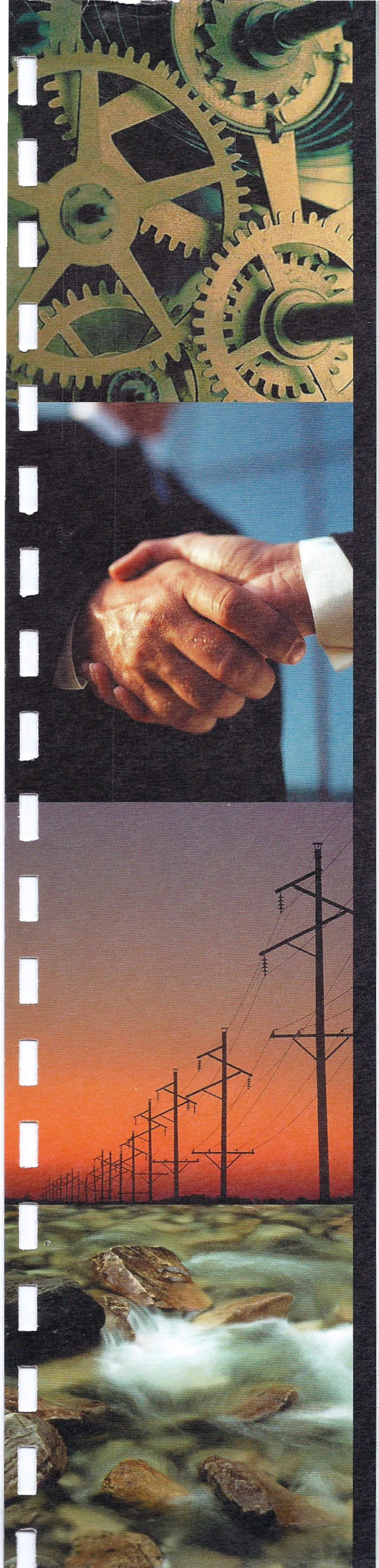

Town of Yacolt

EES Consulting

General Sewer Plan

December 2001

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Chapter 1 - Introduction

Background

Yacolt is a rural town nestled in the western foothills of the Cascade range, approximately 21 miles northeast of Vancouver, Washington (See Figure 1.1). It is situated at 700 feet above sea level within a 15 square-mile verdant valley drained by the East Fork of the Lewis River.

The town does not currently have a strong economic base. In the past, logging and other timber-related industries provided job opportunities; however, these economic activities have dwindled and very few employment opportunities exist locally. Today many residents who are members of the labor force commute to jobs within Battle Ground and Vancouver, as well as elsewhere in Clark and Cowlitz counties.

Need for Sewer Plan

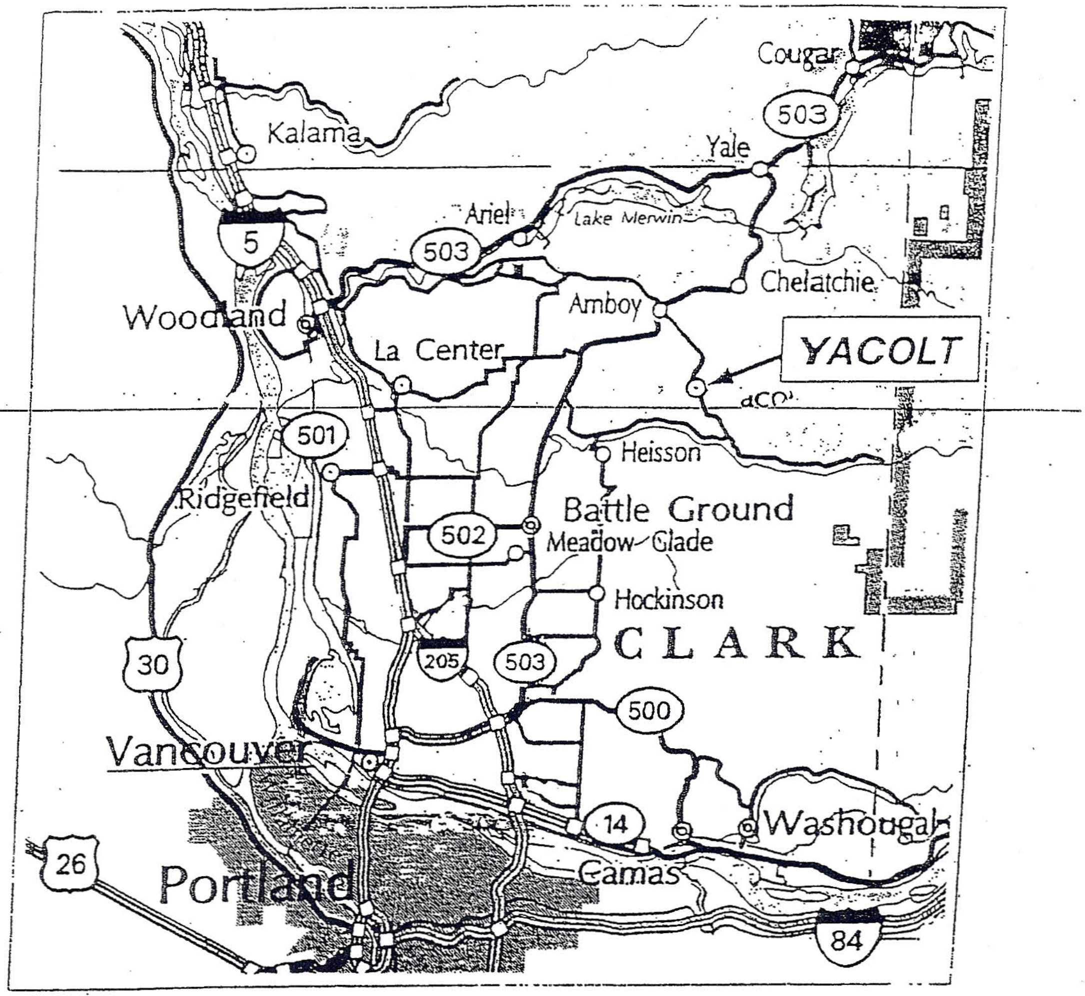
Historically, Yacolt has, at several junctures, investigated and evaluated the need to consider centralized wastewater collection, treatment and disposal. The town is currently served entirely by on-site wastewater disposal systems.

With adoption of the *Yacolt Comprehensive Growth Management Plan* in 1994, the town is obligated to provide for development at urban densities. Achieving urban densities using state-approved septic systems on 5,000-6,000 square-foot lots (typical of many platted prior to 1994) is not feasible. Hence, there is a need to initiate comprehensive and long-term wastewater management planning for the town, which may ultimately result in a public sewer system that could support development at urban densities.

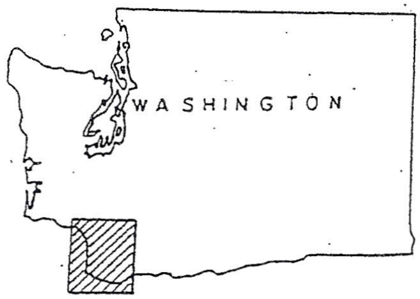
Authorization and Scope

Yacolt, by an Agreement dated May 16, 2001, contracted with EES Consulting, Inc., to prepare a general sewer plan. The plan is the first step for integrating Growth Management Act requirements with state sewer planning requirements under WAC 173-240.

The scope of the general sewer plan involves a review of existing planning criteria and wastewater management facilities (Chapters 2 and 3); development and evaluation of wastewater management alternatives for consideration by the town (Chapter 4); preparation of a capital improvement plan to implement the selected plan of action (Chapter 5); and identification of funding and financing strategies that meet the town's financial limitations (Chapter 6 and 7).



Source: *Yacolt Sewer Feasibility Study*, Wallis Engineering, 1997.



General Location Map
Town of Yacolt

Figure 1.1

EES Consulting, Inc. PACWEST CENTER 1211 SW FIFTH AVE., SUITE 2902 PORTLAND, OREGON 97204 Ph. (503) 223-5900 FAX (503) 223-5999	REVIEWED BY: DESIGN BY: LHO APR'D BY: LHO DRAWN BY: DT DATE: 11/28/01 FILE:	FIGURE 1.1 GENERAL LOCATION MAP TOWN OF YACOLT SCALE: NA DWG. NO.

Chapter 2 – Planning Area Description

Planning Area Boundaries

The area addressed by the general sewer plan extends beyond the corporate limits of Yacolt and the town's urban growth boundary. The planning area for the general sewer plan coincides with the area addressed by the *Yacolt Sewer Feasibility Study*, which was prepared by Wallis Engineering, February 1997. The area embraces approximately 1,000 acres. It extends beyond the corporate limits of the town and the community's urban growth boundary (see Figure 2.1). Smaller service areas, with respect to alternative wastewater management systems, will be described in Chapters 4 and 5 of this plan.

Relationship of the General Sewer Plan to GMA Requirements

Washington State adopted the Growth Management Act (GMA) in 1990. GMA, as promulgated under Chapter 36.70A of the Revised Codes of Washington, requires local governmental agencies in certain urban counties to prepare comprehensive plans aimed principally at fostering compact orderly development and, thus, reducing low-density sprawl.

Clark County is classified as an urban county under GMA. Being an urban county, Clark County and each of its incorporated areas are required to have a comprehensives plan that is consistent with GMA. In November 1994, Yacolt adopted its plan—*Town of Yacolt Comprehensive Growth Management Plan.*

GMA requires a local jurisdiction's comprehensive plan to address the development of land within the confines of an urban growth boundary, which embraces land lying both within and outside the city's or town's incorporated area. The area within an urban growth boundary is intended to ultimately develop at urban densities, once urban services are available. Public water, sewer and road facilities that are adequate to serve urban development are among the most important facilities. Yacolt does not have a public sewer system.

Urban growth boundaries are subject to approval by the county governing board. In the course of delineating Yacolt's urban growth boundary (UGB), the Clark County Board of Commissioners determined that significant development at urban densities should not be permitted in Yacolt beyond the town limits, with only a few exceptions, unless a public sewer is available to serve the community. In December 1994, the Clark County Board of Commissioners approved the town's UGB (see Figure 2.2) with the caveat that the town set forth a plan for a public sewer system. On January 3, 1995, the town adopted Resolution 308 ratifying its adoption of the plan, and stipulating that a program be developed to install a public sewer system within five years. Additionally, the resolution called for the town and the county to reevaluate the land use element of the plan and the UGB, once there is assurance that the public sewer system will be constructed.

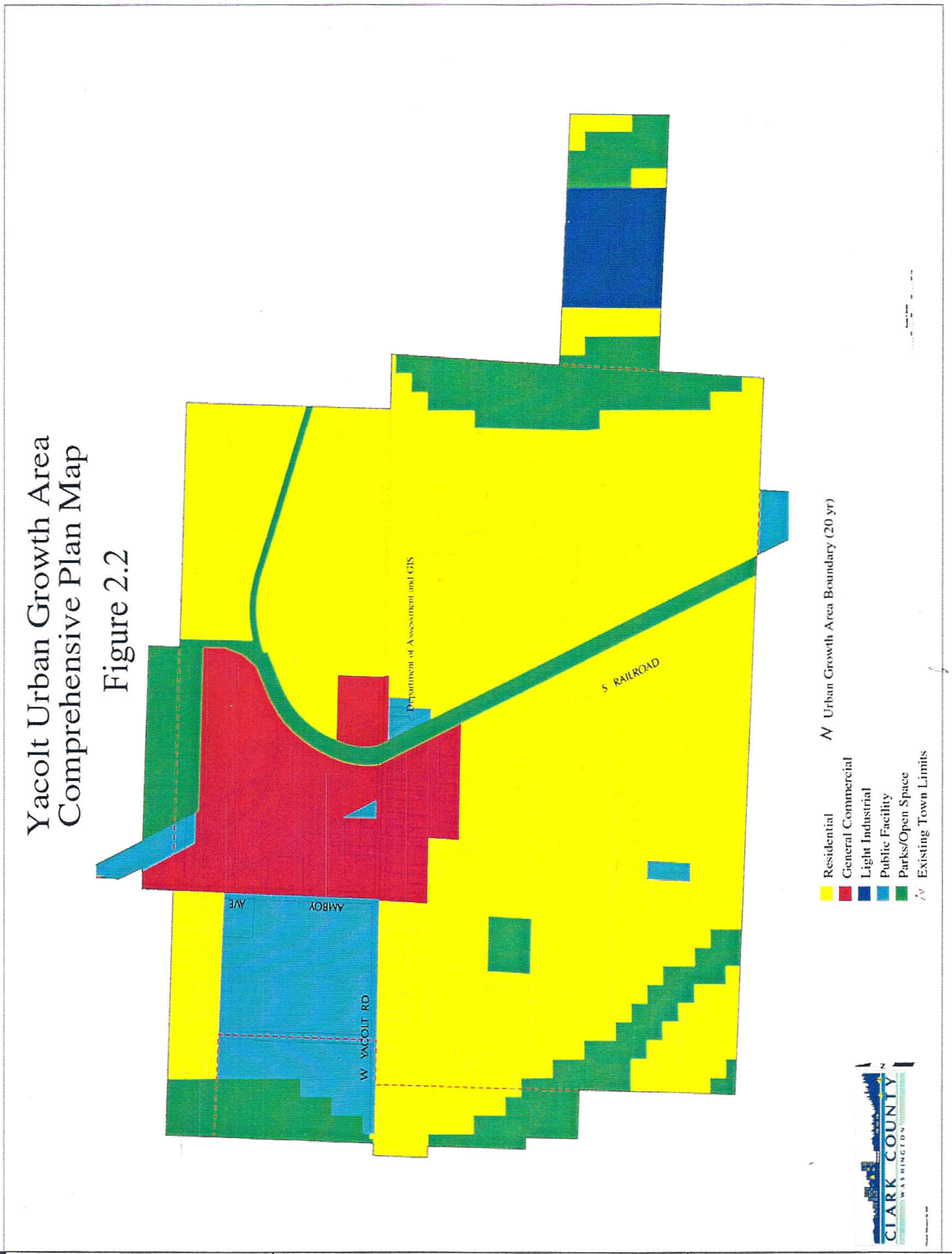


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FIGURE 2.2
YACOLT URBAN GROWTH AREA
COMPREHENSIVE PLAN MAP

SCALE:	DWG. NO.
NA	

Southwest Washington Health District requires new development in the town to locate on large lots relative to the lot sizes permitted in urban areas, since the community continues to depend upon only private on-site septic systems to process wastewater. The health district contends that groundwater in the area may be at risk of contamination from septic tank discharge. New development in the Yacolt community is limited to three units per acre (18,000 square-foot minimum lot size). GMA suggests that densities in urban areas should range between six and eight units per acre, at a minimum. These higher densities cannot be achieved in Yacolt without a public sewer system.

