Cross-Connection Control

As a certified water purveyor of the State of North Carolina we must maintain a high standard for our drinking water. The Town of Hillsborough is dedicated to surpass the State's guidelines. The following information is provided to educate the public, in order for everyone to help the Town avoid contamination due to backflow.

Definitions

Backflow- the undesirable reverse in the flow of water

Backflow backpressure- a condition in which a substance is forced into a water system that is at a higher pressure than the system.

Backflow backsiphonage- a condition in which the pressure in the water system is less than atmospheric pressure.

Backflow prevention assemblies- an inline testable and repairable assembly that is certified through the USC-FCCCHR and ASSE.

Water purveyor – public or private water system that provides potable drinking water to the public

What is backflow?

There are 2 types of backflow. **Backsiphonage and Backpressure**

Backpressure backflow is a state in which pressure for a non-potable system is greater then the distribution system, which will force a substance back into the purveyor's system.

Backsiphonage backflow occurs when there is pressure drop in the distribution system. When this occurs it causes a vacuum which "sucks" a substance back into the distribution system.

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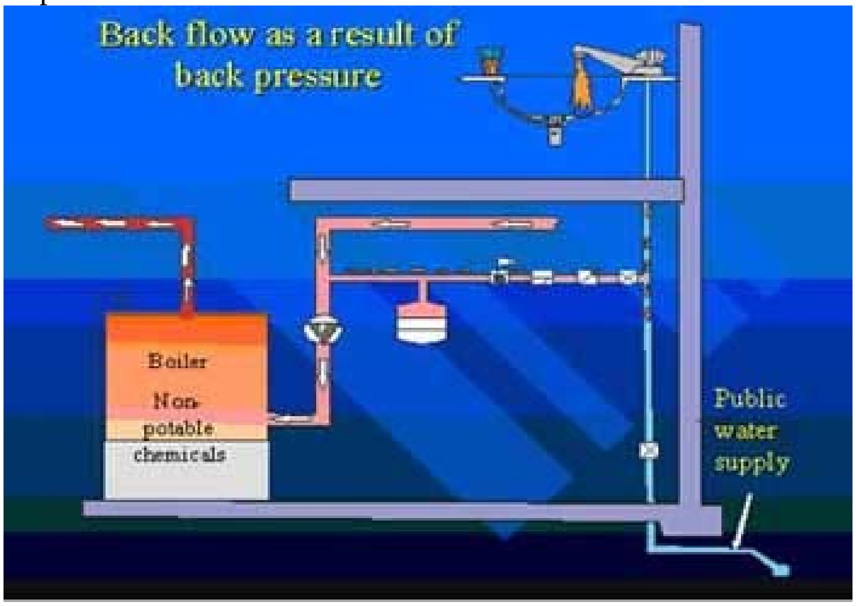
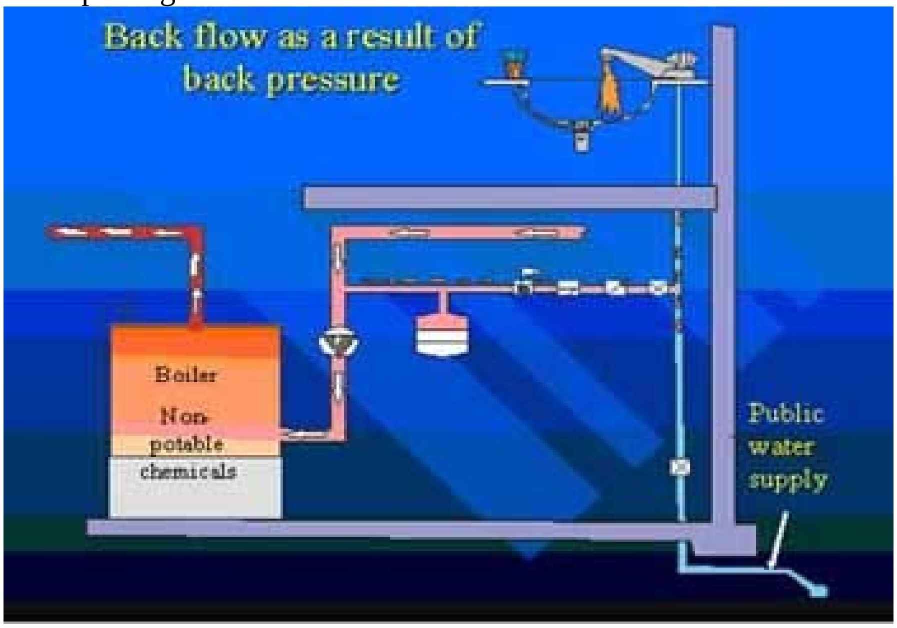
Example Backpressure backflow:



Example Backsiphonage backflow:



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What are backflow preventers?

