

WILDCAT CREEK AQUIFER
HYDROLOGY, REGULATORY ALTERNATIVE, AND
RECOMMENDATIONS -
FINAL REPORT

Prepared for:

**Grays Harbor County
and
The City of McCleary**

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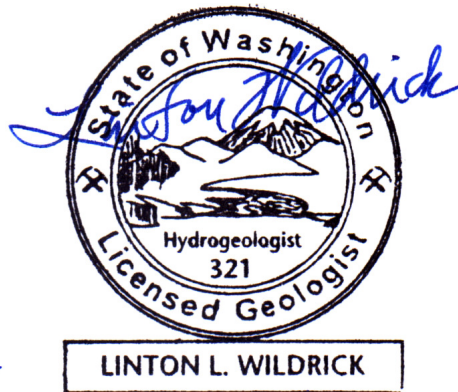
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SIGNATURE

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Part 1 – Hydrogeology and Existing Development

Introduction

The Wildcat Creek Aquifer is a naturally occurring, cost-free reservoir that provides clean, safe drinking water to several hundred individual domestic wells, three Group B public water system wells, and three Group A public water system wells, one of which is the City of McCleary's water system. As the only practical, abundant source of water in the vicinity, the Wildcat Creek Aquifer is a significant natural resource supporting the economy, health, and safety of residents of the City of McCleary and the surrounding unincorporated land under Grays Harbor County jurisdiction.

Because of uncertainty about how future development could affect this indispensable water supply, on February 12, 2007, the Grays Harbor County Board of County Commissioners declared a moratorium on development of land above the Wildcat Creek Aquifer and extended it twice. The current extension expires on August 12, 2008.

While the moratorium has been in effect, County and City officials have been working together to learn more about the aquifer and how to protect it. In 2007 they were assisted by Dan Cappellini of Evergreen Rural Water, which is headquartered in Shelton, and Scott Horsley and his associates at the Horsley Witten Group, a ground water and planning consulting firm from Massachusetts. The Washington State Department of Health paid for Horsley Witten's assistance through a contract with Evergreen Rural Water.

The County and City hired consultant Jim Arthur from Olympia to coordinate their partnership and to prepare this report. The report describes what is now known about the Wildcat Creek Aquifer and recommends actions for its protection and management. The Washington State Department of Community, Trade, and Economic Development funded the report through an Emerging Issues Grant, with matching funds from the County and City. Linton Wildrick, a licensed hydrogeologist with Pacific Groundwater Group, Tumwater, assisted Mr. Arthur in the preparation of this report.

Hydrogeology of the Wildcat Creek Aquifer

How the Aquifer Was Formed

Wildcat Creek Aquifer is a semi-confined aquifer located within sedimentary deposits that partly fill a northeast-to-southwest oriented valley. The nearby hills are composed of basaltic and sedimentary bedrock. The aquifer material consists mostly of sand and gravel that are fragments of rocks from the southeastern Olympic Mountains and the northern Cascades.

The aquifer-containing sediments were carried to the Wildcat Creek Valley by an advancing glacier of the Double Bluff glaciation period. As the glacier moved toward the valley, streams flowing out of the glacier's melting end deposited these "advance outwash" sediments at least 100,000 years ago. As the glacier then advanced into the valley, it over-rode the advance outwash materials and deposited glacial till beneath the ice. Commonly called hardpan, till is a mixture of clay, silt, and gravel, with some sand. Though saturated with water like the outwash below, till is far less permeable and usually does not yield water readily to wells.

The Double Bluff glacier stopped at the southwestern end of the valley, pushing up a terminal moraine of sand and gravel. That is partly why the three branches of Wildcat Creek converge where they do. More than 100,000 years later, the final Ice Age glaciation, called the Vashon stade of the Frasier glaciation, advanced again toward the southwest. It stopped in the upper reaches of the Skookum Creek watershed and deposited only a thin veneer of advance and recessional outwash over the old till in the Wildcat Creek Valley. Since then, modern streams have eroded channels through the glacial materials and deposited minor pockets of sediments along the channels. So, looking at the valley in cross-section:

- At the bottom is bedrock – basalt to the east and south, sandstone to the west and north.
- Above that is the advance outwash, up to 75 feet thick – the aquifer layer that contains the productive water supplies.
- Above that is the till, an aquitard, which varies from as little as 10 feet to as much as 40 feet.
- Above the till is a thin (5 feet or less) discontinuous veneer of Vashon outwash.
- On top are recent alluvial sediments, deposited by running water along Wildcat Creek and its tributaries during the 13,000 years since the last Ice Age.

Only One Aquifer

Previous reports written about Wildcat Creek Aquifer are correct in assuming the presence of a confining layer in the northeast portion of the aquifer. Pacific Groundwater Group's analysis has concluded that the confining layer is till and that it extends throughout the aquifer. The only significant aquifer resides within advance outwash material beneath the till, not in thin or absent outwash material at the surface or deeper in the main aquifer.