Clark County has been growing rapidly. Communities and rural areas in the northern portion of the county are impacted by this growth trend, and Yacolt is no exception. Development has occurred within Yacolt and the surrounding valley. (Yacolt had a population of 561 in 1990. Washington OFM estimates Yacolt's current population to be 1,065.) Without a public wastewater management system, Yacolt will be unable to absorb development, and rural residential sprawl will continue in the surrounding area—a development pattern that runs counter to GMA goals.

Related Plans and Reports

Wastewater Management

The report, *Preliminary Alternative Feasibility Study for the Yacolt Wastewater Management Committee*, December 1999, is the most recent document directly pertaining to wastewater management planning for the town. It reviewed and updated planning considerations, evaluated alternatives to the current practice of on-site wastewater disposal and concluded that the town needs to consider centralized wastewater collection, treatment and disposal to meet its 1994 comprehensive plan requirements. It further recommended that the town focus on septic tank effluent pumping (STEP) and septic tank effluent gravity (STEG) systems for wastewater collection; however, selection of treatment and disposal methods was left to further analysis.

In 1997, Wallis Engineering prepared an engineering report—*Yacolt Sewer Feasibility Study, Yacolt, Washington.* The report compiled background information from studies and plans relating to the subject of wastewater management in Yacolt, and evaluated alternatives for continued reliance on on-site disposal as well as for a public sewer system. The feasibility study indicated that municipal wastewater collection and treatment facilities were not necessary in Yacolt at that time.

As far back as 1976 the town considered developing public wastewater management facilities, as evidenced by the *Town of Yacolt Wastewater Facilities Plan*, Encon Corporation, May 1976. The facilities plan, developed under federal guidelines in place at that time, examined wastewater management needs over a 20-year horizon and recommended construction of a traditional gravity collection system followed by high rate treatment, with discharge to Yacolt Creek during wet weather and to holding ponds during dry weather.

Water System Plans

The town has completed three planning-related projects specifically aimed at developing, maintaining and protecting its domestic water supply. The earliest was a 1982 investigation of locations for potential development of new sources of potable water. More recent planning efforts were the *Wellhead Protection Plan Town of Yacolt*, July 1993, prepared for the town as an Environmental Protection Agency demonstration project under the auspices of the Clark County Neighbors; and the *Town of Yacolt Water System Plan*, Wallis Engineering, October 1993. The findings and conclusions of these planning efforts and information derived recently from other sources provide a foundation for integrating water system considerations into comprehensive wastewater management planning for the town.

Hydrogeologic Investigations

Carr & Associates conducted two hydrogeologic investigations in 1986 and 1990. These investigations addressed the assessed the prospect of maintaining an adequate and reliable supply of quality domestic water for the community. The latest study provides information on groundwater characteristics, specifically what accounts for seasonally low water levels that occasionally interrupt the withdrawal of water from the town's well field, and ways to correct this condition.

Hart Crowser conducted a groundwater study for the town, the results of which are presented in the *Yacolt Hydrogeologic Study*, 1996. The study evaluates physical hydrogeologic conditions and existing groundwater quality in Yacolt's water supply aquifer, to assist the town and Clark County in determining whether transition from on-site disposal to a centralized wastewater management system is warranted. Two of the principal findings appear below:

- The evaluations indicated that transition from individual septic systems to a sewerage system with a centralized wastewater treatment plant would offset predicted potential water quality impacts. Because existing groundwater quality was acceptable for drinking water and should remain so, Yacolt would have a reasonable time horizon of several years to complete a transition from septic to sewer.

- In the event that Yacolt does transition to sewer, groundwater quality standards would require that effluent from a wastewater treatment plant be treated adequately such that it would not degrade groundwater quality upon discharge. Therefore, its location could be based on logistical considerations rather than potential impacts to the town's wells. Use of a wastewater treatment plant would not adversely impact the amount of recharge to the Yacolt Aquifer, since septic discharge represents only a small portion of the overall recharge.

Water quality considerations from the hydrogeologic investigation are discussed in Chapter 3.

Interagency Involvement

Clark County Community Development, Clark Public Utilities, Southwest Washington Health District, Hazel Dell Sewer District, Washington State Department of Ecology, Washington State Department of Community, Trade & Economic Development, U.S. Department of Agriculture Rural Development, U.S. Forest Service, and the U.S. Department of Housing and Urban Development, through its CDBG program, have all assisted Yacolt in conducting wastewater management planning activities at various times.

Population

The Town of Yacolt had a population of 561 in year 1990. The 2000 Census reports that the town's population grew nearly 88 percent to 1,055 over the past decade. The most recent official population estimates released by the Washington State Office of Financial Management (OFM) place the number of town residents at 1,065, as of April 2001. Selected population and housing characteristics follow:

Table 2.1
Population and Household Characteristics

Population			**Housing Units** (Year 2001)		
			Total	**Occupied**	
Year 1990	**Year 2000**	**Year 2001**		**Owner**	**Renter**
561	1055	1065	354	84%	16%

Source: Year 2000 US Census of Population; Washington State OFM population estimates; and Clark County building permit information.

Yacolt is updating its comprehensive plan, as required under Washington State GMA. The town's initial plan was adopted in November 1994, as noted previously. Population forecasts for the community are being revised in the process of updating the plan. The Yacolt Town Council projects that the population of the community will reach 1,500 by year 2012. This population forecast has yet to be approved by Clark County. EES Consulting has developed a population projection for the entire study area for use in the General Sewer Plan as shown in Table 2.2.

Existing Wastewater Facilities

As of June 2001, 354 residences in the town were served by individual septic systems. Approximately 20 additional housing units within the planning area surrounding the town are also served by individual septic systems. A large on-site septic system serves the primary school located within the town limits. Currently, over 825 students and faculty are served by the system. Commercial and institutional sources typical of a small town generate wastewater that is substantially similar to domestic wastewater; these are also served by individual on-site disposal systems. There are no industry or other source of wastewater that would be considered non-domestic in nature.

Table 2.2 Total Study Area Population Projection				
		Residential		
Year	Population	Connections	ERUs	Total Study Area ERUs
2002	1,065	354	354	407
2007	1,252	420	420	483
2012 (1)	1,448	482	482	554
2017 (2)	2,393	797	797	916
2022 (3)	3,338	1,112	1,112	1,277
		Schools (4)		
Year		Population	Connections	ERUs
2002		825	1	41
2007		970	1	49
2012		1,122	1	56
2017		1,846	1	93
2022		2,587	1	129
		Commercial (5)		
Year			Connections	ERUs
2002			12	12
2007			N/A	14
2012			N/A	16
2017			N/A	26
2022			N/A	36

1. From Yacolt Wastewater Management Citizens Advisory Committee
2. From 1997 Wallis Engineering Report. Population increase is a result of entire study area on sewer system, instead of the town's population on septic systems.
3. Addition of 945 people over 5 years, same as between 2017 and 2012.
4. Based on .775 students per residential population in town.
5. Based on rate of residential growth.

Water Supply Facilities

Yacolt Water System

Clark Public Utilities (CPU) recently acquired the town's water system at the behest of the town. CPU is solely responsible for the operation, maintenance and improvement of the system. Four wells currently supply water to the system. A fifth well that has recently been constructed will soon be brought on-line. Four of the wells are located in the town's ballfield complex that lies on the north side of the community. The fifth operating well is located in the town park south of the community's core area. Two other wells, which are no longer in service, are also located in the town park. These wells have been abandoned using proper techniques to avoid groundwater contamination.

There are two ground-level water storage reservoirs located at a single site at the west end of the water system. The elevation of this site and capacity of the reservoir would introduce water to the system with a pressure of nearly 100 psi, which is too high, so a system of valves are used to reduce the pressure of water to an acceptable level. Both reservoirs are of reinforced concrete construction, covered and maintained in good condition. Each can be isolated from the water system allowing it to be removed from service for cleaning or inspection. The base elevation of each reservoir is 887.33 feet with overflows located at 907.33 feet.

The older of the two water storage facilities was constructed in 1975. It has a storage capacity of 500,000 gallons. The newer reservoir was constructed in 1991 and has a 300,000-gallon capacity—bringing the total water storage capacity for the system to 800,000 gallons.

The water distribution system is of relatively recent construction and has two pressure zones. The upper pressure zone consists of the well sources and storage reservoirs. This upper pressure zone is connected to the lower pressure zone through three pressure-reducing valves. There are no services connected to the upper pressure zone. The water distribution system consists of approximately 13 miles of pipeline. There are no pumping facilities in the system.

Private Wells

There is only one functioning private water supply well within the town limits. This well is used to supply water for irrigation and not used for domestic purposes, although it is a source of potable water. There are approximately 20 operating private wells outside the town limits but within the remainder of the wastewater management planning area, and there are additional private wells within the public water service territory outside the wastewater management planning area.

Natural Features

Climate

The climate in the Yacolt area is dominated by weather systems from the Pacific Ocean. This marine influence produces a generally mild, wet winter and a cool, dry summer. The total amount of precipitation in Yacolt is in the range of 80 inches per year. Most of the precipitation is in the form of rain. Snow occasionally falls between November and April and amounts to a total of approximately 20 inches annually. The area receives the most snowfall in January.

The strongest winds affecting Yacolt generally come from the southeast, south or southwest, and are accompanied by intense storm systems that pass through the area. Prevailing 5-mile per hour winds also blow from these southerly directions. However, large high pressure cells that move into the area during the summer month will bring winds from the north.

Temperatures in the Yacolt area may vary from below zero to about 100° Fahrenheit (F). Typically, the average annual temperature is 50 to 55° F; summer and winter averages are generally in the vicinity of 60 to 65° F and 40 to 45° F, respectively.

Topography

General topographic features in the vicinity of Yacolt are shown in Figure 2.3. Yacolt is located in a valley that is surrounded by hills of 1,000 feet in elevation or more. Forests, composed mostly of conifers, blanket the surrounding hills. Lowland grasses and bush with interspersed stands of conifer trees lie on the valley floor.

Surface Waters

Four streams drain the Yacolt valley (see Figure 2.3). There is a surface water divide along the north edge of the town limits. Cedar Creek drains areas north of this divide. It is an older drainage, flowing in a deep, meandering channel. Yacolt, Weaver and Big Tree creeks drain most of the valley south of the divide. These are all believed to be younger drainages, as evidenced by the shallow, straight channels of the streams.

The western and southern portions of the community drain to Yacolt Creek, the eastern portion drains to Weaver and Big Tree creeks, and the northern portion of the town drains to Cedar Creek. Yacolt, Big Tree and Weaver creeks join two miles south of town and their combined flows discharge to the East Fork near Moulton Falls. Cedar Creek meanders northwest and discharges to the North Fork of the Lewis River.

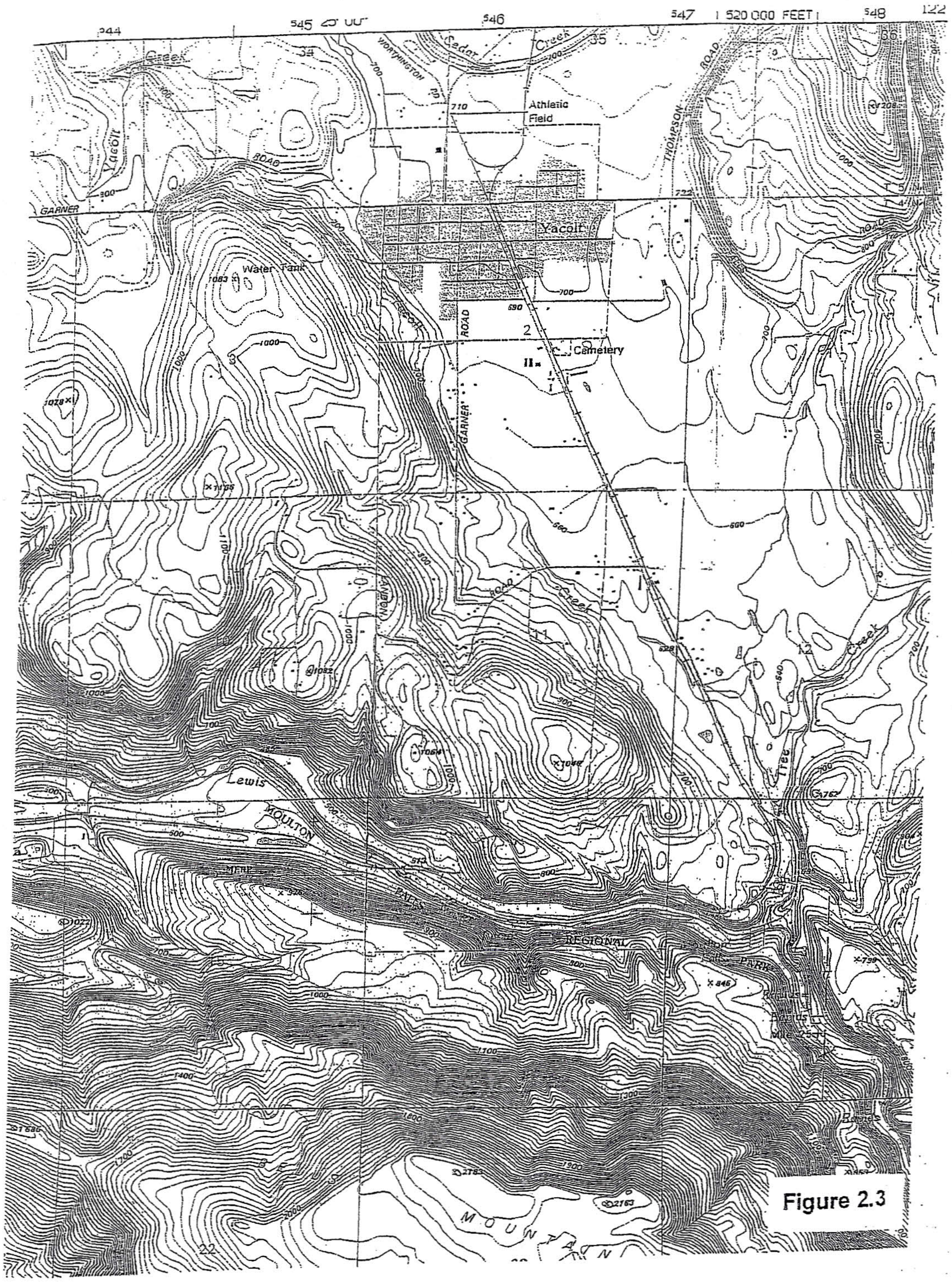
Geology and Soils

Soils in the Yacolt valley consist of unconsolidated sediments deposited by ancient streams and glacial activity. Sediments are a mixture of gravel and sand with variable percentages of silt. Except for a cobbly gravel zone overlying bedrock in the vicinity of the town's wellfield (Figure 2.3) no other distinct difference in sediment classification is discernible based on available information. This cobbly gravel zone is apparently thin and becomes fine grained in an easterly direction. Well profile information indicates that the total thickness of the unconsolidated sediments ranges from 60 to 120 feet. Sediments appear to thin toward the south end of the valley. (Additional discussion of Yacolt soils and their suitability for on-site disposal is provided in Chapter 4.)

