CHAPTER 7

OPERATION AND MAINTENANCE PROGRAM

WATER SYSTEM MANAGEMENT AND PERSONNEL

The City of Sequim is governed by a City Manager and seven member City Council. Water system staff include a Public Works Director and three Water Distribution Managers. The City's Public Works Director is Mr. James E. Bay, and the lead operator is Marty Hogoboom, Water Distribution Manager 2. Mr. Hogoboom is also the Cross-Connection Specialist 1 for the City. On weekends, Mr. Wayne Balholm and Mr. Alan Chrisman alternate duties as operators. Mr. Bay also serves as the Fire Marshall. The certification status of City water utility staff is shown below:

Mr. James E. Bay	Public Works Director WDM-2 (360) 683-4908 (8 a.m.-5 p.m. Weekdays) (360) 460-0077 (Pager)
Mr. Marty Hogoboom	WDM-2, C.C.S.1 (360) 683-4908 (7:30 a.m.-4 p.m. Weekdays) (360) 460-0077 (Pager)
Mr. Alan Chrisman	WDM-2 (360) 683-4908 (7:30 a.m.-4 p.m. Weekdays) (360) 460-0077 (Pager-Weekends)

PROFESSIONAL GROWTH REQUIREMENTS

In order to promote and maintain expertise for the various grades of operator certification, Washington State requires that all certified operators complete not less than three Continuing Education Units (CEU) within each three year period. Programs sponsored by both Washington Environmental Training Resources Center (WETRC) and the American Waterworks Association (AWWA) Pacific Northwest Subsection are the most popular source of CEUs for certified operators in Washington State.

Besides providing CEUs, operator training is an important component in maintaining a safe and reliable water system. At a minimum, all personnel performing water system related duties should receive training in the following areas.

- Confined space
- Trenching and shoring
- Traffic Flagging
- Asbestos cement pipe safety
- Cross Connection Control

The City of Sequim's certified operators all complete CEUs on a regular basis. All certified operators have received training for confined space, trenching and shoring, traffic flagging, asbestos cement (AC) pipe safety, and cross connection control.

SYSTEM OPERATION AND CONTROL

MAJOR SYSTEM COMPONENTS

The locations of the major system components are shown on Figure 1-2, the system facilities map. A description of the normal operation of each facility is given in the following sections.

The City of Sequim currently utilizes three major sources of supply: the Infiltration Gallery, the Silberhorn Well Field, and the Port Williams Well Field. The Infiltration Gallery, which is a series of perforated interception pipe lines buried under the bank of the Dungeness River, is operated at a constant supply rate of 200 gpm as turbidity levels allow. The Infiltration Gallery also consists of a collection well, a chlorination unit, and a 12-inch transmission line with valves. The system is operated by a siphon which is primed by a diaphragm air pump. The chlorinator is triggered on by flowing water in the pipe. The Infiltration Gallery feeds the City's 1.7 MG and 0.5 MG reservoirs. The Infiltration Gallery has recently been designated by DOH as a potential GWI source.

The Silberhorn Well Field consists of three wells. Currently the City only utilizes two of the three wells, with the third being used for monitoring purposes. The City operates each well at a maximum pumping rate of 350 gpm. A remote vacuum chlorinator chlorinates the water prior to it being pumped to the City's 1.7 MG reservoir and the 395 (420) pressure zone.

The Port Williams Well Field currently consists of two wells, each designed for a pumping capacity of 560 gpm. A total of five (5) wells are planned to be drilled at the Port Williams site. All wells in the Port Williams Well Field are proposed to pump through the Control Building and be connected to the 12-inch water main located on Port

Williams Road. Each well is equipped with a flow meter, and the total flow from all wells is measured with the flow meter in the Control Building. Sodium hypochlorite is injected into the water main in the Control Building to provide chlorine disinfection of the system. The existing wells can be operated together based on the water level in the 1.7 MG reservoir or by drop of pressure at the Control Building. The wells are programmed to alternate on each pump cycle. These wells pump to the 350 Zone.

The City has three (3) hydraulic pressure zones in order to maintain reasonable pressures (minimum and maximum) within each zone. The upper 480 zone is served by the booster station and 0.2 MG reservoir on Reservoir Road. This system is isolated from the other zones by closed gate valves. The intermediate zone contains the 1.7 MG and 0.5 MG reservoirs. The overflow of the 1.7 MG reservoir is 420 and the overflow of the 0.5 MG reservoir is 395, therefore the hydraulic grade line (HGL) in the intermediate zone varies between 420 when the reservoir is being filled and 395 when the reservoirs are supplying flow to the system.

