Dev[illegible]ion of water to surrounding dairy farms began during the middle part of the century. Between 1959 and [illegible], four wells (in the Kneuman Road Wellfield) were drilled and water was supplied to the City of Nooksack and the rural area to the south. Sumas and the rural area to the east were also supplied from the wells, and everyday use of the spring diversion box was discontinued. (The spring diversion box can be reactivated in emergency situations.) In 1982, the existing 500,000 gallon reservoir was installed.

In the mid-1980s Sumas began to pursue industrial development. The existence of adequate water, coupled with the border crossing and the confluence of transportation infrastructure (Burlington Northern Railroad, State Route (SR) 9, SR 547, SR 546, British Columbia Highway 11, the Trans-Canada Highway, and two major cross-border natural gas pipelines) fostered the development of several industrial sites, including a truck-rail reload facility, a gas-fired cogeneration plant with associated lumber kiln, and a shingle-manufacturing facility. To support the needs of the new industries, a fifth well was drilled in 1992 at the Kneuman Road Wellfield. And, the May Road Wellfield was purchased from the City of Lynden and outfitted with two new wells (for a total of three production wells and one observation well).

Recent industrial growth has brought increased demand for housing. More industrial growth is expected, and more [illegible]trial and commercial growth will also follow. The City of Sumas comprehensive plan envisions a town of [illegible]out 1,600 people by the year 2018.

Current population and service connections

As [illegible] April 2009, the population of Sumas was 1326 people. Sumas conducts its own census each spring using the Office of Financial Management's approved methodology, so this number is believed to be very accurate.

As of August 2009, service connections were as follows:

Connection type	Number of connections
Single-family	358
Multi-family	47
Comm., Gov., Ind.	95
Agricultural	0
Total	500

The 47 multi-family connections represent 152 dwelling units, so there are a total of 510 dwelling units in Sumas's direct service area.

In addition, Sumas currently has four wholesale customers: the City of Nooksack, the Nooksack Valley Water Association (NVWA), and the Sumas Rural Water Association (SRWA), all of which purchase potable water, and [illegible]tric co-generation facility that purchases non-potable water.

General description of water system

Sources

Th[illegible]ain source of potable water is the Kneuman Road Wellfield (aka Sumas Wellfield), which contains five wells. These wells draw water from the Sumas (Abbotsford-Sumas) aquifer, a glacial sand and gravel upland covering the north end of Whatcom County and extending into southern British Columbia. Although artesian flow conditions exist at each well, submersible pumps or booster pumps are installed to achieve adequate volume and pressure. The wells supply two distinct distribution zones. Three of the wells are used to supply wholesale customers south of town, including the NVWA and the City of Nooksack. Two of the wells supply Sumas itself and the SRWA, which is located east of town. The two distribution zones normally operate independently, but an intertie is available to allow emergency supply from one system to another.

Sumas also operates the May Road Wellfield (the original point of withdrawal for the subject water right), which taps the same aquifer as the Kneuman Road Wellfield. There are currently two wells (wells 1 & 3) in use at the May Road Wellfield. One (well 3) serves industrial customers. The other (well 1) is tied into the Sumas distribution system.

Storage

Sumas owns a 500,000 gallon reservoir located at the top of Moe's Hill. A second 500,000 gallon reservoir was built in 2001 next to the existing reservoir and is owned by the SRWA. Storage within the Nooksack/NVWA zone [illegible]omplished at reservoirs jointly owned by those entities.

Distribution

Within the city limits is a distribution system consisting of 94,000 linear feet of pipe ranging from 1 to 12 inches in ter. Major lines lead from the Kneuman Road Wellfield along the Canadian border to the reservoir and along Barbo Road and Halverstick Road to the south end of Cherry Street. A network of smaller pipes distributes water throughout the developed part of town.

Individual well descriptions

Currently authorized by G1-26398C

- *May Road Wellfield well 1* - This well was drilled in 1992. It is outfitted with a submersible pump capable of pumping 200 gpm against the prevailing head. All components of this well are in good condition. It has a life expectancy of 20+ years.
- *May Road Wellfield well 2* - This well was drilled in 1987 for the City of Lynden. A pump test conducted by Golder showed the well can sustain a yield of 500 gpm, not accounting for interference with other wells. There is currently no pump installed in the well. The 8-inch casing is capable of accommodating a submersible pump rated at 500 gpm.
- *May Road Wellfield well 3* - This well was drilled in 1992. A pump test conducted by Robinson & Noble showed the well can sustain a yield of 800 gpm, not accounting for interference with other wells. The well is outfitted with a submersible pump capable of pumping 840 gpm against the prevailing head. All components of this well are in good condition. It has a life expectancy of 20+ years. Robinson & Noble calculated a maximum of 900 gpm can be withdrawn from wells 2 and 3 in combination, due to interference effects.

