WATER SHORTAGE RESPONSE PLAN

Tacoma Water

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TACOMA WATER
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In the event of weather patterns or water system operating emergencies that challenge Tacoma Water's ability to meet customer demand while maintaining guaranteed minimum stream flows in the Green River, Tacoma Water is prepared to implement this Water Shortage Response Plan (Plan).

The Plan:

- Reinforces Tacoma Water's objectives to be environmentally responsible and well prepared to serve our customers when dealing with water shortage and system problems.
- Complements existing water conservation programs and provides guidelines and options to address extended low flows in the Green River or reduced availability of groundwater.
- Provides a menu of possible responses to emergencies such as loss of well capacity or loss of transmission capacity because of major water main or pumping system disruptions.

Underlying the objectives of the Plan are the need to preserve essential public services while it minimizes adverse effects on public health and safety, community and utility economic activity, environmental resources, and quality of life. Depending on the severity of the water supply shortage, Tacoma Water may implement one or more stages of the Plan.

Section 12.10.150 of Rate Ordinance No. 25102 regarding the "Emergency Interruption of Service" (approved by the Tacoma Public Utility Board on October 15, 1987, and subsequently updated in 1992) authorizes the director of Tacoma Public Utilities or the Tacoma Water superintendent "to change, reduce or limit the time for, or temporarily discontinue the use of water." In addition, the ordinance states that "the Public Utility Board is authorized to adopt and/or amend a Water Conservation/Curtailment Plan applicable to any or all classes of customers, which Plan is consistent with the standards in this section."

In effect, customer compliance with the Plan is a condition of continued water utility service by Tacoma Water.

PURPOSE OF THE WATER SHORTAGE RESPONSE PLAN

This Plan is a guide for Tacoma Water regarding the best management of Tacoma Water's supplies for the duration of any type of water shortage. The Plan outlines the actions available to reduce customer water demand, with primary focus on non-essential water use and additional actions that Tacoma Water may adopt to reduce supply-side uses of water.

While typical water conservation programming involves ongoing promotion of efficient

water use, the Plan is a short-term tool to organize reductions in water demand in concert with appropriate supply augmentation. The Plan is designed to complement Tacoma Water's Water Supply Plan and Habitat Conservation Plan (HCP).

Tacoma Water's HCP includes provisions for reducing Green River water withdrawals to protect important fish habitat. Depending upon the severity of the water shortage affecting the Green River, drought coordination meetings between Tacoma Water, local, state and federal resource agencies, the Muckleshoot Indian Tribe and U.S. Army Corps of Engineers may be required to "fully explore all alternatives that will allow the maintenance of guaranteed minimum stream flows" and to institute "consensus derived" water-use restrictions. Before reducing river flows at the Auburn gauge below 250 cfs, Tacoma Water is required to institute water-use restrictions consistent with Tacoma Water's HCP and 1995 agreement with the Muckleshoot Indian Tribe.

DROUGHTS AND SYSTEM EMERGENCIES

A water shortage, as it applies to Tacoma Water's supply system, is a temporary and insufficient flow of water in the Green River and/or a lack of groundwater supplies that cannot be offset by supply of water from other portions of Tacoma Water's well, reservoir and distribution system. The Green River flow is measured at the U.S. Geological Survey stream gauges at Palmer (USGS #12106700) and Auburn (USGS #12113000). Such a shortage may be caused by insufficient snowpack and precipitation within the watershed, an insufficient volume of water available in the supplemental groundwater system, or both.

Water shortages can occur any time, but Tacoma Water generally categorizes droughts according to their seasonal influence. A spring drought actually occurs during summer but develops during the spring, usually because of low snowpack combined with lower-than-normal spring rains. Because there is minimal precipitation in summer, watershed conditions prior to summer govern streamflow during summer. A fall drought is much more difficult to foresee because it is caused by delayed fall rains. When dry summer conditions extend into fall, streamflow continues to decline, which can be particularly critical because salmon spawning begins in fall. Tacoma Water has experienced more fall droughts than spring droughts.