The lower zone has been designed to operate at an HGL of 350. This lower zone HGL can be varied to meet the desired operational pressures within the area by adjusting the pressure reducing valves at 5th Avenue and McCurdy Street, at 3rd Avenue and the easterly extension of McCurdy Street, and on River Road.

When a Port Williams well is pumping and does not provide all of the supply required for the 350 Zone, or if the well has not been called, the PRV at 5th Avenue and McCurdy Street will open to allow water to flow from the reservoir to the lower zone and the PRV will modulate to maintain the set hydraulic gradient for the zone. If the Port Williams well is pumping more than required to meet demands in the 350 Zone, the booster station at 5th Avenue and McCurdy Street will be enabled to start under certain conditions and pump water to the 1.7 MG reservoir.

PREVENTIVE MAINTENANCE PROGRAM

The most cost-effective method for maintaining a water system is to provide a planned preventive maintenance (PM) program. A planned PM program can provide the optimum level of maintenance activities for the least total maintenance cost. The routine maintenance procedures for each system component follow.

RESERVOIRS

Improperly maintained reservoirs can cause contamination in public water systems. This is a result of contaminants entering the reservoir through cracks or openings at the vent, overflow or drain screens. Deteriorating hatch covers and vandalism can also compromise reservoir water quality. Poorly designed and maintained reservoirs can hamper the emergency operation of a water system. If reservoir drains are not functioning properly, it may be impossible to purge a contaminant from the system.

Written documentation of reservoir maintenance must be completed with each inspection and repair, and a copy of the report retained on file. The City of Sequim currently cleans their reservoirs every five years. Reservoir levels are monitored daily.

Distribution System Valve and Hydrant Maintenance

The City should implement a distribution valve exercising program on an annual basis. Valves that do not close tight should be removed, repaired or replaced. An important aspect of distribution system valve maintenance is to ensure distribution valves are completely open. A partially closed valve can seriously reduce peak day operation and fire flow supply. Example maintenance reporting forms are included in Appendix M.

Currently, the City observes the pressure drop across pressure regulating valves weekly. Valves are exercised semi-annually. Once every six months a downstream fire hydrant is opened to make sure PRV's are operating.

Dead-End Water Lines

Dead-end water lines are susceptible to water quality problems and should be flushed at least quarterly or more frequently to remove stagnant water and debris which may have been deposited. Flushing of all dead end mains should be accomplished twice each year or more often if water quality complaints should occur. The City currently flushes dead end mains to maintain water quality.

Meters

Accurate water metering is an essential financial and conservation oriented component of water system infrastructure. A substantial amount of revenue may be lost through inaccurate metering of residential, commercial and in the future industrial accounts. The importance of accurate master or source meter readings cannot be over estimated. Without accurate master or source meter readings, the water utility cannot determine lost and unaccounted for water volumes. Service meters, including all residential and commercial customer meters, should be calibrated and/or replaced according to the following schedule:

1. 3/4-inch and 1-inch meters should be tested every 10 years and replaced, if necessary. Replacement is recommended if it is cheaper to replace meters than to test and if necessary, repair meters.

2. 2-inch through 4-inch meters should be tested and calibrated every 3 to 5 years.

3. 4-inch and larger meters should be tested and calibrated every 1 to 3 years.

Inventory of Materials

The City should establish and maintain an inventory of parts and supplies including the appurtenances needed to make emergency repairs. At a minimum the materials on hand and included in the inventory should include the materials necessary to repair leaks for every size and type of pipe in the system. Spare valves in sizes 8-inch and smaller should be included in this inventory.

Operation and Maintenance Schedule

Table 7-1 is a listing and schedule of normal maintenance and operations activities. The frequency listed is the actual frequency.

TABLE 7-1

Preventive Maintenance Schedule

Operation and Maintenance	Frequency
Drain and Clean Reservoirs	Every 5 years
Monitoring Reservoir Levels	Daily
Distribution System Valve Exercising	Annually
Hydrant Exercising	Annually
PRV Inspection	Every 6 months, repair as needed
Service Meter calibration	As needed(1)
Flushing Dead-End Water Mains	Weekly
Commercial Meter Readings	Monthly
Residential Meter Readings	Bi-monthly

(1) Service meters are calibrated on an as-needed basis. The City looks for deviations on billing reports that might indicate the need for meter calibration.

