CITY OF TUMWATER

UTILITIES PLAN

An Element of the Tumwater Comprehensive Plan
Adopted May 18, 1993
2004 Update

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1. ORGANIZATIONAL AND LEGAL CONTEXT

1.1 Introduction

This Utilities Element presents plans for gas, electricity, cable TV, and telecommunications covering the City of Tumwater and its proposed planning area. Each chapter analyzes the existing utility delivery system and describes proposed improvements which are necessary to meet the City's rapidly changing demands.

The Growth Management Act defines electricity, gas, telecommunications and cable TV as being utilities. The term "utility" usually describes a greater range of services including water supply and sewer systems. However, the Growth Management Act defines water and sewer systems separately as "public facilities." Plans for water supply and sewer are to be found in the Capital Facilities Plan Element of this Comprehensive Plan.

The preparation of this document has been prompted by the Growth Management Act which requires the City to prepare a Utilities Element of the Comprehensive Plan. However, the City sees this legal requirement as an opportunity to identify ways of improving the quality of services. This plan will identify issues and policies that ensure a provision of utilities that is properly coordinated with land use. The City will implement these policies through its franchise agreements with the utilities and through the land use permit process.

The provision of utilities is the responsibility of a large number of public and private agencies involved with regulation, coordination, production, delivery and supply of services. This section of the Utilities Plan identifies the major pieces of legislation and organizations that are most prominent in the utilities sector.

1.2 State Overview

Revised Code for Washington and the Washington Utilities and Transportation Commission.

Utilities and transportation are regulated in Washington under the authority of RCW 80.01.010. This legislation created the Washington Utilities And Transportation Commission (WUTC) which is composed of three members appointed by the Governor. The WUTC is empowered to regulate the utilities (including, but not limited to

electrical, gas, irrigation, telecommunications, and water companies) in accordance with State law. State law regulates the rates and charges, services, facilities and practices of the utilities. Any change in customer charges or service provision policy would require Commission approval.

1.3 Growth Management Act Requirements

The GMA requires that the Utilities Element must contain descriptions of locations and capacities of existing and proposed facilities. The GMA also requires that the Comprehensive Plan should have internal consistency. This means that the Utilities Element must be fully coordinated with other elements of the Comprehensive Plan; specifically, infrastructure and services must be provided to meet the needs of existing and new development.

1.4 Federal Energy Regulatory Commission (FERC)

FERC is an independent five-member commission within the US Department of Energy. FERC regulates the interstate transmission of natural gas, oil, and electricity. FERC also regulates natural gas and hydropower projects.

1.5 Franchise Agreements Between Tumwater and Utilities

All private utilities (except telecommunications) have existing franchise agreements to provide service in Tumwater. The franchise agreements are a non-exclusive right to occupy the public right-of-way.

1.6 Compliance with Growth Management Act Goals

The Growth Management Act contains a number of goals to be used in considering and adopting the various planning elements under the Comprehensive Plan. Not all of the goals apply to any one portion of the Comprehensive Plan, such as Utilities. The following goal applies to the Utilities Plan:

> *"1. Urban Growth. Encourage development in urban areas where adequate public facilities and services exist or can be provided in an efficient manner."*

The Utilities Plan helps ensure that utilities such as electricity, natural gas, phone,

and cable are provided in the City of Tumwater, which is within the Urban Growth Boundary.

1.7 Compliance with the Thurston County, County-Wide Policies

Similarly to the GMA goals, the Growth Management Act required the County and all the cities within the County to adopt county-wide policies. These policies deal with a variety of subjects, most of which do not concern the Utilities Plan. Goal 2.3 (a.) of the adopted County-Wide Policies reads as follows:

> *"Assuring that each jurisdiction will have adequate capacity in transportation, public and private utilities, stormdrainage systems, municipal services, parks and schools to serve growth that is planned for in adopted local comprehensive plans;"*

The Utilities Plan, where possible, estimates the future need for private utilities and analyzes the ability of the utility companies to meet that demand. The Utilities Plan finds that the anticipated demands of twenty years of growth will be adequately met by the private utility companies.

1.8 Essential Public Facilities Evaluation

WAC 365-195-320 (2) (d) requires the Utilities Plan to evaluate whether any utilities should be considered essential public facilities under the terms of the Growth Management Act. Because natural gas, phone and cable facilities are not an absolute necessity for households or most businesses, they will not be considered essential public facilities by the City of Tumwater. Natural gas, phone and cable service are certainly desirable, however; and this plan analyzes their ability to meet demand over the twenty year planning period.

Electricity is a necessity for all homes and businesses. Because of this, and because siting some electrical facilities is sometimes met with opposition, this Plan recommends that high capacity electrical transmission lines (230 kV and above) be considered for inclusion in the regional process for siting essential public facilities.

1.9 Overall Utility Policies

When siting utilities within the City of Tumwater, the following criteria should be

adhered to whenever and wherever possible:

- *When siting utilities, private utility companies should communicate with City staff regarding anticipated growth projections, in order to appropriately size utilities to meet anticipated demand.*

- *When local review of utility improvements occur, Tumwater should be cognizant of the public service obligations of the utility provider.*

- *Whenever feasible, transportation rights-of-way should be utilized for utility corridors.*

- *The City should provide timely notification to all affected utilities prior to road construction.*

- *Whenever feasible, approval of utility permits should occur when the project to be served is approved.*

- *The City of Tumwater should coordinate with Thurston County and the cities of Lacey and Olympia to ensure consistency of the respective utility plans in order to facilitate orderly utility service.*

1.10 Plan Amendments

This plan shall not be amended more than once annually, except in an emergency. All proposed amendments should be proposed concurrently not more than once a year, so that the cumulative effects of the amendments can be ascertained. It is expected that the Utilities Plan may require amendment based on the revised population estimate and policy decisions made as part of the Comprehensive Plan required by the Growth Management Act.