- There is only one aquifer.
- Both shallow domestic wells and slightly deeper City wells are drilled through the overlying till into this aquifer.
- The semi-confining effect of the till accounts for the upward pressure in the City wells.
- While some recharge comes from the surrounding hillsides, most recharge percolates down from precipitation falling directly on the land surface overlying the aquifer. There is little contribution via fractures in basalt.

- Because of its silty or clayey matrix, the till delays the percolation of rainwater down to the aquifer. That delay provides some protection against aquifer contamination but also lowers the recharge rate.

To develop this understanding of the aquifer as a whole, Mr. Wildrick examined all 200-plus well logs for the area. By contrast, Hart Crowser interpreted 67 logs, most of them located in the northeastern part of the valley, the more relevant area to analyze for a study that focused on the City's wellfield. Mr. Wildrick also spoke with Robert L. Logan, the geologist who most recently mapped the local geology for the Department of Natural Resources (Logan, R. L. 1987.)

In analyzing these well logs, what puzzled Mr. Wildrick was that the drillers all noted the presence of yellow clay, gravel, and "hardpan," the driller's term that usually means glacial till. Till is formed by the weight of ice, and the yellowish color, a sign of iron oxide, means that a deposit has weathered for a long time. Mr. Logan explained that the outwash that makes up the aquifer came not from last Ice Age advance, as had been assumed, but from the next-to-last advance. Because it has been more than 100,000 years since the Double Bluff advance deposited the till, ample time has passed for deep weathering to have occurred in the area's wet, maritime climate.

Though precipitation percolates through the till to recharge the aquifer in the advance outwash layer, the till does act as a semi-confining layer. Mr. Wildrick determined that the confined water level (the piezometric head) usually occurs above the top of the confined aquifer and about 5 to 20 feet below land surface, but never above land surface, which would make it artesian. He also noted that a water table occurs within the surficial Vashon outwash or Double Bluff till at a slightly higher level than in the Wildcat aquifer and may reach the surface during winter, forming seasonal wetlands.

The water table and piezometric water levels can be readily explained by the hydrodynamic balance of local recharge from precipitation as it percolates downward through the less permeable till into the much more permeable outwash, where it then flows down the valley or toward the creeks. Additional recharge by surface water from the surrounding hills is not required to explain the head distribution. The computer model used by Hart Crowser confirmed this conceptual interpretation by reproducing the head distribution and flow pattern in the northeastern part of the valley.

Finally, the very thin outwash and uppermost weathered till do not constitute an aquifer; no known wells tap these deposits. A few wells appear to tap thin, discontinuous, permeable lenses of sand and gravel within the till. These lenses could be called aquifers in the strict sense of the scientific term, but are insignificant in volume compared to the Wildcat Creek Aquifer and so do not constitute a second, independent aquifer of importance to our considerations.

Learning More about the Aquifer and Safe Yield

Fieldwork by the Horsley Witten Group in 2007 indicated that groundwater from the Wildcat Creek aquifer is discharging to the branches of Wildcat Creek. Groundwater

discharge to streams, called baseflow, is the natural source of streamflow during the dry months in western Washington. Monitoring streamflow below the confluence of the three branches would make it possible to estimate the average annual recharge of the aquifer. In other words, each year there is an approximate balance between the amount of water that is recharged and the amount that drains away to the streams; otherwise the groundwater level would rise or fall in the long-term.

Streamflow monitoring could be accomplished with a simple staff gauge that would be observed weekly or even monthly, coupled with several flow measurements each year, using a current meter on a wading staff. Monitoring need only be done during the dry season (June through October), since most water in the creeks would then be baseflow from groundwater. Several years of streamflow monitoring would improve the estimate of groundwater recharge, because recharge varies with the weather.

It would also be useful to monitor water elevations in various locations in the aquifer. Monitoring levels in two or three wells would be sufficient. For example, one of the unpumped City could be monitored along with one or two newer, private wells. One should only monitor wells for which a driller's construction log is available, because the depth and geology must be known for the results to be meaningful. Depth-to-water measurements in wells usually are done with an "electrical tape" (e-tape), consisting of a coaxial cable on a reel, with depth markings on the cable and an indicator needle. Initially monitoring should be done monthly, but once the typical seasonal pattern is known, the monitoring can be cut back to quarterly or half-yearly.

In especially dry years, well owners may be concerned about whether their water supply will be depleted. Historic data on water levels compared to annual rainfall could then help water managers and governments compare current conditions to the past.

Another long-term benefit of combined streamflow and groundwater level monitoring would be improved understanding of the specific dependency of Wildcat Creek on baseflow from the aquifer. Pumping groundwater always reduces baseflow to some extent. The tough questions one must answer to define "safe yield" for an aquifer are how much effect on streamflow and other wells is acceptable to the community and to regulatory agencies. Also, if the City needs additional water rights, the monitoring results would permit more accurate estimates of the effects of new pumping, as is routinely required by Department of Ecology.