Water shortages related to system operating emergencies are not as predictable. Shortages may result from failures of major transmission mains; loss or failure of multiple wells, pump stations or water treatment systems; or contamination of the Green River upstream of the intake. Any major loss of a significant source of supply may require Tacoma Water to implement one or more stages of this Plan. Response to earthquakes, mud slides, lahars, floods, contamination, power or communication failures, civil or employee disturbances, and terrorist attacks are covered in greater detail in the Tacoma Water Emergency Operations Plan.

TYPES OF DROUGHT EXPERIENCES

The Tacoma Water system has experienced two very different types of droughts in recent history.

On September 1, 1987, Tacoma Water agreed to limit diversions from the Green River to slow depletion of the supply in the Howard Hanson Reservoir. This action was taken due to an extremely low streamflow and the risk of losing the ability to supplement future flows from the reservoir because of a low pool of water. On October 14, 1987, the Tacoma Public Utility Board approved a Water Conservation and Curtailment Plan that outlined a four-stage response plan. On October 15, 1987, Tacoma Water implemented Stage 3, mandatory water use restrictions, prohibiting outdoor water use and curtailing a portion of the supply of water to the Simpson Tacoma Kraft paper mill (Simpson). In December 1987, the water supply situation had improved to the point that mandatory water use restrictions were lifted.

In 1992, Tacoma Water experienced a different type of drought. A dry, mild winter and spring raised concerns about the ability of the Green River supply to meet municipal and instream needs in late summer and early fall. In June 1992, the Tacoma Public Utility Board implemented a two-step approach to Stage 2 of the Water Shortage Response Plan. At this time, water demand had surpassed 100 million gallons per day (mgd) and stream flows were near record lows. The stages were implemented as follows:

Step 1: Tacoma Water established a water demand goal of 81 mgd or 20 percent reduction by June 17, 1992. All customers, including industrial, commercial, and institutional customers, were asked to reduce water use by 20 percent. In addition, Simpson was asked to implement all possible voluntary reductions. A mandatory restriction to limit lawn and turf watering to once per week was implemented for all customer classes. Some exceptions were allowed for new landscape insallations.

Step 2: A mandatory ban on lawn and turf watering for all customer classes was authorized if the 20 percent reduction goal was not met by July 1,1992. The goal was not met, so lawn watering was prohibited as of July 6, 1992. Exceptions were allowed for new lawns, and gardens. The Tacoma City Council also amended the Simpson contract to include a “temporary reduction incentive” that reduced the contract demand charge, providing greater financial incentives for water conservation.

All mandatory restrictions were lifted in August 1992 as supply levels returned to normal with the onset of rainy weather.

Previous to these events, there have been additional periods of potential water shortage, and another potential event occurred in 2005, but the potential was short-lived and did not impact customers.

TACOMA WATER'S WATER SOURCES

Tacoma Water gets its water supply from several sources. Most water comes from the Green River, under a 1912 water right claim, known as the First Diversion. An additional water right on the Green River, known as the Second Diversion, is associated with the Second Supply Project. A large wellfield in South Tacoma provides additional water when needed, along with several other minor wellfields in the Tacoma area. Together, the wells can provide as much as 55 mgd for short periods, or smaller amounts for longer periods. Tacoma Water also has a wellfield located alongside the North Fork of the Green River that is used as a substitute for river water. This source does not provide additional capacity and is generally available only during periods of higher-than-average precipitation. Details of each of these sources is provided below:

The FDWR allows Tacoma to divert up to 113cfs from the natural flow of the river, and requires Tacoma to maintain 250 cfs in the Green River at the Auburn Gage. Tacoma Water's First Diversion is a very reliable source, although it there are times when it may provide less than 73 mgd in the fall in dry years when natural river flows are low. Also, if the natural river flow falls below 73 mgd, Tacoma Water must reduce its diversion.