sted to be added to G1-26198

- *Kneuman Road Wellfield wells 1, 2, 3 (SO1, SO2, SO3 respectively)* - These three wells flow freely through a manifold to the pumphouse pressurizing the Nooksack/NVWA system. The combined group is identified as wellfield source SO6. They are the oldest and shallowest wells in this field, all drilled to a depth of about 57 feet during the period from 1959 to 1971. A group of three manually operated booster pumps is used to regulate the rate of withdrawal from the wells. The maximum sustainable pumping rate is 500 gpm. If pumped at a greater rate, the cone of depression becomes so deep as to allow excessive air to enter the perforated portions of the casings. Although the wells are 30 to 40 years old, they show no signs of deterioration (e.g., no increase in sanding). The AC manifold pipe and the pumphouse are in good condition and are readily accessible for repair and replacement, so there is no expected date of obsolescence of this source.
- *Kneuman Road Wellfield well 4R (S08)* - This is the newest well in the field, drilled in 1997. This well pumps to the 10-inch line serving the Sumas/SRWA distribution system, and together with SC5 (described below), comprises wellfield source SO7. A pump test conducted by Robinson & Noble indicates the well can sustain a yield of 1,200 gpm, presuming all other wells in the field are operating under normal production conditions. The well is outfitted with a submersible pump capable of pumping 810 gpm against the prevailing head (i.e., reservoir almost full). The submersible pump is 18 years old but was completely rebuilt in 199?, when it was moved from well 4 to well 4R. Well 4, the predecessor to this well, exhibited sand buildup after 28 years of use. Well 4R has a life expectancy of 20+ years.
- *Kneuman Road Wellfield well 5 (SO?)* - This well was drilled in 1992. It pumps to the 10-inch line serving the Sumas/SRWA distribution system, and together with SC8 (described above), comprises wellfield source SO7. A pump test conducted by Robinson & Noble indicates the well can sustain a yield of 1,100 gpm, presuming all other wells in the field are operating under normal production conditions. The well is outfitted with a submersible pump capable of pumping 860 gpm against the prevailing head (i.e., reservoir almost full). The submersible pump was new in 1992. All components of this well are in good condition. It has a life expectancy of 20+ years.

Ecology unique well numbers

May Road Wellfield

- Well 1 – AGK 351
- Well 2 – AGF 270
- Well 3 – AGK 357
- Observation Well – AGF 252

Kneuman Road Wellfield

Well 1 – AGK347

- Well 2 – AGK373
- Well 3 – AGK313
- Well 4 – AGK337 (capped)
- Well 4R – ACR 785
- Well 5 – AGK361

Validity of certificate G1-26398

The subject certificate issued for 460 gallons per minute, 1376.0 acre-feet per year, from the May Road Wellfield (wells 1, 2, & 3). The purpose of use is industrial supply and stream augmentation. This certificate requires 18% of the entire May Road Wellfield instantaneous quantities (under both G1-26398 and G1-23698) to be used for stream augmentation (as mitigation). Stream augmentation is to occur simultaneously as the water is withdrawn.

The certificate is in good standing at its full face value. This office received a Proof of Appropriation form (attesting to full beneficial use) from the City of Sumas on October 14, 2009. A proof examination was conducted on October 28, 2009, confirming full beneficial use of groundwater permit G1-26398P. On December 7, 2009, a final certificate of water right was issued for the full beneficial use (perfected) quantities.

Conservation

Current conservation measures

- *Source meters* - Sumas has had source meters in place for many years. The 2010 Water System Plan (currently being developed) will establish an updated maintenance schedule, ensuring accuracy of the meters over time.
- *Service meters* - Sumas has had service meters in place for many years. Virtually every residential service meter was replaced in the 1996/97 biennium as part of an upgrade to wand-readable meters. Starting in 1999 with the largest meters, (i.e., the meters at the interties to the neighboring rural associations); Sumas replaced all intertie meters with compound meters to ensure accurate accounting of water use by large users.

Conservation objectives

The objectives of Sumas's 2010 conservation program are:

- *Decrease unaccounted water* - In 2008, 78 acre-feet of water was pumped at the Kneuman Wellfield and not billed to customers. This amounts to approximately 6 percent of supply, as compared to 6.5 percent in 1995. Sumas will seek to reduce unaccounted water to 5 percent or less.
- *No long-term increase in agricultural use* - The bulk of Sumas's potable water is used by dairy farms in the outlying agricultural areas. There is an ongoing trend toward consolidation of small dairy farms into larger operations, combined with an overall increase in the size of the herd. This trend implies an increasing demand for water by the dairy farms. This program will seek to ensure that future demand remains constant, despite the increasing size of herds.
- *Purveyor assistance (agricultural emphasis)* - Sumas will collect information about best management practices for dairies with regard to water conservation. Information sources are expected to be the Agricultural Extension Service, the Conservation District, and the Natural Resource Conservation Service. Sumas will develop a brochure and/or informational packet that will include contacts at appropriate existing technical assistance agencies. The brochure will then be mailed to "large users" in the neighboring water associations. Preceding the mailing, Sumas will contact each large user by phone to alert them of the brochure and encourage their voluntary compliance with suggestions.
- *Conservation pricing* - Sumas will institute conservation pricing.
- *Reuse of industrial water* - Heavy industries are using an increasing amount of nonpotable water for cooling purposes. By reusing water wherever possible, the available supply will support a greater number of users, including supplying water to the systems in the high nitrate area.