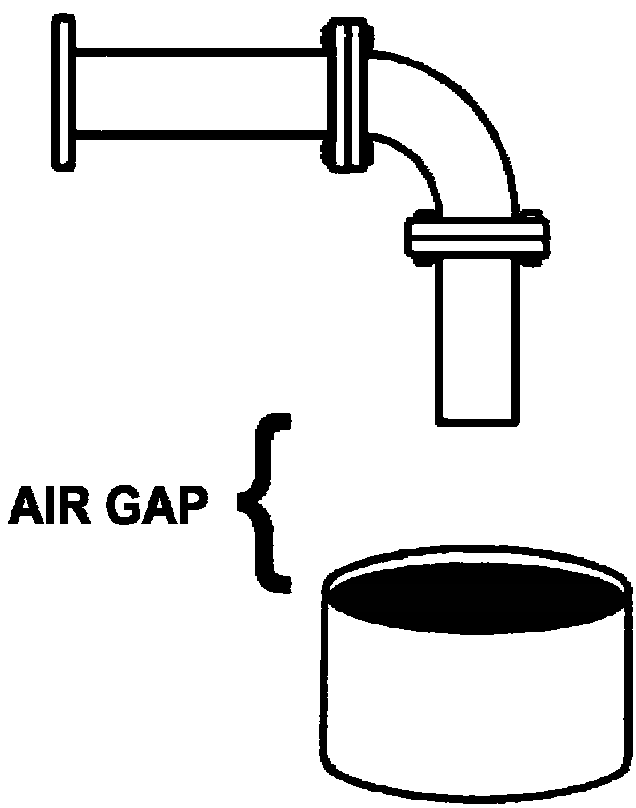
Backflow preventers are what the USC-FCCCHR and ASSE have certified as inline testable and repairable.

1. AG - Air gap
2. PVB- Pressure Vacuum Breaker
3. DCVA- Double Check Valve Assembly
4. DCDA- Double Check Detector Assembly
5. RP- Reduce Pressure Principle Assembly
6. RPDA- Reduce Pressure Detector Assembly

<u>Air Gap or AG</u>

Air gap is the most effective way to prevent a cross-connection by a separation between the potable water source and a non-potable source. At the same time it is the one approved method that is compromised the most by direct or in-direct cross-connect. This is not a device, it is actually a method. Minimum requirement is 2 times the diameter of the influent pipe. Air gaps are effective against what is deemed a “High Health Hazard”.

Example Air Gap:



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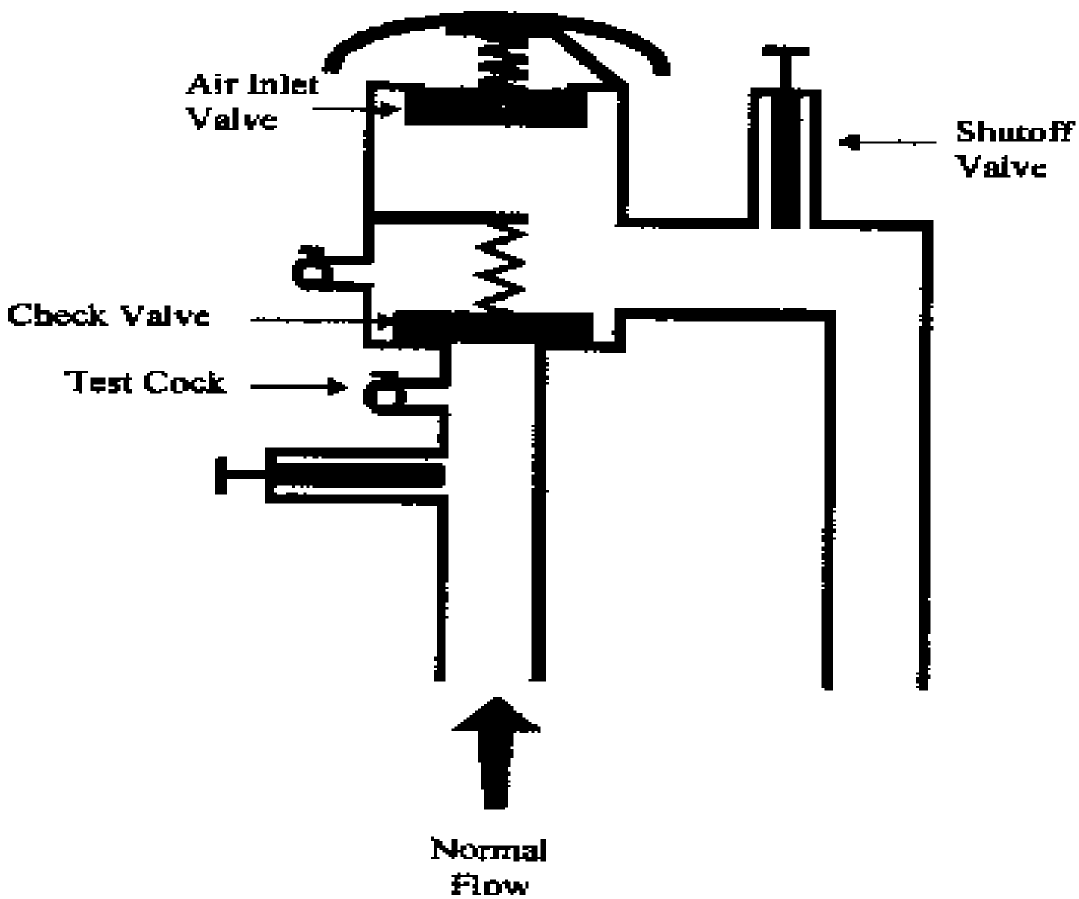
Common uses for an AG:

