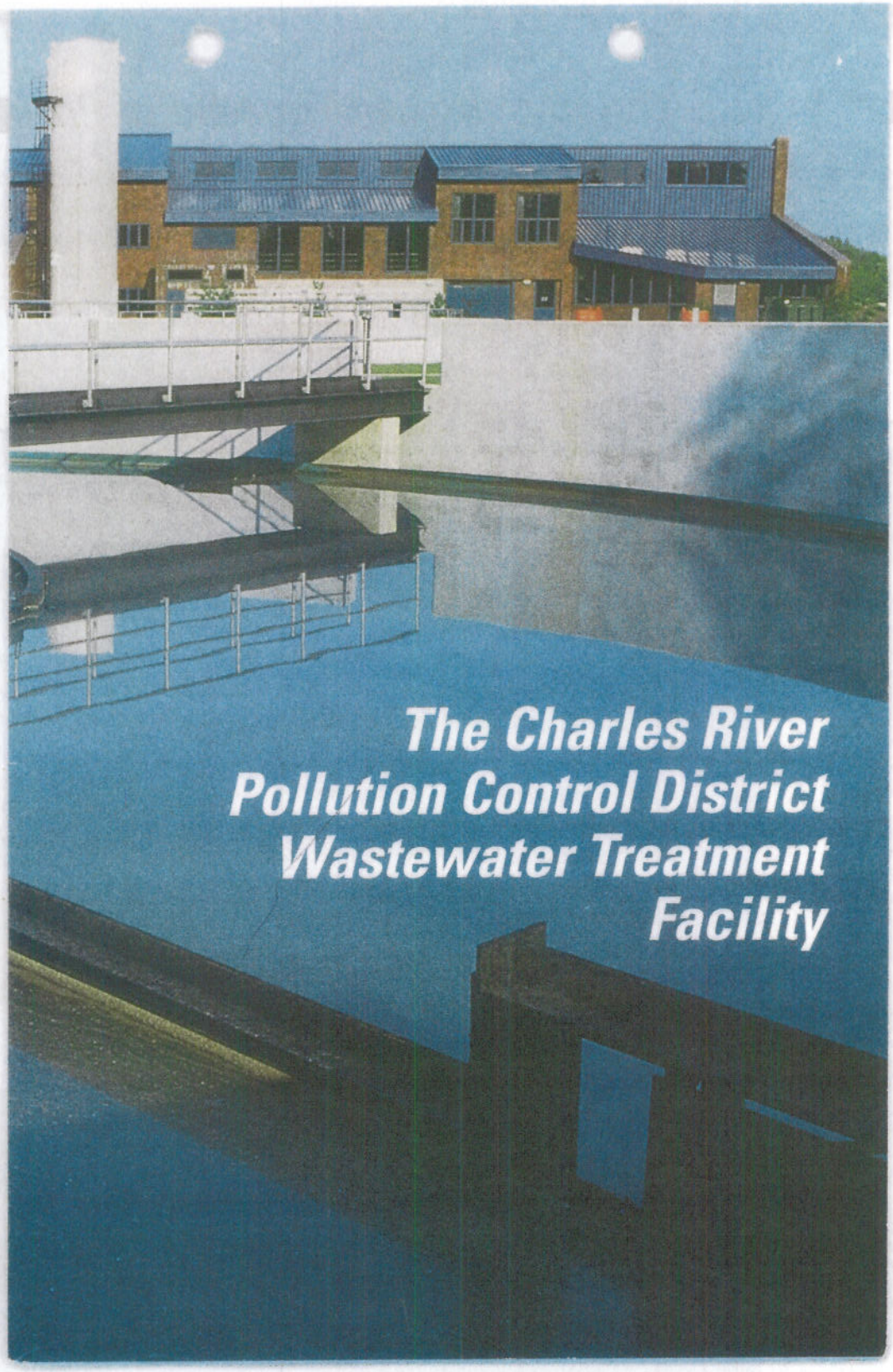
The Charles River
Pollution Control District
Wastewater Treatment
Facility

The Wastewater Treatment Process

The wastewater treatment process at the CRPCD plant includes a number of steps. Solids and grit are removed from the wastewater flow. Chemicals are added to remove phosphorus and control odors. Biological processes and sedimentation reduce organic matter. During the treatment process, some flow and solids recycle back through several steps. After being treated, the flow is filtered, chlorinated, and discharged.