Groundwater

The *Yacolt Hydrogeologic Study* conducted by Hart Crowser in 1996 identified a single confined aquifer, the Yacolt Aquifer, within the valley sediments. Because the valley sediments are a variable mix of gravel, sand and silt, the Yacolt Aquifer is also expected to exhibit variable characteristics across the valley. There is no low-permeability barrier (e.g., a silt barrier) that would impede groundwater flow; thus, all areas of the valley deposits act as a single groundwater unit. Although a Carr Associates report (*Hydrogeologic Study for Town of Yacolt Water System Improvements*, 1990) identified the cobbly gravel zone in the vicinity of the town's wellfield as a separate groundwater unit (referred to as the Gravel Aquifer), the Hart Crowser report notes that the Gravel Aquifer does not appear to be hydraulically differentiated from the Yacolt Aquifer; therefore, the Gravel Aquifer is treated as part of the Yacolt Aquifer for purposes of their study.

The depth to water contained in the Yacolt Aquifer varies with respect to location and the season. In the northern portion of the town seasonal water table depths between 45 and 75 feet have been observed. For the southern portion of the valley seasonal variations of 6 to 22 feet have been recorded. Wet-season groundwater recharge occurs primarily between mid-November and mid-January, whereas water levels drop more gradually during the dry season, typically from March or April through early November (Hart Crowser, 1996).



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The following excerpts from the Hart Crowser 1996 report describe other characteristics of Yacolt valley's groundwater:

- Cedar Creek and southern portions of Yacolt and Weaver Creeks are in direct hydraulic connection with the Yacolt Aquifer. As the water table rises during the wet season, longer reaches of both Yacolt and Weaver Creeks come into direct connection with the aquifer, but it appears improbable that the upper reaches of either creek are ever in direct connection with the water table.

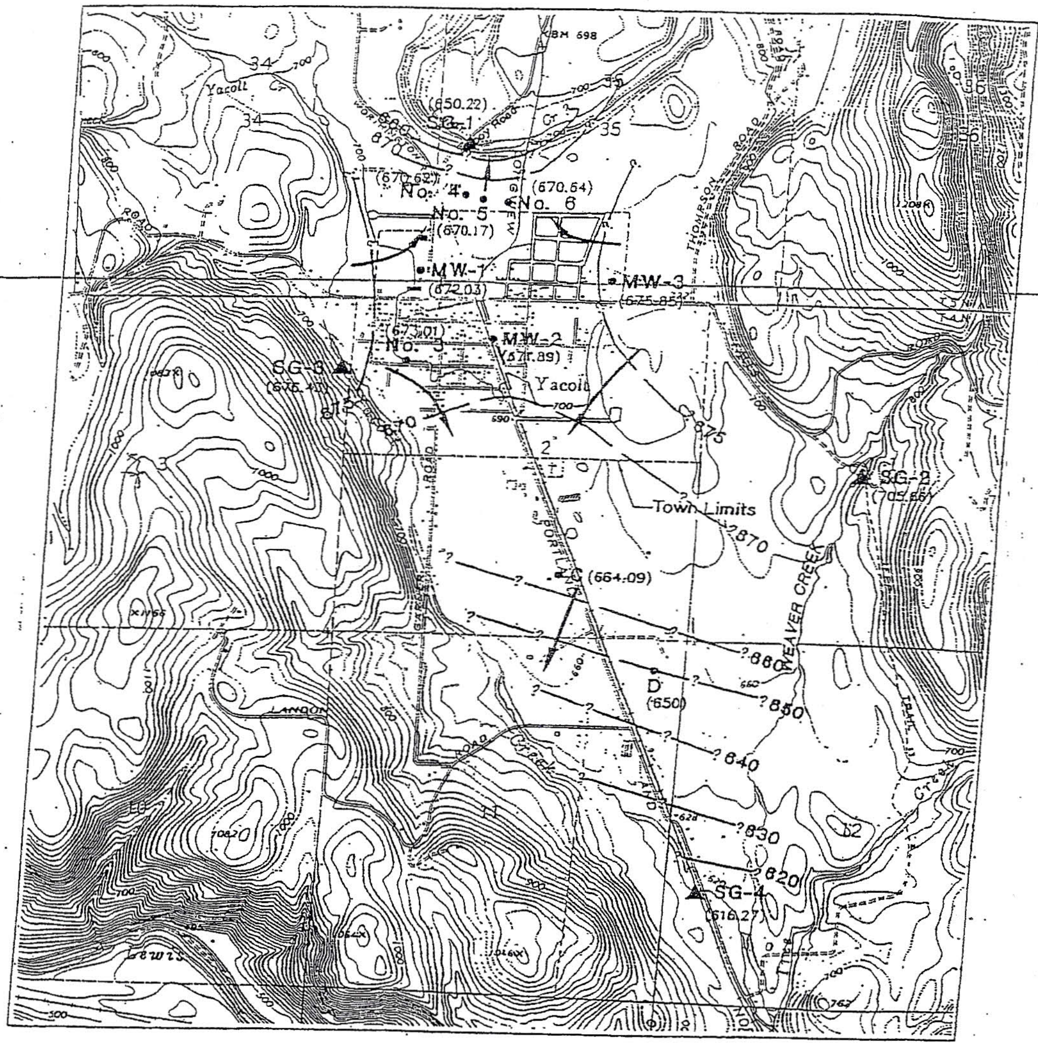
- Available data suggest that both Yacolt and Weaver Creeks are losing streams year-round in their upper reaches-likely recharging the Yacolt Aquifer by infiltration through their creek beds. Recharge/discharge relationships between the aquifer and creeks in their middle reaches are uncertain and likely vary seasonally. The Yacolt Aquifer appears to discharge year-round to Yacolt Creek, and possibly Weaver Creek, near their confluence at the south end of the study area.

- Throughout most of the year groundwater flow directions in the Yacolt Aquifer appear to be relatively consistent. From December through August, the water table surface beneath the town forms a saddle-higher near the recharge areas east and west of town and sloping away on both the north and south edges of town (see Figures 2.4 and 2.5). As a result, groundwater flows from both east and west of town toward the central portion of town and then diverges either to the north toward Cedar Creek or to the south down the valley, as indicated on the figures. The available data indicate that the localized east-west trending groundwater divide is near the center of the town limits.

South of town groundwater flows generally to the south, i.e., down the valley. More precise determinations of flow directions in the southern portion of the valley are not possible from the wells monitored during the study. However, assuming that Yacolt and Weaver Creeks in this portion of the valley are in hydraulic connection with the water table (as discussed above), lines of equal elevation drawn between the creeks indicate a slope toward the southeast. Because groundwater is relatively shallow in this area and the water table slope is likely to mimic the topographic slope, groundwater in the southern portion of the valley is inferred to flow generally toward the southeast (see Figures 2.4 and 2.5).

During the driest month(s) (lowest water table), the groundwater divide beneath the town disappears and the typical groundwater flow direction toward Cedar Creek reverses, flowing away from Cedar Creek (Figure 2.5). During the minimum water level condition, the water table remains higher east and west of town than in the town center, and Cedar Creek is also higher than the water table in the center of town. Therefore, groundwater flows from the west, north and east toward the south. Cedar Creek remains at a level above the adjacent water table only between approximately mid-September and mid-November; therefore, this groundwater flow direction reversal is of similarly limited duration, and there is little net recharge to the aquifer from Cedar Creek.

Water Table Elevation Contour Map
January 1995



• MW-1 Well Location and Number

▲ SG-1 Staff Gage Location and Number

(650.22) Spot Water Table or Stream Elevation in Feet

—820— Water Table Elevation Contour in Feet

⟵ Generalized Groundwater Flow Direction

------- Approximate Location of Groundwater Divide

Note: Base map prepared from USGS 7.5 minute quadrangle maps of Yacolt and Amboy, Washington, dated 1971, and street map provided by Town of Yacolt, dated March 1994. Data collected on January 4, 1995.

N

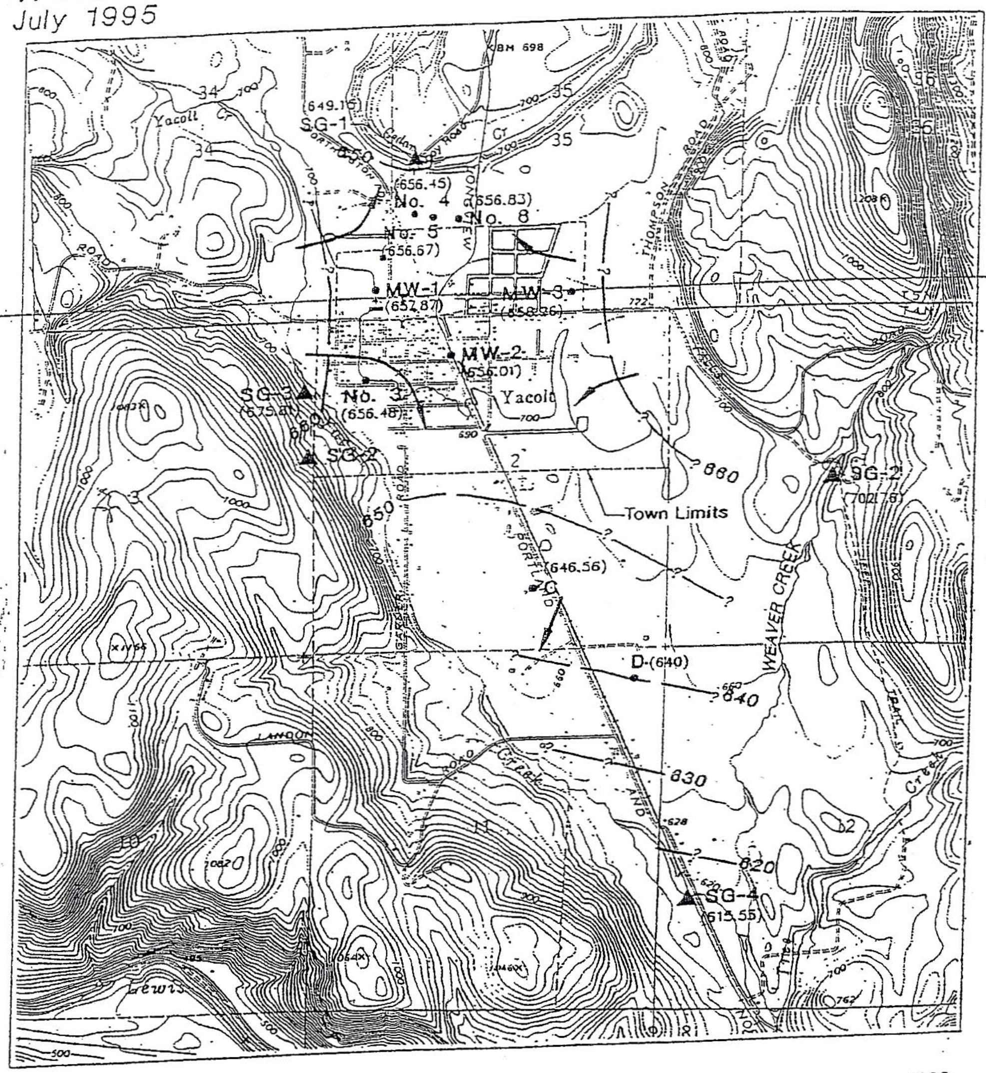
0 2000 4000
Scale in Feet

HARTCROWSER
J-4234 1/96

Figure 2.4

EES Consulting, Inc. PACWEST CENTER 1211 SW FIFTH AVE., SUITE 2902 PORTLAND, OREGON 97204 Ph. (503) 223-5900 FAX (503) 223-5999	REVIEWED BY: DESIGN BY: LHO APR'D BY: LHO DRAWN BY: DT DATE: 11/28/01 FILE:	FIGURE 2.4 WATER TABLE ELEVATION CONTOUR MAP JANUARY 1995 SCALE: NA DWG. NO.

Water Table Elevation Contour Map
July 1995



- ● MW-1 — Well Location and Number
- ▲ SG-1 — Staff Gage Location and Number
- (650.22) — Spot Water Table or Stream Elevation in Feet
- —820— — Water Table Elevaton Contour in Feet
- ← — Generalized Groundwater Flow Direction
- - - - - - - — Approximate Location of Groundwater Divide

Note: Base map prepared from USGS 7.5 minute quadrangle maps of Yacolt and Amboy, Washington, dated 1971, and street map provided by Town of Yacolt, dated March 1994. Data collected on June 26, 1995.