EMERGENCY RESPONSE PROGRAM

Water utilities have the responsibility to provide an adequate quantity and quality of water in a reliable manner at all times. To do this, utilities must reduce or eliminate the effects of natural disasters, accidents, and intentional acts.

EMERGENCY PROCEDURES

Although is not possible to anticipate all potential disasters affecting the City's water system, formulating procedures to manage and remedy several common emergencies is appropriate.

Water System Personnel Emergency Call-Up List

Mr. Jim Bay is the City of Sequim's Public Works Director and City Fire Marshall. Mr. Bay is in charge of initiating emergency response procedures and ensuring that customers and emergency response agencies are notified.

Table 7-2 is an emergency phone list for the City.

TABLE 7-2

Emergency Phone List

Agency/Group	Contact	Phone Number
Fire/Police	--	911
Public Works Director	James Bay ~~Pager~~ Cell Phone -	360-683-4908 360-460-0077
Utility Operator Cross-Connection Specialist	Marty Hogoboom Pager	360-683-4908 360-460-0077
City Shop	--	360-681-3449
Contractor	Klahn Construction	360-681-0987
Contractor	Primo Construction	360-683-5447 or 360-457-5708
Plumbing Supplies	Bill's Plumbing Supplies	360-683-4638 or 360-452-9084
Pipe/Fitting Suppliers	Walt Davy Supplies	360-683-2960
Pipe/Fitting Suppliers	H.D. Fowler	206-863-8600
Pipe/Fitting Suppliers	Western Utilities	800-772-6004
Telemetry Repair and Installation	S&B, Inc.	425-644-1700
Control Valve and Maintenance Repair	G.C. Systems, Inc.	253-939-8322
Testing Lab	Laucks, Inc.	206-767-5060
Testing Lab	Water Management Laboratories	253-531-3121
Washington State Dept. of Health	SW Regional Office	360-664-8058
Clallam County	Emergency Services	360-417-2305
Clallam County	Public Health	360-417-2274
P.U.D.	--	360-452-9771
State Wide One-Call	Utility Locates	800-424-5555
Gray & Osborne, Inc.	Seattle Number	206-284-0860

Bacteriological Presence Detection Procedure

Notification procedures for notifying system customers, the local health department, and DOH of water quality emergencies are an important component of an emergency response program. Many public water systems will occasionally detect positive coliform samples, mainly as a result of minor contamination in distribution mains or sample taps, or improper bacteriological sampling procedures. However, the persistent detection of coliforms in the water supply, particularly E. coli or fecal bacteria, may require issuing a public boil water notice to ensure the health and safety of the water customers. Emergencies such as floods, earthquakes, and other disasters can affect water quality as a result of damage to water system facilities, thereby warranting a boil water order in advance of supply. A suggested boil water notification is included in Appendix N. WAC 246-290-320 requires water utilities to follow specific procedures in the event coliform bacteria are detected in the water system. These procedures are outlined in Figure 7-1.

VOC/SOC and Inorganic Chemical/Physical Characteristics Detection Procedures

A procedure to comply with DOH requirements in the event of a volatile organic chemical or synthetic organic chemical procedure is presented in Figure 7-2. A procedure for an inorganic chemical/physical characteristic detection is presented in Figure 7-3.

Power Failure

Various types of weather can cause loss of power, such as wind, lightning, freezing rain, freezing snowstorm. The Silberhorn and Port Williams Well Fields have emergency power supplies which meet the minimum requirements of Section 5.B.6 Power Considerations of the Sizing Guidelines for Public Water Supplies and can be considered a non-interrupted power source. The Silberhorn Well Field has a 75 kWH generator and sufficient fuel to provide back-up service for 24 hours. The Port Williams Well Field has a 200 kWh generator which can operate the two wells simultaneously. The Infiltration Gallery feeds the water system by gravity and therefore would not be affected in the event of a power failure.