2. NATURAL GAS

2.1 Introduction and Overview

This chapter describes and analyzes Puget Sound Energy's existing natural gas system within Tumwater, and describes improvements that are necessary to meet growing consumer demand. Descriptions of this system are supplemented with a diagram and maps which illustrate the system and proposed improvements.

Tumwater and the surrounding urban growth area are served entirely by Puget Sound Energy (PSE) as part of a service area that serves several Washington counties including Thurston, King, Pierce, Lewis, Snohomish, and Kittitas. Over 643,000 customers are served within this service area.

2.2 Legal and Regulatory Context

The activities of PSE are regulated by both federal and State legislation. This legislation is primarily concerned with promoting competition among gas suppliers and controlling the cost of natural gas to the consumer. PSE is subject to the general regulations and oversight by the energy agencies, such as the Washington Utilities and Transportation Commission (WUTC) and the Federal Energy Regulatory Commission (FERC). However, there are some other pieces of legislation which have specific implications for the natural gas industry, which are described below:

2.3 Natural Gas Policy Act 1978

The National Gas Policy Act (NGPA) encouraged competition among fuels and suppliers across the United States. As a result, natural gas has essentially been de-controlled. The NGPA also contained incentives for developing new natural gas resources and a tiered pricing structure aimed at encouraging the development of national transmission pipelines.

2.4 The Northwest Power and Conservation Council

The Council was authorized by the Northwest Power Act of 1980 and approved by a vote of the legislatures of all four northwestern states (Washington, Oregon, Idaho, and Montana). The governor of each state appoints two members to serve on the Council. Its focus is on the generation of electricity; however, its policies have

implication for gas. The Act contains three principal mandates for the Council to carry out:

1. Develop a 20-year electric power plan that will guarantee adequate and reliable energy at the lowest economic and environmental cost to the Northwest. Energy conservation, renewable resources, such as wind power, solar, geothermal and biomass, and high-efficiency resources, such as those that use heat from manufacturing processes to also generate electricity, are listed in the Power Act as priorities.

2. Develop a fish and wildlife program to protect and rebuild populations affected by hydropower development in the Columbia River Basin.

3. Conduct an extensive program to educate and involve the public in the Council's decision-making processes.

The plans and policies the council develops and approves are implemented by numerous agencies including Bonneville Power Administration, U.S. Army Corps of Engineers, Bureau of Reclamation, and Federal Energy Regulatory Commission. State, tribal and local governments often work closely with the Council as it develops its power and fish and wildlife plans, and these entities also implement measures in those plans. The power plan and fish and wildlife program are updated at least every five years. Currently, work on the 5th Edition of this plan is underway.

2.5 The Clean Air Act Amendment of 1990

The passage of the Clean Air Act amendments in 1990 has shown a federal intent to promote the diversification of fuel sources for motor vehicles. This is in response to the need to both reduce carbon dioxide atmospheric emissions and to reduce the nation's reliance on gasoline for strategic reasons. This act promotes the use of Natural Gas Vehicles (NGV's) by requiring 30% of state government's vehicle fleets to be NGV's by July 1992 and increasing by 5% each year. It has provisions for developing NGV refueling stations.

2.6 Supply to the Puget Sound Region

The Pacific Northwest receives its natural gas from a wide range of sources in North

America. 60% of the region's natural gas supply comes from Northern British Columbia and Alberta and 40% is from domestic sources including the San Juan Basin in New Mexico/Texas in the South. The Pacific Northwest, which consists of Washington, Oregon, and Idaho, consumes over 300 billion cubic feet of natural gas a year.

2.7 Transmission System

Natural gas is supplied to the entire Puget Sound Region from the Northwest pipeline (See Map 2-1). Their system within the state of Washington is primarily two large pipelines, one 26 inch and one 30 inch. Locally, these lines run geographically in a north-south direction south of Yelm, with a lateral line running south of Tumwater in the Littlerock area in a northwesterly direction. In 2002, a 20 inch gas main line was installed in an existing natural gas utility easement running across the southern urban growth area and the southernmost portion of the City of Tumwater. This utility easement is generally located between 93rd Avenue and 88th Avenue (see map 2-1). This new main line was constructed to serve a possible future natural gas powered electrical generation facility at the former Satsop Nuclear Plant. This is the closest point of the Northwest Pipeline to Tumwater (See Map 2-1). Pressures in these lines range from 600-900 psi. The "gate station" on the Northwest Pipeline that provides most of the natural gas to Tumwater is located approximately between Yelm and Tumwater.

Note: The Olympic Oil Pipeline that supplies fuels throughout western Washington has a spur line that extends through the Tumwater urban growth area and into the City of Tumwater terminating at a fueling/storage facility at the corner of Center Street and Tumwater Boulevard (see Map 2-1). This pipeline does not meet the definition of a utility, which is why it is not addressed in detail in this plan. However, its presence is significant and the public should be made aware of its location due to recent incidents involving oil pipelines elsewhere in the state. Most notable is the deadly pipe rupture that occurred in Bellingham.