0 2000 4000
Scale in Feet

N

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J-4234 1/96
Figure 2.5

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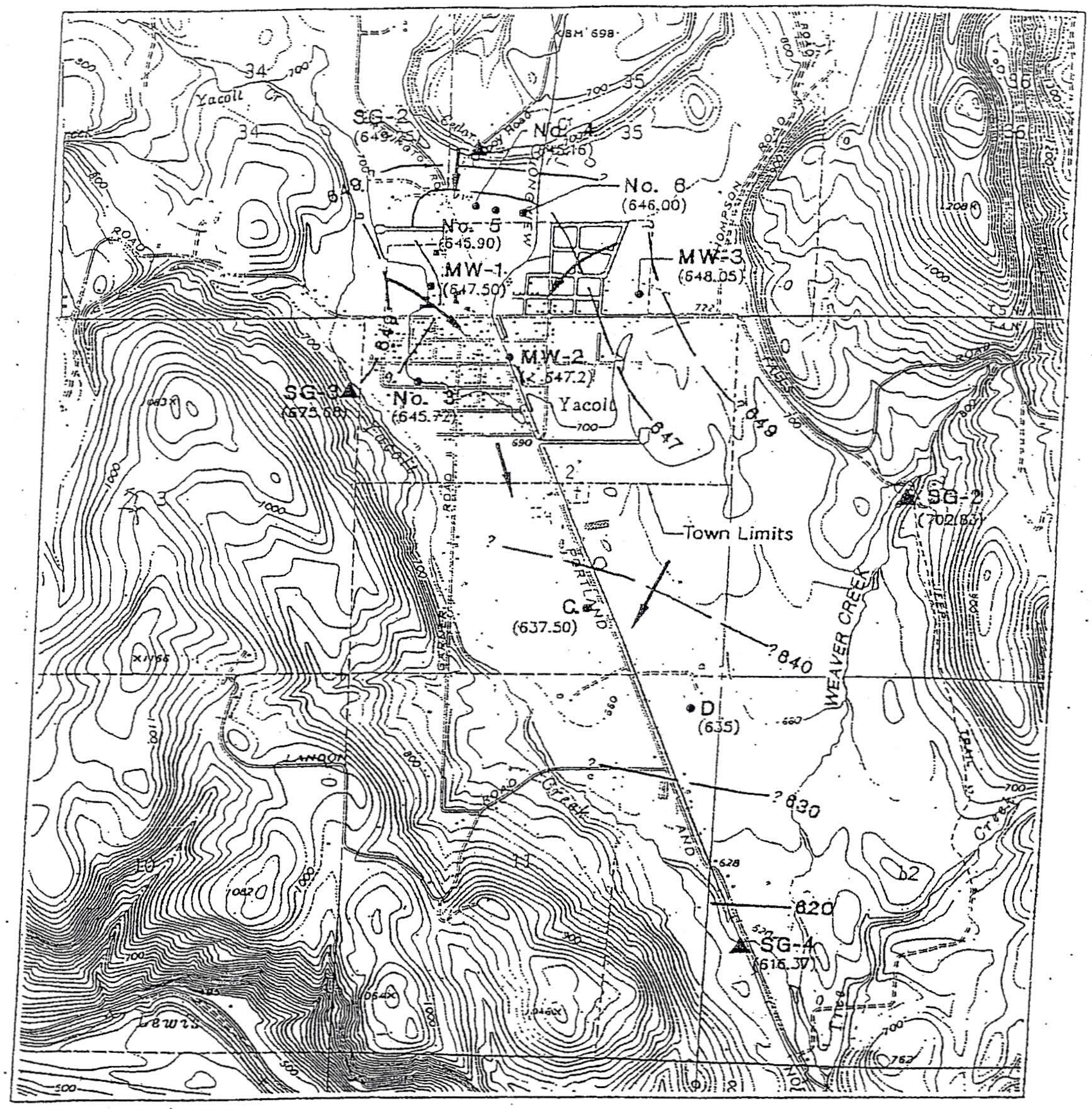
FIGURE 2.5
WATER TABLE ELEVATION CONTOUR MAP
JULY 1995

SCALE:	DWG. NO.
NA	

Water Table Elevation Contour Map
October 1995



● MW-1 Well Location and Number

▲ SG-1 Staff Gage Location and Number

(650.22) Spot Water Table or Stream Elevation in Feet

—820— Water Table Elevaton Contour in Feet

◄— Generalized Groundwater Flow Direction

0 2000 4000

Scale in Feet

N

HARTCROWSER

J-4234 1/96

Note: Base map prepared from USGS 7.5 minute quadrangle maps of Yacolt and Amboy, Washington, dated 1971, and street map provided by Town of Yacolt, dated March 1994. Data collected on October 4, 1995.

Figure 2.6

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FIGURE 2.6

WATER TABLE ELEVATION CONTOUR MAP

OCTOBER 1995

SCALE:	DWG. NO.
NA	

Future Wastewater Management Needs

Conflict with GMA

As presented in the previous section—*Relationship of the General Sewer Plan to GMA Requirements*—there is a conflict between the planning goals under GMA and the permissible lot size for use of on-site wastewater disposal specified by the Southwest Washington Health District. Many of the existing lots in Yacolt are 5,000 to 6,000 square feet, while residential zoning within the town specifies lot sizes of 10,000 to 12,500 square feet. The minimum lot size allowed by the health district for residential septic systems is 18,000 square feet. Hence, development at urban densities recognized under GMA cannot be achieved in the town with the use of on-site wastewater disposal technologies currently approved by the state. A public wastewater management system is necessary in order to permit future development at urban densities.

Economic Considerations

Yacolt is a small community with a limited tax base. (The current total assessed valuation of taxable properties within the town limits is $39,697,821. The town will receive $118,215 in property tax revenue during year 2001.) It must receive outside funding assistance in order to construct wastewater collection and treatment infrastructure, and to take on the even greater long-term costs associated with operating the system. The town is confronted with a conundrum: It must grow and develop an economic base in order to support the cost of constructing and operating a sewer system, yet it is unable to grow without at least a publicly administered wastewater management program, given the restrictions imposed by GMA and other rules.

The town is concerned about its lack of economic opportunity, and continuously prospects for economic development, as indicated by the following goal and policies expressed in the town's comprehensive plan.

Goal: Provide land use opportunities that encourage the diversification of the economic base of Yacolt; promote economic opportunity for all residents, including unemployed and disadvantaged persons.

Policy: Facilitate orderly long-term commercial and industrial growth and an adequate supply of land suitable for compatible commercial and industrial development.

Policy: Encourage the location of new businesses that are acceptable to the community within the urban growth area in order to provide greater local employment opportunities and broaden the economic base of Yacolt. Encourage the location and retention of employers who will increase the standard of living in the community.

Among the factors that have stymied the location of business and industries in the community is the absence of a public sewer system or at least a publicly administered wastewater management program. A public sewer system is, indeed, essential to the location of certain economic activities.

Groundwater Quality

On-site disposal systems have impacted groundwater quality, although not to the point where health issues or the state's anti-degradation policy under groundwater standards require enforcement action. Only nitrate has been identified as a constituent of concern. A public sewer system would remove existing sources of septic system discharges and eliminate the possibility of future releases (see Chapter 3).

Need for a Wastewater Management Utility

Whatever method or combination of methods is selected to manage wastewater generated in the community will require administrative oversight. An existing public agency, a new entity, or a framework of agencies working in concert with one another may administer the wastewater management program. A local utility could be established, at least initially, to ensure proper use and maintenance of existing private on-site wastewater disposal systems. The utility could partner with the town, Southwest Washington Health District and, perhaps, Clark Public Utilities to distribute information to residents regarding proper use of septic systems with respect to protecting public health and the environment; provide incentives for proper use and maintenance of systems; and establish a framework for enforcing compliance with pertinent regulations. The utility could assist in assembling financial resources to support the phased construction of a wastewater collection and treatment facilities, and in fostering the orderly transition of the program to the agency that would ultimately manage the public sewer system.

Chapter 3- Existing On-Site Disposal

On-Site Disposal Facilities

As noted in Chapter 2, residences in the Yacolt planning area are served by individual septic tanks and drainfields, and so, too, are institutional and commercial wastewater generators. All of these land use activities are typically found in small towns. These uses are of the type and scale that generate wastewater of a domestic nature. There are no cesspools in town.

Within the town limits there are 354 housing units on septic systems. There are no large-scale multi-family housing complexes. The Yacolt Primary School is served by a large on-site system (LOSS) that was designed for 825 people at a flow of 5,200 gallons per day (gpd). The school's LOSS is approved and regulated by the Washington Department of Health.

Outside of the town limits, but within the planning area, there are 20 homes on septic tanks. Aside from the school, there is no other large-scale commercial or institutional generator of wastewater.

Water Quality Considerations

When properly designed, installed and maintained, on-site disposal systems provide a low-cost means of partially treating domestic wastewaters. In addition to removing material that readily settles, biological activity decomposes the settled material, changing its character and reducing its volume. The liquid that remains for disposal to the soil via a drainfield contains various hazardous constituents, e.g., pathogenic viruses and bacteria, and chemicals such as ammonia, that receive further treatment within the soil itself.

Previous studies addressed the impact of the town's on-site disposal systems on groundwater quality. The town's *Wellhead Protection Plan*, July 1993, notes that with regard to potential contamination of the town's water supply wells, nitrate from septic system discharge is the primary constituent of concern. The plan also assessed the significance of other potential contaminants, including pathogens. Table 3.1 presents wellhead protection strategies related to septic systems that were recommended for implementation. The town has made some effort to educate the community about the proper use of septic systems. Most new housing units have been sited on lots that are large enough to support individual septic systems, owing to recent changes in development regulations imposed by the local zoning code and the Southwest Washington Health District. Other wellhead protection strategies have yet to be implemented.

The 1996 Hart Crowser study evaluated existing and potential future impact of septic system discharge, principally nitrate, on groundwater quality. The evaluation was based on the analysis of groundwater sampled from monitoring wells that were constructed specifically for the study, as well as from the town's water supply wells. Water quality was assessed against state groundwater quality standards (WAC 173-200).

Table 3.1 Septic Tank Wellhead Protection Strategy					
	Type of Strategy		**Recommendation**		
	Regulatory/ Institutional	**Educational/ Voluntary**	**Within Six Months**	**Within One Year**	**Within Five Years**
#1 Provide information to encourage proper system use.		X			
#2 Increase lot size limitations to decrease system density.	X				
#3 Increase septic system setbacks from public and private wells to avoid groundwater contact with septic effluent.	X		Not recommended–existing protection adequate	Not recommended–existing protection adequate	Not recommended–existing protection adequate
#4 Establish a nitrate warning level to allow for early action in the event of increase nitrate contamination.	X				
#5 Source prohibition (i.e., eliminate local sale of solvent-based septic system cleaners).	X				
#6 Encourage water conservation to eliminate excessive waste water and increase system life.		X			
#7 Pursue system inspection and maintenance program.	X				
#8 Require water conservation measures or all new construction.	X				

Source: *Wellhead Protection Plan for the Town of Yacolt*, July 1993.

Table 3.2 summarizes nitrate concentrations reported in the 1996 Hart Crowser study. Two monitoring wells constructed specifically for the study reveal the innate quality of groundwater in the area. These monitoring well were located where they were least likely to be affected by discharge from septic systems. Nitrate in water sampled from these wells measured between 0.1 and 0.39 mg/L, with an average of 0.14 mg/L. The town wells, a private domestic well and a monitoring well were sampled to obtain information on nitrate concentrations in groundwater below the town—locations that may be affected by septic system discharge. Nitrate in water sampled from these wells measured between 0.1 and 3.1 mg/L, with an average of 1.6 mg/L.

To determine the impact of the town's septic system discharges on existing groundwater quality, procedures presented in the groundwater quality standards were followed. In particular, the anti-degradation policy of the state groundwater standards was applied because measured nitrate concentrations were below the health-based standard of 10 mg/L set by the Environmental Protection Agency. As applied to wastewater treatment by septic systems in Yacolt, the anti-degradation policy requires 1) maintenance and protection of groundwater as a drinking water source; and 2) that existing groundwater quality not be degraded unless all known, available and reasonable treatment is applied to the wastewater and the overriding public interest will be served.

The Hart Crowser report concluded that the urban growth area could safely support only a modest share of the additional population growth projected to occur in the area over a 10-year period (1996 through 2006), without a publicly administered wastewater management program. It also noted that a centralized wastewater treatment plant would offset predicted potential water quality impacts, and that Yacolt should have a reasonable time horizon of several years to transition from on-site disposal to a public wastewater management system.

Septic System Inspection and Maintenance

The Southwest Washington Health District requires individual subsurface wastewater disposal systems to be inspected or pumped at least once every four years. A licensed inspector must conduct the inspection at least every other time an inspection is due, i.e., unless the system has been pumped, a licensed inspector must examine a system once every eight years. The health district recommends annual inspection of systems that involve pumps to force the dispersal of treated wastewater into drainfields. The district provides property owners with a list of licensed septic system inspectors and qualified commercial septic tank pumping outfits. Septic tank inspection records are filed with the district and the town.

Table 3.2
Nitrate Concentrations in the Yacolt Aquifer

Representation	Number of Measurements	Sample Period	Nitrate mg/l	
			Range	Average
Natural Quality	8	January to October 1995	0.1 – 0.39	0.14
Existing Quality	24	April 1984 to October 1995	0.1 – 3.1	1.60

Source*:* *Yacolt Hydrogeologic Study*, Hart Crowser, 1996

Chapter 4- Wastewater Management Alternatives

Courses of Action

Alternatives for managing the town's wastewater are presented in the *Yacolt Sewer Feasibility Study* prepared by Wallis Engineering, February 1997, and the report on the *Yacolt Wastewater Management Project* prepared under the direction of a citizen advisory committee appointed by the Yacolt Town Council, December 1999. After analyzing the alternatives, EES Consulting amalgamated them into the five possible actions listed below:

- No Action
- Existing Onsite Septic Management – existing onsite septic wastewater disposal systems would continue to be utilized, under the oversight of a locally managed program providing for the stringent inspection and maintenance of onsite wastewater disposal systems throughout the community.
- Advanced Septic Management Program - Existing onsite septic and other onsite wastewater disposal systems that provide advanced treatment would be utilized, under the oversight of a locally managed program providing for the stringent inspection and maintenance of onsite wastewater disposal systems throughout the community.
- Long-Term Sewer Plan - Existing onsite wastewater disposal systems would continue to be utilized on an interim basis, while a public sewer system is planned and constructed. No program established providing for the stringent inspection and maintenance of onsite systems.
- Short-Term Septic Maintenance and Long-Term Sewer Plan - Existing onsite septic systems would continue to be utilized on an interim basis, under the oversight of a locally managed program providing for the stringent inspection and maintenance of onsite wastewater disposal systems throughout the community, while a public sewer system is planned and constructed.

