUBLIC SEWERAGE[4]		
						SEWER COLLECTION SYSTEM[5,6]		DEVELOP-ABLE LOTS[9]
SUBDIVISION	NUMBER OF LOTS	DEVELOP-ABLE LOTS	PIPE COST[1]	TREATMENT[2]	COST/LOT[3]	COST/LOT[7]	PIPE COST/ LF[8]	
Audobon Hills	31	28	$111,840	$1,147,666	$44,982	$415,888	$1,069	31
Birch Tree Estates	50	46	$69,499	$1,370,009	$31,294	$152,358	$1,014	50
Denali View	21	21	$117,440	$765,568	$42,048	$601,746	$1,078	21
Drake[10]	45	43	$43,294	$1,630,497	$38,925	-	-	-
Elmore	69	67	$72,081	$1,715,224	$26,676	$152,358	$1,014	69
Fronius Forest	2					$230,991	$1,029	2
Grecian Hills	38	38	$26,024	$1,062,853	$28,655	$230,991	$1,029	38
Kimberly Manor	12	9	$21,808	$648,716	$74,503	$230,991	$1,029	12
Loma Estates[11]	26	24	$111,132	$943,211	$43,931	$169,724	$1,139	26
Mindyer Manors[11]	15	15	$56,790	$459,537	$34,422	$169,724	$1,139	15
Paradise Valley	212	195	$886,324	$5,865,953	$34,627	$139,356	$1,144	212
Rabbit Creek Heights	262	261	$1,156,563	$6,249,064	$28,374	$124,513	$1,033	262
Rabbit Creek View	72	71	$315,693	$2,518,358	$39,916	$124,513	$1,033	72
Shenandoah Hills	9	9	$6,640	$293,056	$33,300	$148,608	$1,081	9
Siefker[10]	32	32	$119,027	$1,222,332	$41,917	-	-	-
Sky Harbor Estates[10]	22	22	$34,307	$498,832	$24,234	-	-	-
South Hills	71	66	$363,350	$2,315,909	$40,595	$230,991	$1,029	71
Susitna View[11]	24	19	$106,838	$835,072	$49,574	$169,724	$1,139	24
Talus West	102	102	$476,400	$2,671,586	$30,863	$148,608	$1,081	102
Terrace Heights	19	19	$34,626	$532,306	$29,839	$230,991	$1,029	19
Trails End	82					$372,034	$999	82
Valhalla	36	36	$76,685	$948,430	$28,475	$148,608	$1,081	36
Woodridge[11]	26	26	$113,358	$743,276	$32,947	$169,724	$1,139	26

Costs shown in this table for public sewerage are very high because the costs reflect the impact of extending sewer mains to individual, isolated subdivisions. At the costs shown in this table, public sewerage is clearly beyond the level that individual homeowners could ever afford. Actual costs would likely be significantly lower for two reasons. One is that public money would likely supplement the costs charged to individual owners. For example, if, for public health reasons, it was necessary to extend public sewerage to one or more subdivisions and the cost could not be borne by individuals, public funding would be required. This was the case when sewerage was established in Girdwood and Talkeetna. The second reason actual costs would likely be lower is because, as is noted above, these costs were calculated for individual, isolated subdivisions. This means that a large capital cost (the sewer mains) was allocated among a small number of ratepayers. In practice it is more likely that if sewerage was extended, the costs for the sewer mains would be shared over a wider base, significantly lowering costs.

For comparison, rough estimates indicate that installations costs (2007) for traditional and advanced on-site wastewater treatment systems (depending on design-, site-, and system-specific factors) can range from $8,000 to $24,000 or higher. For a more detailed explanation, see the On-site chapter of the Hillside District Plan Issues, Goals and Choices Report, referenced in Appendix A. Hillside District Plan Supporting Documents.

1. Pipe cost includes all costs including septic tanks, pumps, controls, and piping, as well as transmission pipe to the off-lot treatment area.
2. Treatment costs include all tankage, buildings, treatment units, and drainfields, as well as the cost of the land on which the treatment system is located.
3. Cost per lot is the total cost for the on-site and off-site components of the neighborhood system divided by the number of developable lots.
4. Unit costs are based on AWWU's 2006 Anchorage Wastewater Master Plan. Total costs are based in improvement district formation, with costs levied by equal assessment methodology.
5. In some cases, multiple subdivisions are grouped together into one sewer collection system.
6. Sewer trunks are used to connect the sewer collection systems to AWWU's current infrastructure.
7. Cost per lot is the total cost of the sewer collection system and connecting sewer trunk divided by the number of developable lots.
8. Pipe cost/LF is the total cost of the sewer collection system and connecting sewer trunk divided by the total length of pipe.
9. Developable lots served by AWWU's sewer system is assumed to be the total number of lots within the subdivision.
10. Different assumptions are used for the two types of service; therefore, no public sewerage costs are provided.
11. A sewer trunk is not necessary to connect the sewer collection system to AWWU's current infrastructure.