The Second Diversion Water Right (SDWR) makes 100cfs of water available but is limited by instream flow limits. At the Palmer gage, located just downstream of the Headworks, natural river flows must be at least 200 cfs in summer and 300 cfs in winter before SDWR water can be diverted. At the Auburn gage, there needs to be at least 400 cfs in summer in order for SDWR water to be diverted from the natural, or run-of-the-river. So, access to this water is usually not available in the summer (when flow conditions will not allow it). However, as part of the Additional Water Storage Project, this water right may be stored behind the Howard Hanson Dam in the spring, for use in the summer and fall. SDWR water which has been placed in storage at Hanson Dam can be released and used as needed. For water right purposes, it is considered to have been diverted from the natural system at the time when it was placed into storage behind the dam.

Operations during the spring refill period and the storage season are carefully managed to balance the environmental and human needs on the river. The Corps chairs an ongoing advisory committee consisting of resource agencies, the Muckleshoot Tribe, Tacoma Water, boaters and other recreational interests, and state and county government agencies. Water management decisions are made on a collaborative basis, within the framework of the Corps' operational requirements.

As mentioned above, Tacoma Water is required to provide adequate water to support instream flows during summer and fall to protect fish habitat, which means that Tacoma Water will either need to reduce its diversion or use water stored in Howard Hanson Reservoir to support streamflow. Tacoma Water has reduced its diversion in two types of situations. The most serious is when the Howard Hanson Reservoir is in danger of being depleted of stored water and the only remaining water is natural flow. Tacoma Water has reduced its diversion to as low as 25 mgd in this situation, which is very rare. A much more common situation is when Tacoma Water has voluntarily curtailed the diversion in the fall to leave additional water in the river for fish. This may reduce the diversion to as low as 36 mgd for a month or more.

Tacoma Water's South Tacoma wells are another important source of water and are typically used for peak water demands during the summer. If they are run for long periods in the summer, peaking capacity is reduced. Typical wellfield use in recent years has been as high as 12,000 AF per year. The wellfield can maintain pumping at about 45 mgd for a sustained period of time. Pumping at high rates requires the use of several wells that are generally not used because of water quality considerations. Using the wells extensively early in the season will reduce their available capacity later in the season because well water levels decline.

WATER SUPPLY PLANNING IN TACOMA

Tacoma Water's Water Supply section routinely monitors weather and water supply conditions throughout the year. In winter, a useful indicator of current and future conditions is the snowpack in the Green River watershed. Tacoma Water uses snowpack information as a means of anticipating streamflows in late spring and early summer. Snowpack keeps the ground saturated in the watershed, much like a saturated sponge. Even after the snowpack is gone, water continues to drain from the soil to provide base river flows well into the summer. The same effect can occur from spring rainfall that keeps the soil saturated until the dry season arrives. For purposes of providing adequate base river flows in summer, either the snowpack or the spring rains can be sufficient. In a year with low snowpack, adequate spring rainfall becomes especially important.

Tacoma Water uses other information to help anticipate future conditions. Comparing current snowpack conditions with historical records is one way of evaluating the current year. The National Weather Service's Climate Prediction Center offers an interesting and useful tool that provides long-range temperature and precipitation forecasts for more than a year in advance. These forecasts are a relatively new development, and are usually, but not always, accurate. Their main value is in identifying persistence of long-range trends, rather than in predicting actual weather months in advance. The Natural Resources Conservation Service provides another forecasting tool, which provides estimated river flow information based on snowpack and long-range forecasting. The Corps of Engineers, which is responsible for operating the Howard Hanson Reservoir, is also a good source of forecast information.

South Tacoma Well water level data is also available back to the 1930s. Levels declined in the 1950s when storm sewers were built in South Tacoma, but levels have stayed relatively constant over the last 20 years, typically with an annual fluctuation of only a foot or two. South Tacoma Well water levels tend to be influenced by long-term precipitation fluctuations, and to a lesser degree, by the amount of pumping.