More detailed descriptions of the five alternatives courses of actions follow. Remarks pertaining to various elements of the proposed actions are also provided.

No Action

- Onsite septic systems would continue to be utilized. The onsite systems may serve individual lots and clusters of lots. The same types of septic systems may serve new developments.

- Onsite wastewater disposal systems would continue to be inspected and maintained under Southwest Washington Health District's relatively lenient program, which requires an onsite system to be inspected or pumped only once every four years.

- No public sewer system would be planned for the foreseeable future.

Existing Onsite Septic Management Program

- Existing properly functioning onsite septic systems would continue to be utilized. The same types of septic systems may serve new developments.

- A locally managed ongoing program would be established that provides for the stringent inspection and maintenance of onsite wastewater disposal systems throughout the community. (Alternative organizational frameworks for the management of the onsite system inspection and maintenance program are described in the next section of this Chapter.)

- Improperly functioning onsite septic systems would be repaired or replaced in-kind, i.e., removal of nitrate and/or ammonia from system discharge would not be required (see Alternative 3). Repaired or replaced systems may continue to serve individual lots or clusters of lots.

- No public sewer system would be planned for the foreseeable future.

Advanced Septic Management Program

- Existing properly functioning onsite septic systems would continue to be utilized.

- A locally managed ongoing program would be established that provides for the stringent inspection and maintenance of onsite wastewater disposal systems.

- Existing improperly functioning onsite septic systems would be retrofitted or replaced by onsite systems that would provide for removal of nitrate and/or ammonia from the discharge. The retrofitted or replacement onsite systems may serve individual lots and clusters of lots. Examples of these systems appear in the Appendix.

- Financial support would be provided to financially disadvantaged homeowners to cover a portion of the cost of upgrading onsite systems to provide for nitrate and/or ammonia removal from discharge. The town or a local utility in cooperation with the town would define thresholds for financial hardship. It is suggested that the financial hardship thresholds correspond with the low- and moderate-income thresholds defined by the US Department of Housing & Urban Development, to enable possible CDBG assistance for septic system upgrades.

- New developments would be served by onsite wastewater disposal systems that provide for nitrate and/or ammonia removal from discharge.

- No public sewer system would be planned for the foreseeable future.

Long-Term Sewer Plan

- The town would work as swiftly as possible to plan and construct a public sewer system.

- Existing septic systems would be utilized on an interim basis, while a public sewer system is being developed. The same types of septic systems may serve new developments in the interim.

- No program would be established that provides for the stringent inspection and maintenance of onsite wastewater disposal systems, while the public sewer system is being developed.

Short-Term Septic Maintenance and Long-Term Sewer Plan

- Existing septic systems would be utilized on an interim basis, while a public sewer system is being developed. The same types of septic systems may serve new developments in the interim.

- A locally managed program would be established that provides for the stringent inspection and maintenance of onsite wastewater disposal systems in the interim.

- Existing improperly functioning onsite septic systems would be repaired or replaced in-kind (i.e., onsite systems would not be required to provide for removal of nitrogen from septic system discharge) and utilized in the interim.

- One of the following general types of sewer systems would be designed and constructed. Alternatives for wastewater collection and treatment systems under each general type of system will be described in Chapter 5.

    a. Small-diameter public sewer system that would convey septic tank effluent via a gravity or pumped system to a wastewater treatment facility. Existing septic systems would be retrofitted with an additional tank providing for discharge of effluent to the public sewer collection system.

    b. Regular gravity sewer system that would convey sewage to a wastewater treatment facility.

Recommended Course of Action – *Short-term Septic Maintenance and Long-Term Sewer Plan*

Existing onsite septic systems would continue to be utilized on an interim basis, under the oversight of a locally managed program providing for the stringent inspection and maintenance of onsite wastewater disposal systems throughout the community, while a public sewer system is planned and constructed.

If Yacolt continues to depend solely upon onsite wastewater disposal systems, groundwater would continue to be at risk of contamination and, hence, the threat to public health would continue unabated. Even if systems that provide for advanced onsite treatment of wastewater were phased into the mix of onsite systems serving the community, the risk of groundwater contamination from onsite systems, although diminished in the near-term, would not be eliminated. The need for a public sewer system would be merely postponed.

Yacolt needs to be served by a public sewer system, but the town is not capable of quickly assembling the financing resources necessary to cover the cost of constructing and operating a sewer system. It will take time for the community to plan the sewer system and build a framework for financing, managing and operating the system. During this time the community will need to continue to depend upon properly functioning onsite wastewater disposal systems. A locally managed program should be established providing for the stringent inspection and maintenance of onsite wastewater disposal systems throughout the community to insure that onsite systems function properly, while a public sewer system is developed.

Consideration was given to requiring all replacement and new onsite systems to provide for the removal of nitrogen from the discharge, while a plan is advanced for a public sewer system, but this course of action was rejected. It would be difficult to justify requiring residents to incur the expense of onsite systems that provide for advanced treatment of wastewater, knowing that they will be required to connect to a sewer system sooner or later, especially without a clearly present health risk from conventional septic system discharge.

Septic Tank Inspection and Maintenance

Southwest Washington Health District conducts a relatively lenient onsite wastewater disposal system inspection and maintenance program. The health district requires individual subsurface wastewater disposal systems to be inspected or pumped at least once every four years. A licensed inspector must conduct the inspection at least every other time an inspection is due, i.e., unless the system has been pumped, a licensed inspector must examine a system once every eight years. The district provides property owners with a list of licensed septic system inspectors and qualified commercial septic tank pumping outfits. Septic tank inspection records are filed with the district and the town.

Several of the alternative courses of action involve the establishment of a locally managed, stringent community-wide onsite wastewater disposal system inspection and maintenance program. This program would involve more frequent, rigorous inspection and maintenance of systems than the health district's program. The locally managed inspection and maintenance program will address the following:

Design

The local wastewater management authority must approve the design for a new onsite wastewater disposal system prior to the construction of system. Elements of the design must include the following:

- Location and detail of the access ports on the laterals.

- Detail of pump controls, floats and the position of floats.
- Electrical wiring diagram specific to the facility.
- System parameters and calculations used by the designer to arrive at the component sizing and flow distribution described in the design.
- User's manual for pressure distribution system, which is provided to the homeowner, the local wastewater management agency and the health district. The designer is responsible for the document; however, it may be prepared in cooperation with the installer and submitted with the *as-built* information.

As-Built Information

The as-built description must contain the following as a minimum. The presence of the proper as-built drawings will be verified during each inspection of the system and serve as a guide in inspecting the facility.

- All elements contained in the design submittal as installed, identifying any changes from the approved design.
- The measured drawdown per dose cycle.
- Timer functions.
- Residual pressure and/or squirt height at the end of each lateral, as inspected.
- Pump run and rest times.

User's Manual

The user's manual is provided with the submittal of the design for a new onsite wastewater disposal system. The presence of the proper manual will be verified during each inspection of the system and serve as a guide in inspecting the facility.

- Diagram of the onsite system components.
- General explanation of the function of the system, operational expectations, owner responsibilities, etc.
- Specifications of all operating electrical and mechanical components (occasionally components other than those specified in the original design are present).
- Names and telephone numbers of the system designer, health district, component manufacturers, supplier/installer, and/or the local wastewater disposal management authority, which would be contacted in the event of a mishap.

- Information on the periodic maintenance requirements of the various components of the onsite system.

- Information on troubleshooting common operational problems. This information should be clearly stated to assist the owner of the system in making appropriate decisions about when and how to correct operational problems, and when to call for technical advice or direct assistance.

Operating and Maintenance

The frequency of monitoring and maintaining an onsite wastewater disposal system may vary depending upon the site, soil characteristics and pattern of use. However, it is recommended that a system's drainfield, laterals, pumping cycle, alarm system, and septic tank and pump chamber be inspected and serviced, if necessary, after the first six months of operation and then inspected annually. The property owner, local wastewater management authority and the health district would be informed of the problems identified by the inspections, if any, and the appropriate corrective actions. The following items would be addressed during the inspections:

Drainfield Area

- Indications of surfacing effluent.

- Appropriate vegetation, landscaping impacts, ponds, etc.

- Absence of heavy vehicular traffic.

- Inappropriate structures.

- Impervious materials or surfaces.

- Abnormal ground settling or erosion.

Laterals

- Residual pressure at distal ends. Pressure values that differ from those described in the as-built design may indicate the need for lateral and orifice cleaning.

- Equal flow in each lateral.

- Need for lateral and orifice cleaning, notwithstanding the cause.

Pump Cycle and Drawdown

Values that differ from those described in the as-built design may indicate incorrect pump timer control settings and/ or the need for lateral and orifices cleaning.

Alarm System

Test that the alarm signals high and low fluid levels.

Septic Tank Pump Chamber

- Sludge and scum accumulations. The tank requires pumping when the thickness of deposits exceeds one-third of the camber's depth. (Typical criteria: 12 inches or less from the top of sludge to bottom of outlet baffle; 3 inches or less from the bottom of the scum mat to the bottom of the outlet baffle.)

- Clogs, damage and proper placement of outlet baffle screen.

- Tank and riser leaks.

- Above grade and secure risers and lids.

- Unrestricted operation and proper positioning of instrument triggering floats.

Note: Information and recommendations for conducting a pressure test and inspecting a septic tank pressure distribution system appear in the Appendix.

Onsite Wastewater Management Authority

When onsite systems are used on large lots, failure of some individual systems may not pose a serious public health risk. However, as development densities increase and lot sizes become smaller, failure of even a modest number of onsite systems (due to improper use, inadequate maintenance, undersized drain-fields or a combination of these factors) can pose significant risks to the environment and public health. This is especially true in communities such as Yacolt that depend upon groundwater for their drinking water supply. To insure that onsite wastewater disposal systems will function properly, it is prudent to shift the responsibility for inspecting and managing onsite systems to an organization or agency that has the interest of the entire community in mind—a local wastewater management authority that fosters the reliability of onsite systems.

Whatever method or combination of methods is selected to manage wastewater generated in the community will require administrative oversight. An existing public agency, a new entity, or a framework of agencies working in concert with one another may administer the wastewater management program. The management organization may also operate a public sewer system that may be constructed in the future. The functions of an onsite wastewater management authority will vary depending on the legal framework under which the authority is formed. The following may be among the powers and functions a management authority:

- Approve individual onsite systems designs, and inspect construction of systems.

- Annual or semi-annual inspection of each onsite system in the district.

- Issue permits to operate, citations and abatement orders on failed systems.
- Schedule routine monitoring, inspecting and pumping of septic tanks.
- Employ or obtain access to appropriate technical or professional personnel.
- Own and operate wastewater facilities.
- Authority to access private property to inspect systems and correct malfunctions.
- Levy fees and assessments on properties and invoice property owners for expenses.
- Acquire property by purchase, grant or lease.
- The authority to plan and control how and when wastewater services will be provided within the community.
- Apply for and receive public funds to build wastewater facilities.
- Incur debt obligations.
- Contract and delegate responsibilities to qualified persons or firms for the performance of any or all management functions.

Onsite Wastewater Management Authority Options

Town of Yacolt

Yacolt could perform the functions of an onsite wastewater management authority. It could adopt the ordinances necessary to establish a strong inspection and maintenance program—one with sufficient enforcement authority to require homeowner compliance. The town would need to hire or otherwise retain qualified staff to administer the program, conduct onsite system inspections, etc. Taking on this new, rather complex program may tax the town's administrative framework, which is currently rather rudimentary and not designed to support more than the few services currently provided by the town.

Private for Profit Corporations

The town may contract with a private enterprise to perform onsite wastewater management functions. Alternatively, a residential housing developer or pool of developers may form a private corporation to perform onsite wastewater management functions and be the legal entity responsible for the ongoing, long-term performance of the onsite systems. The town could use its franchising authority to insure that a private nonprofit corporation provides an acceptable level of service for reasonable fees.

Public and Private Nonprofit Corporations

The town could foster the establishment of a public or private nonprofit corporation to perform onsite wastewater management functions. A public nonprofit corporation may be organized and controlled by the creating governing body, i.e., the town. A private nonprofit corporation would be created and controlled by a private party or parties. Rural cooperatives and homeowner associations are examples of nonprofit private corporations. Again, the town could use its franchising authority to insure that a private nonprofit corporation provides acceptable service for reasonable fees.

Public Authority

The town could establish a state-chartered public authority to perform onsite wastewater management functions, as well as finance, construct, own and operate a public sewer system. It would function independently from the town, but upon dissolution of the public authority, its assets could revert to the town. The public authority would be a new organization, which means it would need to work through the process of establishing an administrative framework, and hiring or otherwise retaining staff to carry out the functions of the program.

Special Purpose Agencies

The town could designate an existing agency or establish a new special purpose agency to perform onsite wastewater management functions, as well as finance, construct, own and operate a public sewer system. Yacolt could designate or establish a new agency to serve as the wastewater management authority within the corporate limits of the town. Clark County would be involved in designating or establishing the wastewater management authority, if the agency's service area extended beyond the town limits.

A local utility district is one type of special purpose agency that could be established. It would have its own governing board. A local improvement district is another. Town Council would serve as its governing board, provided its service area is within the town limits. If a new agency were formed for this purpose, it would no doubt experience the throes of establishing an administrative framework, and hiring or otherwise retaining qualified staff to carry out the functions of the program.

Recommended Wastewater Management Authority—*A New Utility District under the Auspices of Clark Public Utilities.*

It is recommended that Yacolt and Clark County ask Clark Public Utilities (Clark) to establish a new local utility district to administer the onsite wastewater management program for the Yacolt community. RCW 54.16.310 authorizes a public utility district to administer such a program. The service territory of the utility district would include Yacolt's wastewater management planning area, which is described in Chapter 2 of this plan. It would include the town of Yacolt and unincorporated properties south of the town limits.

Clark's wastewater management utility serving the Yacolt community could administer the inspection of onsite wastewater disposal systems. It could partner with the town and the health district to distribute information to residents regarding proper use of septic systems with respect to protecting public health and the environment; provide incentives for proper use and maintenance of systems; and establish a framework for enforcing compliance with pertinent regulations. Clark could assist in assembling financial resources to support the phased construction of a public sewer system, and in fostering the orderly transition of system to the agency that would ultimately own and operate it.