Aquifer System Conditions

Policy 13-H

Develop and implement a comprehensive program to improve understanding of aquifer system conditions.

Background

There is no existing comprehensive program for directly monitoring water quality within Hillside aquifers. Nearly all of the water quality data assembled originates from sporadic well samples, under several different programs, without any systematic planning. Although the current system of well sampling has provided a sizeable amount of data, it has limitations described in more detail in the On-site Water and Wastewater Supplementary Report referenced in Appendix A. Hillside District Plan Supporting Documents. The HDP recommends these actions:

- **Develop a current and comprehensive database:** Coordinate with state and federal agencies, the University, private consultants, local groups, and other interested parties in developing a common, internet-accessible, Hillside groundwater database. The database would 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 protocols:** Decide on collection, processing, organization, and access protocols to facilitate efficient data use and analysis. Determine the water quality parameters to be used.
- **Supplement the existing well sampling program:** The existing program is required by the Certificate of On-site Systems Approval (COSA). Increase this program to yearly testing of a select group of individual wells. The well group should be selected to represent the Hillside aquifer system, with particular attention to identified challenge areas. Sampling should be accomplished by trained personnel with no vested interest in a specific outcome.
- **Comprehensive evaluation of specific wells:** Where a sample from an individual well exceeds 5.0 mg/L nitrate, conduct a contamination analysis of the well that may include some or all of these steps: 1) grouting evaluation including well log analysis, down-hole video, and possibly dye testing; 2) follow-

up testing for other contaminants commonly associated with human wastewater systems; 3) evaluation of nitrate levels in neighboring wells; 4) follow-up water testing in six-month intervals to determine if there is a trend or test anomaly. Evidence of well contamination, including any remedial work, should be noted in the database for the well in question.

- **Reduce seasonal variability in data:** Coordinate sampling schedules with community water suppliers on the Hillside to reduce seasonal variables in analysis results.
- **Annual Findings:** Prepare an annual Hillside Well Water Protection Program report of relevant findings, trends, and study results.
- **Areas of Special Concern:** Designate as "Areas of Special Concern" sites that have been identified as particularly sensitive to on-site water and wastewater system nutrients and contaminants. Develop contingency work plans to address detection of elevated or increasing groundwater contaminant levels, for example, through requiring advanced treatment, well grouting and rehabilitation, or other appropriate measures to protect such areas.

Individual Property Owners

Policy 13-I

Develop and implement a program to protect water wells through actions of individual property owners.

Background

Hillside property owners have a high degree of self-interest in maintaining local well water quality. At the same time, the cumulative activities of individual property owners create the potential for adverse impacts on a larger scale. Recommended actions are summarized below. Details of these actions are described in the On-site Water and Wastewater Supplementary Report to the Framework Plan, referenced in the list of Hillside District Plan Supporting Documents, Appendix A.

- **Increase Household Activities Education:** Some household activities and individual habits can adversely affect the performance of on-site wells and wastewater systems and/or the quality of effluent reaching the water well supply. Examples include certain patterns of water usage and the discharge of high-strength wastes or other deleterious substances. Although advisory information on this subject is

presently available through the Municipality's On-site Water and Wastewater Program, it is recommended that more resources be devoted to education.

- **Improve Property Owner Decisions:** On-site wastewater system siting and design are the responsibility of certified design professionals. Property owners, however, typically make significant decisions affecting their on-site wastewater system including: selection of the designer and the level of treatment desired, choice of building size, site features and overall site layout and grading. The plan recommends public education on best property management practices related to fertilizer, management of animal wastes, and the use of herbicides/ pesticides.

Community Actions

Policy 13-J

Develop and implement a program to protect water wells through community actions.

Background

The Hillside District Plan recommends that the Municipality of Anchorage take the lead in organizing and implementing the community actions summarized below.