2.8 Natural Gas Storage

Natural gas is stored in two ways. First, it can be pressurized and then injected into underground aquifers which are suitable for gas storage. This is done locally at Jackson Prairie Gas Storage Field located south of Chehalis. This gas is used to supplement the region's gas supply in cold weather. The second way to store natural

gas is to cool it to -258 degrees Fahrenheit. At this temperature, it becomes a very dense liquid and can be stored in storage tanks. There is a facility of this type at Plymouth, Washington. Storage of natural gas in these ways makes for a more reliable supply and reduces the cost to the consumer because the utilities are able to buy gas when it is less expensive and store it for periods of peak demand.

2.9 Description of the Natural Gas Supply System

The components and hierarchy of PSE's gas supply system is illustrated in Figure 2-1 and is described below.

Gate Station:

A gate station is the delivery point of natural gas to PSE's system. Gate stations normally include metering stations and pressure regulators. Pressure regulators reduce the pressures to approximately 200 to 300 psi.

Supply Mains:

PSE's supply mains transport gas to district regulators throughout PSE's service area. These supply mains vary in size from 4" to 20" and in pressure from 200 to 300 psi.

Limiting Station:

A limiting station reduces pressure from supply main pressures to limited supply pressures; these pressures vary from 60 psi to approximately 200 psi. Supply mains located downstream of the limiting station are called "limited supply mains."

District Regulators:

District regulators are a pressure-regulating station that furnishes gas to intermediate pressure (IP) distribution systems. Pressures in the IP systems normally range from 20 to 60 psi. Distribution main sizes vary from 1-1/4" to 8" in diameter.

2.10 Tumwater's Existing Natural Gas Supply System

Information depicting Tumwater's existing natural gas supply system is shown on Map 2-2. This map shows the existing piping system supplying natural gas to Tumwater customers.

Natural gas is supplied to PSE from the Northwest Pipeline Corporation through four gate stations in the Olympia area.

- Olympia Gate Station at Flying Carpet and Fir Tree. This gate station also serves Olympia and Lacey.
- Olympia Town Border Station at 42nd and Boulevard. This station also serves Olympia and Lacey.
- Littlerock Gate Station at 90th Lane SW and Littlerock Road.
- Black Lake Gate Station at Delphi and 62nd Avenue SW.

Other additional gas facilities serving Tumwater include the following:

- A six-inch gas main from Olympia Gate to the Capitol, serving about 5,000 residential customers.
- A four-inch West Olympia Main from Black Lake to Evergreen College serving about 1,600 residential customers.
- A four-inch main from Littlerock to Tumwater serving about 1,600 residential customers.

2.11 System Analysis

The number of PSE natural gas customers in Tumwater has increased from 964 customers in 1982 to 1,876 customers in 1992 to 3080 customers in 2003.

The average residential home (using natural gas for heat and water) consumes about 1,000 therms a year. Tumwater residential customers used approximately 3,080,000 therms of gas in 2003, up from 1,876000 therms of gas in 1992.

Tumwater's natural gas supply system currently fully meets existing demand. WUTC regulations prohibit PSE from extending gas facilities to areas that are not expected to pay for themselves from the outset. This is to keep the existing rate payers from financing improvements to other areas. This can, however, make service delivery of natural gas more difficult to marginally profitable areas because when profitability can be proven, installation of gas lines would have to be provided after initial development is completed.

2.12 Proposed New and Improved Facilities

In order to respond to anticipated future demand, PSE has plans for a number of improvements in areas needing increased capacity. PSE engineers design gas facilities for a minimum delivery pressure of 15 pounds per square inch (psi). If pressure should drop below 15 psi, there are a number of methods available to PSE to increase supply to an area as follows:

- "Looping" the distribution and/or supply lines to provide an alternative route for the natural gas to travel to an area needing additional supply. This method typically entails construction of high pressure mains, district regulators and intermediate pressure gas mains.

- Installing lines parallel to existing lines to supplement supply of natural gas to a particular area.

- Replacing existing gas mains to increase volume of natural gas to a particular area. However, this type of construction is rare, because looping is usually more economical.

PSE has a number of system improvements planned over the next ten years to meet future demand for natural gas in Tumwater as follows:

- Rebuild a Gate Station at Littlerock Road and 90th Lane SW
- Install a 4" main along Israel Road between 11th Avenue SW and Capitol Boulevard
- Replace existing 2" bare steel main with 2" polyethylene (PE) along Cleveland Avenue between Capitol Way and North Street
- Replace existing 4" bare steel main with 6" main along Capitol Boulevard between Deschutes River and C Street

Natural gas facilities should be made available to new developments whenever practicable in order to provide a variety of energy sources to developments in accordance with Washington Utilities and Transportation Commission requirements for siting natural gas facilities.

2.13 Description of Customer Hook-Up Policies

Connection to PSE's distribution system is driven by demand. This means that connections are not planned in advance; connections are initiated by customer requests.

PSE installs service for new construction and conversion from electricity or oil to natural gas. A typical process for residential gas service is shown below:

1. Potential customers (builders, homeowners or heating contractors) call PSE to request gas service to the potential service address.

   If gas is available, gas service can be obtained for no charge, if the residence utilizes gas heat and gas hot water heating.