Severe Earthquake

System Component	Action
Wells and PRVs: Wells may have lost power and PRVs may be damaged	• Repair/manipulate wells as needed to continue supply of water to system • Check PRVs for damage
Distribution System: Distribution and transmission mains may be broken	• Isolate broken sections and repair
Reservoir: Reservoir may be leaking or structurally damaged 1.7 MG reservoir has a seismic valve which will close in the event of an earthquake	• Check reservoir for structural damage and drain if in danger of bursting • Check reservoir for cracks and leaks, and seal or drain as required

Severe Snowstorm

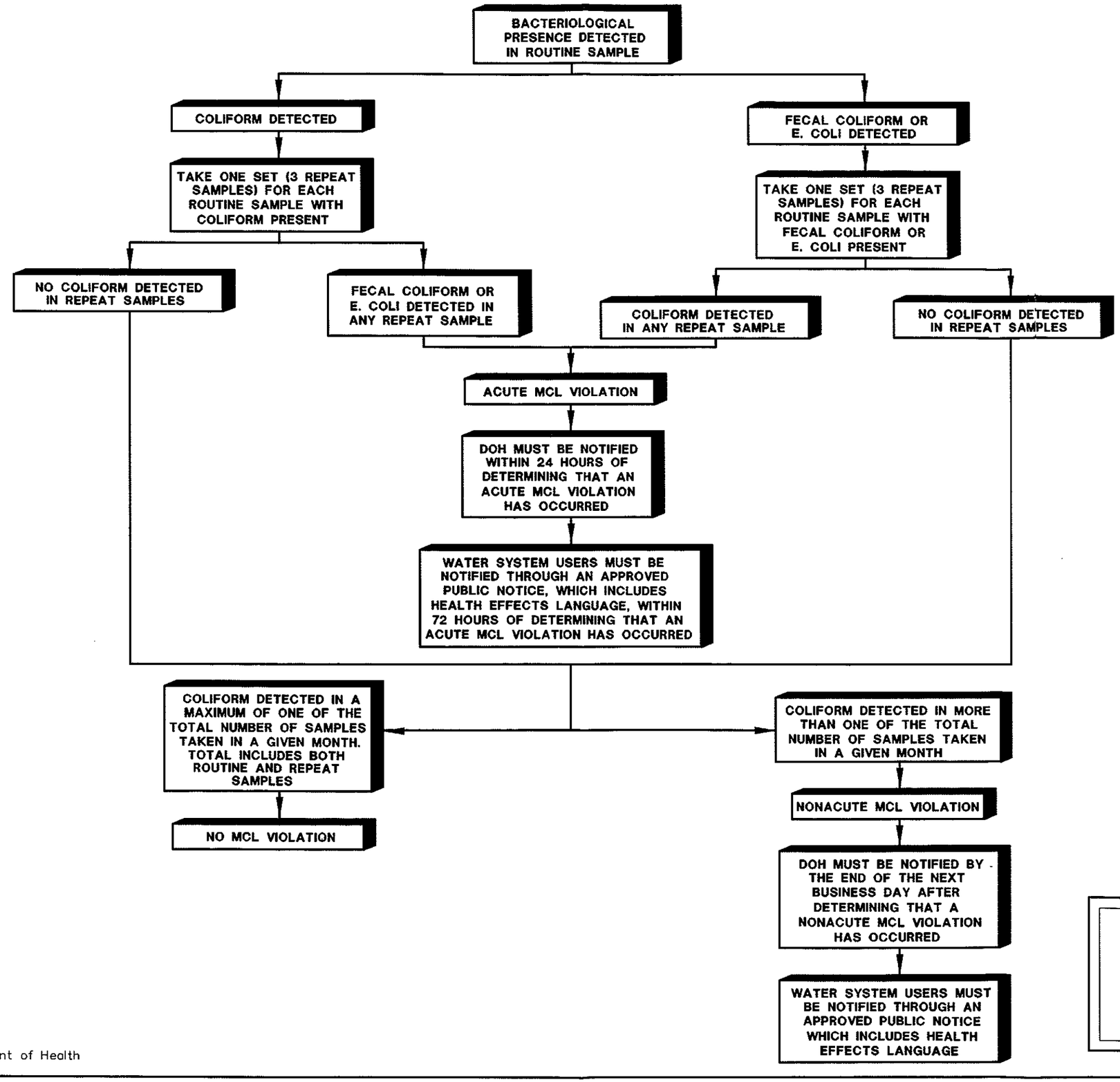
Heavy snowfall may bring motor vehicle traffic to a standstill. Employees may not be able to reach problem area.