- **Initiate Program:** Carry out the steps outlined under HDP Policies 13 G-K, including identifying and committing necessary resources to the Municipality of Anchorage On-site Services Section, which has responsibility for implementing and managing the Well Water Protection Program.
- **Involve Stakeholders:** Engage other key stakeholders for participation, including the State of Alaska, the Anchorage Water and Wastewater Utility (AWWU), community councils, the Alaska Horse Council, the Hillside Area Landowners Organization, Inc. (HALO), the Anchorage Waterways Council, and homeowners associations.
- **Educate the Public:** Prepare press releases, seek interviews with local media, develop an internet website link (in concert with the Municipality's On-site Services webpage), encourage public addresses by municipal officials, use billing stuffers and flyers, and conduct outreach programs in schools and community councils. Encourage community groups such as HALO to develop and distribute a brochure with guidelines for operating on-site well and wastewater systems.

- **Change Municipal Code:** Amend the Municipality of Anchorage Wastewater Disposal Regulations (Chapter 15.65) as described in HDP Policy 13-L.

Funding

Policy 13-K
Develop a system for funding the Well Water Protection Program.

Background
A rough order-of-magnitude estimate places the ongoing cost to the Municipality for an effective Well Water Protection Program at $300,000 annually. This works out to less than $35 per year for each of the area's residences. The benefits of Hillside well water protection, however, extend beyond the local area. In consideration of the potential contamination risks posed by the limitations of available data and the tangible long-term benefits of a protected groundwater supply, it is recommended that Hillside residents and property owners, the greater Anchorage community, municipal departments, and state agencies share the Hillside Well Water Protection Program costs. 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, the plan recommends that the On-site Services Section work with the Hillside community, its own constituents, and participating agencies to establish a fair, risk/benefit-based allocation of financial responsibility. Chapter 6. Implementation contains additional details.

On-site Wastewater Code

Policy 13-L
Revise the existing Wastewater Disposal section of the Anchorage Municipal Code to improve the construction and operation of on-site wastewater systems.

Background
Chapter 15.65 of the Anchorage Municipal Code, Wastewater Disposal, was reviewed in detail and compared to existing on-site water and wastewater system regulations in other states and countries. This plan recommends the following be considered when reviewing code changes to Title 15:

- 15.65.010 Definitions
  - Modify Earth Privy to read, "Earth Privy means a device for the disposal of human excreta in an unlined pit in the earth."
  - Modify insulation to read, "Insulation means two inches or more of high-density, direct-burial, closed-cell foam insulation or direct-bury approved equivalent non-degradable material of comparable insulation value, approved by the On-site Water and Wastewater Program."
  - Add a definition to read, "Treated Effluent (Wastewater) means effluent discharged from a watertight covered receptacle that separates raw wastewater solids (floatables and settlables) and allows clarified effluent to exit."
- 15.65.050 Septic Tanks
  - 15.65.050.C – Revise the requirement for a four-inch standpipe from each compartment of a septic tank to require a minimum 24-inch diameter watertight riser to the finished grade above the tank for the first compartment. Risers shall be insulated with a minimum of four (4) inches of spray urethane to at least two (2) feet below ground level and have insulated locking (securable) lids. This facilitates ease of pumping and inspection for tank integrity during a COSA or drainfield upgrade (or any) inspection.
  - Add a new subsection that disallows Cold Tar Pitch (TNEMEC) coating on steel septic tanks. A method to accomplish this may be to revise the requirements for septic tanks from two compartments to a single compartment, and add a S.T.I.P. coating that has a much greater resistance to corrosion and installation damage. An outlet filter would be required for any single-compartment septic tank.
- 15.65.060 Subsurface disposal fields
  - 15.65.060.A.1.d and f – Change ten (10) feet to six (6) feet for wide drainfields and beds.
  - 15.65.060.E.9 – Specify the width of insulation over the crown of pipe to be a minimum of 24 inches, centered over the pipe crown.
  - 15.65.060.E.11 – Add the following wording to the end of the subsection, "… and graded at minimum two percent

(2%) slope to promote the run-off of precipitation and/or snow melt. All areas disturbed during the installation of the on-site wastewater system shall be reseeded with a seed mix approved by the department."

- 15.65.060.H.5 – Change the maximum separation distance between perforated distribution laterals in a bed to three (3) feet.
- 15.65.060.J – add a new subsection titled "Drainfield Design Criteria" with the following subsections:
- 15.65.060.J.1 – All drainfields shall be designed to be dosed by either a siphon, pump or no more than 20 lineal feet of drainfield without an inlet from the septic tank.