   If gas is not available and a main extension is required, a New Customer Development Representative (NCDR) determines, through an approved Washington Utilities and Transportation Commission (WUTC) program, the customer cost for extending gas main from existing facilities to the house of the potential customer. The cost is based on how much gas the customer will use, distance from the main and other special circumstances (see PSE Tariff Rule 7).

   NCDR's will also assess and provide assistance to identify prospective customers on main extensions. PSE is required to follow PSE Tariff Rule 7, so that existing customers are not charged with any cost associated with new customers.

2. Once it is determined that natural gas will be made available to the customers, the job is approved and processed by the distribution department.

3. All jobs (whether they are assumed by the customer or the gas company) must receive PSE approval.

4. A design of how the pipe will travel down the right-of-way, or easement if necessary, to the service is performed by the Engineering Department.

5. Applications are made for the appropriate permits, and easements if necessary.

   Note: Permits such as shorelines, railroad, highway, sensitive areas, etc., may result in delays of six months or more.

6. After acquisition of all permits, the job is issued to construction for installation. The construction time will vary based on the following:

   1) The type and complexity of construction; and
   2) Volume of incoming requests.

2.14 Conclusion

Natural gas, unlike some other utilities such as electricity, is not a necessity. As such, PSE is not required to provide service on demand. In fact, as noted above, PSE is only allowed to extend natural gas lines into areas that are immediately profitable, so that existing rate payers do not finance system expansion. PSE expects to expand its customer base with new growth. PSE carefully engineers line sizes to insure adequate gas supply to those areas served, thus adequately serving areas served by gas for the next twenty years.

3. ELECTRICITY ANALYSIS

3.1 Introduction and Overview

This chapter analyzes the existing electricity supply system and proposed system improvements impacting the greater Tumwater service area. Tumwater receives electrical service from Puget Sound Energy (PSE).

PSE is an investor-owned public utility incorporated in the State of Washington. The utility delivers local service to more than one million residential, commercial and industrial customers in a nine county, 4,500 square mile service territory. Approximately 200,000 customers have been added to this service territory in the past ten years. PSE builds, operates and maintains an extensive electrical system consisting of generating plants, transmission lines, substations and distribution systems.

The principle high voltage bulk transmission lines serving the Puget Sound region are owned and operated by the Bonneville Power Administration (BPA), a power marketing agency of the U.S. Federal Government. PSE relies on BPA for bulk transmission services of power generated by federal hydro dams and Washington Public Power Supply System (WPPSS) generators.

This chapter considers all aspects of the electrical delivery system in order to evaluate adequacy in serving Tumwater. The quality of service within Tumwater is dependent on the local delivery system operated by PSE, the bulk transmission system operated by BPA, and power generation by a number of agencies including PSE. However, the focus of this chapter is on the delivery system within Tumwater which is operated by PSE.

3.2 Organizational and Regulatory Context

PSE and BPA activities are coordinated by the policies of the Western Electricity Coordinating Council and Northwest Power and Conservation Council. Regulation for the system is provided by the Federal Energy Regulatory Commission (FERC), and the Washington Utilities and Transportation Commission (WUTC). The role and structure of the WUTC, which regulates all utilities, has been described in Chapter 1. Organizations and regulations that are specific to electricity supply are described below:

1. Western Electricity Coordinating Council is responsible for coordinating electricity supply across the western U.S. It covers the whole portion of the U.S. west of the Rockies and parts of Mexico and Canada. Its primary function is to coordinate wheeling of power between the regions and to provide safeguards in the national grid so that a power disturbance in one part of the country will not leave another region without power.

2. Northwest Power and Conservation Council is responsible for coordinating power planning in the Pacific Northwest. The Council has two members each from Montana, Idaho, Oregon and Washington, and was established by the Pacific Northwest Electric Power Planning and Conservation Act of 1980. The Council issues an updated Northwest Electric Power Plan every two years which guides the BPA's resource acquisitions. Although the Council does not directly control the activities of northwestern utilities, it exerts control indirectly through its influence on BPA's resource acquisition plans, funding levels, its regional planning function and its mandate under the Act to protect fish and wildlife.

3. The Northwest Power Pool is an integrated system of generating resources and transmission facilities owned by Northwest Utilities. The Pool was formed in 1942 to coordinate sales and interchange of power within the region. PSE is a member of the Pacific Northwest Power Pool.

3.3 Electricity Supply to the Puget Sound Region

Power Generation

Hydroelectric plants generate a large proportion of the electricity consumed in the Pacific Northwest. Much of the power comes from dams on the Columbia River to the east of the Cascades. PSE owns or has long term operating contracts on fourteen hydroelectric plants (includes PSE owned projects, Mid-Columbia Projects and contracts based on qualifying facilities), five coal fired plants (Coalstrip 1, 2, 3 & 4 and Encogen) and seven natural gas fired plants (Fredonia 1, 2, 3 & 4, Whitehorn 3 & 4, and Fredrickson. In 2003, the company's energy production was 40 percent hydro resources and 60 percent thermal plants. Thermal plants take a number of forms, including coal-fired, natural gas-fired and oil-fired. PSE does not presently own any nuclear

generating facilities.