Yacolt may consider the prospect of Clark owning and operating the sewer system that will serve its community. RCW 54.16.230 authorizes a public utility district to own and operate public sewer systems, with voter approval. In 1989, an election was conducted and Clark received the approval of Clark County voters to operate public sewer systems in the county. Clark currently owns and operates the sewer system serving the city of La Center.

Chapter 5-Sewer and Treatment Plant Alternatives

Introduction

This section of the report discusses alternatives for a future sanitary sewer collection system, treatment facility and disposal. The purpose of this exercise is to identify feasible alternatives and probable costs associated with the alternatives so that a capital improvement program can be developed and financial aid can be sought for the town. Many of the alternatives presented in this Chapter were developed for the town in two previous reports.

- Yacolt Sewer Feasibility Study, February 1997, by Wallis Engineers
- Yacolt Wastewater Feasibility/Engineering Report, December 1999, Yacolt Wastewater Management Project Citizen's Advisory Committee

In addition, alternatives for treatment and disposal were included from recently constructed facilities at similar size cities where disposal options are limited.

Planning Criteria

Planning criteria used for collection, treatment and disposal alternatives development are shown in Table 5.1.

Table 5.1
Planning Criteria for Yacolt Sewer System

	2002	2007	2012	2017	2022
Population (1)	1,065	1,252	1,448	2,393	3,338
Residential ERUs	354	420	482	797	1,112
Commercial ERUs	12	14	16	26	36
Public Facility ERUs (2)	41	49	56	93	129
Industrial ERUs	0	0	0	0	0
Total ERUs	407	483	554	916	1,277
Gravity					
Average Daily Flow, gal (3)	95,700	113,570	130,264	215,384	300,095
Peak Monthly Flow, gal (4)	185,700	203,570	220,264	305,383	390,095
Peak Daily Flow (4)	287,100	340,710	390,795	646,152	900,285
Step					
Average Daily Flow, gall/day (7)	65,700	82,200	95,090	157,150	219,200
Peak Monthly Flow, gal/day (7)	120,700	142,000	164,100	271,200	378,300
Peak Daily Flow, gal/day (7)	131,400	164,400	190,180	314,300	438,400
Average Month BOD, lbs/day (5)	240	290	332	550	766
Average Month TSS, lbs/day (6)	240	290	332	550	766
Peak Month BOD, lbs/day (5)	355	406	465	836	1,073
Peak Month TSS, lbs/day (6)	359	435	498	896	1,149
Peak Day BOD, lbs/day (5)	551	667	764	1,264	1,762
Peak Day TSS, lbs/day (6)	599	725	830	1,374	1,916

1. Population projection is a straight line increase based on projected population of 1,500 in 2012.
2. Based on school ERUs of 1 per 20 students. Increase projected the same as population.
3. From Wallis, 1997.
4. I/I contribution 90,000 gal/day. Hydraulic peaking 3.0. From LaCenter Sewer Plan, for gravity sewer alternative only.
5. Based on peaking factors of 1.4 and 2.3, per capita loading 0.2 ppcd.
6. Based on peaking factors of 1.5 and 2.5, per capita loading 0.2 ppcd.
7. From Mill City, Oregon Step System Design, October 1990.

For potential discharge requirements, it is expected that, Ecology would impose fairly strict criteria, if a discharge were allowed at all. Discharge criteria used for planning purposes are shown in Table 5.2

Table 5.2 Planning Discharge Concentrations for Yacolt	
BOD	< 10 mg/L
TSS	< 10 mg/L
Nitrogen	< 1 mg/L
Chlorine	< 0.1 mg/L

Collection System Alternatives

There are two general approaches to collecting sanitary waste from residences and commercial buildings in the town.

- Collection of pumped effluent from septic tanks, or
- Director connection of sanitary waste lines to a sewer.

Alternative Collection Systems

The Wallis (1997) report examined three sewer collection alternatives, including a conventional gravity system, a small-diameter variable grade (VGS), and a small diameter pressure system, called a septic tank effluent pumping (STEP) system. The report recommended a conventional gravity sewer that was comprised of approximately 33,00 lineal feet of gravity main and 1,750 feet of force main. The cost of the sewer system was estimated at $70/foot including manholes and service laterals. The total cost was estimated at $2,362,500, plus $1,000 per service connection (See Figure 5.1).

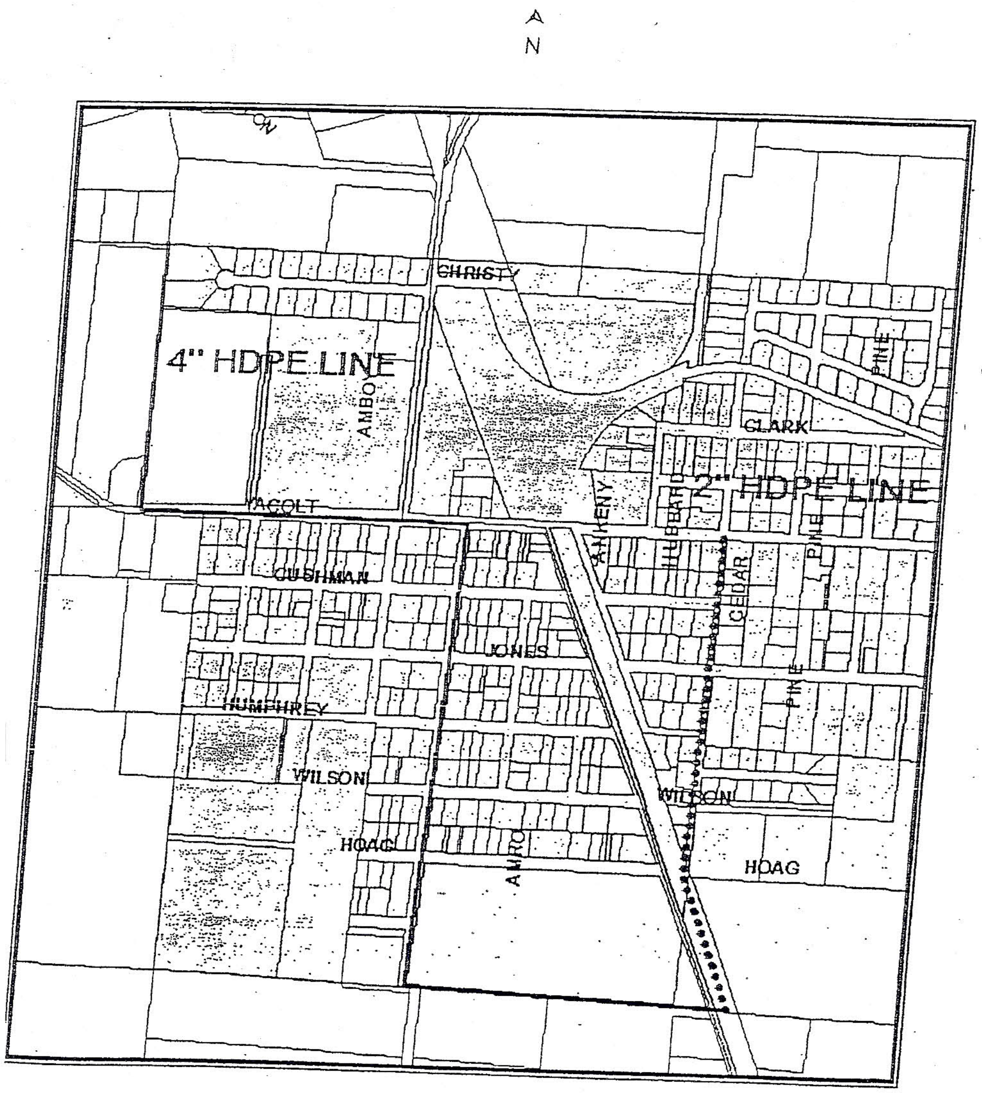
In 1999, the report evaluated a conventional gravity sewer, a STEP collection system and a septic tank effluent gravity (STEG) system. This report recommended a combination STEP and STEG system which was partially laid out in Figure 5.2. If the pipelines were extended throughout the town, the cost for this alternative was estimated at between $960,000 and $2,040,000 including retrofitting or replacement of on site systems.

In addition to the cost savings provided by the STEP and STEG systems, the opportunity for inflow and infiltration is reduced, when compared to a gravity sewer system. The addition of inflow and infiltration requires additional treatment capacity and can pose added difficulties if no effluent discharge is permitted or sought.

The disadvantages of small diameter systems include increased maintenance and a need for homeowner education, especially during periods of power outages, when septic tank pumps would not operate. However, there are many examples where small communities have reaped the benefits of small diameter sewers with a minimum of operational problems. One survey of septic tank pumps found models which averaged over 5 years of operation between servicing.

Figure 5.2

SUGGESTED LINE SYSTEM DESIGN
Based on Topography of Town



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REVIEWED BY:
DESIGN BY: LHO
APR'D BY: LHO
DRAWN BY: DT
DATE: 11/28/01 FILE:

FIGURE 5.2
SUGGESTED LINE SYSTEM DESIGN
BASED ON TOPOGRAPHY OF TOWN

SCALE: NA
DWG. NO.

All existing residences, commercial facilities and public facilities have operating septic systems, and since their continued operation would result in less collection and treatment costs required at the community facility, the alternative to pump the effluent from these tanks is recommended.

Wastewater Treatment Alternatives

Alternatives for Centralized Treatment

For the purposes of this report the location for the proposed wastewater treatment facility is the same as the location proposed in the Wallis Report, that is, near the southwest corner of the town limits. Treatment options for the town range from highly mechanical and small footprint to low tech and large land requirement. The land requirements for treatment ranges from approximately two-to-twelve acres depending on the treatment method selected.

The method and level of wastewater treatment is dependent on the discharge point for the final effluent. For example, a discharge to the East Fork of the Lewis River would require a higher level of treatment than that of a discharge to a non-contact irrigation area. The basic types of wastewater treatment include Extended Aeration/Activated Sludge Plant (EA/AS), Sequencing Batch Reactors (SBR), Aerated Lagoon Treatment and Constructed Wetlands. The descriptions of the treatment processes in this report have been simplified.

Extended Aeration/Activated Sludge

The extended aeration/activated sludge (EA/AS) process consists of primary screening followed by activated sludge aeration, clarification with some sludge returned to the aeration tank and finally disaffection and discharge of final effluent. The EA/ES treatment plants are available in pre-engineered package plants in sizes that range from 50,000 to 1,000,000 gallons per day. The estimated wastewater flow from the Town of Yacolt ranges from 95,000 to 900,000 per day (depending on population). This flow is within the acceptable range of package wastewater treatment plants.

Key advantages of this process include reliability, with sufficient operator attention, relatively low initial cost; minimal land requirements, quick installation; and the process can handle moderately high hydraulic shock loads without upset.

Some of the key disadvantages of this process include blower noise and odor potential (this can be mitigated with plant buffering and location), high power demand/costs, and the process requires a high level of operator involvement to maintain consistent discharge quality.

Sequencing Batch Reactor

The treatment process using sequencing batch reactors (SBR) is basically the same as with EA/AS except the wastewater is processed in batches processed in sequence using a single tank (usually two tanks for continuous operation and redundancy). The process includes a fill phase, followed by aeration/mixing phase, then a settling phase and, finally, the decant of the effluent phase.

Advantages of a SBR treatment plant include a simple to operate process that requires less operator attention, the process is capable of a high quality effluent and the treatment processes flexible allowing for nutrient (nitrogen) removal.

Disadvantages of a SBR treatment plant include some operational problems during the tank decant phase which have been reported. Although less operator attention is required, the staff must be highly skilled to maintain the controls and process in addition to the inspection and maintenance.

Aerated Lagoon

Aerated lagoon systems are designed to treat wastewater on a continuous basis and are one of the most frequently used forms of wastewater treatment in the United States. These treatment systems are typically multi-cellular, 10 feet in depth and are designed TO take between four-to-ten days for the wastewater to flow through the lagoon system. Aeration can be provided with mechanical surface aerators or blowers and diffusers. Additional provisions would need to be considered for the containment of the fifty-percent exceedance of the winter rainfall level within the lagoon, approximately an additional 5-6 feet in available freeboard. It is likely that the effluent from an aerated lagoon could not be discharged to a surface water body, i.e., the East Fork of the Lewis River.

Advantages of an aerated lagoon are minimal operation skills are required, low construction capital costs and a minimum of solids disposal (could be as infrequent as every 10-20 years or more with STEP systems).

Disadvantages of an aerated lagoon are their large land area requirements and associated cost and the process will probably not meet the stringent surface water discharge requirement. Additionally, the process would not be able to provide for nutrient removal.

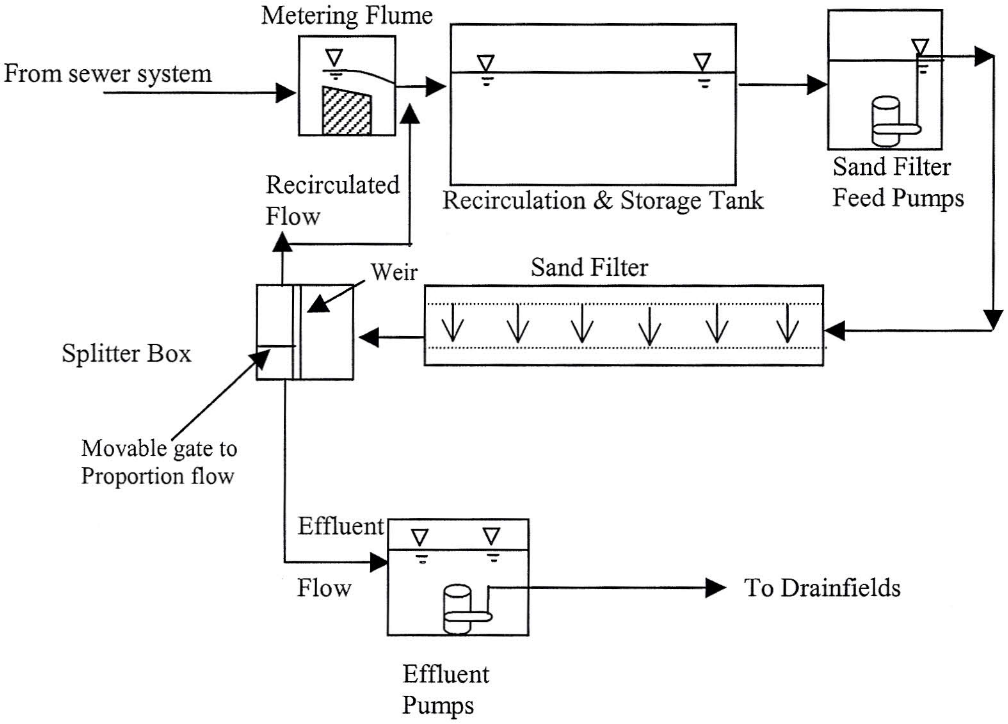
Recirculating Sand Filter

The recirculating sand filtration option recycles a portion of the flow continuously through a sand filter. The plant would consist of a recirculation and storage tank, sand filter feed pumps, a sand filter with 3 to 4 feet of media and effluent pumps. Although the plant relies on mechanical equipment (pumps) it requires very little operational oversight. A schematic is shown on Figure 5.3. The effluent from the sand filter could be used for irrigation or disposed in a drain field.

