

Combining Infrastructure Improvements and Air Quality Benefits: A Case Study of the New York/ New Jersey Harbor Deepening Project



This case study is an example of how a team of federal, state, and local stakeholders in New York and New Jersey worked together to cost-effectively and expediently offset emissions over the life of a harbor deepening project. The resulting marine vessel engine upgrades ensured the project complied with the Clean Air Act and provided lasting clean air benefits.

Introduction

Efficiency improvements are increasingly important for ports around the country as they strive to handle growing container volumes, compete for inland markets and cope with market uncertainties. But ports are not the only player in a rapidly changing industry. Ocean carriers have made their own efficiency gains, rapidly increasing the size of their ships to take advantage of economies of scale on the high seas. A generation ago, the largest container ships could barely hold 4,000 twenty-foot containers. Today ships are built to hold five times that number.

The expansion of the Panama Canal, completed in 2016, provided an impetus for ports on the East and Gulf Coasts to embark on major projects to cope with these larger vessels by deepening navigation channels

and harbors. But dredging millions of cubic yards of sediment is neither easy nor cheap, and carries with it the potential to disrupt the environment. Many deepening projects spark opposition from local communities or environmental advocates, who viewed this infrastructure development at odds with goals of protecting human health and the environment.

This need not be the case. The New York/New Jersey Harbor Deepening Project demonstrated how to simultaneously protect air quality and modernize critical infrastructure. The achievement was made possible by a proactive collaboration between federal, state and local agencies and the local port authority. The benefits of the multi-agency collaboration went further than the immediate project, helping to position the agencies to meet federal environmental requirements for future projects.

Overview

The \$2.1 billion New York/New Jersey Harbor Deepening Project began construction in 2004. Over the course of the subsequent 12 years, the US Army Corps of Engineers (Army Corps) oversaw the completion of 21 dredging contracts, removing more than 40 million cubic yards of sediment to provide a 50-foot depth for ships accessing the Port of New York and New Jersey, the East Coast's largest port.

Before the project could proceed, the Army Corps as the lead federal agency had to demonstrate compliance with environmental requirements. To meet Clean Water Act requirements, they committed at the outset to construct 40 acres of wetlands at two marsh restoration sites. Through the beneficial reuse of dredged material, they were able to restore two additional sites later in the project.

The Federal General Conformity provision under the Clean Air Act requires federal agencies to ensure that their activities do not interfere with state efforts to attain the National Ambient Air Quality Standards in areas that don't meet those standards. When a new federally funded project exceeds an annual air emissions threshold, the sponsor must offset all the air emissions from the project.

For the Harbor Deepening Project, meeting the Federal General Conformity obligations was not a straightforward process. At the onset of the project, there were significant uncertainties related to the timing of construction work and emissions over the lifetime of the project. Ultimately there were over twenty separate dredging contracts for the various phases of the project spanning over a decade. There was no way prior to the start of construction to be certain of the extent of offsets needed each year.

In addition, the types of offsets mattered. The air regulators and affected communities expressed concern that obtaining credits from stationary sources shut down many years ago would not adequately protect air quality and be consistent with state efforts to achieve federal standards. They indicated a strong preference for concurrent emission reduction projects to achieve compliance with General Conformity.

The potential offsets, however, were also subject to a large amount of uncertainty. Several different types of offset projects – equipment electrification, engine repowering and vehicle replacements for example –

were known to be effective emission reduction options, however the cost and technical feasibility in the marine sector were not well understood.

Lastly, the timing and magnitude of emissions and offsets was also a major consideration. The initial plan envisioned project emission spread relatively evenly across the multiple years of the project, never exceeding 500 tons per year. However the project partners recognized that conditions might change which they did. At peak construction, dredging operations resulted in approximately 1,000 tons of nitrogen oxides (NO_x) that would need to be offset.

Project Details

Early on, the Army Corps and Port Authority of New York and New Jersey recognized the need for close coordination with federal and state partners. A full five years before construction began, the agencies formed a Regional Air Team, lovingly referred to as the RAT, to ensure open communication and develop a coordinated plan. Agencies involved in the RAT include the Army Corps of Engineers New York District, Port Authority of New York and New Jersey, New York State Department of Environmental Conservation, New Jersey Department of Environmental Protection, New York City Department of Transportation, and U.S. Environmental Protection Agency – Region 2.

Specifically, the RAT was charged with the following:

- Provide a mechanism by which the final decisions could be agreed upon and signed, ensuring that General Conformity requirements would be met prior to the start of construction while the design phase moved forward and the start date could remain unchanged;
- Provide a determination of the federal action's potential emissions impact;
- Identify emission reduction strategies and technologies;
- Develop an implementable mitigation plan to bring the project into conformity with the Clean Air Act; and
- Develop monitoring and recordkeeping procedures to track emissions and reductions during the life of the project to ensure compliance.

Two major milestones prior to breaking ground were the conditional Statement of Conformity and the Harbor Air Management Plan. A Statement of

Conformity is a determination by the federal sponsor that the project meets its General Conformity obligations. The determination was conditional because rather than specifying the precise mix of credits and mitigation projects that would be used to offset the Harbor Deepening Project emissions, the conditional Statement of Conformity described a process to arrive at the preferred offsets. This was combined with a commitment not to begin construction until the offset plan was in place.

The Harbor Air Management Plan laid out this offset strategy. The RAT evaluated a total of 19 categories of offsets and prioritized them based on timing, cost effectiveness and risk.