Air gaps are used in residential kitchens and bathroom. Sinks and bath tubs use this method to form a physical gap between the potable water and non-potable water. Commercial facilities not only use air gap in food prep areas and restrooms, they also use them with chemical vats or where they would need a physical gap between the potable and non-potable sources.

Pressure Vacuum Breaker or PVB

A pressure vacuum breaker assembly consists of an independently operating internally loaded check valve and an independently operating loaded air inlet valve located on the discharge side of the check valve, with properly located resilient-seated test cocks and tightly closing resilient-seated shut-off valves attached to each end of the assembly.

Example Pressure Vacuum Breaker



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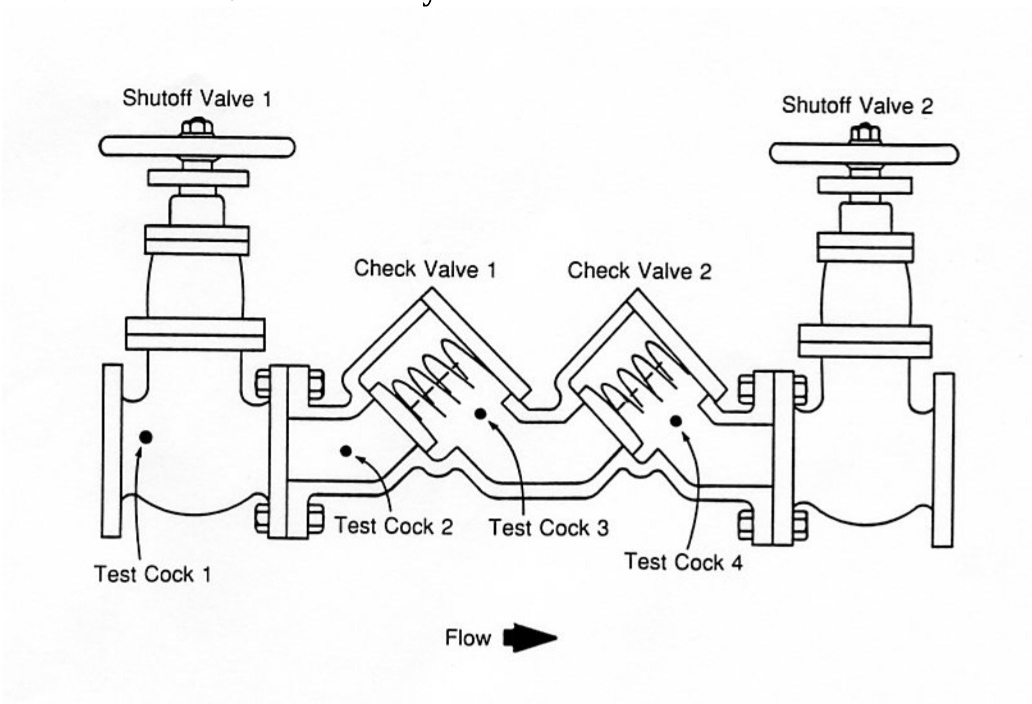
Common uses for a PVB:

Pressure vacuum breakers are primarily used in irrigation. PVB is effective against backsiphonage backflow. However this device will not protect against backpressure backflow.

