



# CDM



wastewater

consulting  
engineering  
construction  
operations



# Total Solutions

Each community has different reasons for improving and upgrading its wastewater system—increased population may require capacity expansion, environmental regulations may require treatment process upgrades, water resources needs may dictate new reuse or discharge strategies, and aging infrastructure may require repairs.

To address the dynamic needs of today's wastewater utilities, CDM provides the full suite of consulting, engineering, construction, and operations services.

Throughout the past half-century, CDM's wastewater specialists have studied, piloted, designed, constructed, and operated wastewater treatment facilities ranging in capacity from less than 0.1 million gallon per day (mgd) to more than 1,000 mgd. From planning and facility design, to collection, treatment, sludge and biosolids management, and reuse programs, CDM delivers the right total solution.

Using state-of-the-art technologies, CDM addresses each client's need for reliability, efficiency, and sustainability. In approaching a wastewater challenge, we consider technical, environmental, social, political, and financial issues, providing clients with long-term, cost-effective solutions for today and tomorrow.

## Planning



## Collection



## Treatment



## Reuse



## Biosolids



# Planning

Planning and optimization of wastewater collection and treatment systems are key components of CDM's wastewater management strategy. CDM engages in community dialogue to exchange information, balance stakeholder concerns, and develop affordable, long-term solutions.

- Facilities master planning
- Regulatory compliance and permitting
- Data collection, pilot testing, and benchmarking studies
- Systems optimization
- Organizational enhancement
- Treatment practices evaluation
- Preliminary and final design
- Implementation plans, cost estimates, and funding strategies



Photo: Kevin Kirwin/RVA

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**1. Facilities plan**—CDM developed the Massachusetts Water Resources Authority's Deer Island facilities plan, designed secondary residuals treatment facilities, and saved ratepayers \$165 million by recommending plan modifications during construction. Inset: Egg-shaped digesters.

**2. Optimization**—Strategies reducing operating costs and stabilizing sewer rates saved Topeka (Kan.) \$500,000 in the first year.

**3. Integration strategy**—Collaborative development and implementation of an extensive process control system balanced multiple stakeholder interests with treatment needs for the Metropolitan Council of Environmental Services in St. Paul (Minn.).

# Collection

Our comprehensive collection system services include development, expansion, and rehabilitation. CDM addresses wet-weather challenges with the right combination of collection, storage, pumping, and in-system treatment tools for each community's needs.

- Infiltration/inflow evaluation and hydraulic system modeling
- Combined sewer and sanitary overflow mitigation
- Trenchless sewer rehabilitation
- Real-time controls (RTC)
- System design and construction
- Operations and maintenance
- Capacity, management, operations, and maintenance (CMOM) audits



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**4. System expansion**—Design and construction management of the \$1.5 billion Cairo, Egypt collection system expansion includes more than 425 miles of sewers and 12 large pump stations, serving 17 million people.

**5. Pump system**—Design/build of a precast pump station, sewers, and overflow tank in a Wallingford (Conn.) neighborhood included permitting and working with residents for aesthetic planning.

**6. Wet-weather strategies**—Activated by real-time controls, an inflatable rubber dam inside Philadelphia's (Pa.) main relief sewer will temporarily store overflows, improving water quality in the Schuylkill River.

**7. Trenchless technologies**—Using trenchless technologies, CDM replaced and enlarged portions of Franklin Township's (N.J.) sewer interceptor system with minimal disruption to residents.



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# Treatment

As regulations become increasingly stringent and treatment technologies advance, wastewater utilities face a growing number of challenges. In designing, upgrading, constructing, and operating treatment facilities, CDM combines both established and innovative technologies to facilitate compliance, accommodate increased flows, and support sustainable operations. CDM works with clients worldwide to address treatment requirements, space constraints, impacts to nearby neighborhoods, effluent quality, and operability.

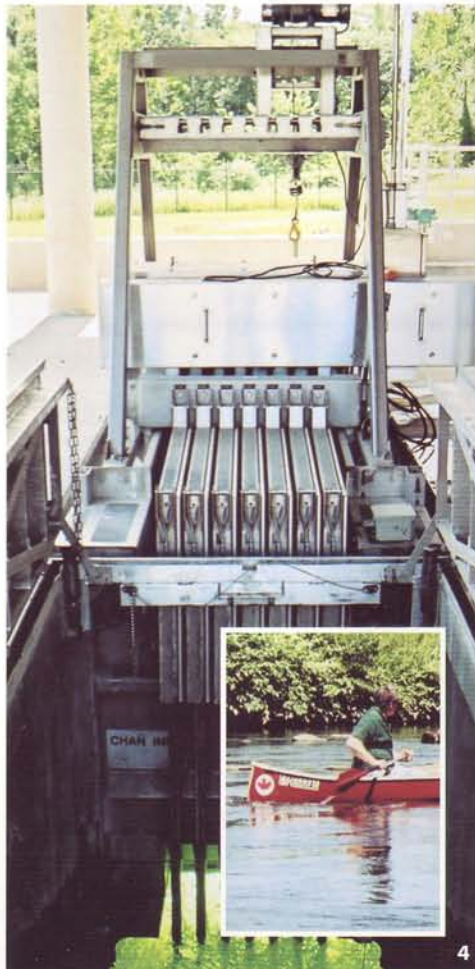
- Process evaluation
- Design
- Pilot testing
- Construction and design/build
- Odor control
- Cost-benefit analysis
- Resources strategies