- The advantages of this process are its relatively compact design, ease of operation, low construction costs and minimal solids disposal. Nutrient removal can also be achieved with this process.

- Disadvantages include reliance on mechanical pumping systems for proper operation.

Figure 5.3
Recirculating Sand Filter Schematic Diagram



Constructed Wetlands

Like natural wetlands, constructed wetlands for wastewater treatment are lands where water surface is near or above the ground surface to maintain saturated soil conditions and promote related vegetation. There are two different types of constructed wetland: 1) a free surface wetland (FSW) where the wastewater flows through a relatively shallow pond; and 2) a sub-surface flow (SF) wetland where the wastewater flows subsurface through a gravel bed. Both types include a barrier to prevent groundwater contamination.

- Advantages of constructed wetlands are similar to those of the aerated lagoon and may be able to provide nutrient removal.

- Disadvantages of constructed wetlands are similar to those of the aerated lagoon and the process may not be able to provide for nutrient removal without harvesting plant material. The use of constructed wetlands may be more appropriate for a polishing process and for disposal rather than for primary and secondary treatment.

Alternatives for On-site Treatment

On-site Treatment/On-site Disposal

There are onsite alternatives available other than the conventional septic tank leachfield system, such as a rotating biological contractor (RBC) system or aerobic systems, with denitrification, filtration system and disinfecting system.

- An advantage of the "backyard treatment plant" would be that there is no up front cost to the Town and the systems could retrofit existing systems as they fail. New development could construct cluster systems for an economy of scale.

- Disadvantages include higher maintenance costs due to "windshield time" and an overall higher community cost than a regional system. Modified onsite treatment and disposal options probably would not meet the requirements under the GMA for higher land use densities.

On-site Treatment with Community Disposal

This process would be a combination of the on site treatment with a small-diameter collection system and a community disposal area. This method may be able to meet the goals of growth plan of the Town and be "permitted" by the Washington Department of Ecology.

Both of these alternatives would require professional maintenance, and would require the formation of a Maintenance Management Entity that would provide said maintenance of the system or the Town could contract with a private maintenance company. One of the suppliers of the backyard treatment plant requires the maintenance contract prior to installation. Table 5-3 below summarizes the estimated order of magnitude costs for the various alternatives. Assumptions include land cost at $80,000 per acre, a 35 percent factor for contingency, design, surveying and administration. Additionally, the land requirement includes a 100-foot buffer and six months worth of storage for the pond options.

Table 5-3
Summary of Various Treatment Process Costs

Process	Construction Cost (2002$)	Land Required (Acre)	Land Cost (2002$)	Engineering, Permitting Admin	Total Capital Cost (2002$)
Sequencing Batch Reactor	$1,100,000	2	$40,000	$200,000	$1,340,000
Activated Sludge (1)	$800,000	2	$40,000	$160,000	$1,000,000
Constructed Wetlands (2)	$1,300,000	28	$560,000	$360,000	$2,220,000
Recirculating Sand Filter	$800,000	4	$80,000	$200,000	$1,080,000
Onsite Treatment with Community Disposal	$4,280,000	0	0	$120,00	$4,400,000
Aerated Lagoon	$600,00	24	$480,000	$160,000	$1,240,000
Advanced Onsite Treatment	$3,750,000	0	0	$150,000	$3,900,000

1. Conventional Activated Sludge plant, for denitrification adds approximately 30 percent to construction cost.
2. Grayed processes not recommended.

Effluent Disposal

Slow Rate Land Application for Irrigation

This disposal method involves intermittent application of secondary wastewater for irrigation. The amount of wastewater that could be applied is based upon the soil infiltration rate, the crop being irrigated and the evaporation rate. Typically, this method can be used only six months a year and the wastewater would need to be stored for the remaining six months or non-growing season. Land requirements could range from 10 to 50 acres depending on actual infiltration rates and crops selected. This method could be combined with a surface water discharge during the winter months if the effluent is of sufficient quality.

Subsurface Infiltration

Not unlike the typical onsite system, treated wastewater is infiltrated into the soil and the underlying groundwater, with the soil providing polishing of the wastewater prior to discharge into the groundwater. Treatment would need to include nitrogen removal as part of the treatment process. Processes that could include nutrient removal include the SBR, EA/AS and perhaps some forms of wetland treatment. To optimize for nitrogen removal the application period would range from 7-9 days with a rest period of 12-16 days and alternating application areas. The expected infiltration rate in the soils around Yacolt is a minimum of 0.63 in/hr. The infiltration area could range from 6 to 12 acres including area for a redundant infiltration area. The final area requirement would depend on actual infiltration rates. The use of the land for subsurface disposal does not preclude its use for other purposes, such a parks, golf courses, ball fields or other recreational uses.

Surface Water Discharge

A surface water discharge for treated wastewater was once the simplest method for wastewater disposal when adjacent to receiving water. In today's climate, a surface water discharge for secondary treated wastewater would be nearly impossible. In addition to biological stabilization, the wastewater would likely require treatment for nitrogen removal, coagulation and filtration for turbidity and perhaps cooling. Surface water discharge is not recommended due to these stringent requirements. Additionally, surface water discharge is a waste of water that could be put to beneficial use in the basin such as groundwater recharge or irrigation.

Disposal Options Cost Estimates:

Table 5-4
Disposal System Cost Summary

Disposal Option	Units	Quantity	Unit Price*	Total Price
Outfall Pipe [1] (24" Diameter RCP)	Lf	400	$150	$60,000
Infiltration area	Ac	20	$50,000	$1,000,000
Irrigation	Ac	50	$20,000	$1,000,000

Note: Includes both land at $80K/acre and construction/grading costs

1. Using a surface water discharge would greatly increase the treatment requirements and costs and may not be permitted by regulatory agencies.

Solids Handling

With every process discussed in this report there is the needs to handle residual solids. Even with the current on-site systems, the tanks must be pumped periodically and the solids treated and reused or disposed.

The process available to the town for the size of the wastewater treatment system proposed include hauling waste solids for treatment by others, thickening of the solids and hauling, and treatment of the solids on site.

The options for treatment on site includes lime stabilization or digestion followed by thickening. The thickening would require some sort of mechanical process due to the wet climatic conditions experienced in the town of Yacolt. Even with treatment the solids must be either disposed of or put to some beneficial use.

In disposal, the treated, dried biosolids are used for daily cover in a sanitary landfill or, as practiced by of the city of Vancouver, the untreated dewatered biosolids are incinerated. Beneficial uses of biosolids mainly consist of some sort of soil amendment process. Regulations restrict where and when biosolids can be used, depending on the level of treatment and pathogen reduction. The application areas range from placement in tree farms and grazing areas to application on fields growing crops for human consumption.

Site Locations

The site proposed for a centralized wastewater treatment system is in the southeast corner of the town of Yacolt. This location is the same location as proposed by the previous report by Wallis Engineering.

Summary of Collection, Treatment and Disposal

Collection

There are two feasible alternatives for sewer collection:

- Large diameter gravity sewer
- Small diameter pressure sewer

The smaller diameter sewer systems are obviously easier and less expensive to collect. However, the savings in sewer costs are overcome by the need for an additional pump and tank at each connection. If the town is likely to remain fairly small (less than 2000 people) a smaller diameter system is probably the best alternative to construct. As the town gets larger a gravity sewer system becomes the best alternative.

Treatment

There are a number of possible treatment systems that could be applied. There are three types of treatments that likely make the most sense for the town;

- An aerated lagoon system, or
- A recirculating sand filter system, or
- A sequencing batch reactor

All of the three treatment processes have similar capital costs. The main differences are in operations, land requirements and aesthetics. The aerated lagoon will require more land and will likely look less pleasant than the other two alternatives, but it is exceedingly simple and inexpensive to operate. The other two alternatives both can provide advanced treatment on relatively small areas. The recirculating sand filter can be entirely constructed below ground and would provide the most pleasing aesthetics, but this process may be most applicable if a small diameter sewer is used.

Disposal

Disposal to a stream is unlikely to be permitted, therefore, irrigation or subsurface disposal will be needed. Subsurface disposal will require less land, but more infrastructure (piping). Subsurface disposal may also be aesthetically acceptable to the community.

Costs

A summary of expected sewer collection, treatment and disposal costs are presented in Table 5-5 below.

Table 5-5
Summary of Expected Collection, Treatment and Disposal Costs

	Collection	Treatment	Disposal	Total Price
Alternative A- Gravity Sewer, Lagoon Treatment, Irrigation	$2,362,500	$1,240,000	$1,000,000	$4,602,500
Alternative B- Step Sewer, Recirculating Sand Filter, Subsurface Disposal	$1,740,000	$1,080,000	$1,000,000	$3,820,000
Alternative C- Gravity Sewer, Sequential Batch Reactor, Subsurface Disposal	$1,740,000	$1,340,000	$1,000,000	$4,080,000

Chapter 6 – Recommendations-Capital Improvement Plan

This chapter of the Sewer Plan provides recommendations for the town of Yacolt to develop a septic management program for the next 10 years and develop a sewer system in the 11 to 20 year time horizon.

Recommendation (1) – Inspection Ports

Apply for a grant to install inspection risers on all septic systems within the community. This will enable a septic system inspection program to be developed. The individual cost for installation of the inspection ports can range from $200 to $400 dollars. Inspection ports should be required on all new septic tanks.

Recommendation (2) – Two-Year Septic Tank Inspection Study

Conduct a two-year inspection study that includes every septic system within the town's service area. This study could be funded with a two dollar per month fee. In contrast, having the homeowner contract for a private inspection will cost $80 to $160 each. The results of the two-year study should be reported to the town. The report should include the condition of existing septic tanks and a recommendation for an ongoing inspection and pumping program. Clark Public Utilities has shown interest in conducting this two-year septic tank study.

Recommendation (3) – Ongoing Septic Maintenance

After the two-year study is complete the town should adopt an ongoing septic maintenance program based on the study results. The town should adopt a schedule for inspections and develop a utility to implement the inspections and conduct pumping on an as needed basis. It is estimated that the monthly fee for this service would be approximately $5 to $10 dollars per equivalent residential unit (ERU). By contrast, a single septic tank pumping can cost a residential homeowner $250 to $400 each, on top of the inspection fee. Clark Public Utilities has also shown interest in developing the ongoing septic maintenance program for the town, and would likely contract with private companies to pump tanks.

Recommendation (4) – Long-Term Sewer System Planning

The town should begin planning for a long-term sewer, treatment and disposal system to be constructed between 2012 and 2017. In order to accomplish this project in a cost effective manner, it will be essential to obtain a high degree of grant financing. Grants can be obtained for many aspects of the sewer system project:

- Completion of an engineering report for a collection system
- Completion of a facility plan for the treatment and disposal system
- Design of the sewer collection system
- Permitting for a sewer collection system
- Construction of a sewer collection system
- Design of a treatment system
- Permitting for a treatment system
- Construction of a treatment system
- Design of a disposal system
- Permitting of a disposal system
- Construction of a disposal system
- Purchase of land for a treatment facility
- Purchase of land for a disposal system

The portions of the plant that cannot be financed with grant money will have to be paid by loan, or pre-collected funds. A financial strategy is presented in Chapter 7.

Capital Improvement Program

The Capital Improvement Program shown in Table 6.1 reflects the recommendations discussed above.

Years 2002 and 2003

During the first two years it has been assumed that a septic tank inspection study will be conducted and that grant financing is obtained to install inspection ports on the existing septic tanks.

Years 2004 through 2011

During the next seven years it is assumed that an ongoing septic system maintenance program will be conducted, and financing will be sought for completion of the fewer collection, treatment and disposal program. It is also expected that an engineering report be prepared for collection and a facilities plan for treatment and disposal .

Years 2017 through 2022

During the last 10 years of this sewer plan it is expected that a collection system, wastewater treatment plant and disposal system will be completed and operating.

The costs for the collection system are based on the implementation of a small diameter sewer system that would use the existing septic tanks, and pump the effluent to a central treatment system. The treatment facility used for the cost estimates is a recirculating sand filter. The disposal system used for cost estimating is subsurface disposal.

Table 6.1 Town of Yacolt Sewer Plan Capital Improvement Plan			
Year	**Description**	**Cost**	**Paid By**
2002	Install inspection ports on all existing septic tanks	$217,500	Grant
2002	Septic tank inspection study	$10,800	$2/month fee for each ERU
2003	Septic tank inspection study	$10,800	$2/month fee for each ERU
2004 through 2011	Ongoing septic maintenance, inspection and pumping program	To be determined by inspection study	Monthly fee
2002 through 2011	Seek financing for long-term sewer	$3,000 to $5,000 per year	General Fund
2002 through 2011	Collection system engineering report	$24,000	Grant or loans
2002 through 2011	Facility Plan for treatment and disposal	$88,000	Grant or loans
2006 through 2011	Collection system design	$150,000	Grant, loan or SDC
2006 through 2011	Collection system permitting	$30,000	Grant, loan or SDC
2006 through 2011	Treatment Facility Design and Disposal Design	$340,000	Grant, loan or SDC
2006 through 2011	Treatment Facility Design and Disposal Permitting	$80,000	Grant, loan or SDC
2011 through 2012	Collection system construction and septic pumping	$1,740,000	Grant, loan or SDC
2011 through 2012	Treatment and disposal construction	$2,300,000	Grant, loan or SDC
TOTAL		**$4,752,000**	

Chapter 7 - Financing Strategy

Introduction

The primary objective of the financing strategy for the project is to fund growth-related improvements through growth-related revenues. A discussion of internal and external funding alternatives is provided below, followed by the recommended financial strategy.