<u>Double Check Valve Assembly or DCVA</u>

This assembly consists of two internally loaded check valves, either spring loaded or internally weighted, installed as a unit between two tight closing resilient-seated shut-off valves as an assembly, and fittings with properly located resilient-seated test cocks.

Example Double Check Valve Assembly



Common uses for a DCVA:

This device is effective against both backsiphonage and backpressure backflow, but is not suitable for any situation deemed as a "High Health Hazard".

<u>Double Check Detector Assembly or DCDA</u>

This assembly is a larger DCVA with another smaller DCVA and meter on a bypass line**.**

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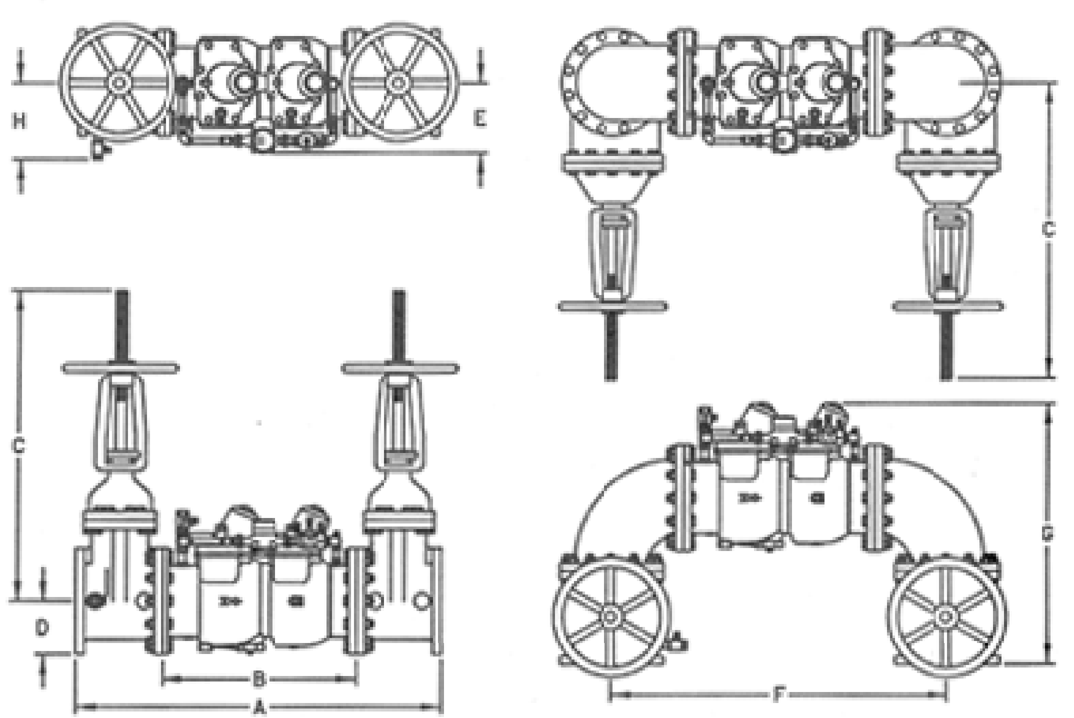
Example Double Check Detector Assembly



Common uses for a DCDA:

Determines if there is any use of water on a non-metered connection. Fire services are a good example of where a DCDA would be used to help detect leaks or water consumption from this type of service.

Reduced Pressure Principle Assembly or RP

This device consists of 2 spring loaded check valves with a pressure-regulated relief valve located between the checks.

Water flows from the supply into the first check valve, pressurizing the lower side of the diaphragm in the relief valve. The first check valve has a spring with no less than 5 pounds of resistance. When the first check opens, it fills the reduced pressure zone and the top of the diaphragm at the relief valve at 5 psi less than system pressure. The water passes through the second check valve losing at least 1 psi, then on to the customer. In the relief valve, there is a spring rated with at least 3 psi difference. If there is a condition of back pressure, backflow, or backsiphonage backflow, the pressure in the relief valve will equalize and the relief valve will open, venting water to atmosphere.