THE PLAN

The Water Shortage Response Plan includes four stages of response related to droughts or other supply shortages. These include Advisory (Stage 1), Voluntary (Stage 2), Mandatory (Stage 3), and Emergency (Stage 4). Stages 1 through 3 will be used in response to droughts and water system disruptions, and Stage 4 will be used in response to disasters.

During a drought, Stages 1 through 3 will be implemented in sequence based on Tacoma Water's evaluation of current and projected conditions. Conditions may include weather, climate

forecast, streamflow, rainfall, reservoir storage level and anticipated fish runs. As conditions increase in severity through the three stages, consultation and collaboration with related resource and water management agencies will also increase. Actions of the previous stages will remain in effect in each successive stage. Water supply or use patterns could also be affected enough to impose Stages 2 or 3 without implementation of prior stages by a water system disruption, or by a volcanic eruption that emits ash affecting Tacoma Water's service area.

Tacoma Water's wholesale customers are expected to develop a water conservation and water shortage response plan for their own planning purposes or to follow Tacoma Water's conservation program implementation process and Water Shortage Response Plan. In particular, these agreements include a provision that wholesale customers will assist and support emergency curtailment measures required to manage demand during an emergency or shortage.

Following is an outline of the communications, utility operations and demand management objectives associated with each stage of the Plan. Potential conservation, media, operational strategies, and impacts and mitigation for all stages are outlined in Table II. It is expected that the Tacoma Water superintendent will be in regular communication with the director of utilities, Public Utility Board and City Council as conditions warrant, and will seek concurrence of Board and Council members for various actions, as required.

Stage 1 - Advisory

Tacoma Water will implement Stage 1 when potential water supply problems exist and when early indications are that additional steps will be needed if conditions deteriorate.

One objective of this stage is to increase customer awareness about the potential for a water shortage and advising what may happen if conditions worsen. Another objective is to distinguish between the water supply situation and conservation needs of Tacoma Water and those of other area utilities. Customers and businesses will be asked to use water wisely and to implement standard voluntary conservation measures. The estimated savings from these actions are described in Table I.

As early as meaningful data are available that water supply sources and normal demands may not be sufficient to meet instream flows, the Tacoma Water superintendent may call for a number of actions, including:

- Initiate inter-agency communications called for in Tacoma Water's HCP.
- Establish base water use and standard conservation options.
- Plan to implement the voluntary stage of the Water Shortage Response Plan.
- Begin public and customer information efforts.
- Begin developing or reviewing distribution and supply-side operation plans.

Stage 2 - Voluntary

Tacoma Water will initiate Stage 2 when available water sources are not expected to be sufficient to support normal demands (based upon Tacoma Water's current water demand forecast and current usage) and adequate support of instream flows.

Actions from Stage 1 will remain in effect. The objective of this stage is to encourage Tacoma Water's customers to further reduce water use. Stage 2 also provides guidelines that the utility may take to reduce its water use. The superintendent may call for additional actions, including the following:

- Establish additional desired savings.
- Increase frequency of evaluation of conditions creating drought and water-use trends.
- Intensify communications for water conservation.
- Plan for implementing mandatory restrictions.
- Establish key customer representatives among Tacoma Water staff.
- Contact targeted high-use peaking customers and propose water conservation strategies.
- Examine potential for water use reduction by Simpson and other high-use or peaking industries.
- Implement Tacoma Water's operational reductions.
- Examine alternate water supply sources.
- Ask wholesale customers to use other sources if available

Stage 3 - Mandatory

Tacoma Water will implement Stage 3 when available sources combined with voluntary demand reductions are not expected to be sufficient to support projected demands and provide adequate support of instream flows.