❶ **Screening**—Wastewater enters the plant and passes through screens that remove large material, called screenings.

❷ **Seasonal treatment of nutrients**—From April to October, ferric chloride and lime are added to remove phosphorus. Ferrous chloride is added year-round to control odor.

❸ **Grit removal**—The flow is pumped to the aerated grit chamber, where grit settles out. Grit is pumped to devices that wash away organic matter. Grit and screenings are disposed of in a landfill.

❹ **Primary clarification/flocculation**—The flow enters tanks, where solids flocculate (form clumps) and settle. These settled solids are called primary sludge. The primary sludge is pumped to the gravity belt thickener for further processing.

❺ **Biological treatment**—The flow enters the anoxic selector, where it is mixed with return activated sludge and with recycled flow from the aeration tanks. This combination of wastewater, sludge, and recycled flow is called mixed liquor.

Aerated grit tanks

Biological microorganisms in the mixed liquor seek oxygen. In the anoxic selector, the only available oxygen is in the nitrate. To obtain it, the microorganisms convert nitrate to nitrogen gas and oxygen.

The flow then undergoes aeration. The flow can be split among eight rectangular mechanical aeration tanks and two diffused-air aeration tanks. In these tanks, the microorganisms in the mixed liquor consume the organic matter present in the flow and break

Primary clariflocculator

the organic compounds down into carbon dioxide and water. Also, ammonia is converted to nitrate. This is the nitrate that gets recycled and sent to the anoxic selector, where it is converted by the microorganisms into nitrogen gas and oxygen.

⑥ Secondary Sedimentation/Chemical Treatment—The flow then enters four secondary clarifier tanks, where solids settle out. These solids contain active biological microorganisms; hence they are called activated sludge. Ferric chloride is added seasonally to remove additional phosphorus from the flow.

Disk filters

⑦ Filtration and Chlorination—The flow proceeds from the secondary clarifiers to four disk filters and, when the volume of the flow is high, to two gravity sand filters. The filters remove additional suspended solids. Then the flow proceeds to chlorine contact tanks. Chlorine is added to disinfect the effluent, and sodium bisulfite is added to remove the residual chlorine. In final preparation for discharge, the effluent flows down a cascade. This cascading adds dissolved oxygen needed to support aquatic life in the Charles River.

Mechanical aeration tanks

Diffused air aeration tanks

⑧ Sludge processing and disposal—Sludge is the solid material that settles out of wastewater. Primary sludge is pumped from the primary clariflocculator tanks to the gravity belt thickener. Sludge also flows from the secondary clarifiers to the wet well. From the wet well, some (called return activated sludge) is sent to the anoxic selector, and the remainder (called waste activated sludge) is pumped to the gravity belt thicker. Polymer (long-chain organic molecules that bring about the formation of larger particles) is added to aid thickening, and the thickened sludge is stored in sludge holding tanks. Trucks haul the sludge off-site for final processing and disposal.

