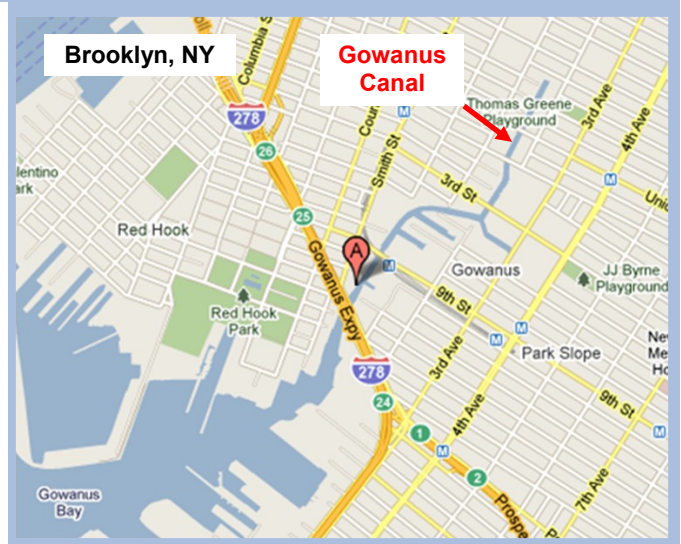


GOWANUS CANAL Brooklyn, New York

D.O. Supplementation of Canal

Design Performance: Maintain 4 mg/l minimum D.O.
throughout 7500 ft canal length

Reference: Roger Owens
Dvirka & Bartilucci Consulting Engineers
330 Crossways Park Drive
Woodbury, NY 11797



Project Background

The Gowanus Canal originally served as a navigable waterway prior to the development of efficient railroads and truck routes. Built in the 1860s, the canal served industries such as tanneries, cement works, paint, ink and soap facilities. As a result of years of discharges, storm water runoff, sewer outflows and industrial pollutants, the Gowanus Canal has become one of the nation's most extensively contaminated bodies of water. Contaminants include PCBs, coal tar wastes, heavy metals and volatile organics. In 2010, the Gowanus Canal was added to the EPA's Superfund National Priorities list for further investigation.

In 1911, a flushing tunnel was built to allow for artificial circulation of the water in the canal. This flushing tunnel had to be updated and a new pump station was needed to control Combined Sewer Overflows (CSOs) at the head end of the canal. During the 26 months construction period, the Gowanus Canal had to be able to support existing aquatic life. Without the flushing action from the Upper New York Bay, dissolved oxygen (D.O.) levels would quickly deplete. The New York City Department of Environmental Protection (NYC DEP) chose the ECO₂ SuperOxygenation technology out of 5 investigated aeration technologies to maintain D.O. levels in Gowanus Canal.

Dissolved Oxygen Supplementation of Lakes, Rivers, Reservoirs



Gowanus Canal, NY



Marston Reservoir, CO



Upper Oso Reservoir, CA



GPA Savannah Harbor, GA



3939 Priority Way South
Drive, Suite 400
Indianapolis, IN 46240
317.706.6484

www.eco2tech.com

The ECO₂ SuperOxygenation technology is an innovative, economical and environmentally friendly solution for Dissolved Oxygen (D.O.) Supplementation in lakes, rivers and reservoirs. Applications include D.O. discharge compliance, supplemental oxygenation below powerhouse dams, and injection into the hypolimnion of reservoirs to improve fish habitats and reduce algae blooms. The proprietary ECO₂ technology has been proven at locations including the Marston Reservoir in Colorado, the Upper Oso Reservoir in California, and the Savannah Harbor ReOx Demonstration Project. Visit our website at www.eco2tech.com to read more about our technology.

Design Considerations and Selection of ECO₂ SuperOxygenation

The Gowanus Canal is 7,500 feet in length and 100 feet in width with a depth ranging from 4 to 16 feet at mean low water. The Gowanus Canal is an estuarine waterbody with a semi-diurnal tidal cycle varying between 5 and 7 feet. During a period between the mid-1960s and 1999 when the flushing tunnel was inoperable the median D.O. level was 2 mg/L resulting in discoloration, odors, and adverse impacts to aquatic life. After the tunnel returned to operation in 1999, the median D.O. level was 8 mg/L, considerably improving water quality.



Installation of ECO₂'s Speece Cone at Gowanus Canal

The NYC DEP developed a facility plan to reduce the level of CSO occurring into the Gowanus Canal requiring the shut down of the flushing tunnel for a period of 26 months while construction occurred. Dvirka & Bartilucci Consulting Engineers reviewed a number of alternatives to maintain D.O. levels, including an interim flushing system, surface aeration, surface aspiration, venturi aspiration, diffused aeration, and side stream oxygenation. Side stream oxygenation, using the [Speece Cone developed by ECO₂](#), was selected based upon several important considerations:

- Efficient oxygen transfer rates (90-95%), regardless of canal water level
- Non-clogging / Non-fouling
- Low operations & maintenance costs
- No stripping of odors due to gas bubble action
- Versatile control of D.O. levels
- No interference with canal use
- Oxygen transfer performed in a centralized, controlled unit

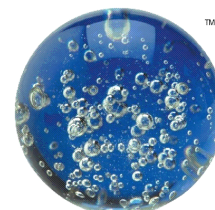
Results

The [ECO₂ SuperOxygenation System](#) is sized for a maximum oxygen feed rate of 3,250 lb/day and is designed to run continuously during the 26 month construction period. The oxygenated water is distributed along a 2,500 ft diffuser pipeline to ensure adequate lateral mixing of the water without undue disturbance of bottom sediments.

The system was commissioned in mid-July 2010 and quickly elevated D.O. levels to 12 mg/L. As the system could easily maintain 8 mg/L in the canal, the project team and contractor were able to shut down the flushing tunnel and move forward with the construction project according to schedule.



Exposed Diffuser Pipe at Low Tide



ECO₂