Development in the Valley

Unincorporated Area

Approximately 250 parcels in the unincorporated part of the valley have houses on them. Forty-five houses do not have on-site sewage disposal permits but are assumed to have on-site sewage systems. The County issued 171 permits for on-site systems before 1995, and has issued 74 permits since then. The new standards that took effect in 1995 have resulted in the construction of a greater number of pressure distribution systems, and there are now about 50 such systems in the valley. County records show that 13 on-site

systems have been repaired in the valley, a number that may be low since repairs before 1980 may not have been recorded.

There are fewer individual wells than on-site sewage systems because of homes served by the six public water system wells: Two Group B wells (Olin 330 & Sky Acres) and one Group A well (Pit Co 328) in the northeastern portion of the valley; one Group B well (Wintercreek MHP) and one Group A well (Forrestview Senior 55+ community) in the southwestern portion of the valley; and the City of McCleary's water utility, which serves four homes located outside City boundaries on Larson Road.

Approximately two-thirds of the unincorporated area is presently zoned for 5 acre or larger lot sizes. The remaining one-third is R2 – General Residential and RR – Rural Residential.

The minimum lot size in the RR zone is one acre, provided that various conditions are met. As a practical matter, however, County requirements for distances between on-site sewage systems and wells suggest that the actual minimum lot size would be between one and two acres. (The County requires a setback of 100 feet from the edge of an on-site system's soil dispersal component and a set-aside area for a reserve drainfield. Also, wells must be 50 feet from any sewage tank and distribution box, sewer line, and non-perforated distribution pipe.)

In the R2 zone, the minimum lot size is 10,000 square feet for a single family home, or 11,500 square feet for a duplex, provided that (1) the area is within the designated urban service area of a city, town, water, or sewer district or (2) the area is adjacent to a city or developed area and has an adequate public water system and either an adequate public sewer system or is suitable for the long-term use of on-site septic systems at the permitted density.

Under current zoning, the build-out potential above the aquifer and within County jurisdiction is an additional 400 to 500 homes on individual, on-site sewage systems, for a total of approximately 650 to 750 residences.

City of McCleary

Approximately one-third of the aquifer lies within the City of McCleary, including the downtown commercial district and the Simpson mill. The land in the very center of the aquifer is zoned industrial but, except for the 14-acre site of a former pole yard, is undeveloped. Port Blakely operated the pole yard for several years but only to peel poles, which were then shipped to another company for treatment.

In recent years the City has annexed northward along Summit Road and approved subdivisions for the construction of approximately 125 homes, all of which will be located within this report's recommended City wellhead protection area. The 2007 estimated City population is 1,550.

Risks to Wells

On-Site Sewage Disposal

The primary source of potential contamination in the Wildcat Creek Aquifer is on-site sewage systems. In much of the portion of the aquifer under County jurisdiction, the risk to wells is low because of the current low density of development. The more significant risks to manage for are those associated with wells of the group public water systems, including the City of McCleary, and individual wells in the R2 and RR zones that may be located too close to improperly functioning, on-site sewage systems.

Hazardous Chemicals

The Hart Crowser report listed potential contamination sites for hazardous materials upgradient to the City wells. That list was updated in the City of McCleary's *Wellhead Protection Plan* (Cleveland, 1999.)

Monitoring Private Wells

One unknown about the aquifer is the quality of water in the several hundred private wells. The risk presumably would be for wells receiving water from failed on-site sewage systems. A program to check the quality of private well water should test for nitrate, at a minimum. Caffeine and methylene blue substances (used in detergents) also are relatively inexpensive to detect and their presence can indicate an impending problem.

An initial round of tests would establish the background concentration of these substances. There is always some nitrate from natural sources, but caffeine and methylene blue substances should not be detectable. Subsequent testing could then focus on areas downgradient from and close to housing developments having a relatively dense concentration of septic systems. Retesting once every few years likely would be adequate.

Previous reports (Hart Crowser and Horsley Witten) have recommended extending public water and sewer to houses on Lynch and Larson Roads, immediately north of the City wells. Monitoring private wells in this area could reveal whether, in fact, on-site sewage systems there are causing a problem.

Wellhead Protection Areas

The City of McCleary's Time-Related Capture Zone

Hart Crowser conducted a capture zone analysis to determine areas where the McCleary wellfield is most vulnerable to land use impacts. The analysis used a numerical modeling method, with input from the aquifer pumping test that the firm conducted on a City well from July 27 to July 30, 1993. (For more about the Hart Crowser analysis, please see pages 5, 8-10, and Appendices A and B in the Hart Crowser report, 1994.)

Hart Crowser's method and test procedures were state-of-the-art and equivalent to those currently recommended by EPA and the Department of Ecology. As noted in their report, however,

It is important to recognize that these modeled capture zones are subject to uncertainty.... The uncertainty is unavoidable because it is not possible to have perfect knowledge of the aquifer and its hydraulic properties. [p. 10]

Because of this uncertainty and to provide a margin of safety, Pacific Groundwater Group has recommended that Hart Crowser's original 10-year time-of-travel capture zone be enlarged (see Wildcat Creek Aquifer Map). This enlargement increases the width by about 50 percent to the west; to the east it extends the zone to the railroad and highway to draw attention to the potential for spills from road vehicles or trains.