The objective of Stage 3 is to limit or prohibit non-essential water-uses. Restrictions will be determined based on the season of the year, targeted demand levels and other considerations. Because implementation of Stage 3 can create severe economic impacts, the superintendent will have the authority to waive or exempt customers who comply with and meet exemption criteria. Some actions from Stages 1 and 2 may remain in effect if they assist in meeting the required water-use reduction. Additional actions the superintendent may call for include:

- Establish additional desired savings.
- Further increase the frequency of evaluation of conditions creating the shortage and water-use trends and evaluate all options to reduce consumption.
- Increase communications to advise customers about the status of the water system and mandatory water-use reductions.

- Restrict non-essential water uses according to the severity of water supply conditions.
- Curtail water supply to Simpson as operating and economic factors allow or dictate.
- Implement water use limitations that could affect new construction.
- Increase Tacoma Water's operational reductions.
- Pursue alternate water supply sources.
- Further reduce wholesale water provisions in accordance with wholesale agreements.

Stage 4 - Emergency

An emergency water supply shortage could arise as a result of a major catastrophic event such as an earthquake of significant magnitude. Critical situations include the loss of the Tacoma Water Headworks or Tacoma Water's primary transmission mains. A triage response would be required if a catastrophe were to affect all or significant portions of Tacoma Water's water supply system. Refurbishing damaged facilities and supply lines while maintaining an effective a level of water service is the objective of Stage 4.

Weather-related implementation of Stage 4 could occur as a result of a major or extended drought, especially if it culminates during high-water demand months or is coupled with another critical situation that affects either the available water supply, treatment or distribution system. Maintaining an effective level of water service is the objective of Stage 4 when it is the result of severe or extended drought.

Some actions from the previous stages would remain or go into effect if they assist in meeting the required water-use reduction. Tacoma Water may need to provide water through contracted water supply trucks or by partial operation of the water system. Reduced system pressure can be expected to occur. Intermittent water supply to parts of the city may be available with a "boil water" order if safe water quality cannot be ensured. Commercial and industrial water use may be curtailed except for public health and safety needs.

The superintendent will coordinate and authorize all activities related to supplying water service, public information and determining the timing and the extent of necessary actions.

TABLE I
WATER SHORTAGE RESPONSE PLAN – SUMMARY ACTIONS

Stage	Criteria	Demand Reduction/Conservation Actions
1 Advisory	Impending risk to instream resources.	• Initiate inter-agency communications called for in Tacoma Water's HCP. • Establish base water use and standard conservation options. Potential savings projected to be. • Plan to implement the voluntary stage of the Water Shortage Response Plan. • Begin public and customer information efforts. • Begin developing or reviewing distribution and supply-side operation plans.
2 Voluntary	Available sources insufficient to support normal demands and instream flows.	• Increase frequency of evaluation of conditions creating drought and water-use trends. • Intensify communications for water conservation. • Establish additional desired savings. • Plan for implementing mandatory restrictions. • Establish key customer representatives among Tacoma Water staff. • Contact targeted high-use peaking customers and propose water conservation strategies. • Examine potential for water use reduction by Simpson and other high-use industries. • Implement Tacoma Water's operational reductions. • Examine alternate water supply sources. • Communicate to wholesale customers regarding water supply availability and potential opportunities to obtain a temporary supply.
3 Mandatory	Available sources, combined with voluntary conservation, are insufficient to meet projected demands while also supporting instream flows.	• Further increase the frequency of evaluation of conditions creating the shortage and water-use trends and evaluate all options to reduce consumption. • Increase communications to advise customers about the status of the water system and mandatory water-use reductions. • Establish additional desired savings. • Restrict non-essential water uses according to the severity of water supply conditions. • Curtail water supply to Simpson as operating and economic factors allow or dictate. • Implement water supply limitations for new construction according to the severity of water supply conditions. • Increase Tacoma Water's operational reductions. • Pursue alternate water supply sources. • Communicate to wholesale customers regarding water use restrictions.
4 Emergency	Major catastrophe (earthquake, loss of Howard Hanson Dam, destr. of trans mains)	• Intermittent supply to customers (associated with "boil water" order). • Reduce system pressure. • Use water trucks. • Curtail commercial/industrial use except for essential services.