Storage

Electricity cannot easily be stored for future use. In order to take advantage of seasonal surplus electricity generation (eg: resulting from snow melt in the spring), Northwestern utilities exchange power with utility companies outside the region. PSE currently has an agreement to provide power to the bulk transmission grid during "peak load" summer conditions for Pacific Gas & Electric (PG&E) in California. PG&E reciprocates by providing an equal amount of power during winter seasons when the PSE service area experiences peak loads. The process of moving electricity into a common transmission grid and distributing it where needed is called "wheeling."

Wheeling is accomplished through an elaborate transmission system that allows the PSE System to receive power from outside the region, support transportation of power to other regions, integrate internal generation into the system, and reliably supply loads. These requirements must be met during all load conditions, including forced outages, planned outages, and a wide variety of generating patterns.

Conservation

Conservation plays an important role in energy resource management. PSE has provided conservation services for its electricity customers since 1979. The energy savings from energy efficiency programs represent 11 percent of PSE's average existing annual electric load. In the last few years PSE increased its commitment to conservation by doubling its annual conservation targets. In August 2002, PSE filed new conservation tariffs with the Washington Utilities and Transportation Commission (WUTC). This resulted in expanding approximately 20 programs while another 10 new and pilot programs were added.

3.4 The Bulk Transmission System

The Bonneville Power Administration (BPA) was created in 1937 by the Roosevelt Administration under the "New Deal." BPA operates a region wide, interconnecting, transmission system and supplies electric power to utilities from federal hydro-electric projects east and west of the Cascades.

The primary service BPA provides to PSE is wheeling energy around the region. Electricity is wheeled to the PSE service area from several BPA transmission lines.

The Northwest US and Canada can generate large amounts of hydro electric energy during daily peaks. Columbia River dams do not have the large amount of seasonal storage capacity that Canadian dams have, but they are efficiently used for peaking sources during daily load variations. The Columbia River dams have enough turbines to generate power during high load periods; these turbines can be turned off during light load periods. High capacity transmission facilities bring power from the Columbia River electric generation system to Western Washington.

3.5 System Analysis

During the recent cold spell in January 2004, the region's heavily loaded system experienced no power flow problems. Although no major loss of power occurred during that period, the BPA power system benefited significantly from the timely completion of the Kingly – Echo Lake 500 kV project.

Four programs to reduce the potential for system overload were identified in the early 1990s in the BPA "Puget Sound Reliability Study". These programs included the following:

- Increase conservation activities.
- Comprehensive load management programs.
- Expand the transmission system.
- Build new generation facilities west of the Cascade mountains.

These measures have been successfully implemented jointly by BPA and local utilities including PSE. At the local level, PSE continues to pursue energy conservation programs set forth in its least cost planning process. PSE offers grants and consultation for energy conservation measures in industrial design. There is also an active program to raise consumer consciousness regarding energy conservation.

Both BPA and PSE are working to manage demand. The aim is to reduce demand at peak times, and spread demand more evenly over the daily and seasonal cycle. This can be achieved by encouraging commercial customers to carry out high energy consumption processes when supply is plentiful in off peak periods. This would

encourage customers to use power when greater supply is available.
BPA is undertaking programs to develop the bulk transmission system. The aim of these programs is to increase system capacity, to deliver more power, and to protect the consumer from power loss.

3.6 Transmission System

The "transmission system" is the second tier in the electricity supply system. Map 3-1 shows the portion of Puget Power's transmission system which covers Thurston County and Tumwater. It is a grid which provides a link between BPA's Bulk Transmission System and the local feeder system which connects with customers. It has the function of moving power around PSE's service area.

Tumwater is included in a PSE service area which also covers Bucoda, Lacey, Olympia, Rainier, Rochester, Tenino, Yelm and the unincorporated areas of Thurston County. There is one power generation station (Centralia) near this sub-area that feeds electricity into PSE's transmission system. Other sources of power outside this subarea flow through three transmission stations in Thurston County.

Power from generating plants along the Columbia River is delivered through existing 500 KiloVolt (kV) lines to the BPA Raver Station in King County, to the BPA Paul Station near the Centralia Generating Plant. The Tono Station just south of Thurston County steps the 500 kV voltage down to 115 kV, supplying two 115 kV lines north into central Thurston County.

The 500 kV system continues north to the BPA Olympia Substation located west of Tumwater in Thurston County, where the power is stepped down to the 230 and 115 kV levels. A 230 kV line originating at the White River Generating Plant in Pierce County also provides power to the BPA Olympia Substation, where the power is stepped down to the 115 kV level. From there, two 115 kV lines run east from the BPA Olympia Substation to serve PSE's Olympia Transmission Substation. This transmission station then serves the Saint Clair and the West Olympia Substations in the Olympia area. A 115 kV line originating at the White River Station runs southwest to the Saint Clair Transmission Station, which serves substations in the Lacey area.

Power is transformed from 115 kV to 55 kV by one transformer at the Olympia Transmission Substation to serve some distribution substations with 55 kV lines. The

Saint Clair and West Olympia Transmission Substations have a similar transformer used to serve 55 kV distribution substations in Thurston County.

The capacity of these transmission substation transformers measures their ability to serve the load with all the system components in service.

3.7 Transmission System Analysis

In the Thurston County area, all of the transmission lines are energized at 115 kV, except for a 55 kV system between the Olympia, West Olympia, and Saint Clair Transmission Stations. Three 55 kV lines come together at Plum Street Station, where some of the downtown Olympia load is served at 4 kV distribution voltages. PSE will convert (transform), in the future, the 55 kV and 4 kV systems to 115 kV and 12.5 kV respectively to better serve electricity demand.