While this larger capture zone does not cover the entire area from which water may be influencing City wells, the so-called "beneficial recharge area," it is believed to sufficiently encompass the area that could contribute contaminants to the wells for the foreseeable future. The distinction between "capture zone" and "beneficial recharge area" refers to the way that water in an area beyond a capture zone can reduce drawdown around a well without actually getting pumped up a well. Beneficial recharge helps to maintain the groundwater level at a well (by causing less drawdown) even though most if not all of the water in the "beneficial recharge area" never shows up at the well and, in fact, bypasses the well field.

In addition to the added protection of the expanded capture zone, we now recognize that older glacier till covers the entire Wildcat Creek aquifer. This layer provides additional filtration for septic effluent and delays the vertical movement of contaminants down to the aquifer, thereby allowing more time for cleanup of accidental spills.

Wellhead Protection Areas for Other Group Water Systems

At present the wellhead protection areas for other group public water system wells using the Wildcat Creek Aquifer are defined by the simple "fixed-radius" method, which does not incorporate the effect of recharge. Time-related capture zones for these wellhead protection areas could be estimated reliably by EPA's "WhAEM 2000" model (Kraemer and others, 2007), which would use the same hydraulic inputs as Hart Crowser's model but is much simpler to construct and execute.

Part 2 – Regulatory Alternatives

Introduction

Several state and federal statutes address the protection and management of groundwater resources, especially for communities without a practical alternative drinking water source. All such programs require detailed applications, considerable funding, and appear to be more complicated than needed for present management of the Wildcat Creek Aquifer.

Sole Source Aquifer Protection Program

The federal Safe Drinking Water Act authorizes the U. S. Environmental Protection Agency to designate aquifers that are the sole or principal source of drinking water for an area. To meet the criteria for designation, a sole source aquifer must supply at least 50 percent of the drinking water to persons living over the aquifer, and there can be no feasible alternate source of drinking water. Once designated, EPA can review proposed projects that are to receive federal funds and that could contaminate the aquifer. The EPA Sole Source designation is also referred to in several state statutes as justification for applying a state program.

Washington State Statutes and Programs

The Water Resources Act of 1971

Chapter 90.54.140 of the Revised Code of Washington singles out sole sources and is referenced in several Department of Ecology groundwater programs:

The legislature hereby declares that the protection of groundwater aquifers which are the sole drinking water source for a given jurisdiction shall be of the uppermost priority of the state department of ecology, department of social and health services, and all local government agencies with jurisdiction over such areas. In administration of programs related to the disposal of wastes and other practices which may impact such water quality, the department of ecology, department of social and health services, and such affected local agencies shall explore all possible measures for the protection of the aquifer, including any appropriate incentives, penalties, or other measures designed to bring about practices which provide for the least impact on the quality of the groundwater.

Regulation of Public Groundwaters Act, Chapter 90.44 RCW

Excerpts from RCW 90.44.400, Groundwater Management Areas:

(1) This legislation is enacted for the purpose of identifying groundwater management procedures that are consistent with both local needs and state water resource policies and management objectives; including the protection of water quality, assurance of quantity, and efficient management of water resources to meet future needs. In recognition of existing water rights and the need to manage groundwater aquifers for future use, the department of ecology shall, by rule, establish standards, criteria, and a process for the designation of

specific groundwater areas or sub-areas, or separate depth zones within such area or sub-area, and provide for either the department of ecology, local governments, or groundwater users of the area to initiate development of a groundwater management program for each area or sub-area, consistent with state and local government objectives, policies, and authorities. The department shall develop and adopt these rules by January 1, 1986.□□

(2) The department of ecology, in cooperation with other state agencies, local government, and user groups, shall identify probable groundwater management areas or sub-areas. The department shall also prepare a general schedule for the development of groundwater management programs that recognizes the available local or state agency staff and financial resources to carry out the intent of RCW 90.44.400 through 90.44.420. The department shall also provide the option for locally initiated studies and for local government to assume the lead agency role in developing the groundwater management program and in implementing the provisions of RCW 90.44.400 through 90.44.420. The criteria to guide identification of the groundwater areas or sub-areas shall include but not be limited to, the following:□□

(a) Aquifer systems that are declining due to restricted recharge or over-utilization;□□

(b) Aquifer systems in which over-appropriation may have occurred and adjudication of water rights has not yet been completed;□□

(c) Aquifer systems currently being considered for water supply reservation under chapter 90.54 RCW for future beneficial uses;□□

(d) Aquifers identified as the primary source of supply for public water supply systems;□□

(e) Aquifers designated as a sole source aquifer by the federal environmental protection agency; and□□

(f) Geographical areas where land use may result in contamination or degradation of the groundwater quality.□

(3) In developing the groundwater management programs, priority shall be given to areas or sub-areas where water quality is imminently threatened.