- 15.65.080 Lift Stations
  - 15.65.080.B – Change the wording in the last sentence to read, "The alarm must be activated when the effluent level in the tank reaches a point where 150 gallons of capacity remains."
- 15.65.170 Limited wastewater assessment-service districts
  - Consider revising this section (in cooperation with planning and zoning changes and Title 21) to allow neighborhood wastewater systems where AWWU sewer service is not permitted by the Maximum Perimeter of Public Sewerage.
- 15.65.350 General Design Requirements
  - 15.65.350.B.4 – Add the following wording to the end of the sentence, "… and in a direct line of sight to the pump chamber manhole riser."
- 15.65.360 Maintenance and repair
  - 15.65.360.F – Correct the spelling of "manufacturer's."

These changes could add approximately $2,000 to the cost of installing a typical system, but the benefits should far outweigh the added costs. The trade-off for extending drainfield life lies in higher initial system capital costs and lower annual monitoring costs. While these improvements seem less glamorous than initial costs would suppose, they can more than pay for the higher installation costs over the life of the system.

Maximum Perimeter of Public Sewerage

Policy 13-M

Modify the Maximum Perimeter of Public Sewerage as shown on HDP Map 5.8.

Background

In 1982, the Anchorage Assembly approved and adopted the Hillside Wastewater Management Program as an element of the Municipality of Anchorage Comprehensive Plan (Anchorage Ordinance No. 82-52). This and other elements of the Comprehensive Plan can be found under Title 21 of the Anchorage Municipal Code. The 1982 plan established areas where public wastewater services may be extended and where they may not be extended.

The boundary of these service areas is identified as the "recommended Maximum Perimeter of Public Sewerage." Since its adoption, the recommended Maximum Perimeter of Public Sewerage has been amended by ordinance thirteen times as a result of property owner petition and approval by the Anchorage Assembly. In general, these amendments resulted in slight changes to the boundary, encompassing or removing areas abutting the perimeter.

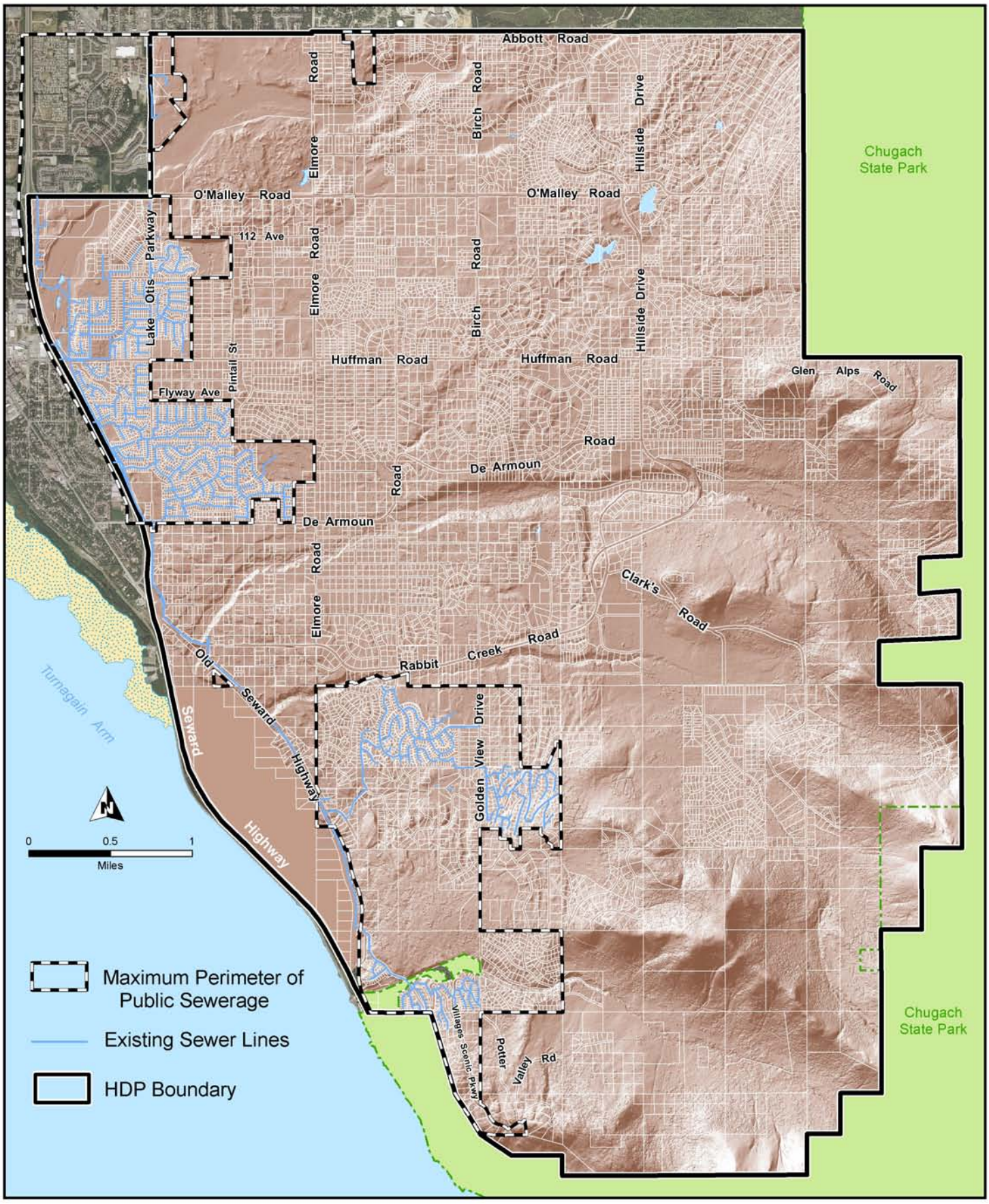
The Hillside District Plan will replace the 1982 Hillside Wastewater Management Plan and its associated amendments. As part of this process, the recommended Maximum Perimeter of Public Sewerage was re-evaluated. Once the Hillside District Plan is adopted by municipal code, the Anchorage Water and Wastewater Utility will be required to abide by the new recommended Maximum Perimeter of Public Sewerage.