Geology/hydrogeology of the area

All of the Sumas wells, in both wellfields, are completed in Quaternary glacial deposits defined locally as the Sumas aquifer. The aquifer is composed largely of Sumas stratified sand and gravel outwash and the coarse-grained alluvium

of the Nooksack and Sumas Rivers, but also includes some locally important fine-grained deposits such as ice-contact deposits, lacustrine silt and clay, and peat.

Although groundwater in most of the Sumas aquifer is unconfined, it becomes confined in places (both wellfields) in the Sumas River Valley where it is overlain by recent lacustrine silt and clay and along the margins of the Sumas Valley where it is overlain by fine-grained ice-contact deposits. Several valley wells (including the wells in both wellfields) flow as a result of artesian (confined) conditions.

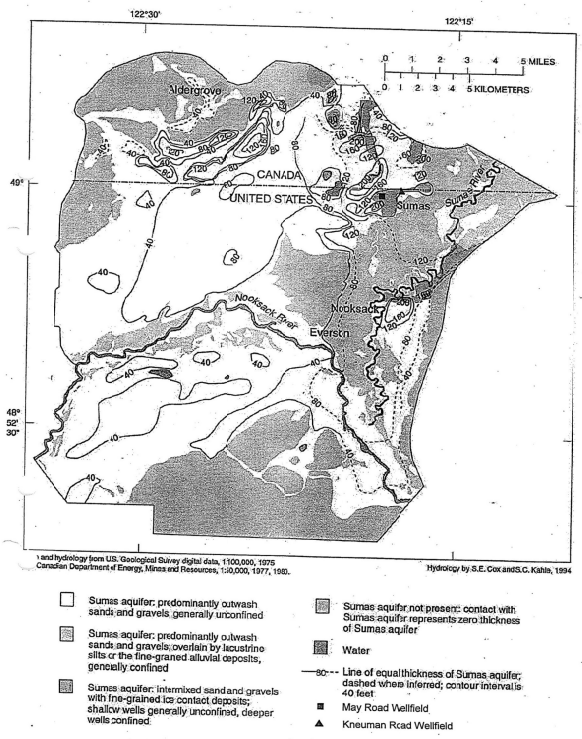

Figure 1: Extent, approximate thickness, and hydrologic condition of the Sumas Aquifer (USGS Report 88-4195).

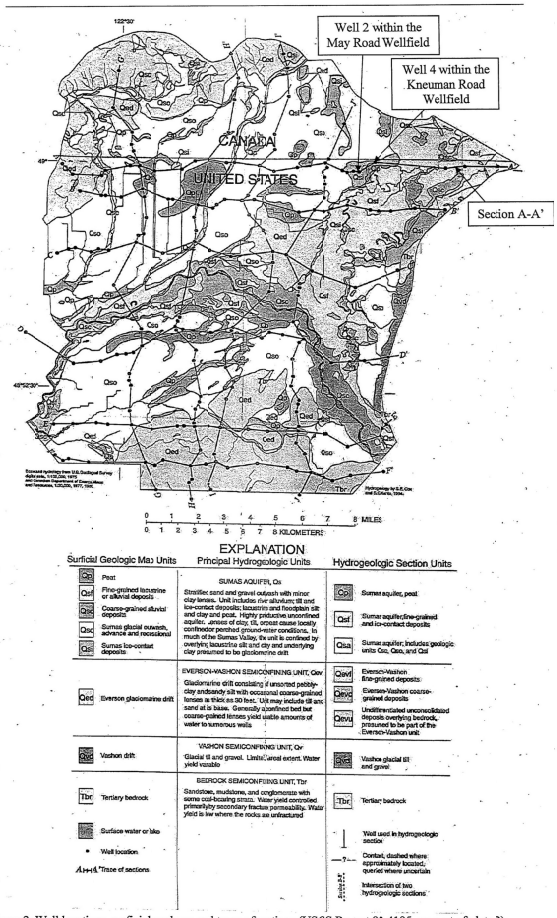

Figure 2: Well locations, surficial geology, and trace of sections (USGS Report 91-4195, excerpt of plate 2).