Special Protection Area – Department of Ecology

Excerpt from WAC 173-200-090:

(1) The purpose of a special protection area is to identify and designate ground waters that require special consideration or increased protection because of one or more unique characteristics.

(2) The unique characteristics of a special protection area shall be considered by the department when regulating activities, developing regulations, guidelines, and policies, and when prioritizing department resources for ground water quality protection programs.

(3) The characteristics to guide designation of a special protection area shall include, but not be limited to, the following:

(a) Ground waters that support a beneficial use or an ecological system requiring more stringent criteria than drinking water standards;

(b) Ground waters, including, but not limited to, recharge areas and wellhead protection areas, that are vulnerable to pollution because of hydrogeologic characteristics; and

(c) Sole source aquifer status by federal designation.

(4) Special protection areas may be proposed for designation at any time by the department upon its own initiative or at the request of a federal agency, another state agency, an Indian tribe, or local government.

Statutes for Counties and Cities

Aquifer Protection Areas Act (RCW 36.36.010)

The purpose of this statute is to allow counties to create

...aquifer protection areas to finance the protection, preservation, and rehabilitation of subterranean water.... When a county legislative authority proposes to create an aquifer protection area it shall conduct a public hearing on the proposal.... After the public hearing, the county legislative authority may adopt a resolution causing a ballot proposition to be submitted to the registered voters residing within the proposed aquifer protection area to authorize the creation of the aquifer protection area, if the county legislative authority finds that the creation of the aquifer protection area would be in the public interest.... An aquifer protection area shall be created by ordinances of the county if the voters residing in the proposed aquifer protection area approve the ballot proposition by a simple majority vote. The ballot proposition shall be in substantially the following form:

Aquifer protection areas are authorized to impose fees on the withdrawal of subterranean water and on on-site sewage disposal...to fund:

(1) The preparation of a comprehensive plan to protect, preserve, and rehabilitate subterranean water, including groundwater management programs adopted under chapter 90.44 RCW. This plan may be prepared as a portion of a county sewerage and/or water general plan pursuant to RCW 36.94.030;

(2) The construction of facilities for:

- (a) The removal of water-borne pollution;
- (b) water quality improvement;
- (c) sanitary sewage collection, disposal, and treatment;
- (d) storm water or surface water drainage collection, disposal, and treatment; and
- (e) the construction of public water systems;

(3) The proportionate reduction of special assessments imposed by a county, city, town, or special district in the aquifer protection area for any of the facilities described in subsection (2) of this section;

(4) The costs of monitoring and inspecting on-site sewage disposal systems or community sewage disposal systems for compliance with applicable standards and rules, and for enforcing compliance with these applicable standards and rules in aquifer protection areas created after June 9, 1988; and

□ □

- (5) The costs of:
- (a) Monitoring the quality and quantity of subterranean water and analyzing data that is collected;
 - (b) ongoing implementation of the comprehensive plan developed under subsection (1) of this section;
 - (c) enforcing compliance with standards and rules relating to the quality and quantity of subterranean waters; and
 - (d) public education relating to protecting, preserving, and enhancing subterranean waters.

Critical Aquifer Recharge Areas – The Growth Management Act (Chapter 36.70A RCW)

The GMA requires all counties and cities, even those not planning under the Act, to designate and protect critical areas, among which are critical aquifer recharge areas. Critical aquifer recharge areas are defined as “areas with a critical recharging effect on aquifers used for potable water.” As examples of critical aquifer recharge areas, the Washington Administrative Code, Chapter 365-190-080, lists:

- (i) Sole source aquifer recharge areas designated pursuant to the Federal Safe Drinking Water Act.
- (ii) Areas established for special protection pursuant to a ground water management program, chapters 90.44, 90.48, and 90.54 RCW, and chapters 173-100 and 173-200 WAC.
- (iii) Areas designated for wellhead protection pursuant to the Federal Safe Drinking Water Act.
- (iv) Other areas meeting the definition of “areas with a critical recharging effect on aquifers used for potable water” in these guidelines.

Chapters 36.70 and 35.63 RCW for Non-GMA Counties and Cities

Counties and cities not planning under the Growth Management Act, such as Grays Harbor County and the City of McCleary, must include two elements in their comprehensive plans – a land use element, which designates the proposed general distribution, location, and extent of land uses, and a circulation element, consisting of the general location, alignment, and extent of major thoroughfares, transportation routes, terminals, and trunk utility lines. The statutory language for the required land use element includes the following wording: “The land use element shall also provide for protection of the quality and quantity of groundwater used for public water supplies....” [RCW 36.70.330 and RCW 35A.63.061]

Consistency of Development Regulations with Comprehensive Plan

Beginning July 1, 1992, the development regulations of each city and county that does not plan under RCW 36.70A.040 [The Growth Management Act] shall not be inconsistent with the city's or county's comprehensive plan. For the purposes of this section, "development regulations" has the same meaning as set forth in RCW 36.70A.030. (RCW 36.70.545 and RCW 35.63.125)

Grays Harbor County Comprehensive Plan

As a result of the Rural Lands Study, 1982, two elements were added to the Grays Harbor County Comprehensive Plan: The Rural Lands Element and the Community Plan Coordination Element.