The 115 kV transmission system in the Thurston County subarea consists of two lines between the Saint Clair and Olympia Transmission Substations which serve the central Olympia, Tumwater and Lacey areas. In addition, there are two lines from the BPA Olympia Substation to the Olympia Transmission Substation that are sources to this area.

Because the power system in the Thurston County area is connected to a larger transmission grid throughout the Northwest, power must be able to flow north and south as the needs of the system evolve. As mentioned previously, the demand for electricity in the Puget Sound area varies throughout the year. In the spring, heavy water flows from the winter snowpack cause large amounts of imported power to flow across our system from Canada to California. In the fall, when local power reservoirs are low, power is imported from California to the PSE system.

3.8 Proposed Transmission Improvements

In Thurston County, there is currently a need for transmission lines (230 kV and above) to support this system. The 115 and 55 kV lines in Thurston County were designed to primarily serve distribution substation loads that supply power to customers. As a result, the conductor wire size and voltage level of these lines are not large enough to serve distribution load and allow power to flow across Thurston County. Thus, the existing system relies upon power flowing through BPA lines, which have an upper loading limit. In addition, the seasonal exchanges and growth

pressures in the Puget Sound area are creating a need for additional 230 kV lines, in order to raise the power transfer capability of the transmission network. New 230 kV lines would also allow for contingencies such as one line being out of service.

In addition to the electrical improvements noted above, the following improvements will be necessary for the system to serve twenty years of growth:

1) The existing 500 and 230 kV transmission network that supports the Thurston County area and Tumwater is owned by the Bonneville Power Administration. When one of their lines is out of service, such as the 500 kV line from BPA Raver to BPA Paul Substations, part of the remaining 230 kV system does not have capacity to serve the load. As new load is added from growth pressures, additional 230 kV will be necessary to strengthen the system.

2) As new 115 kV substations are added to the power system to serve the forecasted load increases, an additional 230-115 kV step-down transformer will be needed to supply this 115 kV load. This new transformer will also support the existing two transformers at BPA Olympia Station in the event that one transformer is out of service.

3) As the need for future substations becomes evident, the existing 115 kV lines will no longer be able to handle the load requirements. Additional lines and transmission substations will be needed to shorten the length between line terminals and to strengthen the network of lines between power sources. In this subarea, the existing lines could be reconfigured using the existing 55 kV transmission system, converted to 115 kV, so that all the transmission lines in the area can be tied together for normal load and backup support.

4) The Electron Heights-Blumaer 115 kV line overloads when the BPA Paul-Raver 500 kV line is out of service. When a transmission line is opened, the power flows through parallel lines, which is referred to as "loop flow." In this case, the Electron Heights-Blumaer 115 kV line overloads due to the loop flow, which is added to the normal load served from this line. Options to fix this problem include upgrading the line for the short term, and rebuilding/reconfiguring the line as a longer term solution.

3.9 Distribution System

The "distribution system" is the third and final tier in the electricity supply system. Power is supplied from the transmission system into Tumwater's local feeder system at five distribution sub-stations, three of which are located in Tumwater or its Urban Growth Boundary. The two remaining are located in Olympia or its Urban Growth Boundary.

3.10 Proposed Distribution Improvements

Long term plans for Tumwater include a new distribution substation in Tumwater to serve forecasted load growth and the Irving substation in the Mottman area..

3.11 Future Electrical Facilities

Unlike some other utilities, such as cable and phone, electrical facilities sometimes encounter opposition from citizens in the permitting process for various reasons. Nevertheless, electricity service is required for nearly all land uses, making electrical facilities a necessity. As such, the City of Tumwater should seek to assist with permitting needed electrical facilities in appropriate areas while mitigating any negative aspects of the development through the environmental review process.

The City of Tumwater intends to work closely with PSE in the permitting and development of new electrical facilities in order to meet the growth demands in Tumwater and its Urban Growth Boundary for the next twenty years, and will pursue the following policies to help ensure reliable electricity supply:

1) *The City will accommodate additions and improvements to electrical utility facilities which enhance the capacity and reliability of regional resources.*

2) *The City encourages the designation and development of utility corridors and electric utility facilities in a manner consistent with the needs and resources of other jurisdictions. Decisions cannot be made on the basis of purely local considerations if multi-jurisdictional or regional interests would be affected.*

3) *The City will process permits and approvals for electric utility facilities in as expeditious a manner as possible, in order to insure predictability and reliable electricity service.*

4) *Tumwater and PSE will work closely to provide information on populations,*

employment and development projections and electrical load projections in order to provide electrical service to a growing population.

5) Tumwater recognizes the need for electric facilities that can sufficiently support economic development.

6) Tumwater will work with PSE to effectively plan for and implement the siting of electrical facilities while mitigating any potential impacts to the environment through the environmental review process.

7) New electrical facilities, whenever practicable, should be located in or near industrial, commercial, or other primarily non-residential areas. However, this provision recognizes that electrical facilities are necessary in residential areas, requiring facilities in residential areas. Electrical facilities should be designed in a manner to be reasonably compatible with surrounding land uses and planning policies.

8) Whenever possible and practicable, undergrounding of existing distribution electrical lines should be encouraged, in accordance with the Washington Utilities and Transportation Commission tariff requirements under which private utility companies must operate.