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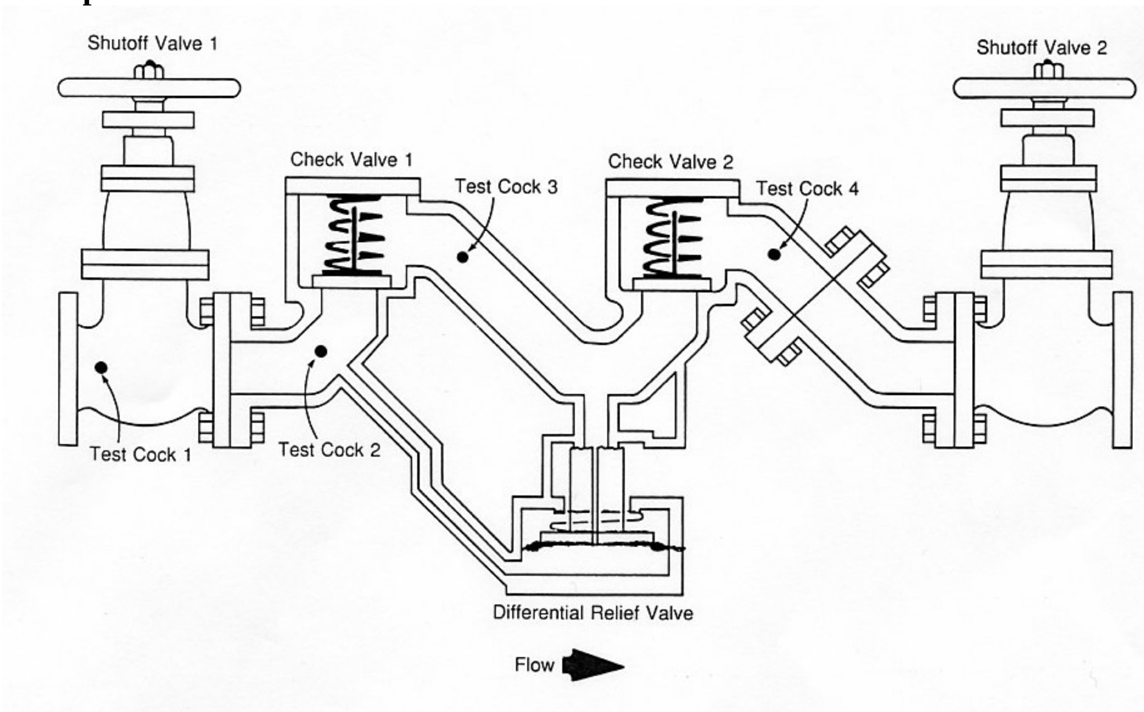
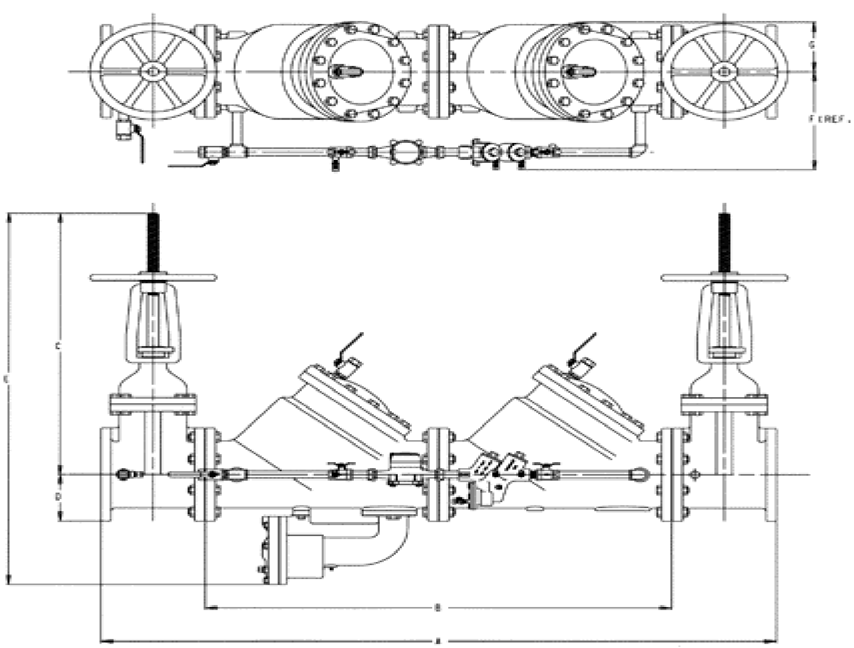
Examples of a RP:



Reduced Pressure Detector Assembly

This assembly is a larger RP with another smaller RP and meter on a bypass line**.**

Example of a RPDA:



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Common uses of a RPDA:

Determines if there is any use of water on a non-metered connection. It is used anywhere there is a need to detect leaks or water consumption through a service that is a “High Health Hazard”.