The Rural Lands Element

The Rural Lands Element established the policy basis for deciding how 29,000 acres of marginally productive agricultural land in the eastern part of the county were to be zoned. As stated in its introduction, "One of the key purposes of a comprehensive plan is [to] guide decisions and the Rural Lands Element's goals, objectives, and policies are intended to guide the manner in which the rural areas of Eastern Grays Harbor County are zoned." [p. vi]

For purposes of managing and protecting the Wildcat Creek Aquifer, the important policies in the Rural Lands Element are those that guide the designation of land use densities of less than one unit per five acres. Reprinted below are the Rural Lands Element's two goals and the relevant objectives, followed by the policies for the RR – Rural Residential Zone and the R2 – General Residential Zone.

Goals

1. To provide opportunities for rural development at appropriate intensities while protecting the natural resources and character of the rural lands.
2. To develop a land use pattern which minimizes development, service, and maintenance costs for residents, property owners, builders, and public agencies. [p. 2]

Objectives

5. To protect and maintain the high quality of the air, water, and groundwater resources of the rural lands.
11. To ensure that County, Regional, City, and Town development plans, programs, and policies are well coordinated and integrated.
13. To ensure County policies, programs, and ordinances, especially zoning and capital improvement programs, will be coordinated with and support the goals, objectives, and policies of this plan. [p. 2]

Policies for Rural Residential

Reprinted below are the relevant sections from the Plan:

Purpose: The purpose of the Rural Residential designation is to provide areas for small acreage rural residential development where compatible with the area's natural resources, natural limitations, public facilities, and public services. [p. 3]

Description: These areas would be primarily composed of rural residential uses with a maximum density of not more than one (1) unit per acre. The permitted density may vary depending on the suitability of the site for development. During the platting process a determination shall be made as to whether conditions are present which limit the site's development potential. These conditions include:

- (a) Areas within the one hundred year flood plain.
- (b) Areas subject to riverbank erosion.
- (c) Areas of very steep slopes.
- (d) Areas of low suitability for on site waste disposal systems.
- (e) Areas of high groundwater tables or ponding.
- (f) Other conditions or hazards which limit development.

If any of these conditions are present, measures may be required as necessary to overcome the limitations including, but not limited to: special site designs, the clustering of structures, special construction requirements, engineered drainage and/or waste disposal systems, and reductions in the maximum permitted density. While the primary character of these areas will be rural residential, a mix of compatible forestry and agricultural uses will be permitted and encouraged.

...

Criteria for Designation: [p. 4]

Areas suitable for this designation shall meet the following criteria:

- (a) The areas shall have an adequate supply of ground water given the one acre density or access to a community water system.
- (b) The areas shall be located to minimize the travel distances of residents, school buses, and emergency equipment over substandard roads.
- (c) The areas shall be located to minimize their impact on those fire and school systems least able to accommodate growth.
- (d) In addition, designated urbanizing areas may be designated Rural Residential until they are served by adequate public facilities, including streets, water, and sewer systems.

Areas to be avoided by this designation: [p. 4]

- (a) Areas which would require major public expenditures to adequately accommodate the permitted growth.
- (b) Areas substantially or wholly within the one hundred year flood plain.
- (c) Areas subject to major riverbank erosion.
- (d) Extensive areas of soils with a poor suitability for on site waste disposal systems.
- (e) Areas where septic systems may contaminate groundwater resources.

Policies for R-1 and R-2 Zones

Reprinted below are the relevant sections from the Plan:

Purpose: The purpose of the Residential designation is to provide for low and moderate density residential communities adjacent to developed areas where adequate facilities and services are available or can be economically provided. [p. 13]

...

Criteria for Designation: Areas suitable for this designation include either:

- (a) The designated urban service areas of a city, town, water or sewer district. Or;
- (b) Areas which have all of the following characteristics:
 - (i) The area is adjacent to either the corporate limits of a city or town or the built-up portions of a developed area. Areas designated Residential shall not be more than a half mile from the corporated limits or built-up area. (See definition of developed area.) [DEVELOPED AREA: An area of compact, continuous development containing residences, businesses, and other land uses served by a water system(s), a road system and other public facilities. The built-up portion of the developed area is the area of contiguous development. p.33]
 - (ii) An adequate public water system shall be available to serve the area or expansion of a public water system into the area must be planned.
 - (iii) An adequate sewer system shall be available to service the area or the area shall be suitable for the long term use of on-site septic systems at the permitted density.
 - (iv) The area should be located to minimize the impact of new residences on those fire and school systems least able to accommodate growth.

Areas to be avoided by this designation:

- (a) Areas within the one hundred year flood plain.
- (b) Areas subject to riverbank erosion.
- (c) Areas where the available public facilities and services are not adequate to serve the development.
- (d) Areas adjacent to planned agricultural lands.
- (e) Areas of high resource value.