9) Whenever practicable and appropriate, encourage locating electrical transmission lines (115kV and above) within existing transmission line utility corridors. Where possible and appropriate, the City should facilitate the protection and preservation of existing electrical transmission corridors to maintain their usefulness in meeting future needs.

New electrical transmission utility corridors should, whenever practicable, be encouraged to locate in non-residential areas, recognizing that existing land use patterns and the need to meet the electrical needs of residential land uses may require new transmission utility corridors in residential areas.

3.12 Conclusion

In conclusion, PSE is currently supplying sufficient power to serve the existing electrical needs of Tumwater. There is not, however, enough excess capacity to serve the expected population and employment growth over the planning period, PSE is

using population, employment, and business forecasts to plan for adequate new and expanded electrical facilities to serve this demand.

4. TELECOMMUNICATIONS

4.1 Introduction and Overview

This chapter analyzes the existing and proposed systems of telecommunications provision within Tumwater. Tumwater receives phone service from Qwest.

Qwest is an investor-owned public utility. Since the breakup of AT&T, telecommunications provision has become a highly competitive business. Because of this, Qwest is unable to provide many pieces of information to Tumwater because we would be required to make that information public. Because of these constraints, this chapter will by necessity be rather brief and cursory.

4.2 Organizational and Regulatory Context

As with other utilities, Qwest is regulated by the Washington Utilities and Transportation Commission (WUTC). WUTC promulgates the regulations governing Qwest operations and fee structure. In addition, the Federal Communications Commission promulgates various federal laws and regulations by which Qwest must comply.

4.3 Telecommunications Operations

Qwest is the primary provider of local telephone service to Tumwater. Qwest does not provide maps showing existing or proposed phone utility installations. Qwest and its predecessors have provided telecommunications services in Washington communities for over 100 years. Because of the nature of telecommunications operations, facilities are not necessarily located near the customers served. Qwest is required by the WUTC to provide adequate telecommunications service on demand, accommodating whatever growth pattern occurs. Again, Qwest does not provide specific information because it is deemed competitively sensitive. For similar reasons, statistical data on customers is considered proprietary information.

4.4 Technological Impacts

The telecommunications industry is currently undergoing large advances in technology. Cellular and optical fiber technology are changing the way telecommunications service is delivered. In addition to this, technology is evolving

that will eliminate current physical barriers that separate data, video and voice technologies. With the breakup of AT&T, new technology and new service providers have entered the market at a very rapid pace. Because of these factors, the industry is changing too quickly to accurately assess the way in which future telecommunications services will be provided.

4.5 Transmission Towers

There are a number of transmission towers within the City of Tumwater that fulfill a variety of purposes. The bulk of these are located on Tumwater Hill and Bush Mountain because the height of these areas facilitate clear transmissions.

The abundance of transmission towers has in the past caused interference to television and radio reception to some of the residential areas on Tumwater Hill. It is beyond the scope of this plan to address specific methods to combat interference, however, telecommunication companies should make all reasonable efforts to reduce and prevent interference. This is principally handled by the companies owning and operating the transmitters, and peripherally by the Federal Communications Commission (FCC). Very often the company causing the interference can install internal filters to improve television and radio interference. The FCC requires any radio, pager, or cellular transmitter to respond to all reasonable complaints of interference.

What follows is a description of the various transmitting towers in Tumwater (see Map 4-1):

1. The mono pole on Tumwater Hill near the water tank overlooking Barnes Boulevard and the Somerset Peak Apartments contains various mobile phone transmitters.

2. A number of wireless phone antennae are attached to the water tank overlooking Barnes Boulevard and the Somerset Peak Apartments located on Tumwater Hill.

3. Two towers east of Barnes Boulevard and West of Fifth near the end of "E" Street. One tower is a transmitter for mobile phones, the other is a Department of Transportation communications transmitter for use in highway crew communications.

4. Two towers on Bush Mountain. One tower is owned by the Bonneville Power Administration which has a reflector from the main BPA substation (see Chapter 3) which reflects communications from the substation to other towers outside of Tumwater. The second tower is owned privately and is used for wireless phone and/or paging purposes.

5. One AM radio transmitter, KVSN is located on Linwood Avenue. This is the only radio transmitter in the City.

6. One monopole tower is located at the northeast corner of the intersection of Interstate 5 and Israel Road. This tower contains wireless phone antennae.

7. One monopole tower is located on Linderson Drive between Lee Street and Dennis Street. This tower contains wireless phone antennae.

8. A number of wireless phone antennae are attached to a water tower located on 76th Avenue between Center Street and New Market Street.

9. One communications tower located on Armstrong Road. This tower is located inside the regional Washington State Patrol facility and is used for government purposes.

10. One wireless phone tower is located east of the intersection of Old Highway 99 and 88th Avenue in the Tumwater Urban Growth Area.

11. One wireless phone tower is located at the southern end of Lathrop Drive near Interstate 5 and 93rd Avenue in the Tumwater Urban Growth Area.

4.6 Transmission Facility Siting

Any future siting of transmission facilities within Tumwater must comply with Title 11 of the Tumwater Municipal Code and future siting of facilities within the urban growth area must comply with requirements of the Thurston County Code.

4.7 Existing Phone Facilities

Qwest is not able to provide maps showing existing facilities. Qwest currently provides service to all of Tumwater and its Urban Growth Boundary area. Phone

facilities are typically located in the same trenches and overhead lines as electrical lines.