Currently, if a Hillside property owner residing in an area outside the recommended Maximum Perimeter of Public Sewerage desires to acquire public sanitary sewer, the owner must request an amendment to the recommended Maximum Perimeter of Public Sewerage. Amendments are considered by the Municipality of Anchorage Planning Department through a formal amendment process that involves the property owner, the MOA Development Services Department On-Site Water and Wastewater Program, Anchorage Water and Wastewater Utility, and the Planning and Zoning Commission. The process includes public hearings and concludes with the Anchorage Assembly voting on the proposed amendment. This lengthy and time-consuming process is defined in more detail in the "Extending Facilities" Whitepaper,

Map 5.8

Maximum Perimeter of Public Sewerage as Established by the Hillside District Plan

Hillside District Plan



referenced in Appendix A. Hillside District Plan Supporting Documents.

After considering land use alternatives and objectives, the Hillside District Plan identifies one area where residential densities will be allowed to change from what is possible under current zoning, translating into the need for one change to the recommended Maximum Perimeter of Public Sewerage: a contraction of the perimeter in the Potter Valley area. HDP Chapter 2. Land Use contains more information on the specific land use objectives driving this change.

Furrow Creek Area

Currently the Maximum Perimeter of Public Sewerage as defined in the Hillside Wastewater Management Plan includes approximately the western half of the area between O'Malley Road and DeArmoun Road and Lake Otis Parkway and Elmore Road. This is where the headwaters of Furrow Creek are located. In this plan, the area under discussion is referred to as the Furrow Creek area.

The area west of the perimeter is served by both public sewer and water through the Anchorage Water and Wastewater Utility. Churches and schools are connected to these public systems.

The area east of the perimeter uses on-site water and wastewater systems. Schools and churches use on-site wells and wastewater systems. However, because of poor soil conditions, some of these institutions employ holding tanks that are periodically pumped and taken to the public sewerage system.

For the Furrow Creek area, the Hillside District Plan recommends conducting a planning study to determine future need and location of a sewer trunk as backbone infrastructure required based on land use patterns and development potential, evaluation of the data resulting from Hillside District Plan recommendations and programs, soils, topographical conditions, lot sizes, failed septic systems and nitrate levels to determine the appropriate sewer service area boundary and cost feasibility (HDP Policy 1-D).

Potter Valley Area

The Maximum Perimeter of Public Sewerage currently includes an area along Potter Creek, above the existing Potter Valley subdivision. Property owners currently use on-site water and wastewater systems. Although within the Maximum Perimeter of Public Sewerage, the area is not currently served by public sewerage.

This plan recommends contracting the Maximum Perimeter of Public Sewerage west to Greece Drive, south of England Avenue, and allowing sewer service by on-site or neighborhood wastewater systems, but not allowing public water and sewer service east of that boundary.

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