Community Plan Coordination Element

Reprinted below are the Goal, Objectives, and Relevant Policies of the Community Plan Coordination Element:

Goal

To ensure the continued development of a balanced land use pattern with adequate areas for housing, commerce, industry, agriculture, forestry, recreation, and other uses through the development of a coordinated land use plan. [p. 29]

Objectives

1. To encourage the development of urban land uses within areas designated to be served by urban facilities and services.
2. To promote appropriate land uses within suitable areas.
3. To ensure the coordination of the region's land use pattern by considering the plans and concerns of cities, towns, and other affected agencies during the development and administration of county plans and implementing ordinances.
4. To encourage cities, towns, and other agencies to consider county plans and concerns during the development and administration of their plans and implementing ordinances thereby ensuring the continuity of land uses throughout the region.
5. To ensure that county, regional, city, and town development plans, programs, and policies are well coordinated and integrated.
6. To ensure that jointly adopted plans, programs, and policies are incorporated into land use, public facilities, and public services decisions.
7. To coordinate amendments and updates to jointly adopted plans with all affected jurisdictions.
8. To encourage the joint review of development proposals which because of size, location, or public services needs affect more than one jurisdiction.

Policies

1. [Adoption of city and town plans by reference.]
2. Residential and commercial growth should be encouraged in areas designated for urban services including water, sewer, and other public services.
3. [Procedure for joint adoption of plans.]
4. The jointly adopted plans should guide county decisions on rezones, conditional uses, site plans, subdivisions, the provision and extension of public facilities and services, appropriate densities, land use plan revisions, and other land use matters within the areas to which they apply.
5. [Evaluating development proposals and joint review.]
6. [Procedure for county to inform other jurisdictions.]
7. [Joint review is advisory.]
8. [Providing public services to a development.]
9. The County should encourage community comprehensive plans to designate urban services areas. Urban services areas are those lands that cities, towns, and special districts intend to incorporate into their communities and provide with urban services, such as water and sewer.
- 10 – 12. [More about providing urban services.]
13. [Special district plans.]

City of McCleary Comprehensive Plan

Introduction

Three subjects in the City of McCleary's Comprehensive Plan bear on aquifer protection and management: (1) development in the wellhead protection area; (2) industrial zoning; and (3) stormwater management.

1. Development in the Wellhead Protection Area

The City's Comprehensive Plan, adopted in 2002, has two objectives that are relevant for managing and protecting the aquifer:

- LU 2.1 Protect critical areas within the city: [including]...areas with critical recharging effect on aquifers.
- LU 2.3 Manage development so growth does not negatively affect the quality and quantity of groundwater and surface water.

These objectives are followed by Implementation Steps:

- Manage areas with development constraints by:
 - Enforcing the city's critical areas ordinance.
 - Protecting Wildcat Creek as a Critical Area.
- Maintain water quality and quantity by:
 - Keeping the city's wellhead protection program current to protect the public water supply;
 - Developing and enforcing [words appear to missing here in the City text] that protect the city's aquifer recharge areas;
 - Requiring new development in all zoning districts to be on the city sewer system to protect ground water quality;
 - Requiring new development to provide adequate stormwater management as specified and adopted by the City.
 - Adopting requirements for minimum removal of vegetative cover for reducing storm water runoff.

With the City's approval of 125 new homes in the City's recharge area not long after the Comprehensive Plan was adopted, the City's emphasis for aquifer management and protection is now focusing on the second set of implementation steps, those for maintaining water quality and quantity. Because the new homes are served by City water and sewer, the approach now is on maximizing recharge given the additional impervious surfaces and educating residents about proper use of pesticides and fertilizers.

Although the 2002 Comprehensive Plan did not anticipate the new growth along Summit Road, it did project that the City would encompass the developed area along Lynch and Larson Roads, presently zoned R2 – General Residential by the County. Both the Hart Crowser and Horsley Witten reports cite this area as one of concern because of the proximity of private on-site sewage systems to City wells, some of which are within the wells' one-year travel time capture zone.

2. Industrial Zoning

Goal 5, on Industrial Development, calls for increasing "... McCleary's economic diversity by encouraging new industrial land uses in suitable locations." The associated objective, LU 5.1, calls for maintaining "... a supply of industrially zoned land for new industry that will provide minimal disruption to existing citywide land use patterns." The associated implementation step calls for pursuing "... the potential for industrial expansion in northern areas of McCleary."

Land to the north of the City is zoned industrial, but its development for industrial use would need to overcome several constraints: a high water table making it unsuitable for the construction of heavy buildings; delineated wetlands between the zone and Simpson

Road to the south complicating access to the freeway; and the only other access being Larson Road, a residential neighborhood. In addition, the land lies at the center of the aquifer, between the Middle Fork and East Fork of Wildcat Creek. As such, its undeveloped condition may prove to be useful to the City as an area worth investigating for a back-up wellfield – and associated recharge area.