Discussion of Funding Alternatives

The typical funding alternatives for municipal wastewater systems include state and federal grant/loan programs and municipal bonds financed through rate revenue. Internal sources of funding available for capital projects include a combination of general facility charges and monthly user rates.

External Funding Sources

Environmental Protection Agency —-Wastewater Facility Grants

Since passage of PL 92-500 in October, 1972, and its amendment as PL 95-217 in 1977, the Federal government has provided grant support to wastewater projects. Previously, the maximum federal funding level was for 75 percent of eligible project costs. Recent federal budget restrictions have significantly reduced the scope and level of federal grant funding. Currently, the funding level is at 55 percent of eligible project costs, unless the project utilizes technology which is approved as innovative and alternative to conventional treatment and disposal techniques. If a project is recognized as innovative, it may be eligible for a grant to cover 75 percent of the project cost.

Washington State Department of Ecology—Centennial Clean Water Grants

The Centennial Clean Water Fund program provides grants to cover 50 percent of project costs. The program, administered by the Washington State Department of Ecology, has limited available funds. Ecology has stipulated that all remaining grant funds be utilized only for projects that aim at upgrading or constructing secondary or more advanced sewage treatment plants. Communities having been denied 301(h) waivers will receive enforcement points in the rating process.

The total project costs for the proposed project are not "eligible" costs. The State grant program will provide 50 percent of the costs for planning and engineering reports (Step I) and design (Step II); however, funding for construction (Step III) is limited to 110 percent of the existing residential and commercial flows and capacity required to treat infiltration/inflow.

US Department of Housing & Urban Development – Community Development Block Grants

The Clark County Urban Policy Board administers CDBG funding for a wide variety of projects that fall within three board program categories: infrastructure, social services, and housing. Sanitary sewer planning and facility development projects are eligible for grants and loans under the CDBG Urban County infrastructure program.

Projects must serve residents that have annual earnings below the current low- and moderate- income threshold. The applicant jurisdiction must demonstrate that at least 50 percent of the households that would benefit from a project are below this income threshold. Most of the time 1990 Census information is used to determine the income characteristics of the households within a project area.

The applicant agency need not contribute local matching funds to receive a CDBG grant for a project; however, agencies that pledge significant local funds in their applications for CDBG assistance receive high scores. The application process begins in October of each calendar year and extends to December 15th of that year. Projects are approved in the spring of the following year, and funding for projects is available in July of that year.

US Department of Agriculture – Community Facilities Loans

The USDA Community Facilities program (formerly the Farmer's Home Administration) provides low interest loans to communities under 10,000 population that meet a financial needs test. Yacolt is clearly eligible to apply for a loan to finance sewer facility improvements under the Community Facilities program. The current interest rates range from 3.5 to 4 percent, depending upon the income characteristic of the population served by the project. A loan may have an amortization period of up to 40 years or the life of the facilities.

Some disadvantages of the program follow: A loan application is costly and time-consuming to prepare, and there is no assurance Yacolt will be awarded the loan, as other public agencies and non-profit organizations will be competing for financing. USDA loan proceeds would not be available during the construction period. The town may need to secure interim financing to cover costs during the construction periods. USDA requires the establishment of a sizable loan reserve account that must be maintained and encumbered for the life of the loan.

Washington State Department of Ecology – Pollution Control State Revolving Fund (SRF) Loans

Washington State Department of Ecology provides loans under the State Revolving Fund (SRF). SRF provides low-interest loans to public bodies for construction of wastewater treatment facilities and implementation of activities that improve and protect the state's water quality. The current loan rate is approximately 2.5 percent for the average loan term. The loans can also be used to match grants awarded from the Centennial Clean Water program or other state and federal agencies.

Washington State Public Works Board – Public Works Trust Fund Loans

The Washington State Public Works Board provides low-interest, long-term loans from the Public Works Trust Fund for a variety of public facility projects. The design and construction of wastewater collection and treatment facilities are among the projects eligible for PWTF loans. The current loan rates ranges from 0.5 to 1.5 percent, depending upon the amount of local funding contributed to the project. The Washington State Office of Trade & Economic Development, under the Washington State Department of Community Development, administers the program.

A local jurisdiction must impose a 0.25 percent excise tax on the sale of real property, in order to be eligible for PWTF loan assistance. Additionally, projects must be included in an adopted capital facilities program.

Washington State Community Economic Revitalization Board – Loans

The Washington State Community Economic Revitalization Board provides low-interest, long-term loans to local agencies for public facility projects that have a direct relationship to stimulating or preserving economic opportunity, particularly manufacturing activity. Wastewater facilities are among the projects eligible for loan financing. The Office of Trade & Economic Development, under the Washington State Department of Community Development, administers the program.

Local Financing Techniques

Ad Valorem Taxation

The town of Yacolt utilizes revenues derived from ad valorem taxation to repay certain capital improvement loans. This method of financing distributes construction costs among all properties in the taxing jurisdiction. The tax on each property is apportioned on the basis of individual assessed values. The use of ad valorem taxation is most appropriate for special purpose districts and small communities—where projects are essentially local in character and the benefits of the improvements to properties within the jurisdiction are relatively uniform.

Special Assessments

A special assessment is a tax on real property to defray all or part of the cost of installing or improving a capital item. The assessment is apportioned according to the estimated benefit which will accrue to each property taxed.

Special assessments are levied within a "local improvement district." Subject to applicable charter provisions, the town council may set the boundaries of the district. The district may embrace all or any portion of the town, but must not include properties which will not be benefited by the improvement.

The initiation of local improvement projects to be financed by special assessments is accomplished by petition of property owners, resolution by the governing body, or administrative recommendation. Most local governments utilize petitions to determine the wishes of property owners regarding local improvements. The boundaries of the local improvement district must be defined in the petition.

The assessment to each property is allocated according to the benefit that a property may derive from an improvement. Descriptions of methods of allocating assessments for public facility improvements follow:

a. The zone method involves the division of land on either side of the improvement into zones or strips which parallel the improvement. Two or more zones are established and, typically, the rate of assessment decreases with distance from the improvement. The properties within a particular zone are assessed a percentage of the cost of the improvement, depending upon the proximity of that zone to the improvement.
b. With the frontage method, each property abutting an improvement is assessed the proportion of the total cost of the improvement which its frontage is to the total frontage of all properties abutting the improvement. This method may be inequitable in cases of irregularly shaped lots with varying frontages.
c. Sanitary and storm sewer improvements are frequently assessed to benefiting properties on the basis of area. Each property is assessed the proportion of the cost which its area bears to the total area served by the project.
d. The service unit or lot unit method assesses each lot equally. In the case of a lot which could be subdivided, unit assessments may be made according to the number of potential building lots or service nits. This method is similar to that of connection fees, except that it applies to vacant as well as developed property.
e. The assessed value of the property benefited has been used as a basis for allocating the cost of certain improvements.
f. The basic allocation schemes are sometimes used in combination with each other. For example, a percentage of an improvement cost may be charged on a frontage basis and the remaining cost allocated by area. Sewer improvements may be charged on service unit and frontage basis, etc.

All of the above assessment methods have one objective in common: to require property owners to pay for improvements from which they will be deriving direct benefit. The local government serves essentially as project manager. It sets up the local improvement district, contracts for engineering and construction, supervises the project, offers low-interest credit to property owners, and assumes continuing responsibility for operation and maintenance. In conclusion, special assessments can be expected to continue as a mainstay of capital improvement financing.

Certain projects may be financed by benefiting properties within the town of Yacolt without establishing a local improvement district. The town pays for the project at the outset, using resources available in the particular facility fund. Property owners pay 50 percent of the project, making installments over a period of years. The expenses and procedural requirements associated with the establishment of a local improvement district are avoided.

Interim Financing

Although it is technically possible to levy a special assessment in advanced of the completion of a capital improvement, to do so has the disadvantage of requiring a second assessment or a refund in the event that the final costs of the improvement differ from the estimates. Therefore, it is necessary to use other means to pay for the work, performed prior to the actual assessment.

A common interim finance practice is for the governmental unit to issue general obligation warrants in anticipation of the revenue to be collected through special assessments. The jurisdiction or project contractors convert these warrants into cash by pledging them as security to lending institutions.

Another interim financing method involves the use of a revolving fund. Such an account holds funds derived from general bond issues, service charges, tax receipts, etc. A number of revolving funds may exist. Each fund is related to a specific category of capital improvements and all or a portion of its funds may be used to finance interim costs associated with those improvements for which the fund is intended. Once the project is completed, the fund is reimbursed with proceeds from special assessments and bonds, as well as other receipts.

Interim financing by means of a revolving fund has the advantage of eliminating the cost and complications involved in issuing general obligation warrants. Of course, an even less complicated interim financing source than a revolving fund is the general fund. If a surplus is available, the cost of a project may be charged against the general fund. Once the project is completed, the general fund is reimbursed with proceeds from assessments, bonds, etc.

Bonding

Certain types of capital improvements may be financed safely and reasonably by long-term loans. Projects which are large and costly in relation to a jurisdiction's financial resources, which have utility over a long period of time, and which are not frequently re-occurring are legitimate items to be financed by loans. The capital costs of self-supporting enterprises, such as those associated with certain water and sewage disposal systems, may be met by loans, provided that the amortization of the debt is sufficiently rapid to keep ahead of depreciation and obsolescence.

Yacolt and other units of general and special purpose governments may borrow money by issuing, or selling, bonds. In essence, a bond is pledge to repay a loan in accordance with specific terms. Bonds buyers include a variety of financial institutions, federal agencies and individual investors.

The amount that a local jurisdiction may borrow to finance a project—the size of the bond issue—varies, depending upon the amount of financing being sought, the jurisdiction's debt-paying capacity or credit rating, and the relationship of its outstanding bonded indebtedness to the statutory limitation on such indebtedness. The maximum debt that may be incurred by the Yacolt under state law is .25 percent of the assessed value of all properties within the town limits.

Interest rates on bonds also vary depending upon the type of bond, the amount of collateral backing the bond, the prevailing market conditions, and the maturation schedule or term of the loan, as well as other factors. Long-term loans normally have higher interest rates than short-term loans, all other factors being equal.

General Obligation Bonds

The issuance of general obligation bonds is a common method of borrowing funds for capital funds for capital improvements. They are backed by the full faith and credit of the local jurisdiction and, hence, have lower interest rates than, for example, revenue bonds (see Revenue Bonds).

Financing a capital improvement with general obligation bonds is accomplished in the following manner: The engineer prepares a detailed cost estimate on the construction. An election is held to ascertain whether or not the public ants the bonds to be sold to finance the improvement. If the bond issue receives voter approval, construction begins and the project is funded by interim financing (see Interim Financing). Once the project is completed and exact project cost determined, the bonds are sold.

If the project directly benefits the entire community, the bonds are normally retired with revenues generated by a uniform and valorem tax. However, if the project benefits only a segment of the community, the bonds are retired by special assessments or other funds received from benefiting property owners or service recipients.

Revenue Bonds

A revenue bond is an obligation issued to finance a revenue-producing facility or enterprise and the bond is retired exclusively with the earnings from that facility. In general, the kinds of capital improvements that are suitable for financing with revenue bonds are those which provide services for which payment is largely in the form of service charges (see User Charges).

Revenue bonds may be collateralized by a lien against the income-producing property, but the bonds offer no claim on the general credit or taxing power of the jurisdiction which issues them. Owing to its limited security, the interest rate for a revenue bond is typically higher than that for a general obligation bond of the same denomination and maturity schedule.

User Charges

User charges are payments made by individuals who use or benefit by specific services, facilities and resources. User, or service charges may include (1) fees for service, resource or energy consumption, (2) rents, and (3) charges to mitigate the adverse effects of certain private sector activities on the general public (e.g., the impact of industrial pollution). These charges are most frequently used to partially finance services that are desired by certain individuals in the community, without extracting payment from those who either do not desire the services or have already paid for them.

User charges should be applied to only certain services and structured in conformance with the goals of the community. If prices for vital, expensive services are structured to cover the full cost of providing them, low-income individuals and households might be excluded from the market or may be forced to purchase these high-priced services with their limited incomes.

User charges have the advantage of broadening the community's financial base in that they can be used to secure payment for services from tax exempt properties and consumers residing outside of the taxing jurisdiction. Furthermore, service charges can provide dependable revenue sources that are not affected by the constraints imposed by state or federal tax law, except in cases where charges are associated with leased facilities.

Revenues derived from user charges are usually applied to the annual operating and maintenance expenses of various urban services. However, these receipts may be used to retire bonds or may be deposited into "sinking funds" and combined with tax revenues, and the like, to finance capital improvements.

System Development Charges

This source of funding is a one-time charge paid at the time a user makes a connection to the municipal wastewater system. It is frequently called a general facility charge, connection charge, system development charge, and or a variety of other things. In essence, the system development charge is for the right to use capacity in the major facilities of the system. Municipalities charge this fee as a way for a new property to pay an equitable share in the cost of existing as well as new facilities. The charge may be based upon the historical value of the existing facilities, replacement value of existing facilities, projected new facilities required to meet projected growth, or a combination of these and other factors. Table 7.1 is an estimated proposed system development charge for the town of Yacolt.

Table 7.1
Proposed System Development Charge Calculation

Funding Assessment	
Total Sewer Collection, Treatment and Disposal Costs	$4,752,000
Total ERU at Design Capacity	1,229
Cost per ERU	$3,867
Existing ERU	407
Cost per New ERU	$5,781
Assume 50% Grant	
Proposed System Development Charge on New Construction	$2,890

Recommended Financing Strategy

It is recommended that the town accept the following financing strategy:

- Institute a sewer utility fee to pay for the cost of a septic tank study, and adjust it in the future to cover septic maintenance.
- Aggressively seek outside funding for predesign, design, permitting and construction of a sewer system planned for 10 years in the future.
- Institute a system development charge for new homes to pay their share of sewer capital costs.

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