Cases of illness and death due to lack of Cross-connection control at other water systems:

BACKFLOW AT A MORTUARY:

DATE OF BACKFLOW INCIDENT: ?
LOCATION OF BACKFLOW INCIDENT: ?
SOURCE(S) OF INFORMATION:
- U.S. Environmental Protection Agency, Cross-Connection Control Manual, 1989

CASE HISTORY
The chief plumbing inspector in a large southern city received a telephone call advising that blood was coming from drinking fountains at a mortuary (i.e., a funeral home). Plumbing and health inspectors went to the scene and found evidence that blood had been circulating in the potable water system within the funeral home. They immediately ordered the funeral home cut off from the public water system at the meter. City water and plumbing officials did not think that the water contamination problem had spread beyond the funeral home, but they sent inspectors into the neighborhood to check for possible contamination. Investigation revealed that blood had backflowed through a hydraulic aspirator into the potable water system at the funeral home.
The funeral home had been using a hydraulic aspirator to drain fluids from bodies as part of the embalming process. The aspirator was directly connected to a faucet at a sink in the embalming room. Water flow through the aspirator created suction used to draw body fluids through a needle and hose attached to the aspirator. When funeral home personnel used the aspirator during a period of low water pressure, the potable water system at the funeral home >became contaminated. Instead of body fluids flowing into the wastewater system, they were drawn in the opposite direction--into the potable water system.

BACKFLOW AT A CARWASH:

DATE OF BACKFLOW INCIDENT: February 1979
LOCATION OF BACKFLOW INCIDENT: Seattle, Washington
SOURCE(S) OF INFORMATION:
- American Water Works Association, Recommended Practice for Backflow Prevention and Cross-Connection Control, AWWA Manual M14, Second Edition, 1990
- Pacific Northwest Section of the American Water Works Association, Summary of Backflow Incidents, Fourth Edition, 1995
- U.S. Environmental Protection Agency, Cross-Connection Control Manual, 1989
- Watts Industries, Inc.; Watts Regulator News/Stop Backflow

CASE HISTORY

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On February 12, 1979, many residents in the Greenwood District of Seattle, Washington, began complaining about "grey-green and slippery," "muddy," or "soapy" water. One resident brought a water sample to the Seattle Water Quality Laboratory. Preliminary analysis of this sample showed that the water was contaminated with a detergent solution. The Seattle Water Department dispatched an emergency field crew to initiate flushing of hydrants in the affected area. Investigation revealed that recycled wash/rinse water at a large car wash facility had backflowed into the public water system.

On February 10, a high-pressure pump at the car wash facility broke down. This pump was used to pump recycled wash/rinse water to the initial/scrubber cycle of the car wash, which was not normally connected to the potable water system at the car wash. After the pump broke down, workers kept the car wash operating by connecting a two-inch-diameter hose between piping in the rinse cycle of the car wash, which was directly supplied with water by the car wash's potable water system, and piping in the scrubber cycle.

On February 12, the owner of the car wash facility repaired the high-pressure pump and turned it on. However, nobody removed the hose connection between the rinse-cycle piping and the scrubber-cycle piping. Unbeknown to car wash personnel, the high-pressure pump forced a large quantity of recycled wash/rinse water through the hose connection, the rinse-cycle piping, and the car wash's potable water system into the public water system. This recycled wash/rinse water was, in turn, distributed to the potable water systems of homes and commercial establishments in the surrounding area. Sometime later, a car wash employee flushed the toilet in the car wash's rest room and noticed brown soapy water in the toilet bowl. Car wash personnel quickly realized that they had created a cross-connection and removed the hose between the rinse-cycle piping and the scrubber-cycle piping.

After finding the source of the soapy water problem, the City Water Department conducted water main flushing to intercept and limit the scope of the contamination. Because of its prompt response, the City Water Department confined the contamination to an eight-block area. Nevertheless, the City Water Department delivered a public notification statement to six radio and television stations. Two people in the contaminated area reported illness after drinking the water, but investigations by the Seattle-King County Health Department epidemiologist were unable to authenticate either report.

The City Water Department ordered the owner of the car wash facility to install a reduced-pressure principle backflow-prevention assembly in the potable water service connection to the car wash. The owner complied within 24 hours.