3. Stormwater Management

The purpose of “low impact development” is to maximize recharge to groundwater and reduce stormwater runoff. A technical manual published by the Puget Sound Action Team and the Washington State Extension Service uses the following definition:

Low impact development is a stormwater management and land development strategy applied at the parcel and subdivision scale that emphasizes conservation and use of on-site natural features integrated with engineered, small-scale hydrologic controls to more closely mimic pre-development hydrologic functions. (Hinman, 2005)

The City of McCleary can employ low impact development in two ways – by requiring this approach in new development and by using it to the extent feasible when upgrading existing neighborhoods and managing stormwater.

Part 3 -- Recommendations

A. Joint County – City Recommendations

1. Establish the Wildcat Creek Aquifer Management Area by inter-local agreement.

a. Purpose: To coordinate risk management and other actions to ensure the long-term benefits to the economy and to public health and safety provided by the Wildcat Creek Aquifer.

b. Management Principles: To ensure a margin of safety, manage the aquifer in accordance with the following principles:

- i. Maximize recharge to the aquifer.
- ii. Minimize the transmission of contaminants to the aquifer.
- iii. Monitor well water and measure streamflows to learn more about the aquifer's hydrogeology, groundwater conditions, and safe yield.
- iv. Regulate land use in a manner that is clear, fair, and assures that groundwater will be protected.
- v. Manage the aquifer comprehensively through compatible city and county policies, actions, and ordinances.

c. Responsibility:

- i. Designate staff with responsibility for each action listed under (e) below.
- ii. Designate lead officials from each jurisdiction to oversee staff.
- iii. Publish an annual report on aquifer management.

d. Funding: Where appropriate, apply jointly for funding to carry out the management purposes of the Management Area.

e. Actions:

- i. Update the list of potential point-source contamination sites within aquifer boundaries. Include sites on surrounding hillsides from which surface runoff could carry hazardous contaminants to the aquifer.
- ii. Monitor individual wells in the RR and R2 zones for quality. If water quality tests show a problem with a well, work with the landowner to correct the problem; the emphasis should be on assistance, not penalty.
- iii. Measure streamflow below the confluence of the three branches of Wildcat Creek and measure water levels in several wells to learn more about groundwater movement and quantity.
- iv. Review and coordinate spill-response plans(s) for accidental spills along transportation corridors within the Wildcat Creek Aquifer Management Area. Include Fire District 12 in this action.

- v. Educate the public about the do's and don'ts of living above their water supply.
- vi. Adopt by reference the Low Impact Development Technical Guidance Manual for on-site development and surface water management.
- vii. Review and, where appropriate, revise the zoning ordinances of both jurisdictions to prevent the location above the aquifer of land uses and activities that would introduce risks that could not be eliminated by development conditions and operating practices. This would include a review of a zoning district reclassification of general development five-acre (G-5) for any property currently zoned industrial (I-1 or I-2).

2. Under the Community Plan Coordination Element of the Grays Harbor County Comprehensive Plan, review and, if necessary, revise the City and County plans for the area. In accordance with Policy (9), designate an urban services area for the City of McCleary.

B. Recommendations for Grays Harbor County

1. Adopt an ordinance that (1) affirms the Grays Harbor County Comprehensive Plan's policy basis for zoning in the Wildcat Creek Valley and (2) cancels the development moratorium upon the completion of the adoption process for amending Grays Harbor County Code 17.56.180 governing critical areas.
2. Designate the City of McCleary's wellhead 1-year capture zone, the 5-year capture zone, and the 10-year capture zone, as delineated by Pacific Groundwater Group in this report, as a critical aquifer recharge area.
3. Amend the Grays Harbor County Code for critical areas, Title 17, to define the Wildcat Creek Aquifer as a specific area.
4. Set forth requirements and review responsibilities for development activities, including rezones and subdivisions, located within the Wildcat Creek Aquifer.
5. Set forth requirements for development activities, including rezones and subdivisions, located within a Wildcat Creek critical aquifer recharge area, including a wellhead and wellhead time-of-travel protection plan. Specify that purveyors shall review the proposals and that the Grays Harbor County Environmental Health Division shall determine whether the proposal would provide a reasonable margin of safety for the critical aquifer recharge area; and further, that if proposal does not, the proposal shall be (a) required to be revised to increase the margin of safety, including a reduction in lot density, or (b) shall be denied based upon evidence that the proposal represents a probable significant adverse impact to the critical aquifer recharge area.

C. Recommendations for the City of McCleary

1. Investigate the feasibility of establishing a back-up wellfield.

2. Designate the City portion of the wellhead protection area for the City wells as a critical aquifer recharge area.
3. Revise the City's wellhead protection area to conform to the ten-year time-travel capture zone, based on the delineation by Pacific Groundwater Group.
4. Revise the City's Integrated Pest Management program to make it more workable.
5. Develop a monitoring program to determine whether on-site sewage systems located in the wellhead protection area on Lynch and Larson Roads are contributing contaminants to City wells.
6. Reconsider the existing industrial zoning above the aquifer.
7. Continue efforts to reduce per capita water consumption.

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