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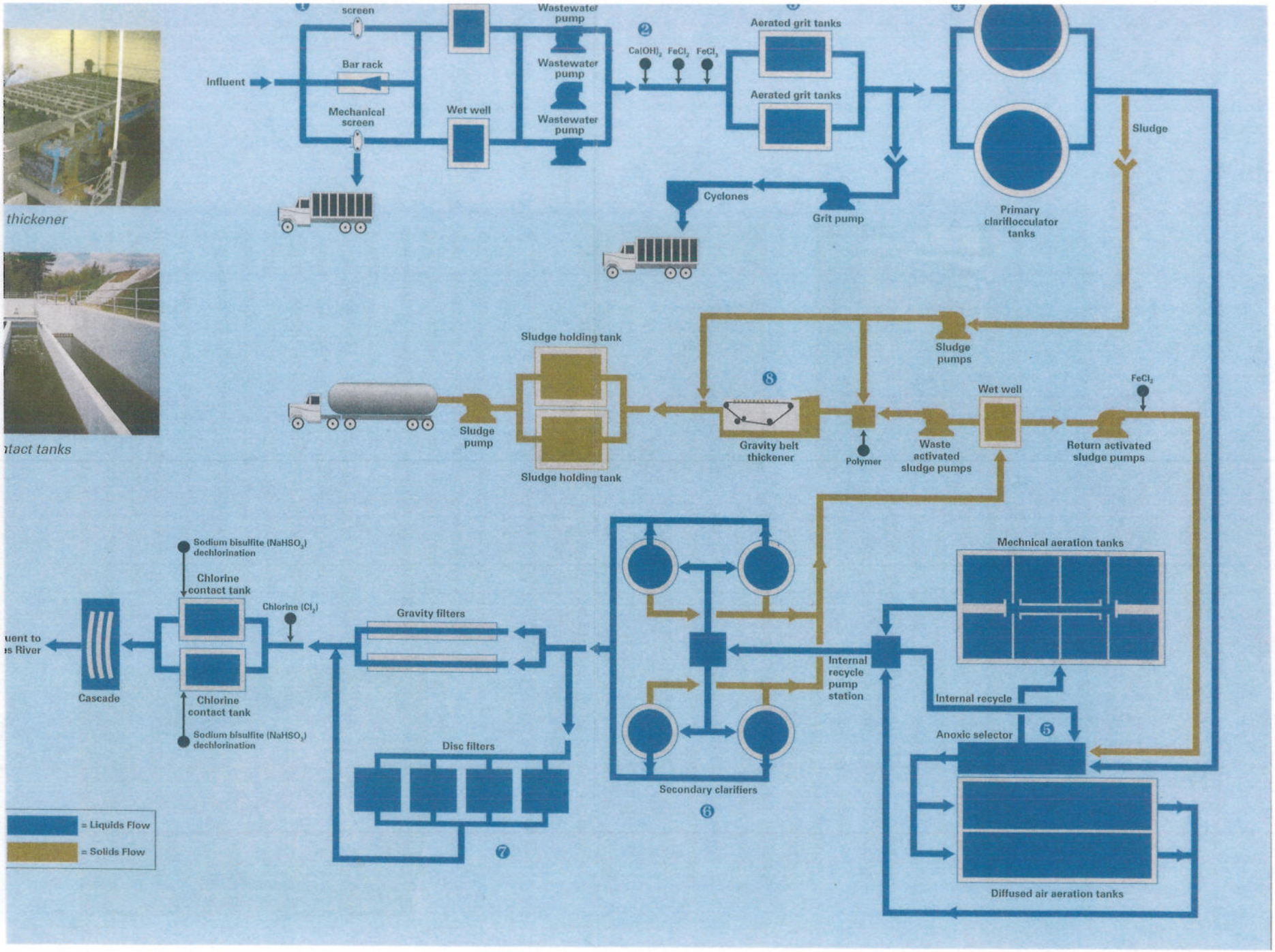

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Improving the Charles River's Water Q

A History of the District

The Charles River Pollution Control District (CRPCD) formed in 1973 to help Franklin and Medway provide wastewater treatment for their increasing populations and to improve water quality in the Charles River. CDM, an environmental consulting firm, helped the CRPCD evaluate and plan to meet regional pollution control needs. CDM provided engineering services for the initially required wastewater facilities. The 4.54 million-gallon-per-day (mgd) plant began operation in 1979. It was designed to meet regional wastewater treatment needs through 1995.