4.8 Future Phone Facilities

Qwest is not able to provide maps showing proposed facilities, because their data base does not follow municipal boundaries. Instead, they refer to RCW 80.36.090, which requires Qwest to provide phone facilities on demand.

4.9 Conclusion

Qwest currently provides phone service to all of Tumwater and does not expect difficulties in providing that service to the future residents of Tumwater over the next twenty years.

5. CABLE TV

5.1 Introduction and Overview

This chapter describes the components of the Cable TV system and the supply from the source to the customer.

5.2 History of Cable TV

Cable was originally developed in order to improve television reception. The first cable systems were built with military surplus cable and very primitive electronics. They required separate amplifiers for each channel and could not carry adjacent channels.

In the mid-fifties, broadband amplifiers were developed that amplified several channels in one piece of electronics, a major step in the advancement of cable television. In the sixties, the development of 12 transistorized amplifiers further advanced the cable industry. Slowly, the old electronics were replaced with new state- of-the-art equipment.

In the late 1970's, push-pull circuitry increased channel capacity to 21 channels, 30 channels, then 36, 54, 68, and finally 72, with more channels on the horizon. The ability to carry channels in the reverse direction has made possible numerous new cable services such as pay-per-view.

5.3 CATV System Framework

A CATV system has several major component parts that connect to form the operational CATV plant. The first of these is the receiver site where towers with antennas and earth station receivers are located to pick up air and satellite signals. From the receiver site, the signals are sent to the headend (usually located at or near the same site) to be processed for entry onto the trunk line, the main artery of the cable system. From the trunk, the signals are branched off onto feeder lines which carry the signals past individual homes. The signals are branched off again from the feeder onto drop cable that allows the signal to flow to the subscribers television set.

5.4 Signal Reception

Cable systems receive their signals in several different ways. Some are received through the air directly from broadcast television stations using antennas similar to those used by home owners.

Other signals are transmitted from point to point via microwave. Microwave transmission differs from off-air broadcast channels because the carrier that the video, color and sound are modulated upon is at a much higher frequency in microwave transmission.

A third source of signal is via satellites. A broadcast signal originating in New York uplinks or beams to a satellite 22,300 miles up and downlinks back to earth at the speed of light, and the picture quality is often better than a television broadcast received a few miles away.

Finally, the cable system can create channels by using its own TV camera and microphone or by using a video tape machine. This is called local origination.

5.5 The Headend

After being received, television signals are sent through electronic equipment at the headend and are prepared for entry onto the trunk line. This equipment differs depending upon how the signals were received. Once the signals are received and processed, they are combined in mixing equipment in the headend and started down the cable.

5.6 The Trunk System

The main cable carrying the signal from the headend throughout the system is called the trunk line. It is designed to get the signal to all areas using a minimum of active, or electronic devices. In larger systems there may be several trunk lines to keep each individual line from requiring too many amplifiers.

The trunk line must be properly maintained and should not have any unnecessary splices or devices. It only transports signal from amplifier to amplifier; it does not provide a direct source of signal to the customers' houses.

The length of trunk line is expressed by the maximum number of amplifiers in a particular line, called a "cascade."

5.7 The Feeder System

Feeder lines originate from trunk amplifiers. The signal is routed from the trunk by a bridger module which connects the trunk system to the feeder system without letting signals back onto the trunk. Directional taps are mounted in feeder lines to provide connection points for the service drops to the customer's home.

5.8 Coaxial Cable

Coaxial cable is the primary method of transporting signals from the headend to all points along the CATV system. It is made of solid copper or copper-clad aluminum center conductor, surrounded by an insulating layer of polyethylene foam. The insulating layer is covered with tubular shielding composed of either tiny strands of braided copper, a seamless aluminum sheath, or a combination of both.

The physical and electrical characteristics of this type of cable allow the transportation of a wide range of carrier frequencies. Coaxial cable ranges in diameter from 1-1/8 inch for CATV trunk lines down to 1/4 inch for individual house drops.

5.9 The Service Drop

The service drop is the last link in the cable system. Drop cable which is smaller in diameter than either trunk or feeder cable transports the CATV signal from the directional tap in the feeder line to the subscriber's television set.

5.10 The Existing System

Tumwater is served with cable primarily by Comcast. All of Tumwater is served by cable TV; though, of course, every household in Tumwater does not choose to subscribe.

The Comcast system serving Tumwater is supplied by a central antenna taking in transmissions. The Comcast cable system is fed directly by coaxial cable from this site.

Tumwater is adequately served by cable at this time and will continue to be adequately served throughout the twenty-year planning horizon. The coaxial cable has a practical length limitation of approximately 14-16 miles from the headend in Olympia, which allows Comcast to serve all foreseeable customers in Tumwater and its Urban Growth Boundary.

5.11 Proposed Improvements

There are a variety of proposed improvements to the system within the City. TCI Comcast engineers work closely with utility companies, Thurston County, and the City to stay informed on proposed developments so that cable can be a part of the developers' plans. Each year, engineers assigned to the Tumwater area assess the need for system expansion based on telephone inquiries, permitting data from the City/County and technological advances in distribution equipment.

Comcast is currently continuing to provide hook-up to customers as demand arises. Customer hook-ups are provided according to customer demand and in compliance with the regulations of the Washington Utilities and Transportation Commission. Comcast has a franchise agreement covering Tumwater which provides policy for new customer connections.