## High-Rate Clarification

Wastewater systems often become inundated during wet weather. Existing processes may react too slowly or have limited capacity, resulting in untreated effluent discharges and compliance violations. High-rate clarification (HRC)—a physical-chemical process operating at high influent loading rates—is one cost-effective, highly efficient solution to managing storm-induced overflows. CDM is the industry leader in applying HRC technology to treat combined and sanitary sewer overflows. CDM successfully secured the first federal permit providing full implementation of an HRC treatment train and received two national engineering excellence awards for HRC facilities.

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**1. Treatment upgrade**—Planned upgrades to Allegheny County Sanitary Authority's (Pa.) 250-mgd wastewater treatment plant include two-stage packed tower odor control systems for headworks, single-stage odor control systems for aeration basins and channels, solids processing, and primary sedimentation tanks.



**2. Advanced treatment**—Highly treated wastewater effluent discharged into nearby wetlands enables West Palm Beach (Fla.) to develop a new water source. Water from the wetland site will recharge the aquifer to augment the city's drinking water supply.

**3. Stand-alone CSO treatment**—The first U.S. stand-alone combined sewer overflow (CSO) facility to combine HRC with ultraviolet (UV) disinfection will allow Bremerton (Wash.) to reduce CSO discharges to Puget Sound.

**4. UV disinfection**—UV disinfection and biological nutrient removal (BNR) systems at Waterbury's (Conn.) treatment plant safeguard a nearby river from pollution while increasing treatment capacity and meeting future effluent limits. (Hatch open for photograph.) Inset: Recreational boating on the Naugatuck River.

## Membrane Treatment

CDM is spearheading the use of membrane bioreactors (MBR) to treat wastewater for meeting effluent quality requirements and reuse applications. MBRs offer superior performance, reduced space requirements, and improved effluent quality.

## Biological Nutrient Removal

Biological nutrient removal (BNR) is a cost-effective approach for meeting stringent nitrate, phosphorus, and ammonia limitations for wastewater effluent. The BNR process can cleanse effluent for use as industrial cooling water, irrigation water for nitrogen-sensitive crops, and aquifer recharge. CDM evaluates biological and chemical systems to balance each client's needs with federal and local requirements for meeting effluent limits.

## Ultraviolet Disinfection

Because water quality regulations limit the amount of conventional chlorine disinfectant that can be discharged into the environment, ultraviolet (UV) disinfection is an attractive disinfection option for many communities. UV eliminates storage and handling of chlorine and bisulfite required for conventional processes, and requires a shorter effluent detention time. In addition, there is no harmful residuals or toxic byproduct risk to aquatic life when UV is implemented as part of an integrated water resources strategy.

## Odor Control

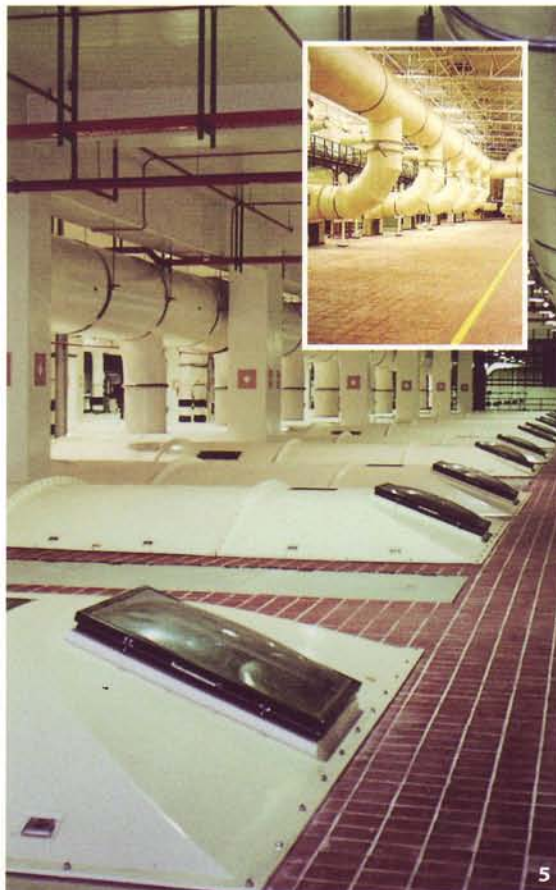
CDM's team of air quality engineers and scientists analyze odor sources and impacts and apply cost-effective, innovative control technologies to make local facilities good neighbors.

**1. Membrane design/build—** Microfiltration and reverse osmosis processes at El Segundo's (Calif.) water recycling plant provide water to local industry.

**2. Biological nutrient removal—** Albuquerque's (N.M.) BNR facility meets stringent effluent limits to improve water quality in the Rio Grande.