In 1998, CDM designed a modification to the plant, to increase its capacity to 5.7 mgd. The CRPCD anticipates that the expanded plant will meet needs through 2015 for the towns it now serves. The CRPCD now provides wastewater treatment for Millis and Bellingham as well as Franklin and Medway, and it accepts septage (the waste content from septic tanks) from other communities.

Entrance to the treatment facility (top), control panel (middle), laboratory (bottom)

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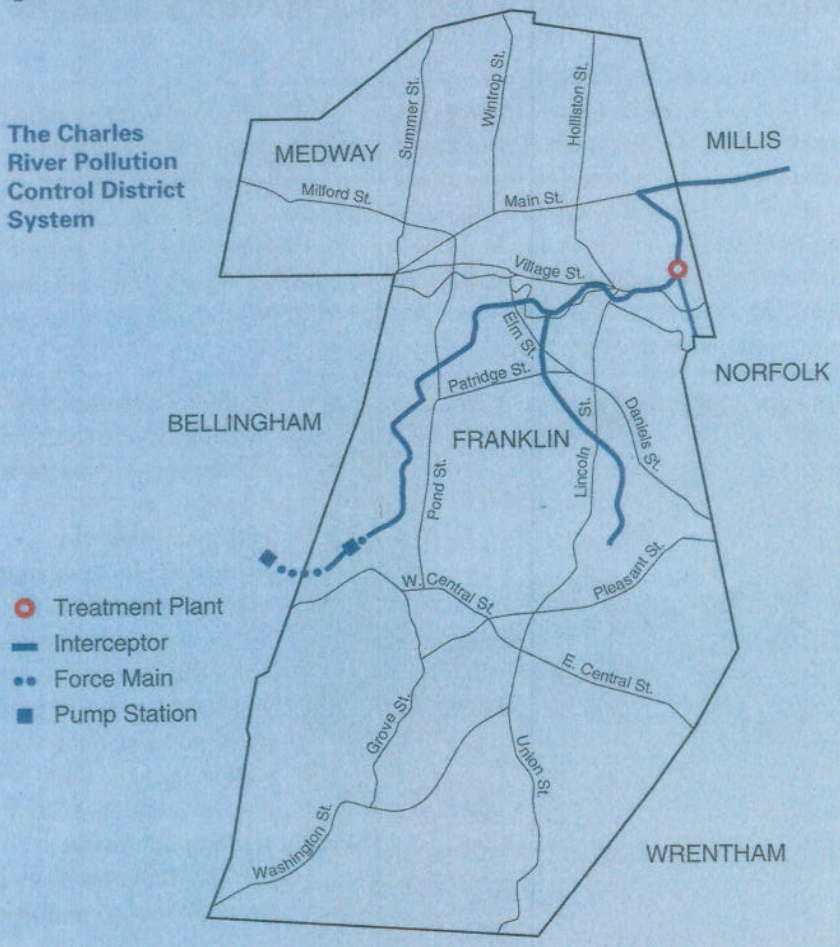
The Charles River Pollution Control District System



The Need for Wastewater Treatment

Wastewater influent (flow that enters the wastewater plant) includes organic and solid materials as well as nutrients such as phosphorus and ammonia. Even after it has been treated, the effluent (the flow that leaves the treatment plant) still contains some of these pollutants. The effluent from the CRPCD treatment facilities is discharged to the Charles River. Significant discharges of certain nutrients would deplete the river's oxygen, necessary to support aquatic life. From April through October, the river is usually too low to assimilate the discharge of phosphorus and ammonia nitrogen, so regulations require particularly stringent treatment during these months.

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Charles River
Pollution Control District

Cheri R. Cousens, Executive Director

Commissioners:
Douglas M. Downing - Chairman
William J. Goode, Jr. - Vice Chairman
Alfred H. Wahlers - Clerk
Paul J. DeSimone
Gene Guidi

Consulting Engineer:
CDM Smith Inc.
Cambridge, MA

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