System Component	Action
Distribution System: Transportation to monitor system and make repairs will be limited	• Plow streets if necessary and if equipment is available • Have chains and other snow gear ready for maintenance equipment and vehicles • Valve locations should be kept current and made available for maintenance personnel
Reservoir: No immediate effect. Snow may prevent access.	• Vehicle access not possible

High Water and Flooding

Heavy snow melt and/or rains cause the water level to rise and reach a flood level.

System Component	Action
Distribution System	Check chlorine residuals throughout distribution system
Reservoir: No effect. Reservoir is above flood level	No action is necessary

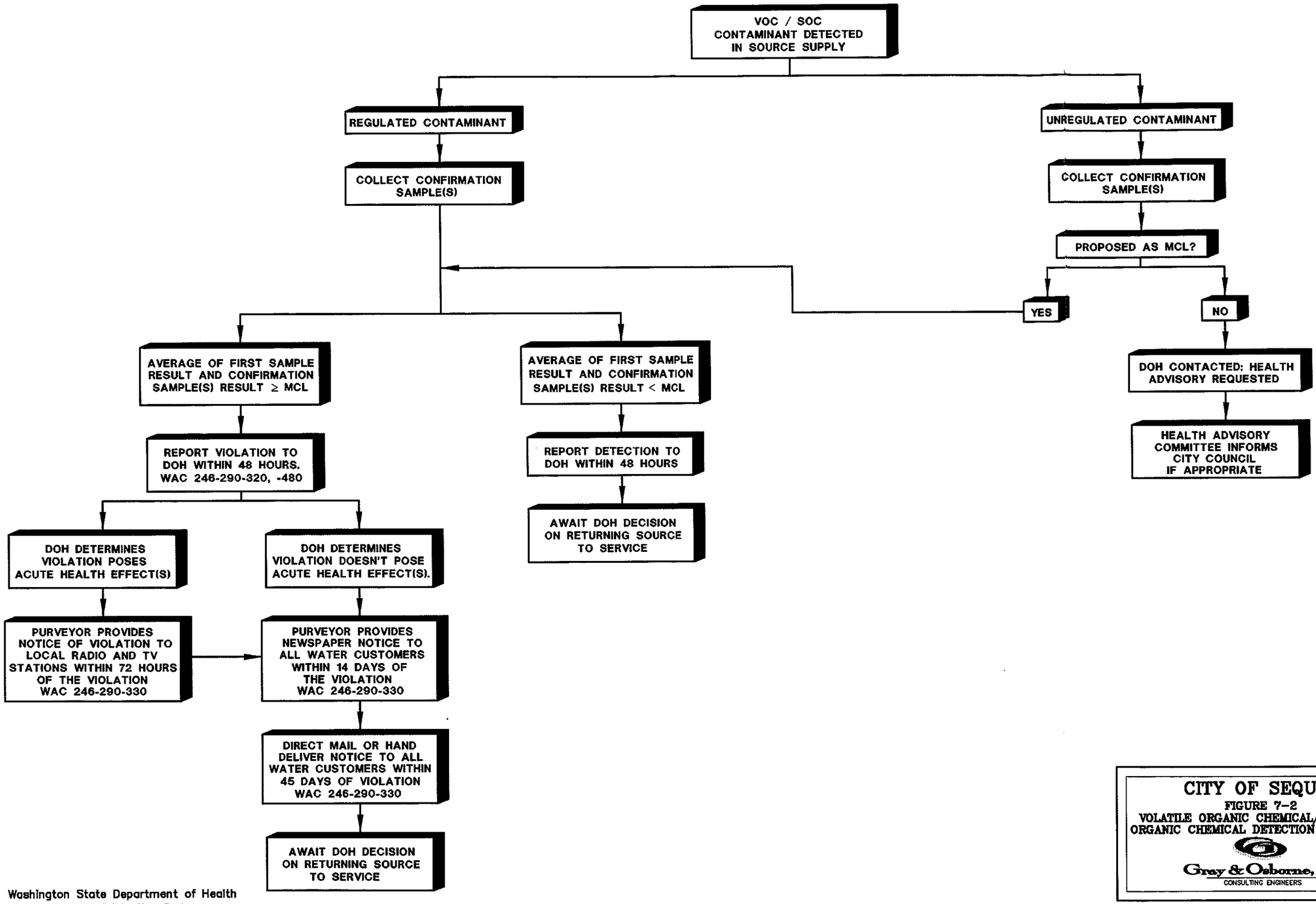


DOH: Washington State Department of Health

CITY OF SEQUIM

FIGURE 7-1
BACTERIOLOGICAL PRESENCE
DETECTION PROCEDURE

Gray & Osborne, Inc.
CONSULTING ENGINEERS



DOH: Washington State Department of Health
WAC: Washington Administrative Code

CITY OF SEQUIM

FIGURE 7-2
VOLATILE ORGANIC CHEMICAL/SYNTHETIC ORGANIC CHEMICAL DETECTION PROCEDURE

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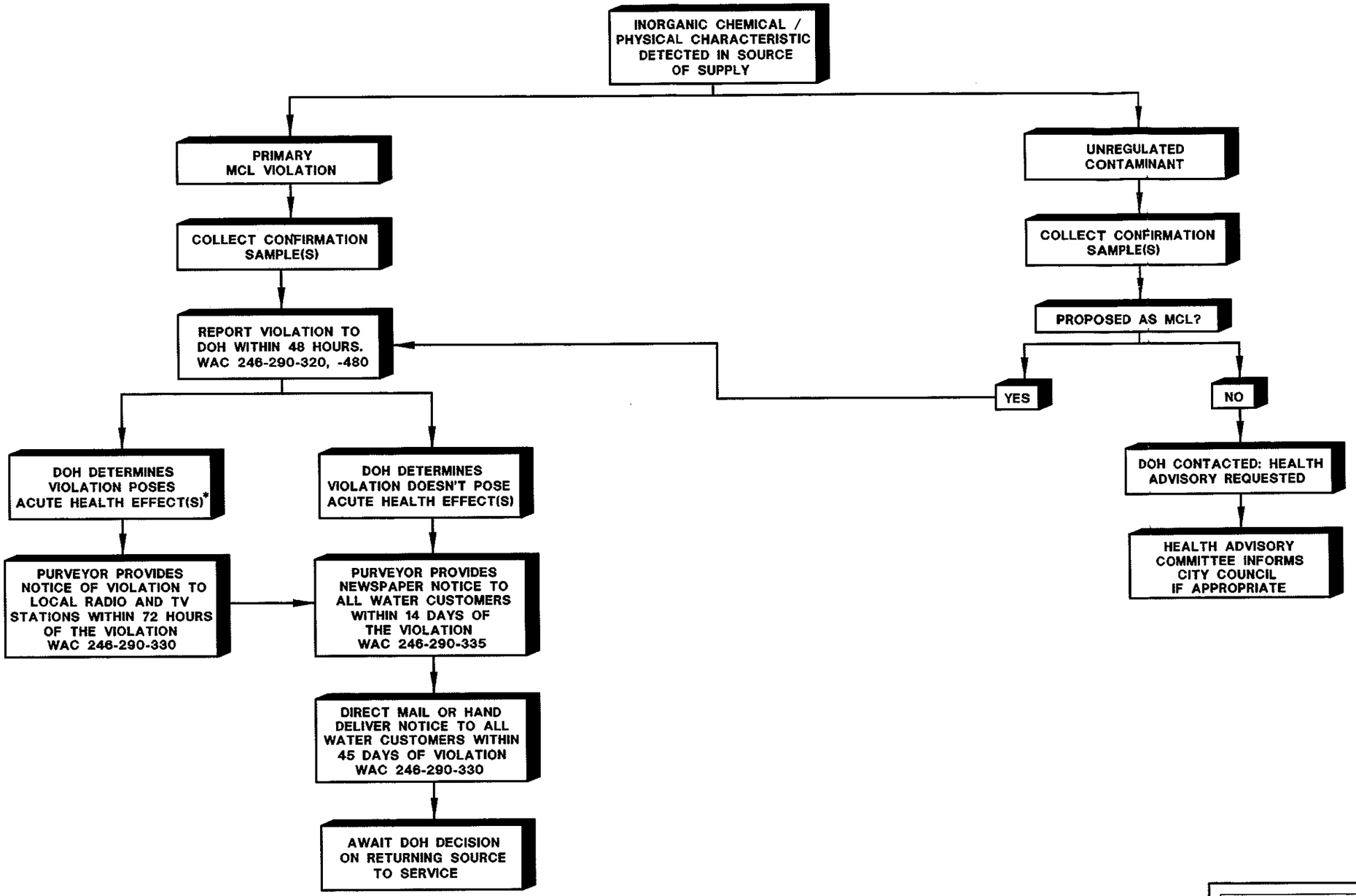