**3. High-rate clarification—** By adding a cost-effective HRC treatment train to increase capacity at Forth Worth's (Texas) wastewater treatment plant (WWTP), the city avoided costly expansion of conventional treatment and will meet sanitary sewer overflow regulations.

**4. Odor control—** Odors from the enclosed primary clarifiers, aeration basins, and grit chamber at Manchester's (N.H.) water pollution control facility are treated year-round in a biofilter. Odor control is also provided at the septage receiving and influent pumping stations and solids handling facility.



**5. Two-stage biological treatment—** To provide odor control and increase treatment capacity of the Ulu Pandan WWTP in Singapore, CDM implemented two-stage, ultra-compact biological treatment, including lamella separators, stacked clarifiers, egg-shaped digesters, and three- and four-stage scrubber and carbon adsorption systems. Inset: Odor control.

**6. Phosphorus removal—** Cost-effective membrane technology was selected to improve phosphorus removal and effluent quality at Arapahoe County's (Colo.) WWTP.

# Reuse

By treating wastewater effluent for industrial, agricultural, recreational, urban, and residential reuse as well as for aquifer recharge, CDM helps communities maximize their water resources and preserve precious potable water. CDM evaluates the compatibility of a potential supply with a wide range of demands, working with each community to promote understanding and gain broad public acceptance of reuse recommendations.

- Alternatives analysis
- Aquifer recharge
- Agricultural and industrial reuse
- Residential and urban reuse
- Recreational reuse
- Wetlands augmentation



**1. Agricultural reuse**— Jordan's first advanced WWTP achieves irrigation-quality effluent while sludge thickening and dewatering equipment treat biosolids for potential use as a soil additive.

**2. Integrated reuse**— Orange County's (Fla.) Eastern water reclamation facility utilizes five effluent reuse applications: power plant cooling water, urban and golf course irrigation, groundwater recharge, and wetlands augmentation.

**3. Residential reuse**— Cary's (N.C.) water reclamation facilities supply water for cooling commercial buildings and irrigating public and private landscapes.

**4. Recreational reuse**— Polishing filtration at Oneida's (N.Y.) WWTP supplies irrigation water to the Oneida Indian Nation golf course.

# Biosolids

CDM is working with clients around the globe to investigate biosolids treatment, disposal, and beneficial use options utilizing the latest thickening, stabilization, dewatering, composting, thermal drying, and incineration technologies. As evolving regulations and public opinion continue to drive biosolids treatment, CDM is helping clients to evaluate options and select the right total solution.

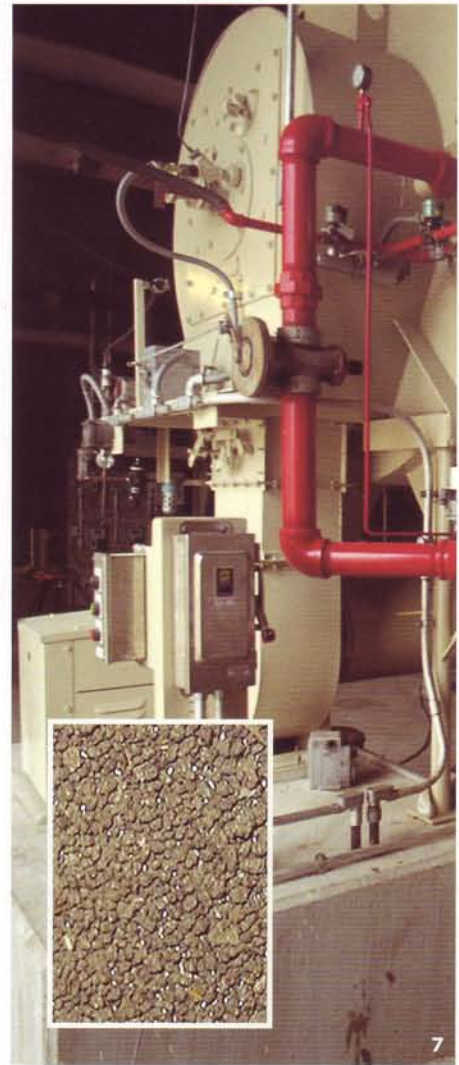
- Planning, site selection, design, and construction services
- Beneficial use investigation and implementation
- Biosolids treatment technologies
- Environmental management systems



**5. Biosolids processing**—Design, contract management, and start-up of new biosolids processing facilities, including odor control, anaerobic digesters, dewatering equipment, and a 40-dry-tons-per-day pelletizing facility, will enable the Greater Lawrence Sanitary District (Mass.) to avoid costly sludge disposal.

**6. Compost design**—Planning, design, and construction services of a biosolids composting facility in Longmont (Colo.) include an aerated static pile process that converts dewatered, undigested sludge to compost for use as a soil additive.

**7. Pelletizing**—A state-of-the-art, heat-efficient, odor-controlled pelletizing facility in Tampa (Fla.) processes 45-dry-tons-per-day of sludge using rotary heat dryers. Inset: Pelletized sludge for beneficial use.



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