In 2004 the plan was finalized, with a commitment to review the plan annually and adjust as needed. The mix of offsets envisioned in 2004 included aftertreatment controls on a Staten Island Ferry, upgrading engines on eight diesel tugboats, and using purchased offset credits during the first two years of the project to allow enough time to fully implement the plan.

To ensure that enough offsets were in place for each year of the project, the RAT established a tracking and reporting process. Prior to the bidding out of contracts, the Army Corps refined emissions estimates based on the type of dredging operations, the amount of material, and the anticipated equipment. They included requirements in the contracts with dredging companies capping emissions and requiring that companies report on engine characteristics and activity on a monthly basis in order to confirm the caps on emissions were not exceeded. The contracts specified that if these caps were exceeded, the dredging company would be required to obtain additional air emission offsets at its own expense.

After the first years of construction, the RAT quickly realized that the initial plan for offsets needed significant adjustment. The RAT's analysis pointed to the strategy of repowering even more marine engines

as the most cost-effective option for reducing NO_x. The Port Authority of New York and New Jersey funded two rounds of vessel repowers, providing funding for vessel owners to replace aging marine engines with new equipment meeting the cleanest standard available at the time. In addition, New York City Department of Transportation retrofitted or replaced engines on its entire Staten Island Ferry fleet. All told, the project partners funded engine repowers or aftertreatment controls on three dozen tugs and ferries operating in the harbor.

As an oversight mechanism, the owners who received funding for repowers were obligated to keep their vessels operating in the nonattainment area and report on activity on an annual basis.

Outcomes

Through this process, the project sponsors were able to ensure compliance with General Conformity requirements – no easy feat for large, complex projects such as harbor deepenings. Any ambiguity as to compliance with these federal rules would leave the project open to lawsuits, which in the worst case could shut down construction.

The innovations in the Harbor Deepening Project went well beyond compliance. The air quality benefits arising from the project were significant and lasting. In putting into place enough offsets to cover the highest year of project emissions, the measures resulted in a surplus of emission reduction offsets during other years. All told, the project partners not only offset the 5,000 tons of nitrogen oxide project emissions but eliminated more than 2,000 tons over and above that figure. Furthermore, the repowered marine engines will continue to provide a benefit for the lifetime of the vessels, well beyond the end of the Deepening Project.

The added benefit to the environment allows the project partners to showcase improvements in air quality to concerned communities that were impacted



Photo Courtesy of New York City Department of Transportation (<https://www.siferry.com/currentvessels.html>)

by construction activity. It also puts agencies in a stronger position for future projects.

It did not take long for these future projects to materialize. In the years after 2012's Superstorm Sandy, Congress authorized the Army Corps of Engineers to conduct an extensive series of beach renourishment projects along the New York and New Jersey coastline. The Army Corps needed to move quickly to provide storm protection while also meeting their General Conformity requirements.

The vessel repowers completed for the Harbor Deepening Project were continuing to provide an emissions benefit that could be applied to these beach renourishment projects as well as others that emerged in the future. The RAT put together a protocol that detailed how the offsets would be counted, tracked and distributed among project partners. The process culminated in a letter of concurrence signed by all the partner agency executives, recognizing that the protocol provided a mechanism to meet the requirements of an Early Emission Reduction Credit program under EPA's General Conformity regulations.

Lessons Learned

Building in flexibility is critical as changes to project schedules and vessel activity can have a significant impact on the timing and quantity of offsets needed. General Conformity requirements typically apply on an annual basis. A critical way in which the RAT dealt with unexpected increases in project emissions or decreases in offsets was by building in contingency factors. The RAT applied a 10 percent buffer for both the project emissions estimates and offset estimates. Building in this buffer proved necessary as invariably towards the end of the year some surprises occurred – a ferry vessel operated less than expected or additional work on a dredging contract was needed.

Additionally, despite the best efforts of the partners, additional emissions credits twice needed to be purchased from the states' offset registries. Monthly meetings where year-to-date emissions were monitored helped to ensure the scheduled offset projects were sufficient. However, when necessary, the group took additional steps to ensure the project was always in compliance with the federal requirements.

The key to project success was a high level of coordination between federal, state and local

agencies, and the non-federal partner (Port Authority of New York and New Jersey). This coordination began well before a dredge scooped the first shovel-full of sediment and continued throughout the entire span of the project. A written record of the meetings, emissions tracking, and key decision documents helped to bring new personnel up-to-date on the background and current status of the project.

The technical work done by the RAT helped develop a better understanding of marine vessel sector emissions and identify the most cost effective NO_x emissions reduction strategies. The program provided real world confirmation of the cost effectiveness of reducing NO_x emissions via marine engine repowers. The average cost per ton of NO_x reduced from the marine repower projects was \$2,078, a figure that compares favorably with most other emission reduction projects in the region.

A number of emerging technologies were evaluated, including retrofitting a Staten Island Ferry with a Selective Catalytic Reduction unit. The RAT also worked with dredge operators to log engine data to have a better understanding of the emissions profile in this sector. Lastly, an emissions inventory of marine vessels in the harbor at both the start and end of the project added to an understanding of the potential for further emissions reductions from this sector.

Next Steps

While the Harbor Deepening Project is over, the Regional Air Team remains active. The group is continuing to track the offsets from the Harbor Deepening and their application to meet General Conformity requirements on other projects. The process put in place has successfully been applied to more than 10 projects subsequently.

The Army Corps of Engineers is in the process of setting up a marine engine replacement program, using the lessons learned from the Harbor Deepening Project, to meet General Conformity obligations for additional upcoming projects.

Additional Resources

- [Harbor Air Management Plan](#)
- [Surplus NO_x Emissions Offset Protocol](#) that includes sample contract language with emissions reporting requirements