CITY OF SEQUIM

FIGURE 7-3
INORGANIC CHEMICAL/PHYSICAL CHARACTERISTIC DETECTION PROCEDURE

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*A VIOLATION OF THE 10.0 MG/L NITRATE MCL CONSTITUTES AN ACUTE HEALTH EFFECT CONCERN.

Contamination of Water Supply

Contamination of water supply for such items as main breaks or pollution from an isolated source.

Distribution System Contamination
• Close valves if possible to isolate source
• Repair and or remove source of pollution
• Flush previously contaminated section and test until free of contamination prior to resumption of use

Reservoir Contamination
• Re-sample to confirm contamination
• Check distribution system for presence of contamination
• Isolate reservoir from system
• Inspect vent screens, hatches, and piping to identify source of contamination
• If reservoir water is contaminated and therefore considered unsuitable for consumption, drain and clean reservoir.
• Consider disinfecting reservoir if bacteriological standards are exceeded. Follow AWWA Standards.

CROSS CONNECTION CONTROL PROGRAM

The City of Sequim's cross connection control program was approved by the Department of Health in October 1998. This program establishes minimum standards for the City to protect the public potable water supply from possible contamination due cross connections. The Program addresses authority, responsibility, requirements, administrative procedures, minimum requirements, record keeping, and standard forms and letters. A copy of the City's cross connection control manual is included in Appendix F.

PROGRAM SCHEDULING

The City plans to implement their cross connection control program according to the following schedule.

Task	Date of Completion
Adopt Cross Connection Control Ordinance	January 2000
Mail Letter to Existing Commercial and Industrial Customers	March 2000
Compile List of Existing Devices	June 2000
Identify Locations in Need of Devices	June 2000
Mail Notices Outlining Testing Requirements to Those With Devices	June 2000
Mail Notices Outlining Installation and Testing Requirements to Those Without Devices	June 2000
Begin Annual Inspection/Develop Procedure for Documentation of Test Results	January 2001

gpm at this location, Project D-1 is recommended. This completes the 10-inch distribution main loop along Hendrickson Street.

Project D-2: Construction of an 8-inch Water Main Along Pine Court, construction of a Pressure Reducing Valve (PRV) station along 7th Avenue at Hammond Street, and installation of a check valve at 5th Avenue and Pine Street

Existing services along Pine Court have experienced low pressures. In order to mitigate these low pressures and expand the boundaries of the 395/420 Zone, Project D-2 is recommended. The recently constructed distribution main along River Road and 9th Avenue will serve the 395/420 Zone as well. The proposed revised boundaries of the 395/420 Zone are shown in Figure 8-1. A check valve will need to be installed at 5th Avenue and Pine Street and a valve will need to be closed just east of 5th Avenue at McCurdy in order to isolate the new 395/420 Zone.

Project D-3: Construction of a 12-inch Water Main along 7th Avenue, between Reservoir Road and McCurdy Road

In order to provide an additional feed to the 350 Zone from the 395/420 Zone, as well as provide redundancy for the distribution mains along 5th Avenue, Project D-3 is recommended.

Project D-4: Construction of 12-inch Water Mains along Hammond Street

In order to meet the fire flow design standard of 3,000 gpm at the Bell Creek Plaza, Project D-3 is recommended. This project provides looping of dead-end distribution mains.

Project D-5: Construction of a 12-inch Water Main South of McCurdy Road, between Sequim Avenue and 3rd Avenue, and construction of a PRV Station at Sequim Avenue and McCurdy Road

The 12-inch distribution main along the new Highway 101 alignment currently is served by the 350 Zone. In order to provide service to the eastern portion of the City's service area, it is recommended that this distribution main be served by the 395/420 Zone. Construction of a 12-inch water main south of McCurdy Road will tie the existing 12-inch water main along the new Highway into the 395/420 Zone. Construction of a PRV station at Sequim Ave. and McCurdy is then recommended to be completed in conjunction with the construction of the water main in order to feed the 350 Zone from the 395/420 Zone.